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FIRST- AND SECOND-ORDER TRIANGULATION IN MICHIGAN

(1927 DATUM)

BY

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TRIANGULATION IN MICHIGAN (1927 DATUM)

GENERAL STATEMENT

This volume contains the results of all first-order triangulation in Michigan executed before 1935 by the Coast and Geodetic Survey and by the United States Lake Survey. It also includes triangulation of other grades, mainly third-order, executed by the United States Lake Survey since its beginning about the middle of the last century. The geographic positions contained herein are on a new datum and supersede the positions heretofore published by either the Coast and Geodetic Survey or by the United States Lake Survey.

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 has also been made. The field work of 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 of the eastern section are now available.

This volume is the sixteenth of a series of publications, each of which contains the geographic positions on the new datum, and the descriptions and other data, for the available first-order (and, in some cases, the second-order) triangulation and traverse of a State. The following volumes have already been published:

	Spec. Pub. No.
Triangulation in Colorado	160
First-Order Triangulation in Southeast Alaska	164
First- and Second-Order Triangulation in Oregon	175
First-Order Triangulation in Kansas	179
First-Order Triangulation and Traverse in Louisiana	183
First-Order Triangulation in Missouri	186
First-Order Triangulation and Traverse in Arkansas	187
Triangulation in Texas	189

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

	Spec. Pub. No.
Triangulation in Oklahoma	190
First- and Second-Order Triangulation and Traverse in North Carolina	192
First- and Second-Order Triangulation in Tennessee	198
First- and Second-Order Triangulation in California	202
First- and Second-Order Triangulation and Traverse in Minnesota	203
Triangulation in Utah	209
Triangulation in Wyoming	212

COMPUTATIONS

Some of the arcs included in this publication form part of the general adjustment of first-order triangulation in the eastern part of the United States. This general adjustment was made under the direction of Dr. Oscar S. Adams, who was assisted by W. F. Reynolds, Hugh C. Mitchell, H. S. Rappleye, and others in the Division of Geodesy. The adjustment of the other arcs on the 1927 datum together with the supplementary stations and intersection points was made by several members of the division, of whom it seems to be specially fitting to mention, J. Z. Reday, W. C. Mott, and D. M. Agey.

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:

$$\phi = 39°13'26''.686$$
$$\lambda = 98\ 32\ 30\ .506$$

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.

Figure 1.—Spectacle Reef Lighthouse.

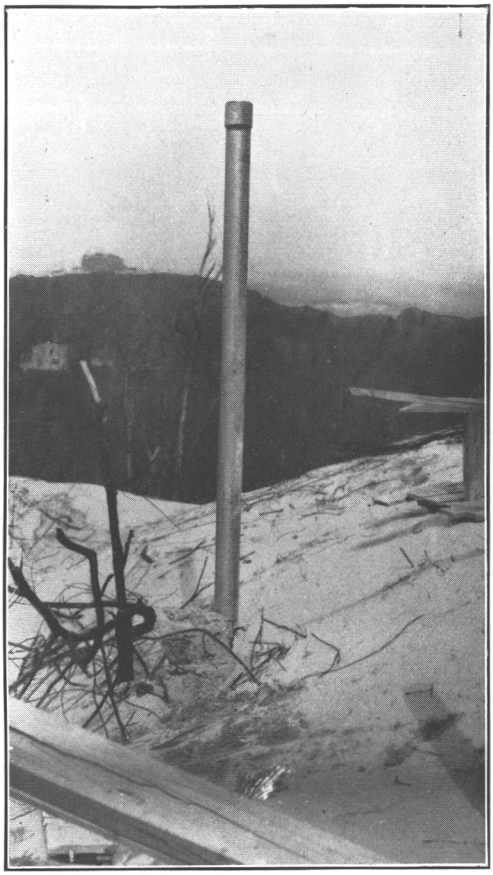

Figure 2.—Triangulation station Park.

ARCS INCLUDED IN THIS PUBLICATION

The triangulation included in this volume consists of nine main-scheme arcs, five of which extend from north to south and four from east to west. Of the north-south arcs the most eastwardly is the Detroit to Thunder Bay arc and just west of it is an almost continuous arc which has been separated into two parts, the upper one of which is the Gaylord to Mount Pleasant arc and the lower one the arc from Saginaw to Hillsdale. Farther west is the arc from Grand Traverse Bay to Sturgis while on the extreme west is the arc East Shore of Lake Michigan. Of the east-west arcs northern Michigan is the most northerly one, below it is the arc from Big Rapids to Lake Huron, farther south is the arc from Detroit to Jackson, and most southerly of all is the arc from Toledo to Chicago.

It has been thought best to designate the location of some of the intersection points by the use of familiar local names and for this purpose the names of rivers have been used to some extent. With few exceptions, however, their geographic positions will be found grouped with those of the arc to which they belong.

All of the supplementary stations and intersection points listed in this volume with the notation "U. S. L. S." have been computed from data either furnished directly by the United States Army Engineers or from data secured from the United States Army Engineers Report of 1902. In order to avoid confusion the names of the stations as given in this publication have been kept in the same form as given by the Army Engineers in the 1902 report.

The positions of some of the stations taken from the United States Army Engineers Report of 1902 were determined by applying a correction to each of the published positions. This correction was the difference in the position of a nearby main-scheme station as computed originally and published in the report of 1902 and the position as computed on the 1927 datum. In some cases no nearby main-scheme station was directly available on both the old and the new datums. Under those circumstances as close an approximation of the locality change as could be derived was used.

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

Discussions of the Laplace azimuths and the bases which control the azimuths and lengths of the triangulation in this volume are given in other publications of this Bureau and are not repeated here. See discussion under heading "Characteristics of First-Order Triangulation" on page 7.

BASE LINES AND AZIMUTHS

The triangulation given in this volume is controlled by several base lines measured by the United States Lake Survey, and by two lines measured in 1931 by the Coast and Geodetic Survey, one at Sturgis and the other at Howard, both on the Sturgis to Big Rapids arc.

In addition to length control the orientation was stabilized by observing eight Laplace azimuths. There is one at Hamlin and one at Johnston on the east shore of Lake Michigan arc; one at LeRoy

and one at Barry on the arc from Grand Traverse Bay to Sturgis. One was observed at Indian on the Gaylord to Mount Pleasant arc, one at Borm on the intersection of the Big Rapids to Lake Huron arc with the arc from Saginaw to Hillsdale, one at Teichman on the Saginaw to Hillsdale arc and one at Hamilton on the arc from Detroit to Jackson.

GENERAL DESCRIPTION OF TABLES AND SKETCHES

The tables of geographic positions, on pages 18 to 165, 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 16, 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 174 to 332, 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 redescribe 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.

Some years ago this bureau adopted systems of plane coordinates for the various States, and now includes in each State publication of triangulation data the plane coordinates of all stations within the State for which geographic positions are given. These plane coordinates are included with the descriptions of the stations; or, where, as in some of the older work of the United States Lake Survey, no descriptions are given, the plane coordinates are arranged in tables. Further mention of the State plane-coordinate systems will be found on page 10.

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 391 of this volume, from which he can find the pages upon which the descriptions, geographic positions, and plane coordinates 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 30 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 30 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. Until the adoption in 1934 of State-wide systems of plane coordinates by the Coast and Geodetic Survey, the engineer was advised to secure a copy of Special Publication No. 71, entitled "Relation between Plane Rectangular Coordinates and Geographic Positions." This publication is sold by the Superintendent of Documents for 10 cents. In it are described both the reduction of geographical coordinates to plane coordinates, and also the transformation of plane coordinates to geographical coordinates. While the engineer may still find this publication useful in rare cases where his survey is of limited extent and is not rigidly adjusted to the national triangulation survey, its use is largely superseded by the adoption of systems of plane coordinates for the various States, making it possible for the engineer to utilize the formulas and methods of plane surveying across wide areas, and at the same time secure the accuracy that comes from the determination of positions by geodetic methods. The system of plane coordinates adopted for the State of Michigan is described further on page 168, and the plane coordinates of all stations within the State, the geographic data for which are included in this volume, are given with the descriptions of stations. (See p. 174.)

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 20 cents; Special Publication No. 145, Manual of Second and Third Order Triangulation and Traverse, cost 25 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 Publi-

cation No. 14, Determination of Time, Longitude, Latitude, and Azimuth, cost 45 cents. If he is interested only in the determination of approximate azimuths, he should secure a copy of Serial 592, Magnetic Declination in the United States, 1935, cost 20 cents.

In computing his triangulation the engineer will find that Special Publication No. 138, Manual of Triangulation Computation and Adjustment, cost 60 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

The main arcs of triangulation contained in this volume are 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, precise 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, in 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.

CHARACTERISTICS OF SECOND-ORDER TRIANGULATION

In second-order triangulation the same general principles apply as in first-order triangulation, but the details of the work will vary with the circumstances. The angles are nearly always determined with a smaller number of measures. The accuracy of second-order triangulation is represented by an average closing error of a triangle of not more than 3 seconds of arc.

Second-order triangulation has been used principally for three purposes: First, for the main scheme of an isolated region of moderate extent such as the Philippine Islands; second, to connect third-order with first-order triangulation when the latter lies at a considerable distance from the area requiring the detailed third-order control; and third, as the detailed control over areas of economic importance. The increasing demand for second-order horizontal control, under the last set of conditions, and the growing economic

importance of the entire coastal region of the United States, led the Director of the Coast and Geodetic Survey to decide, early in 1928, to make the entire coastal main-scheme triangulation of first- or second-order accuracy.

SUPPLEMENTARY STATIONS

In addition to stations which form the main network of the triangulation in Michigan, a number of objects such as water tanks, stacks, and church spires were observed upon from stations of the main scheme. The geographic positions of these supplementary stations have been computed and the data will be found in the tables on pages 18 to 165.

These stations are shown on the sketches and in the index, but only a few are given detailed descriptions as the names of such stations are in most cases adequate for their accurate identification. However, since it has been found convenient for the surveyor using the data to have the plane coordinates on the State system placed with the descriptions of the stations, these stations are included in the descriptions even where the description consists of nothing more than the name of the station, the county in which it is located, and the date of its establishment. Stations originally established by the United States Lake Survey and by the United States Geological Survey may be recognized by the initials, U. S. L. S. or U. S. G. S., placed in parentheses after the name of the station. In the case of the United States Lake Survey, the observations used in computing the positions were made by that organization, except in those instances where ties to them were made in recent years by the Coast and Geodetic Survey in order to place them on the adopted geodetic datum. In all cases positions given for United States Geological Survey stations were computed from United States Coast and Geodetic Survey observations

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 a local 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 of 1927.

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

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

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

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

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

Another Eastern State, New Jersey, early in the year 1935 through legislative enactment,[2] gave legal recognition to the use of its State plane-coordinate system for describing the boundaries of private properties. Similar action was taken by Pennsylvania in 1937, by New York in 1938, and other States are showing considerable interest in the action of these States with the evident intent of at least considering similar legislation for themselves.

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 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

[1] Ch. 116, Laws of 1935, State of New Jersey.

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.

PLANE-COORDINATE SYSTEMS

It has been the practice of the local cadastral surveyor and the engineer making surveys for public works or for projects of a private character to make the computations as if the region involved were a plane and the results would thus be based on a local plane-coordinate system. This is satisfactory when the work is limited to a very restricted area, but when extensions of the surveys are made to surrounding areas trouble is apt to arise. Two adjoining local systems can be coordinated only with a great deal of extra computation. It seemed advisable, therefore, to give study to the possibility of establishing plane-coordinate systems for more extended areas so as to provide the advantages of plane coordinates and at the same time to make possible a perfect coordination of the work of different engineers throughout the whole region for which one system is adequate.

As a result of these studies State-wide systems of plane coordinates were devised for the various States, many States being covered by a system of plane coordinates consisting of a single zone, while for the larger States systems having several zones were required. In order to keep to a minimum the errors of scale which arise from projecting from a curved surface onto a plane, it was necessary to establish three such zones for Michigan. (See p. 168.)

DIFFICULTIES IN USING SPHERICAL COORDINATES

The surface of the earth is not a plane but is very irregular. For purposes of mapping, an ideal surface is assumed that approaches very nearly to what the earth's surface would be if it were entirely covered with water. This assumed surface is not a sphere, but is an ellipsoid of revolution of the form that approaches most nearly the sea-level surface. This spheroidal shape introduces complications in the calculations of survey work when it is extended over a large area. Geodetic surveying is such exact and extensive work that

all computations arising in it have to take into consideration this assumed spheroidal shape which fits closely the actual shape of the earth. All geodetic stations on the earth have to be located by latitude and longitude; that is, each one is referred to a definite place in the network of meridians and parallels that are assumed to cover the surface of the earth in a definite and standardized way. The longitude and latitude of a place on the curved surface of the earth thus correspond in a general way to the x and y coordinates of a place on the usual system of plane coordinates which presupposes a flat surface. But the x and y coordinates of a local plane system have no relation to anything but the assumed origin and the assumed directions of the X and Y axes. Much has therefore been gained through the establishment of State-wide systems of plane coordinates (see pp. 168 to 174), which not only make unnecessary the further use of local independent systems, but which permit the establishment of a definite relationship, for points over a wide area, between plane coordinates on a single plane and geographic positions referred to the meridians and parallels of the earth.

USEFULNESS OF THE SYSTEMS

The establishment of a plane-coordinate system not only simplifies the use of control data but it gives a permanent general grid for large parts of a State. County boundaries, township boundaries, property boundaries, intersections of roads and streets, and any prominent features of a region can be accurately located with definite x and y coordinates. In the general system these plane coordinates can readily be transformed into latitude and longitude, and the point can thus be definitely located in the network of meridians and parallels that serve to locate points on the earth's surface. If the marker at such a point should in some way be destroyed, it could be definitely relocated on the ground from its relation to other marked points. This is a very important characteristic and one that should be given due consideration by all engineers and surveyors.

IMPORTANCE OF PLANE COORDINATES

The establishment of these general systems of plane coordinates are of the utmost importance to State, city, county, and private engineers. Such systems immediately make the general control network of the country easily available for actual use by the field surveyor. This should convince any who are interested in such matters that they constitute an important advance in the execution of local surveys.

Anyone interested in plane-coordinate systems should refer to Special Publication No. 193, Manual of Plane-Coordinate Computation, and Serial No. 562. The Coast and Geodetic Survey has also published two manuals on coordinate systems dealing particularly with traverse. They are Special Publication No. 194, Manual of Traverse Computation on the Lambert Grid, and Special Publication No. 195, Manual of Traverse Computation on the Transverse Mercator Grid.

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EXPLANATION OF TABLE FOR POLYCONIC MAP PROJECTION

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

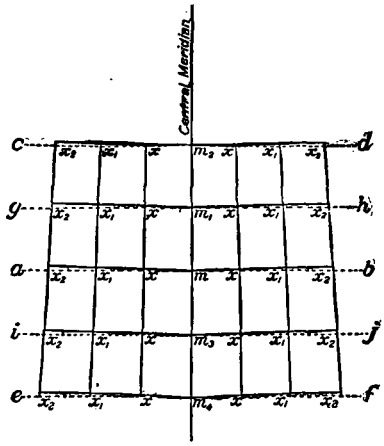

FIGURE 3.—Sketch showing construction of polyconic projection.

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

To make a projection for a large-scale map (1 to 20,000 and larger), first draw a straight line for a central meridian and a construction line *ab* perpendicular thereto, each to be as central to the sheet as the selected interval of latitude and longitude will permit. (See fig. 3.) On the central meridian lay off, on the desired scale, the distances mm_2 and mm_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_4x_2, mx_2, and m_2x_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 mm_2 and mm_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 30 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′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
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′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
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′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
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

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 44°
	1″	1′	1″	1′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
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

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′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
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 latitude 46°
	1″	1′	1″	1′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
46 00	21.518	1,291.1	30.875	1,852.51	0 01	0.1
05	21.486	1,289.2	30.876	1,852.54	03	1.2
10	21.454	1,287.2	30.876	1,852.57	05	3.4
15	21.421	1,285.3	30.877	1,852.59	07	6.6
20	21.389	1,283.3	30.877	1,852.62	10	13.5
25	21.356	1,281.4	30.877	1,852.65	15	30.4
30	21.324	1,279.4	30.878	1,852.68	20	54.0
35	21.291	1,277.5	30.878	1,852.70	25	84.4
40	21.258	1,275.5	30.879	1,852.73	30	121.6
45	21.226	1,273.5	30.879	1,852.76	40	216.1
50	21.193	1,271.6	30.880	1,852.78	50	337.7
55	21.160	1,269.6	30.880	1,852.81	1 00	486.3

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature latitude 47°
	1″	1′	1″	1′		
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*
47 00	21.127	1,267.6	30.881	1,852.84	0 01	0.1
05	21.094	1,265.7	30.881	1,852.87	03	1.2
10	21.062	1,263.7	30.882	1,852.89	05	3.4
15	21.029	1,261.7	30.882	1,852.92	07	6.6
20	20.996	1,259.7	30.882	1,852.95	10	13.5
25	20.962	1,257.7	30.883	1,852.98	15	30.3
30	20.929	1,255.8	30.883	1,853.00	20	53.9
35	20.896	1,253.8	30.884	1,853.03	25	84.3
40	20.863	1,251.8	30.884	1,853.06	30	121.4
45	20.830	1,249.8	30.885	1,853.09	40	215.7
50	20.797	1,247.8	30.885	1,853.11	50	337.1
55	20.763	1,245.8	30.886	1,853.14	1 00	485.4

Polyconic map projection table—Continued

Latitude	Arc of the parallel		Arc of the meridian		Interval of longitude from central meridian	Y coordinate of curvature	
	1″	1′	1″	1′		Latitude 48°	Latitude 49°
° ′	*Meters*	*Meters*	*Meters*	*Meters*	° ′	*Meters*	*Meters*
48 00	20.730	1,243.8	30.886	1,853.17	0 01	0.1	0.1
05	20.696	1,241.8	30.887	1,853.20	03	1.2	1.2
10	20.663	1,239.8	30.887	1,853.22	05	3.3	3.3
15	20.630	1,237.8	30.887	1,853.25	07	6.6	6.6
20	20.596	1,235.8	30.888	1,853.28	10	13.4	13.4
25	20.562	1,233.7	30.888	1,853.30	15	30.2	30.1
30	20.529	1,231.7	30.889	1,853.33	20	53.8	53.5
35	20.495	1,229.7	30.889	1,853.36	25	84.0	83.7
40	20.461	1,227.7	30.890	1,853.39	30	121.0	120.5
45	20.428	1,225.7	30.890	1,853.41	40	215.1	214.2
50	20.394	1,223.6	30.891	1,853.44	50	336.1	334.7
55	20.360	1,221.6	30.891	1,853.47	1 00	484.0	481.9

CONVERSION TABLE

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

In the tables of geographic positions the latitude and longitude of each point are given on the North American datum of 1927, and there are also given the length and azimuth of each line observed over, whether in one or both directions. 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 usually followed in 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. Points whose positions are derived from a measured distance and azimuth are listed to thousandths of a second and are marked as being without check.

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.

If the station is described but not marked, the letter "d." is given in the first column of the table; if marked and not described, the letters "m. n. d." are given; and if described and marked, the letters "d. m." are given. Other letters used in this column are "n. d.", not described; "r.", recovered; "l.", lost; "p. l.," probably lost; and "d. n. m.", described and not marked. In cases where no letters are given on U. S. L. S. stations the information represented by the letters is not available.

The tables may be conveniently consulted by using as finders the sketches and the index at the end of this publication. In the second column of the index will be found for each point a reference to the page on which its geographic position is given, in the third column the page on which the description and/or plane coordinates are given, and in the fourth column the figure number of the sketch on which the station 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 49, the azimuth from Port Austin (U. S. L. S.) to Verona (U. S. L. S.) is 338°56′25″.14 while the back azimuth or the azimuth from Verona (U. S. L. S.) to Port Austin (U. S. L. S.) is 159°01′09″.64.

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

GEOGRAPHIC POSITIONS

Lake Superior

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points	° ′ ″	° ′ ″	° ′ ″				
Farquhars Knob (U. S. L. S.) (Minn.), 1869, r. 1934 (d. m.).	47 52 40.248 89 59 23.202						
East Sawteeth (U. S. L. S.) (Minn.), 1870 (d. m.)	47 23 19.069 91 10 15.211	233 03 59.14	53 56 20.80	Farquhars Knob (U. S. L. S.)	5.0174686	104,104.29	341,548.8
Porcupine Mountains (U. S. L. S.), 1869, p.l. 1935 (d. m.).	46 47 01.127 89 43 50.263	122 06 57.52 170 56 51.57	301 03 40.02 350 45 25.56	East Sawteeth (U. S. L. S.) Farquhars Knob (U. S. L. S.)	5.1085319 5.0906692	128,390.21 123,216.59	421,226.9 404,253.1
Wheal Kate (U. S. L. S.), 1869, r. 1934 (d. m.)	47 04 20.333 88 39 44.669	68 51 50.39 132 19 04.90	248 05 01.16 311 20 23.04	Porcupine Mountains (U. S. L. S.) Farquhars Knob (U. S. L. S.)	4.9417881 5.1280176	87,455.70 134,281.94	286,927.6 440,556.7
Isle Royale East (U. S. L. S.), 1869, r. 1906 (d. m.)	48 07 43.612 88 33 37.364	3 46 30.42 75 52 22.97	183 41 59.17 254 48 38.57	Wheal Kate (U. S. L. S.) Farquhars Knob (U. S. L. S.)	5.0708155 5.0423902	117,710.57 110,252.94	386,188.8 361,721.5
Vulcan (U. S. L. S.), 1869, r. 1935 (d. m.)	47 26 46.729 87 47 37.619	58 00 32.83 143 09 23.92	237 22 16.19 322 35 19.84	Wheal Kate (U. S. L. S.) Isle Royale East (U. S. L. S.)	4.8909228 4.9785034	77,789.82 95,170.73	255,215.4 312,239.3
Huron Mountains (U. S. L. S.), 1871, r. 1872 (d. m.)	46 52 42.363 87 55 17.039	111 11 24.60 188 40 03.17	290 38 54.39 8 45 40.06	Wheal Kate (U. S. L. S.) Vulcan (U. S. L. S.)	4.7807819 4.8053003	60,364.54 63,870.50	198,046.0 209,548.5
Traverse Point (U. S. L. S.), 1871 (d. m.)	47 08 42.132 88 13 59.329	224 36 48.44 321 13 54.73	44 56 10.79 141 27 35.63	Vulcan (U. S. L. S.) Huron Mountains (U. S. L. S.)	4.6737907 4.5792402	47,183.55 37,952.48	154,801.4 124,515.8
Traverse Island (U. S. L. S.) 1867	47 04 10.045 88 16 09.177	198 02 04.20 308 36 52.67	18 03 39.33 128 52 08.04	Traverse Point (U. S. L. S.) Huron Mountains (U. S. L. S.)	3.9463145 4.5306269	8,837.20 33,933.36	28,993.4 111,329.6
Crebassa (U. S. L. S.), 1871, l. 1934 (d. m.)	46 59 00.594 88 24 17.643	215 56 13.92 221 45 16.60 227 08 13.63 237 25 20.56	36 03 46.60 42 12 11.24 47 14 11.08 107 46 32.13	Traverse Point (U. S. L. S.) Vulcan (U. S. L. S.) Traverse Island (U. S. L. S.) Huron Mountains (U. S. L. S.)	4.3463125 4.8401908 4.1480206 4.5869200	22,197.93 69,213.50 14,061.14 38,629.58	72,827.7 227,078.0 46,132.3 126,737.2
Middle (U. S. L. S.), 1871 (d. m.)	46 55 55.157 88 14 22.212	114 31 06.83 171 35 57.93 181 09 58.42	294 23 51.70 351 34 39.75 1 10 15.16	Crebassa (U. S. L. S.) Traverse Island (U. S. L. S.) Traverse Point (U. S. L. S.)	4.1408498 4.1888910 4.3745616	13,830.88 15,448.67 23,689.81	45,376.8 50,684.5 77,722.3
Quaquaming (U. S. L. S.), 1871, p.l. 1934 (d. m.)	46 52 20.291 88 22 21.266	135 20 16.18 168 44 51.29 199 42 13.26 236 45 06.32 268 42 00.39	315 07 34.17 348 43 26.27 19 46 45.26 56 50 56.12 89 01 45.86	Wheal Kate (U. S. L. S.) Crebassa (U. S. L. S.) Traverse Island (U. S. L. S.) Middle (U. S. L. S.) Huron Mountains (U. S. L. S.)	4.4958022 4.1005169 4.3670979 4.0834148 4.5365832	31,318.59 12,604.25 23,286.16 12,117.55 34,401.96	102,751.1 41,352.4 76,398.0 39,755.7 112,867.1
Keweenaw Point north base (U. S. L. S.), 1871, r. 1934 (d. m.).	46 56 48.072 88 26 58.935	219 47 09.05 225 05 43.55 275 45 08.77 324 34 22.90	39 49 06.94 45 13 38.82 95 54 21.66 144 37 45.68	Crebassa (U. S. L. S.) Traverse Island (U. S. L. S.) Middle (U. S. L. S.) Quaquaming (U. S. L. S.)	3.7264643 4.2868250 4.2065230 4.0062264	5,326.77 19,356.42 16,088.77 10,144.40	17,476.2 63,505.2 52,784.6 33,282.1
Keweenaw Point south base (U. S. L. S.), 1871, r. 1934 (d. m.).	46 52 17.821 88 29 16.231	199 10 57.30 206 53 41.26 250 22 52.43 269 27 37.90	19 12 37.56 26 57 19.37 70 33 45.23 89 32 40.75	Keweenaw Point north base (U. S. L. S.). Crebassa (U. S. L. S.) Middle (U. S. L. S.) Quaquaming (U. S. L. S.)	3.9462929 4.1445717 4.3027135 3.9439066	8,836.757 13,949.92 20,077.68 8,788.33	28,991.93 45,767.4 65,871.5 28,833.0
Ives Hill (U. S. L. S.), 1872 (d. m.)	46 49 26.247 87 50 05.110	132 32 01.61 182 33 25.93	312 28 14.04 2 35 14.04	Huron Mountains (U. S. L. S.) Vulcan (U. S. L. S.)	3.9524861 4.8404763	8,963.68 69,259.02	29,408.3 227,227.3
Granite Island (U. S. L. S.), 1872, r. 1873 (d. m.)	46 43 15.511 87 24 40.684	109 33 44.95 114 23 21.64 160 19 51.21	289 20 14.19 294 01 03.00 340 03 02.79	Ives Hill (U. S. L. S.) Huron Mountains (U. S. L. S.) Vulcan (U. S. L. S.)	4.5354174 4.6303772 4.9330247	34,309.74 42,695.02 85,708.66	112,564.5 140,075.2 281,195.8
Triloba (U. S. L. S.), 1873 (d. m.)	46 36 17.966 87 29 21.236	132 46 53.35 166 12 28.03 204 47 49.59	312 31 47.87 345 59 05.83 24 51 13.64	Ives Hill (U. S. L. S.) Vulcan (U. S. L. S.) Granite Island (U. S. L. S.)	4.5553763 4.9838671 4.1524738	35,923.31 96,353.42 14,206.07	117,858.4 316,119.5 46,607.7
Mount Mesnard (U. S. L. S.), 1873 (d. m.)	46 30 48.340 87 23 58.615	146 00 24.53 177 46 56.67	325 56 30.28 357 46 26.09	Triloba (U. S. L. S.) Granite Island (U. S. L. S.)	4.0892310 4.3634037	12,280.92 23,088.93	40,291.7 75,750.9
Shelter Bay (U. S. L. S.), 1873 (d. m.)	46 28 17.920 86 59 16.251	98 30 26.35 111 15 29.45 130 39 21.30	278 12 31.22 290 53 39.33 310 20 53.75	Mount Mesnard (U. S. L. S.) Triloba (U. S. L. S.) Granite Island (U. S. L. S.)	4.5045113 4.6150985 4.6301683	31,952.98 41,219.10 42,674.49	104,832.4 135,233.0 140,007.9
Grand Island (U. S. L. S.), 1872, r. 1929 (d. m.)	46 31 43.339 86 41 34.719	74 27 11.22 98 11 49.07 111 29 29.97	254 14 21.21 277 37 07.46 290 58 10.29	Shelter Bay (U. S. L. S.) Triloba (U. S. L. S.) Granite Island (U. S. L. S.)	4.3712065 4.7898299 4.7710088	23,507.50 61,635.36 59,021.30	77,124.2 202,215.3 193,639.0
Supplementary points							
Farquhars Knob (U. S. L. S.) latitude station (Minn.), 1869 (d. m.).[1]	47 52 40.19 89 59 22.84	103 20 29	283 20 29	Farquhars Knob (U. S. L. S.)	0.892123	7.801	25.59
East Sawteeth (U. S. L. S.) latitude station (Minn.), 1870, l. 1934 (d. m.).[1]	47 23 19.523 91 10 15.500	336 35 22	156 35 23	East Sawteeth (U. S. L. S.)	1.184054	15.28	50.1
Porcupine Mountains (U. S. L. S.) latitude station, 1870 (d. m.).[1]	46 47 01.571 89 43 50.055	17 52 52	197 52 52	Porcupine Mountains (U. S. L. S.)	1.158222	14.40	47.2
Wheal Kate (U. S. L. S.) latitude station, 1866, r. 1870 (d. m.).[1]	47 04 20.652 88 39 43.325	70 50 29	250 50 29	Wheal Kate (U. S. L. S.)	1.477300	30.012	98.46

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Superior—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Isle Royale East (U. S. L. S.) latitude station, 1866, r. 1906 (d. m.).[1]	48 07 43.653 88 33 36.069	87 16 50	267 16 49	Isle Royale East (U. S. L. S.)	1.428380	26.82	88.0
Vulcan Post No. 1 (U. S. L. S.) latitude station, 1867, r. 1908.[1]	47 26 46.673 87 47 38.320	263 17 00	83 17 00	Vulcan (U. S. L. S.)	1.170013	14.79	48.5
Vulcan Post No. 2 (U. S. L. S.) latitude station, 1867, r. 1908.[1]	47 26 45.133 87 47 37.619	180 00 00	0 00 00	Vulcan Post No. 1 (U. S. L. S.) latitude station.	1.6775887	47.598	156.16
Huron Mountains (U. S. L. S.) latitude station, 1866 (d. m.).[1]	46 52 41.589 87 55 17.874	216 29 31	36 29 32	Huron Mountains (U. S. L. S.)	1.473175	29.73	97.5
Keweenaw Point south base (U. S. L. S.) latitude station, 1873 (d. m.).[1]	46 52 17.813 88 29 15.867	91 52 40	271 52 40	Keweenaw Point south base (U. S. L. S.).	0.887288	7.714	25.31

Lake Superior to Menominee

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Logarithm (meters)	Meters	Feet
Principal points							
Mud Lake (U. S. L. S.), 1874, r. 1929 (d. m.)	46 19 13.956 86 48 23.710	140 22 21.14 200 38 11.33	320 14 28.62 20 43 07.63	Shelter Bay (U. S. L. S.) Grand Island (U. S. L. S.)	4.3390142 4.3932641	21,828.02 24,732.28	71,614.1 81,142.5
Divide (U. S. L. S.) 1873, r. 1929 (d. m.)	46 21 41.073 86 39 36.942	68 05 31.46 172 18 47.04 166 07 53	247 59 10.36 352 17 21.68	Mud Lake (U. S. L. S.) Grand Island (U. S. L. S.) Reference mark No. 1.	4.0844565 4.2733651	12,146.65 18,765.71	39,851.1 61,567.2
Manistique (U. S. L. S.), 1874, l. 1929 (d. m.)	46 08 31.475 86 35 54.286	141 05 02.83 168 57 12.65	320 56 01.64 348 54 31.81	Mud Lake (U. S. L. S.) Divide (U. S. L. S.)	4.4069294 4.3951897	25,522.86 24,842.18	83,736.2 81,503.1
Sturgeon (U. S. L. S.), 1874 (d. m.)	46 02 25.964 86 41 10.199	163 24 35.50 210 59 23.34 2 47 43.03	343 19 22.71 31 03 10.94 182 46 39.22	Mud Lake (U. S. L. S.) Manistique (U. S. L. S.) Burnt Bluff (U. S. L. S.)	4.5116447 4.1195494 4.5960883	32,482.14 13,168.90 39,453.75	106,568.5 43,205.0 129,441.2
Fishdam (U. S. L. S.), 1874 (d. m.)	45 57 37.212 86 29 33.422	29 09 44.70 120 48 21.81 157 58 25.86	209 00 21.21 300 40 00.59 337 53 51.66	Burnt Bluff (U. S. L. S.) Sturgeon (U. S. L. S.) Manistique (U. S. L. S.)	4.5427176 4.2416374 4.3383973	34,891.34 17,443.65 21,797.03	114,472.7 57,229.7 71,512.4
Pine Hill (U. S. L. S.), 1874 (d. m.)	45 51 36.857 86 53 54.757	219 19 54.08 322 55 26.00 39 29 42.35	39 29 03.60 143 03 30.16 219 20 56.43	Sturgeon (U. S. L. S.) Burnt Bluff (U. S. L. S.) Ford River (U. S. L. S.)	4.4139417 4.3847409 4.3974365	25,938.31 24,251.63 24,971.03	85,099.3 79,565.6 81,925.8
Burnt Bluff (U. S. L. S.), 1874, r. 1929 (d. m.)	45 41 09.597 86 42 39.112						
Boyer's Bluff (U. S. L. S.), (Wis.), 1874, r. 1929 (d. m.)	45 25 12.631 86 56 10.791	210 42 40.24	30 52 19.70	Burnt Bluff (U. S. L. S.)	4.5364602	34,392.22	112,835.1
Rock Island (U. S. L. S.) (Wis.), 1864, r. 1906 (d. m.)	45 24 53.018 86 48 59.321	93 44 07.77 195 15 40.72	273 39 00.46 15 20 12.14	Boyer's Bluff (U. S. L. S.) Burnt Bluff (U. S. L. S.)	3.9731716 4.4949518	9,400.95 31,257.32	30,842.9 102,550.1
Ford River (U. S. L. S.), 1874, r. 1929 (d. m.)	45 41 12.062 87 06 08.691	270 00 10.27 336 17 42.25	90 16 58.86 156 24 49.09	Burnt Bluff (U. S. L. S.) Boyer's Bluff (U. S. L. S.)	4.4843375 4.5096722	30,502.64 32,334.95	100,074.1 106,085.6
Bark River (U. S. L. S.), 1864, r. 1905 (d. m.)	45 34 30.688 87 14 25.207	253 12 06.48 298 08 28.51 305 50 07.11	73 34 49.05 118 26 36.76 126 03 07.67	Burnt Bluff (U. S. L. S.) Rock Island (U. S. L. S.) Boyer's Bluff (U. S. L. S.)	4.6343305 4.5754957 4.4676172	43,085.44 37,626.66 29,350.61	141,356.1 123,446.8 96,294.5
Cedar River (U. S. L. S.), 1864, r. 1905 (d. m.)	45 25 48.522 87 19 34.384	202 34 31.04 211 25 24.02 271 56 26.72	22 38 11.57 31 34 59.26 92 13 06.55	Bark River (U. S. L. S.) Ford River (U. S. L. S.) Boyer's Bluff (U. S. L. S.)	4.2420977 4.5242794 4.4847858	17,462.15 33,441.01 30,534.15	57,290.4 109,714.4 100,177.5
Door Bluff (U. S. L. S.) (Wis.), 1864, r. 1874 (d. m.)	45 17 46.860 87 03 53.935	126 05 28.38 216 10 39.18	305 54 19.18 36 16 08.72	Cedar River (U. S. L. S.) Boyer's Bluff (U. S. L. S.)	4.4031009 4.2319483	25,298.85 17,058.79	83,001.3 55,967.0
Rochereau (U. S. L. S.), 1874, r. 1934 (d. m.)	45 17 41.138 87 26 11.858	209 51 24.03 269 31 14.57 145 30 17	29 56 06.87 89 47 05.50	Cedar River (U. S. L. S.) Door Bluff (U. S. L. S.) Azimuth mark.	4.2394468 4.4646890	17,355.89 29,153.39	56,941.8 95,647.4
Eagle Bluff (U. S. L. S.) (Wis.), 1874, r. 1934 (d. m.)	45 10 06.515 87 14 13.008	131 53 58.43 166 29 37.00 223 28 40.23 342 53 27	311 45 28.08 346 25 48.58 43 35 59.76	Rochereau (U. S. L. S.) Cedar River (U. S. L. S.) Door Bluff (U. S. L. S.) Azimuth mark.	4.3231365 4.4758475 4.2923514	21,044.40 29,912.14 19,604.30	69,043.2 98,136.7 64,318.4
Menominee (U. S. L. S.) (Wis.), 1874, r. 1934 (d. m.)	45 05 12.662 87 35 33.969	207 54 56.66 251 55 09.11	28 01 35.46 72 10 16.91	Rochereau (U. S. L. S.) Eagle Bluff (U. S. L. S.)	4.4176731 4.4687457	26,162.13 29,426.98	85,833.6 96,545.0
South Egg (U. S. L. S.) (Wis.), 1874, r. 1905 (d. m.)	44 59 20.645 87 21 05.156	119 49 49.41 168 52 19.53 204 17 19.80	299 39 34.66 348 48 42.13 24 22 11.64	Menominee (U. S. L. S.) Rochereau (U. S. L. S.) Eagle Bluff (U. S. L. S.)	4.3404933 4.5394185 4.3400733	21,902.48 34,627.29 21,881.31	71,858.4 113,606.4 71,788.9
Supplementary points							
Peninsula Point Lighthouse (U. S. L. S.)	45 40 05.107 86 58 00.647	355 02 43.9 101 07 17.0	175 04 02.3 281 01 27.9	Boyer's Bluff (U. S. L. S.) Ford River (U. S. L. S.)	4.441789 4.031936	27,656.0 10,763.1	90,735 35,312
Rock Island Lighthouse (U. S. L. S.)	45 25 39.417 86 49 40.925	84 27 58.2 157 58 17.7	264 23 20.5 337 52 21.0	Boyer's Bluff (U. S. L. S.) Peninsula Point Lighthouse (U. S. L. S.).	3.930241 4.460010	8,516.1 28,841.0	27,940 94,623

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Superior to Menominee—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—continued	° ′ ″	° ′ ″	° ′ ″				
Poverty Island Lighthouse (U. S. L. S.)	45 31 21.007	50 12 17.8	230 05 23.1	Rock Island Lighthouse (U. S. L. S.)	4.216340	16,456.6	53,991
	86 39 59.287	124 43 35.8	304 30 43.3	Peninsula Point Lighthouse (U. S. L. S.).	4.454550	28,480.7	93,440
Little Gull (U. S. L. S.), 1864, r. 1903 (d. m.)	45 30 01.526	47 10 32.6	227 05 46.5	Rock Island Lighthouse (U. S. L. S.)	4.075373	11,895.2	39,026
	86 42 59.597	133 44 22.1	313 33 38.5	Peninsula Point Lighthouse (U. S. L. S.).	4.431305	26,996.3	88,570
		237 53 50.4	57 55 59.0	Poverty Island Lighthouse (U. S. L. S.).	3.664599	4,619.5	15,156
St. Martins (U. S. L. S.), 1903 (d. m.)	45 30 38.945	139 05 07.5	318 56 47.1	Peninsula Point Lighthouse (U. S. L. S.).	4.364633	23,154.4	75,966
	86 46 20.093	261 02 01.0	81 06 32.7	Poverty Island Lighthouse (U. S. L. S.).	3.922556	8,366.7	27,450
		284 50 39.8	104 53 02.9	Little Gull (U. S. L. S.)	3.653529	4,503.3	14,775
Sand Point (U. S. L. S.), 1903 (d. m.)	45 44 41.459	325 10 44.0	145 14 00.1	Peninsula Point Lighthouse (U. S. L. S.).	4.016595	10,389.5	34,086
	87 02 34.713	35 37 07.6	215 34 34.4	Ford River (U. S. L. S.)	3.900399	7,950.6	26,085
Stonington (U. S. L. S.), 1903 (d. m.)	45 42 59.300	70 27 48.7	250 22 40.7	Ford River (U. S. L. S.)	3.994747	9,879.8	32,414
	86 58 58.410	124 00 57.6	303 58 22.7	Sand Point (U. S. L. S.)	3.751364	5,641.1	18,508
F. South (U. S. L. S.) (1863), 1903 (d. m.)	45 46 08.040	359 32 19.7	179 32 21.3	Stonington (U. S. L. S.)	3.765467	5,827.3	19,118
	86 59 00.579	60 00 37.9	239 58 04.5	Sand Point (U. S. L. S.)	3.727903	5,344.4	17,534
Escanaba River (U. S. L. S.), 1903 (d. m.)	45 47 29.672	293 44 45.7	113 47 55.5	F. South (U. S. L. S.)	3.796034	6,252.2	20,512
	87 03 25.434	325 18 50.2	145 22 01.5	Stonington (U. S. L. S.)	4.006391	10,148.2	33,295
		348 04 42.7	168 05 19.0	Sand Point (U. S. L. S.)	3.724912	5,307.8	17,414
Escanaba Lighthouse (U. S. L. S.)	45 44 40.944	169 11 19.8	349 10 46.8	Escanaba River (U. S. L. S.)	3.724561	5,303.5	17,400
	87 02 39.377	240 21 13.3	60 23 50.0	F. South (U. S. L. S.)	3.735584	5,439.8	17,847
		303 16 31.3	123 19 09.5	Stonington (U. S. L. S.)	3.757112	5,716.3	18,754
Squaw Point Lighthouse (U. S. L. S.)	45 49 53.279	346 35 50.6	166 36 45.5	F. South (U. S. L. S.)	3.854216	7,148.5	23,453
	87 00 17.264	42 31 08.2	222 28 53.2	Escanaba River (U. S. L. S.)	3.779143	6,013.7	19,730
Sand Bank (U. S. L. S.), 1903 (d. m.)	45 49 56.416	271 48 41.4	91 50 22.4	Squaw Point Lighthouse (U. S. L. S.).	3.482814	3,039.6	9,972
	87 02 38.023	326 18 55.3	146 21 31.2	F. South (U. S. L. S.)	3.927957	8,471.4	27,793
		12 44 11.8	192 43 37.8	Escanaba River (U. S. L. S.)	3.666967	4,644.8	15,239
Elevator (U. S. L. S.), 1903 (d.)	45 51 03.932	351 12 56.7	171 13 07.9	Squaw Point Lighthouse (U. S. L. S.).	3.343847	2,207.2	7,241
	87 00 32.881	52 20 52.3	232 19 22.5	Sand Bank (U. S. L. S.)	3.532937	3,411.4	11,192
Maywood (U. S. L. S.), 1903 (d. m.)	45 50 51.966	46 24 28.3	226 23 25.0	Squaw Point Lighthouse (U. S. L. S.).	3.419517	2,627.3	8,620
	86 58 49.099	99 22 44.5	279 21 30.0	Elevator (U. S. L. S.)	3.355935	2,269.5	7,446
Cleveland Cliffs (U. S. L. S.), 1903 (d. m.)	45 52 32.467	332 50 20.7	152 51 13.7	Maywood (U. S. L. S.)	3.542482	3,487.2	11,441
	87 00 02.876	13 19 28.2	193 19 06.7	Elevator (U. S. L. S.)	3.448557	2,809.0	9,216
Little Lake (U. S. L. S.), 1903 (d. m.)	45 53 03.182	32 26 42.5	212 25 16.8	Maywood (U. S. L. S.)	3.681233	4,799.9	15,748
	86 56 49.755	77 11 28.7	257 09 10.0	Cleveland Cliffs (U. S. L. S.)	3.630551	4,271.2	14,013
Day River (U. S. L. S.), 1903 (d. m.)	45 53 40.155	293 20 14.7	113 21 42.8	Little Lake (U. S. L. S.)	3.459412	2,880.1	9,449
	86 58 52.395	359 12 55.5	179 12 57.9	Maywood (U. S. L. S.)	3.715436	5,193.2	17,038
		36 01 56.6	216 01 06.0	Cleveland Cliffs (U. S. L. S.)	3.412293	2,584.0	8,478
Garth (U. S. L. S.), 1903 (d. m.)	45 54 24.117	333 08 44.7	153 09 26.8	Little Lake (U. S. L. S.)	3.447273	2,800.7	9,189
	86 57 48.427	45 27 32.2	225 26 46.2	Day River (U. S. L. S.)	3.286655	1,934.9	6,348
Door Bluff (U. S. L. S.) latitude station (Wis.), 1865, r. 1874 (d. m.).[1]	45 17 46.130 87 03 54.653	214 47 05.46	34 47 05.97	Door Bluff (U. S. L. S.)	1.438260	27.43	90.0
Menominee (U. S. L. S.) astronomical station (Wis.), 1865.[1]	45 05 56.01 87 37 27.05	298 24 39	118 25 59	Menominee (U. S. L. S.)	3.448958	2,811.6	9,224
Northern Michigan							
Principal points							
South Fox (U. S. L. S.) 1906, r. 1925 (d. m.)	45 24 57.893	90 13 31.20	269 32 39.29	Rock Island (U. S. L. S.)	4.8742196	74,854.79	245,586.1
	85 51 36.711	114 36 25.97	293 59 59.77	Burnt Bluff (U. S. L. S.)	4.8626534	72,887.56	239,131.9
N. W. Manitou (U. S. L. S.), 1906, r. 1918 (d. m.)	45 09 22.874	115 41 04.70	295 08 13.83	Rock Island (U. S. L. S.)	4.8255302	66,916.03	219,540.3
	86 02 45.907	138 45 43.11	318 17 18.43	Burnt Bluff (U. S. L. S.)	4.8952209	78,563.51	257,753.8
		206 44 19.89	26 52 15.44	South Fox (U. S. L. S.)	4.5097430	32,340.22	106,102.9
Cathead (U. S. L. S.), 1868, r. 1932 (d. m.)	45 10 58.052	85 09 38.96	264 51 26.32	N. W. Manitou (U. S. L. S.)	4.5285696	33,773.00	110,803.6
	85 37 05.234	143 52 06.33	323 41 46.89	South Fox (U. S. L. S.)	4.5069970	32,136.39	105,434.1
		327 53 32		Reference mark No. 1.			

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Charlevoix (U. S. L. S.), 1906, l. 1931 (d. m.)	45 20 04.826	60 06 08.33	239 50 17.06	Cathead (U. S. L. S.)	4.5279972	33,728.51	110,657.6
	85 14 45.969	100 52 13.25	280 25 59.81	South Fox (U. S. L. S.)	4.6897259	48,946.98	160,586.9
Beaver Island (U. S. L. S.), 1903, r. 1931 (d. m.)	45 38 22.381	221 27 15.57	41 36 01.50	Hog Island (U. S. L. S.)	4.3795335	23,962.57	78,617.2
	85 33 40.254	249 48 48.79	70 09 53.45	Crane (U. S. L. S.)	4.6093952	40,681.34	133,468.7
		323 52 19.18	144 05 48.03	Charlevoix (U. S. L. S.)	4.6221236	41,891.28	137,438.3
		5 02 17.99	184 59 52.01	Cathead (U. S. L. S.)	4.7072206	50,958.96	167,187.9
		43 21 05.40	223 08 17.25	South Fox (U. S. L. S.)	4.5327022	34,095.91	111,863.0
Goodhart (U. S. L. S.), 1903, r. 1931 (d. m.)	45 35 24.722	25 04 01.96	204 56 47.34	Charlevoix (U. S. L. S.)	4.4960547	31,336.80	102,810.8
	85 04 36.234	72 44 28.42	252 10 56.59	South Fox (U. S. L. S.)	4.8076529	64,217.43	210,686.7
		137 06 17.96	316 54 15.57	Hog Island (U. S. L. S.)	4.5055041	32,026.10	105,072.3
		181 27 48.42	1 28 04.83	Crane (U. S. L. S.)	4.2880792	19,412.40	63,688.8
		98 25 54.76	278 05 08.38	Beaver Island (U. S. L. S.)	4.5818775	38,183.66	125,274.2
		319 28 44		Reference mark No. 1.			
Point aux Chenes (U. S. L. S.), 1908, r. 1929 (d. m.)	45 55 45.527						
	84 54 47.003						
A. Mackinac west base (U. S. L. S.), 1852, r. 1929 (d. m.)	45 47 13.732	145 29 23.49	325 23 21.42	Point aux Chenes (U. S. L. S.)	4.2830158	19,187.38	62,950.6
	84 46 22.462						
Crane (U. S. L. S.), 1902, r. 1918 (d. m.)	45 45 53.290	213 41 48.28	33 48 34.58	Point aux Chenes (U. S. L. S.)	4.3422629	21,991.91	72,151.8
	85 04 13.292	263 45 58.20	83 58 45.58	A. Mackinac west base (U. S. L. S.)	4.3667607	23,268.09	76,338.7
Hog Island (U. S. L. S.), 1903, r. 1918 (d. m.)	45 48 03.438	247 21 52.90	67 41 00.26	Point aux Chenes (U. S. L. S.)	4.5719230	37,318.40	122,435.4
	85 21 25.660	280 06 39.47	100 18 59.37	Crane (U. S. L. S.)	4.3552703	22,660.54	74,345.5
Manitou Payment (U. S. L. S.), 1854, r. 1917 (d. m.)	46 01 47.526	309 29 28.71	129 37 00.77	Point aux Chenes (U. S. L. S.)	4.2443076	17,551.23	57,582.7
	85 05 15.654	357 22 51.89	177 23 36.67	Crane (U. S. L. S.)	4.4697094	29,492.35	96,759.5
		39 30 13.19	219 18 36.42	Hog Island (U. S. L. S.)	4.5175890	32,929.80	108,037.2
Maple Hill (U. S. L. S.), 1896, r. 1917 (d. m.)	46 09 28.085	21 27 31.09	201 21 57.65	Point aux Chenes (U. S. L. S.)	4.4358397	27,279.71	89,500.2
	84 47 03.814	58 52 54.66	238 39 48.01	Manitou Payment (U. S. L. S.)	4.4382048	27,428.67	89,988.9
Rabbit Back (U. S. L. S.), 1851, r. 1896 (d. m.)	45 55 17.737	93 22 53.99	273 14 39.78	Point aux Chenes (U. S. L. S.)	4.1716382	14,846.98	48,710.5
	84 43 19.107	169 35 40.72	349 32 58.98	Maple Hill (U. S. L. S.)	4.4264419	26,695.74	87,584.3
C. Mackinac Island (U. S. L. S.), 1851, r. 1917 (d. m.)	45 51 28.669	57 11 14.30	237 04 29.61	A. Mackinac west base (U. S. L. S.)	4.1614527	14,502.83	47,581.4
	84 36 58.179	73 49 00.30	253 29 27.84	Crane (U. S. L. S.)	4.5657439	36,791.19	120,705.8
		109 05 51.42	288 53 03.95	Point aux Chenes (U. S. L. S.)	4.3868498	24,369.68	79,952.9
		117 45 34.86	297 25 14.95	Manitou Payments (U. S. L. S.)	4.6154757	41,254.91	135,350.5
		130 46 11.37	310 41 37.86	Rabbit Back (U. S. L. S.)	4.0349720	10,838.57	35,559.5
		158 42 21.10	338 35 05.39	Maple Hill (U. S. L. S.)	4.5536883	35,783.95	117,401.2
B′ Mackinac east base (U. S. L. S.), 1851, r. 1917 (d. m.)	45 45 22.086	121 37 05.54	301 33 59.67	A. Mackinac west base (U. S. L. S.)	3.8182068	6,579.711	21,586.93
	84 42 03.070	210 09 20.62	30 12 59.22	C. Mackinac Island (U. S. L. S.)	4.1170523	13,093.40	42,957.3
D. St. Ignace (U. S. L. S.), 1851, r. 1896 (d. m.)	45 51 09.043	173 08 05.11	353 07 34.30	Rabbit Back (U. S. L. S.)	3.8883937	7,733.81	25,373.3
	84 42 36.206	265 13 00.52	85 17 03.08	C. Mackinac Island (U. S. L. S.)	3.8643817	7,317.82	24,008.5
		356 10 30.59	176 10 54.35	B′ Mackinac east base (U. S. L. S.)	4.0308365	10,735.85	35,222.5
		33 56 10.06	213 53 27.80	A. Mackinac west base (U. S. L. S.)	3.9422232	8,754.34	28,721.5
Robinson (U. S. L. S.), 1895, r. 1903 (d. m.)	46 04 04.663	33 30 28.97	213 21 54.41	C. Mackinac Island (U. S. L. S.)	4.4466999	27,970.48	91,766.5
	84 25 02.421	43 33 48.38	223 21 10.85	D. St. Ignace (U. S. L. S.)	4.5183910	32,990.66	108,236.9
		55 31 47.55	235 18 38.72	Rabbit Back (U. S. L. S.)	4.4573516	28,664.98	94,045.0
		109 31 11.28	289 15 18.94	Maple Hill (U. S. L. S.)	4.4783058	30,081.94	98,693.8
Goose Island (U. S. L. S.), 1895, r. 1920 (d. m.)	45 55 34.340	61 57 57.68	241 50 04.58	C. Mackinac Island (U. S. L. S.)	4.2069261	16,103.71	52,833.6
	84 25 59.294	88 47 35.45	268 35 08.43	Rabbit Back (U. S. L. S.)	4.3504697	22,411.44	73,528.2
		184 26 09.10	04 26 50.01	Robinson (U. S. L. S.)	4.1987609	15,803.78	51,849.6
Duke (U. S. L. S.), 1894, r. 1921 (d. m.)	46 15 32.480	355 40 43.01	175 41 36.87	Robinson (U. S. L. S.)	4.3283273	21,297.44	69,873.4
	84 26 17.090	67 17 42.37	247 02 42.41	Maple Hill (U. S. L. S.)	4.4623688	28,998.05	95,137.8
		259 04 26		North quarter corner, sec. 33, T. 44 N., R. 1 W.			
Raco (U. S. L. S.), 1921 (d. m.)	46 21 29.920	292 19 19.07	112 34 21.77	Duke (U. S. L. S.)	4.4609606	28,904.18	94,829.8
	84 47 05.516	359 54 21.94	179 54 23.17	Maple Hill (U. S. L. S.)	4.3480683	22,287.86	73,122.8
		226 31 39		Fire tower.			
Iroquois (U. S. L. S.), 1893, r. 1921 (d. m.)	46 28 19.856	324 22 30.06	144 32 03.26	Duke (U. S. L. S.)	4.4642046	29,120.89	95,540.8
	84 39 29.067	337 28 16.31	157 38 42.56	Robinson (U. S. L. S.)	4.6867524	48,613.00	159,491.1
		15 36 14.93	195 30 46.08	Maple Hill (U. S. L. S.)	4.5596048	36,274.78	119,011.5
		37 38 50.06	217 33 19.43	Raco (U. S. L. S.)	4.2034804	15,976.45	52,416.1
Larke (U. S. L. S.), 1893 (d. m.)	46 27 34.385	09 39 32.63	189 37 24.45	Duke (U. S. L. S.)	4.3542952	22,609.72	74,178.7
	84 23 19.966	93 58 55.35	273 47 12.79	Iroquois (U. S. L. S.)	4.3164994	20,725.23	67,996.0
Pennefather (U. S. L. S.) (Canada), 1895 (d. m.)	46 37 56.236	349 22 24.27	169 24 26.82	Larke (U. S. L. S.)	4.2908264	19,535.59	64,093.0
	84 26 08.786	43 50 57.38	223 41 16.38	Iroquois (U. S. L. S.)	4.3917392	24,645.59	80,858.1
Rankin Mountain (U. S. L. S.) (Canada), 1893 (d. m.)	46 34 20.684	24 31 24.30	204 22 27.11	Duke (U. S. L. S.)	4.5828289	38,267.39	125,548.9
	84 13 55.485	43 51 45.05	223 44 55.48	Larke (U. S. L. S.)	4.2401422	17,383.70	57,033.0
		71 19 59.12	251 01 26.29	Iroquois (U. S. L. S.)	4.5382555	34,534.68	113,302.5
		113 10 13.75	293 01 20.93	Pennefather (U. S. L. S.)	4.2296110	16,967.23	55,666.7
Laird (U. S. L. S.) (Canada), 1894 (d. m.)	46 24 20.652	62 14 52.15	241 57 30.35	Duke (U. S. L. S.)	4.5422726	34,855.60	114,355.4
	84 02 16.861	102 38 03.11	282 22 47.91	Larke (U. S. L. S.)	4.4412656	27,622.67	90,625.4
		141 15 49.45	321 07 22.78	Rankin Mountain (U. S. L. S.)	4.3761353	23,775.81	78,004.5

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Salters Hill (U. S. L. S.) (Canada), 1894 (d. m.)	46 11 41.086	67 14 58.95	246 56 18.90	Robinson (U. S. L. S.)	4.5587922	36,206.98	118,789.1
	83 59 08.802	101 44 04.49	281 24 28.73	Duke (U. S. L. S.)	4.5516728	35,618.27	116,857.6
		133 37 24.77	313 19 55.15	Larke (U. S. L. S.)	4.6312269	42,778.63	140,349.6
		170 16 52.37	350 14 36.41	Laird (U. S. L. S.)	4.3765007	23,795.82	78,070.1
Detour (U. S. L. S.), 1894, r. 1903 (d. m.)	45 59 48.620	74 25 06.75	253 54 51.88	C. Mackinac Island (U. S. L. S.)	4.7526110	56,573.23	185,607.3
	83 54 52.140	101 39 33.68	281 17 50.76	Robinson (U. S. L. S.)	4.5990722	39,725.76	130,333.6
Phillips Hill (U. S. L. S.), 1903, r. 1932 (d. m.)	45 30 54.667	142 41 21.83	322 25 17.13	C. Mackinac Island (U. S. L. S.)	4.6811109	47,985.60	157,432.8
	84 14 29.947	167 31 38.52	347 24 05.17	Robinson (U. S. L. S.)	4.7989237	62,939.57	206,494.2
		205 18 50.93	25 32 54.70	Detour (U. S. L. S.)	4.7728905	59,277.59	194,479.9
Reid (U. S. L. S.) (Canada), 1904 (d. m.)	45 55 19.535	57 27 25.42	236 48 48.13	Phillips Hill (U. S. L. S.)	4.9208491	83,339.15	273,421.9
	83 20 33.199	100 49 06.82	280 24 26.76	Detour (U. S. L. S.)	4.6542601	45,108.68	147,994.1
Bruder (U. S. L. S.), 1904, r. 1932 (d. m.)	45 23 52.506	117 37 35.43	297 23 54.63	Phillips Hill (U. S. L. S.)	4.4504553	28,213.39	92,563.4
	83 55 18.306	180 29 04.69	0 29 23.43	Detour (U. S. L. S.)	4.8232734	66,569.21	218,402.5
		217 33 48.55	37 58 39.85	Reid (U. S. L. S.)	4.8674723	73,700.81	241,800.1
Duck Island (U. S. L. S.) (Canada), 1904 (d. m.)	45 39 15.156	69 29 30.58	248 48 31.38	Bruder (U. S. L. S.)	4.9032474	80,029.00	262,561.8
	82 57 52.006	135 29 44.66	315 13 29.00	Reid (U. S. L. S.)	4.6216404	41,844.69	137,285.5
Presque Isle (U. S. L. S.), 1904, r. 1932 (d. m.)	45 18 14.138	106 51 29.19	286 32 31.30	Bruder (U. S. L. S.)	4.5605161	36,350.98	119,261.5
	83 28 38.843	188 39 34.48	8 45 21.55	Reid (U. S. L. S.)	4.8420219	69,505.94	228,037.4
		225 40 25.11	46 02 21.91	Duck Island (U. S. L. S.)	4.7473924	55,897.50	183,390.4
Posen (U. S. L. S.), 1904, l. 1932 (d. m.)	45 16 30.183	127 49 38.15	307 40 02.03	Bruder (U. S. L. S.)	4.3484175	22,305.78	73,181.5
	83 41 48.274	259 21 18.70	79 30 39.73	Presque Isle (U. S. L. S.)	4.2430390	17,500.04	57,414.7
Walker (U. S. L. S.), 1904, r. 1932 (d. m.)	45 10 46.824	121 45 32.25	301 36 13.36	Posen (U. S. L. S.)	4.3049776	20,182.62	66,215.8
	83 28 40.996	180 11 40.79	0 11 42.33	Presque Isle (U. S. L. S.)	4.1401659	13,809.12	45,305.4
Flanders (U. S. L. S.), 1904, r. 1932 (d. m.)	45 03 38.843	157 45 53.16	337 37 32.99	Bruder (U. S. L. S.)	4.6074218	40,496.90	132,863.6
	83 43 33.751	185 30 53.96	5 32 08.77	Posen (U. S. L. S.)	4.3788139	23,922.91	78,487.1
		235 48 37.62	55 59 10.22	Walker (U. S. L. S.)	4.3722632	23,564.77	77,312.1
		186 59 00		Azimuth mark.			
Mac (U. S. L. S.), 1905, l. 1932 (d. m.)	44 51 04.917	340 59 47.12	161 01 24.16	Henry (U. S. L. S.)	3.9684497	9,299.29	30,509.4
	83 25 21.514	65 03 27.30	244 53 07.59	Comstock (U. S. L. S.)	4.3288769	21,324.40	69,961.8
		134 17 48.46	314 04 56.72	Flanders (U. S. L. S.)	4.5236014	33,388.85	109,543.3
		173 11 33.56	353 09 12.46	Walker (U. S. L. S.)	4.5652069	36,745.73	120,556.6
Stovel (U. S. L. S.), 1905, r. 1932 (d. m.)	44 53 09.209	162 35 54.00	342 32 37.19	Flanders (U. S. L. S.)	4.3090291	20,371.79	66,836.4
	83 38 55.290	202 19 29.95	22 26 44.57	Walker (U. S. L. S.)	4.5478876	35,309.18	115,843.5
		282 02 29.74	102 12 03.85	Mac (U. S. L. S.)	4.2617816	18,271.81	59,946.8
		301 02 57.46	121 14 08.25	Henry (U. S. L. S.)	4.3877689	24,421.31	80,122.2
		6 23 34.33	186 22 48.14	Comstock (U. S. L. S.)	4.1118930	12,938.77	42,449.9
Stovel eccentric, 1932 (d. m.)	44 53 09.026	69 40 37.54	249 31 46.57	Pikes Peak	4.2463495	17,633.95	57,854.1
	83 38 55.463	113 54 23.64	293 38 03.42	Atlanta	4.5216452	33,238.79	109,050.9
		162 36 47.47	342 33 30.78	Flanders (U. S. L. S.)	4.3091199	20,376.05	66,850.4
		202 19 37.70	22 26 52.44	Walker (U. S. L. S.)	4.5479695	35,315.84	115,865.4
		213 46	33 46	Stovel (U. S. L. S.)	0.8322534	6.796	22.30
Supplementary points							
Kentucky (U. S. L. S.), 1919 (d. m.)	46 15 26.667	119 08 27.0	299 01 20.9	Mud Lake (U. S. L. S.)	4.159525	14,438.6	47,371
	86 38 34.234	173 23 07.7	353 22 22.3	Divide (U. S. L. S.)	4.065882	11,638.1	38,183
Shingleton (U. S. L. S.), 1919 (d. m.)	46 18 12.147	69 26 46.0	249 19 07.5	Kentucky (U. S. L. S.)	4.161673	14,510.2	47,606
	86 27 59.892	113 28 02.9	293 19 38.6	Divide (U. S. L. S.)	4.210721	16,245.0	53,297
Edmunds (U. S. L. S.), 1919 (d. m.)	46 29 25.111	12 28 39.4	192 26 03.8	Shingleton (U. S. L. S.)	4.327977	21,280.3	69,817
	86 24 25.047	53 44 37.2	233 33 36.4	Divide (U. S. L. S.)	4.383367	24,175.0	79,314
Driggs (U. S. L. S.), 1920 (d. m.)	46 21 19.511	77 46 34.8	257 31 41.1	Shingleton (U. S. L. S.)	4.432220	27,053.3	88,757
	86 07 24.396	124 37 46.1	304 25 26.7	Edmunds (U. S. L. S.)	4.422497	26,454.3	86,792
		328 25 06		Southeast corner, sec. 36, T. 46 N., R. 16 W.			
Elback (U. S. L. S.), 1920 (d. m.)	46 32 25.832	17 05 12.8	197 01 38.5	Driggs (U. S. L. S.)	4.332864	21,521.1	70,607
	86 02 28.638	78 53 09.9	258 37 14.8	Edmunds (U. S. L. S.)	4.456550	28,612.1	93,872
Beech Hill (U. S. L. S.), 1920, r. 1921 (d. m.)	46 27 21.216	69 32 31.2	249 15 43.7	Driggs (U. S. L. S.)	4.501687	31,745.9	104,153
	85 44 13.207	112 02 35.2	291 49 20.6	Elback (U. S. L. S.)	4.401088	25,181.9	82,618
McMillan (U. S. L. S.), 1920, r. 1921 (d. m.)	46 19 29.269	95 56 52.4	275 37 56.9	Driggs (U. S. L. S.)	4.528153	33,740.6	110,697
	85 41 14.749	131 31 43.8	311 16 20.8	Elback (U. S. L. S.)	4.559406	36,258.2	118,957
		165 21 17.1	345 19 07.9	Beech Hill (U. S. L. S.)	4.177913	15,063.1	49,420
Seney (U. S. L. S.), 1920 (d. m.)	46 20 23.681	96 50 08.3	276 41 56.7	Driggs (U. S. L. S.)	4.165219	14,629.1	47,996
	85 56 05.016	229 38 13.0	49 46 48.4	Beech Hill (U. S. L. S.)	4.299645	19,936.3	65,408
		274 57 10.0	95 07 53.9	McMillan (U. S. L. S.)	4.281395	19,115.9	62,716
Corson (U. S. L. S.), 1921 (d. m.)	46 26 52.669	28 13 54.3	208 09 45.6	McMillan (U. S. L. S.)	4.191298	15,534.5	50,966
	85 35 31.236	94 34 36.1	274 28 17.8	Beech Hill (U. S. L. S.)	4.048245	11,174.9	36,663

177120°—39——3

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Newberry (U. S. L. S.), 1921 (d. m.)	46 20 07.470	85 05 06.3	264 57 28.4	McMillan (U. S. L. S.)	4.133274	13,591.7	44,592
	85 30 41.720	127 46 05.0	307 36 17.4	Beech Hill (U. S. L. S.)	4.340593	21,907.5	71,875
		153 43 15.4	333 39 45.7	Corson (U. S. L. S.)	4.144795	13,957.1	45,791
Fordney (U. S. L. S.), 1921 (d. m.)	46 30 56.777	25 11 03.7	205 05 44.5	Newberry (U. S. L. S.)	4.345313	22,146.9	72,660
	85 23 21.087	64 14 54.2	244 06 04.7	Corson (U. S. L. S.)	4.238113	17,302.7	56,767
		76 07 53.7	255 52 45.7	Beech Hill (U. S. L. S.)	4.439705	27,523.6	90,300
McLeod (U. S. L. S.), 1921 (d. m.)	46 15 16.420	115 30 29.6	295 19 51.0	Newberry (U. S. L. S.)	4.320896	20,936.1	68,688
	85 15 58.258	161 59 38.4	341 54 17.8	Fordney (U. S. L. S.)	4.484850	30,538.7	100,192
Eckerman (U. S. L. S.), 1921 (d. m.)	46 20 26.836	63 28 39.2	243 17 53.0	McLeod (U. S. L. S.)	4.330345	21,396.6	70,199
	85 01 04.447	124 24 38.8	304 08 30.3	Fordney (U. S. L. S.)	4.538291	34,537.5	113,312
		263 43 06.6	83 53 13.6	Raco (U. S. L. S.)	4.256327	18,043.8	59,199
		318 23 46.3	138 33 53.7	Maple Hill (U. S. L. S.)	4.434024	27,165.9	89,127
Furlong (U. S. L. S.), 1921 (d. m.)	46 11 10.958	107 19 34.2	287 05 49.9	McLeod (U. S. L. S.)	4.408461	25,613.0	84,032
	84 56 56.725	162 50 55.5	342 47 56.5	Eckerman (U. S. L. S.)	4.254423	17,964.8	58,940
		213 27 38.8	33 34 46.0	Raco (U. S. L. S.)	4.360288	22,923.9	75,209
		283 57 45.5	104 04 53.3	Maple Hill (U. S. L. S.)	4.117585	13,109.5	43,010
Bois Blanc Lighthouse (U. S. L. S.), 1896 (d.)	45 48 37.901	101 50 04.1	281 37 37.2	D. St. Ignace (U. S. L. S.)	4.360820	22,952.0	75,302
	84 25 15.010	109 13 40.5	289 05 16.1	C. Mackinac Island (U. S. L. S.)	4.205903	16,065.8	52,709
		117 56 17.1	297 43 19.0	Rabbit Back (U. S. L. S.)	4.422304	26,442.6	86,754
		175 45 20.3	355 44 48.5	Goose Island (U. S. L. S.)	4.110346	12,892.8	42,299
		180 32 30.2	0 32 39.3	Robinson (U. S. L. S.)	4.456593	28,614.9	93,881
Spectacle Reef Lighthouse (U. S. L. S.), 1894	45 46 22.892	15 47 03.8	195 42 36.9	Phillips Hill (U .S. L. S.)	4.473849	29,774.8	97,686
	84 08 16.802	100 50 01.0	280 37 51.1	Bois Blanc Lighthouse (U. S. L. S.)	4.349930	22,383.6	73,437
		146 38 02.4	326 26 00.0	Robinson (U. S. L. S.)	4.594358	39,296.9	128,927
		214 48 52.8	34 58 30.5	Detour (U. S. L. S.)	4.481867	30,329.6	99,506
La Fayette (U. S. L. S.), 1908 (d. m.)	45 46 17.528	130 49 57.8	310 47 11.2	Bois Blanc Lighthouse (U. S. L. S.)	3.821600	6,631.3	21,756
	84 21 22.634	269 21 46.7	89 31 09.8	Spectacle Reef Lighthouse (U. S. L. S.).	4.229931	16,979.7	55,708
Martin Reef Lighthouse (U. S. L. S.)	45 54 47.295	45 47 07.9	225 38 11.5	La Fayette (U. S. L. S.)	4.352940	22,539.3	73,948
	84 08 54.959	61 45 10.4	241 33 27.0	Bois Blanc Lighthouse (U. S. L. S.)	4.380598	24,021.4	78,810
		111 52 58.7	291 46 41.7	Penny (U. S. L. S.)	4.085496	12,175.8	39,947
Beaver Harbor Lighthouse (U. S. L. S.), 1903 [1]	45 44 33.74	337 05 06	157 05 31	Stony Point (U. S. L. S.)	3.297444	1,983.6	6,508
	85 30 31.39	26 43 20	206 43 08	Harbor Point (U. S. L. S.)	2.892903	781.5	2,564
Grosse Point (U. S. L. S.), 1918 (d. m.)	45 58 22.232	26 43 58.0	206 42 22.3	Rabbit Back (U. S. L. S.)	3.804631	6,377.2	20,923
	84 41 05.982	337 16 42.4	157 19 40.4	C. Mackinac Island (U. S. L. S.)	4.141150	13,840.4	45,408
Burnt Island (U. S. L. S.), 1918 (d. m.)	45 57 21.096	61 03 57.8	241 00 08.3	Rabbit Back (U. S. L. S.)	3.895672	7,864.5	25,802
	84 37 59.696	115 13 10.0	295 10 56.1	Grosse Point (U. S. L. S.)	3.646702	4,433.0	14,544
		353 02 45.9	173 03 30.1	C. Mackinac Island (U. S. L. S.)	4.039873	10,961.6	35,963
Biddle (U. S. L. S.), 1917 (d. m.)	46 04 31.100	282 33 47.7	102 46 20.2	Manitou Payment (U. S. L. S.)	4.362294	23,030.0	75,558
	85 22 40.849	356 57 07.2	176 58 01.2	Hog Island (U. S. L. S.)	4.484825	30.536.9	100,186
Patterson (U. S. L. S.), 1917 (d. m.)	45 58 02.689	240 37 23.3	60 49 18.9	Biddle (U. S. L. S.)	4.389557	24,522.1	80,453
	85 39 15.257	308 37 46.5	128 50 34.4	Hog Island (U. S. L. S.)	4.470817	29,567.7	97,007
Squaw Island Lighthouse (U. S. L. S.), 1903 (d.)	45 50 24.079	159 49 01.4	339 46 07.8	Patterson (U. S. L. S.)	4.178634	15,088.1	49,502
	85 35 13.480	241 14 19.2	61 35 51.1	Manitou Payment (U. S. L. S.)	4.644502	44,106.4	144,706
		283 34 27.9	103 44 21.6	Hog Island (U. S. L. S.)	4.264598	18,390.7	60,337
		354 49 20.0	174 50 26.8	Beaver Island (U. S. L. S.)	4.349714	22,372.5	73,400
High (U. S. L. S.), 1903, r. 1918 (d. m.)	45 43 54.010	184 59 53.0	5 01 09.4	Patterson (U. S. L. S.)	4.420003	26,302.9	86,295
	85 41 01.688	211 57 10.7	32 01 20.3	Squaw Island Lighthouse (U. S. L. S.).	4.152255	14,198.9	46,584
		253 01 27.9	73 15 30.6	Hog Island (U. S. L. S.)	4.424122	26,553.5	87,118
		316 56 28.8	137 01 44.7	Beaver Island (U. S. L. S.)	4.146215	14,002.8	45,941
		21 29 45.3	201 22 11.8	South Fox (U. S. L. S.)	4.576122	37,681.0	123,625
Scott Point (U. S. L. S.), 1917 (d. m.)	45 57 32.063	251 47 45.0	71 49 21.1	Patterson (U. S. L. S.)	3.481300	3,029.0	9,938
	85 41 28.898	328 28 36.1	148 33 05.7	Squaw Island Lighthouse (U. S. L. S.).	4.190197	15,495.2	50,837
		358 39 56.1	178 40 15.6	High (U. S. L. S.)	4.402496	25,263.6	82,886
Hughes (U. S. L. S.), 1917 (d. m.)	45 57 50.956	272 49 29.0	92 55 56.3	Scott Point (U. S. L. S.)	4.065049	11,615.8	38,110
	85 50 27.656	304 54 23.0	125 05 19.5	Squaw Island Lighthouse (U. S. L. S.).	4.381224	24,056.0	78,924
Seul Choix Lighthouse (U. S. L. S.), 1916 (d.)	45 55 16.764	229 09 01.3	49 12 05.1	Hughes (U. S. L. S.)	3.862262	7,282.2	23,892
	85 54 43.481	256 12 20.2	76 21 51.2	Scott Point (U. S. L. S.)	4.245977	17,618.8	57,804
		289 35 19.5	109 49 19.4	Squaw Island Lighthouse (U. S. L. S.).	4.428132	26,799.8	87,926
		319 50 13.0	140 00 02.4	High (U. S. L. S.)	4.440123	27,550.1	90,387
South Gull (U. S. L. S.), 1922 (d. m.)	45 41 35.167	230 20 12.1	50 31 07.2	Squaw Island Lighthouse (U. S. L. S.).	4.408799	25,633.0	84,098
	85 50 27.860	250 39 06.1	70 45 51.3	High (U. S. L. S.)	4.113092	12,974.5	42,567
		285 09 46.8	105 21 47.5	Beaver Island (U. S. L. S.)	4.354288	22,609.3	74,177

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Fox (U. S. L. S.), 1922 (d. m.)	45 26 28.788	185 14 34.9	5 15 59.7	South Gull (U. S. L. S.)	4.448715	28,100.6	92,193
	85 52 26.539	204 38 16.9	24 46 26.1	High (U. S. L. S.)	4.550478	35,520.4	116,537
		227 51 04.6	48 04 28.5	Beaver Island (U. S. L. S.)	4.517201	32,900.4	107,941
North Fox (1923) (U. S. L. S.), 1923 (d. m.)	45 28 10.093	68 22 35.6	248 18 17.2	Fox (U. S. L. S.)	3.928062	8,473.5	27,800
	85 46 24.097	193 27 05.8	13 30 56.1	High (U. S. L. S.)	4.476651	29,967.5	98,318
		221 09 28.5	41 18 33.8	Beaver Island (U. S. L. S.)	4.400296	25,136.0	82,467
Pisgah (U. S. L. S.), 1903, r. 1904 (d. m.)	45 44 18.174	2 00 19.3	182 00 06.6	Beaver Island (U. S. L. S.)	4.041048	10,991.3	36,061
	85 33 22.495	85 44 54.0	265 39 25.1	High (U. S. L. S.)	3.998088	9,956.1	32,664
		245 44 52.2	65 53 25.8	Hog Island (U. S. L. S.)	4.229903	16,978.6	55,704
Garden (U. S. L. S.), 1903, r. 1919 (d. m.)	45 49 19.226	8 54 08.9	188 52 23.9	Beaver Island (U. S. L. S.)	4.312298	20,525.7	67,341
	85 31 13.589	16 41 30.2	196 39 57.9	Pisgah (U. S. L. S.)	3.986901	9,702.9	31,834
		51 44 26.8	231 37 25.3	High (U. S. L. S.)	4.209357	16,194.1	53,130
		280 23 07.9	100 30 09.5	Hog Island (U. S. L. S.)	4.110857	12,907.9	42,349
White Shoal Lighthouse (U. S. L. S.), 1913 (d.)	45 50 29.786	75 21 42.7	255 12 11.2	Hog Island (U. S. L. S.)	4.250059	17,785.2	58,350
	85 08 08.820	144 13 21.5	324 02 54.6	Biddle (U. S. L. S.)	4.505861	32,052.4	105,159
		190 05 28.4	10 07 32.8	Manitou Payment (U. S. L. S.)	4.327462	21,255.0	69,734
Epoufette (U. S. L. S.), 1918 (d. m.)	46 02 36.235	104 35 32.2	284 27 53.7	Biddle (U. S. L. S.)	4.150367	14,137.3	46,382
	85 12 04.183	279 40 24.3	99 45 18.3	Manitou Payment (U. S. L. S.)	3.950015	8,912.8	29,241
		347 14 22.0	167 17 11.1	White Shoal Lighthouse (U. S. L. S.).	4.361631	22,994.9	75,442
Little Hog (U. S. L. S.), 1918 (d. m.)	46 04 12.086	95 02 43.1	274 58 58.7	Biddle (U. S. L. S.)	3.827194	6,717.3	22,038
	85 17 29.467	292 54 26.5	112 58 20.7	Epoufette (U. S. L. S.)	3.880406	7,592.9	24,911
		334 30 36.4	154 37 19.3	White Shoal Lighthouse (U. S. L. S.).	4.448909	28,113.1	92,234
Whiskey (U. S. L. S.), 1903, r. 1918 (d. m.)	45 48 42.371	34 42 10.7	214 38 46.5	High (U. S. L. S.)	4.034448	10,825.5	35,517
	85 36 16.646	260 06 14.8	80 09 52.1	Garden (U. S. L. S.)	3.822229	6,640.9	21,788
		335 13 11.4	155 15 16.2	Pisgah (U. S. L. S.)	3.953411	8,982.8	29,471
N. W. Garden (U. S. L. S.), 1918 (d. m.)	45 49 42.403	48 36 10.3	228 29 26.3	High (U. S. L. S.)	4.210797	16,247.9	53,307
	85 31 37.991	72 54 12.5	252 50 52.6	Whiskey (U. S. L. S.)	3.798969	6,294.6	20,652
		105 29 12.1	285 26 37.5	Squaw Island Lighthouse (U. S. L. S.).	3.683541	4,825.5	15,832
Cranberry (U. S. L. S.), 1918 (d. m.)	46 02 50.719	1 50 19.5	181 49 54.8	Squaw Island Lighthouse (U. S. L. S.).	4.362939	23,064.2	75,670
	85 34 39.187						
		33 46 01.6	213 42 43.0	Patterson (U. S. L. S.)	4.029148	10,694.2	35,086
		258 34 41.1	78 43 18.4	Biddle (U. S. L. S.)	4.197232	15,748.2	51,667
MXII (U. S. L. S.), 1918 (d. m.)	46 05 39.790	42 19 56.8	222 17 17.6	Cranberry (U. S. L. S.)	3.848741	7,059.0	23,159
	85 30 58.082	281 10 43.8	101 16 42.0	Biddle (U. S. L. S.)	4.037095	10,891.7	35,734
Naubinway Island (U. S. L. S.), 1911, r. 1918 (d. m.)	46 04 31.838	73 06 28.2	253 00 44.8	Cranberry (U. S. L. S.)	4.030006	10,715.3	35,155
	85 26 42.299	110 55 16.5	290 52 12.2	MXII (U. S. L. S.)	3.769557	5,882.4	19,299
		270 13 39.5	90 16 33.4	Biddle (U. S. L. S.)	3.715047	5,188.6	17,023
Mille Coquins (U. S. L. S.), 1911, r. 1918 (d. m.)	46 05 07.109	281 53 46.1	101 56 42.6	Biddle (U. S. L. S.)	3.730980	5,382.4	17,659
	85 26 45.944	355 53 08.7	175 53 11.3	Naubinway Island (U. S. L. S.)	3.038141	1,091.8	3,582
Trout (U. S. L. S.), 1903, r. 1918 (d. m.)	45 46 17.634	246 24 35.5	66 30 42.5	Garden (U. S. L. S.)	4.147162	14,033.4	46,041
	85 41 09.268	290 02 07.4	110 07 41.8	Pisgah (U. S. L. S.)	4.031062	10,741.4	35,241
		357 52 59.5	177 53 05.1	High (U. S. L. S.)	3.647116	4,437.3	14,558
Gull (U. S. L. S.), 1903, r. 1918 (d. m.)	45 42 19.071	255 59 21.4	76 05 51.8	High (U. S. L. S.)	4.084680	12,152.9	39,872
	85 50 07.029	288 47 21.4	108 59 07.3	Beaver Island (U. S. L. S.)	4.353609	22,574.0	74,062
Beaver Island, 1860 (U. S. L. S.), 1860, r. 1925 (d. m.)	45 36 25.418	125 48 32.2	305 45 47.0	Beaver Island (U. S. L. S.)	3.790650	6,175.2	20,260
	85 29 49.023	206 45 24.6	26 51 24.9	Hog Island (U. S. L. S.)	4.382830	24,145.2	79,216
		252 58 39.3	73 12 35.2	Skilligallee Lighthouse (U. S. L. S.)	4.422581	26,459.5	86,809
Middle Village Church (U. S. L. S.), 1925 (d.)	45 33 05.754	101 49 28.9	281 33 07.3	Beaver Island, 1860 (U. S. L. S.)	4.483260	30,427.1	99,826
	85 06 54.707	145 51 52.2	325 41 29.1	Hog Island (U. S. L. S.)	4.525273	33,517.6	109,966
		162 13 16.1	342 10 49.4	Skilligallee Lighthouse (U. S. L. S.)	4.163029	14,555.6	47,754
Northeast Beaver (U. S. L. S.), 1917, r. 1924 (d. m.)	45 45 13.437	19 43 41.8	199 41 11.5	Beaver Island (U. S. L. S.)	4.129700	13,480.3	44,227
	85 30 10.147	245 05 39.4	65 11 55.3	Hog Island (U. S. L. S.)	4.096485	12,487.8	40,970
		288 22 15.5	108 36 27.5	Skilligallee Lighthouse (U. S. L. S.)	4.433621	27,140.7	89,044
South Hog 1903 (U. S. L. S.), 1903, r. 1920 (d. m.)	45 46 08.860	45 14 05.1	225 06 05.8	Beaver Island (U. S. L. S.)	4.310211	20,427.3	67,019
	85 22 30.586	80 16 11.7	260 10 42.4	Northeast Beaver (U. S. L. S.)	4.003361	10,077.7	33,063
		310 26 00.5	130 38 49.2	Goodhart (U. S. L. S.)	4.485661	30,595.7	100,379
South Hog 1917 (U. S. L. S.), 1917, r. 1920 (d. m.)	45 46 08.492	239 07 34	59 07 35	South Hog, 1903 (U. S. L. S.)	1.345609	22.162	72.71
	85 22 31.466						
Sandy (U. S. L. S.), 1917 (d. m.)	45 42 17.986	173 02 25.7	353 02 03.8	Northeast Beaver (U. S. L. S.)	3.736960	5,457.1	17,904
	85 29 39.554	224 58 34.7	45 04 28.5	Hog Island (U. S. L. S.)	4.178687	15,089.9	49,507

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
S. E. Garden (U. S. L. S.), 1917 (d. m.)	45 46 38.452	21 21 52.3	201 20 08.2	Sandy (U. S. L. S.)	3.936217	8,634.1	28,327
	85 27 14.151	55 24 20.7	235 22 14.6	Northeast Beaver (U. S. L. S.)	3.664727	4,620.9	15,160
		250 44 52.1	70 49 01.9	Hog Island (U. S. L. S.)	3.901542	7,971.5	26,153
S. W. Hog (U. S. L. S.), 1920 (d. m.)	45 46 38.750	72 04 06.5	251 59 37.2	Northeast Beaver (U. S. L. S.)	3.931350	8,537.9	28,011
	85 23 54.310	89 53 51.3	269 51 28.1	S. E. Garden (U. S. L. S.)	3.635227	4,317.4	14,165
N. W. Hog (U. S. L. S.), 1920 (d. m.)	45 48 47.829	21 13 29.0	201 12 37.6	S. W. Hog (U. S. L. S.)	3.630933	4,275.0	14,026
	85 22 42.674	55 45 42.5	235 42 27.9	S. E. Garden (U. S. L. S.)	3.850924	7,094.5	23,276
South Garden (U. S. L. S.), 1903, r. 1918 (d. m.)	45 46 26.137	51 33 47.5	231 31 02.6	Pisgah (U. S. L. S.)	3.802911	6,352.0	20,840
	85 29 32.355	273 18 28.6	93 23 30.8	South Hog 1903 (U. S. L. S.)	3.960404	9,128.6	29,949
South Beaver (U. S. L. S.), 1903 (d. m.)	45 42 55.113	182 58 14.8	2 58 26.0	South Garden (U. S. L. S.)	3.814506	6,523.9	21,404
	85 29 48.004	237 38 24.1	57 43 37.4	South Hog 1903 (U. S. L. S.)	4.048799	11,189.2	36,710
North Beaver (U. S. L. S.), 1903 (d. m.)	45 44 42.800	188 16 08.4	8 16 23.8	South Garden (U. S. L. S.)	3.508389	3,224.0	10,577
	85 29 53.816	254 27 12.0	74 32 29.5	South Hog 1903 (U. S. L. S.)	3.997422	9,940.8	32,614
Stony Point (U. S. L. S.), 1903 (d. m.)	45 43 34.561	185 25 58.6	5 26 15.3	South Garden (U. S. L. S.)	3.726006	5,321.2	17,458
	85 29 55.673	243 36 48.2	63 42 07.0	South Hog, 1903 (U. S. L. S.)	4.030832	10,735.7	35,222
Harbor Point (U. S. L. S.) [1]	45 44 11.31	229 57 23	49 58 02	North Beaver (U. S. L. S.)	3.181807	1,519.9	4,987
	85 30 47.64	315 07 54	135 08 31	Stony Point (U. S. L. S.)	3.202199	1,592.9	5,226
Storm signal tower (U. S. L. S.), 1917 (d.) [1]	45 43 38.99	223 38 04	43 40 59	S. E. Garden (U. S. L. S.)	3.884142	7,658.5	25,126
	85 31 18.77	247 53 09	67 59 27	South Hog, 1903 (U. S. L. S.)	4.090572	12,318.9	40,416
Gros Cap (U. S. L. S.), 1851, r. 1902 (d. m.)	45 52 57.708	30 27 56.1	210 23 28.0	Waugoshance Point (U. S. L. S.)	4.202367	15,935.5	52,282
	84 50 07.060	54 25 52.6	234 15 45.7	Crane (U. S. L. S.)	4.351814	22,480.9	73,756
		62 03 37.0	241 52 35.0	Waugoshance Lighthouse (U.S.L.S.)	4.353383	22,562.3	74,023
Flagstaff, Grand Hotel (U. S. L. S.) [1]	45 51 02.84	91 43 04	271 39 27	St. Ignace (U. S. L. S.)	3.813356	6,506.6	21,347
	84 37 34.76	224 42 00	44 42 26	C. Mackinac Island (U. S. L. S.)	3.050031	1,122.1	3,681
Cross Village, Catholic Church (U. S. L. S.), 1925 (d.) [1]	45 38 46.67	57 39 22	237 37 42	Cross Village (U. S. L. S.)	3.555311	3,591.8	11,784
	85 01 44.45	106 40 50	286 34 42	Skilligallee Lighthouse (U. S. L. S.)	4.066315	11,649.7	38,221
South Fox Lighthouse (U. S. L. S.), 1901 (d.)	45 22 42.568	321 37 07.6	141 46 27.7	Cathead (U. S. L. S.)	4.442719	27,715.3	90,929
	85 50 13.412	33 40 41.3	213 31 46.7	N. W. Manitou (U. S. L. S.)	4.471892	29,640.9	97,247
Hat (U. S. L. S.), 1920 (d. m.)	45 49 01.282	67 59 15.6	247 56 49.1	Hog Island (U. S. L. S.)	3.677667	4,760.7	15,619
	85 18 01.280	287 53 52.9	108 03 46.4	Crane (U. S. L. S.)	4.274206	18,802.1	61,687
		325 16 58.1	145 26 34.3	Goodhart (U. S. L. S.)	4.486297	30,640.6	100,527
Goudreau (U. S. L. S.), 1902 (d. m.)	45 52 16.983	59 22 27.1	239 11 24.8	Crane (U. S. L. S.)	4.365320	23,191.0	76,086
	84 48 49.788	341 13 32.9	161 15 18.6	A. Mackinac west base (U. S. L. S.)	3.995106	9,887.9	32,441
Waugoshance Point (U. S. L. S.), 1902 (d. m.)	45 45 32.656	29 47 01.0	209 41 06.7	Goodhart (U. S. L. S.)	4.334754	21,614.9	70,915
	84 56 20.920	93 37 04.7	273 31 26.3	Crane (U. S. L. S.)	4.009789	10,228.0	33,556
		217 55 02.9	38 00 26.6	Goudreau (U. S. L. S.)	4.199575	15,833.4	51,947
		256 22 19.0	76 29 28.1	A. Mackinac west base (U. S. L. S.)	4.123902	13,301.5	43,640
Old Mackinac Point Lighthouse (U. S. L. S.), 1902 (d.).	45 47 15.194	89 14 55.1	269 13 03.2	A. Mackinac west base (U. S. L. S.)	3.527883	3,372.0	11,063
	84 43 46.370	144 55 40.4	324 52 02.7	Goudreau (U. S. L. S.)	4.056481	11,388.9	37,365
		228 21 00.3	48 25 53.0	C. Mackinac Island (U. S. L. S.)	4.071332	11,785.1	38,665
Round Island Lighthouse (U. S. L. S.), 1896 (d.)	45 50 14.047	57 49 16.9	237 44 25.9	Old Mackinac Point Lighthouse (U. S. L. S.).	4.015235	10,357.0	33,980
	84 37 00.540						
		65 24 27.1	245 17 44.1	A. Mackinac west base (U. S. L. S.)	4.125439	13,348.7	43,795
		181 16 01.8	1 16 03.4	C. Mackinac Island (U. S. L. S.)	3.362571	2,304.5	7,561
St. Helena Lighthouse (U. S. L. S.), 1902 (d.)	45 51 17.986	28 52 31.0	208 49 16.0	Waugoshance Point (U. S. L. S.)	4.085374	12,172.3	39,935
	84 51 48.931	58 07 15.4	237 58 21.7	Crane (U. S. L. S.)	4.277430	18,942.2	62,146
		316 54 17.3	136 58 11.7	A. Mackinac west base (U. S. L. S.)	4.013752	10,321.7	33,864
Waugoshance Reef (U. S. L. S.), 1918 (d. m.)	45 45 34.735	93 14 53.1	273 09 13.5	Crane (U. S. L. S.)	4.011117	10,259.3	33,659
	84 56 19.290	120 48 09.2	300 39 40.8	White Shoal Lighthouse (U. S. L. S.)	4.251136	17,829.4	58,495
		208 49 18.6	28 52 32.4	St. Helena Lighthouse (U. S. L. S.)	4.082753	12,099.1	39,695
Skilligallee Lighthouse (U. S. L. S.), 1854 (d.)	45 40 34.652	82 28 01.7	262 11 20.3	Beaver Island (U. S. L. S.)	4.485561	30,588.7	100,356
	85 10 20.057	133 58 57.9	313 51 01.2	Hog Island (U. S. L. S.)	4.300513	19,976.2	65,539
		218 50 31.4	38 54 53.9	Crane (U. S. L. S.)	4.101638	12,636.8	41,459
		322 04 20.5	142 08 26.2	Goodhart (U. S. L. S.)	4.083684	12,125.1	39,780
Waugoshance Lighthouse (U. S. L. S.), 1902 (d.)	45 47 14.271	284 45 44.2	104 52 17.6	Waugoshance Point (U. S. L. S.)	4.088767	12,267.8	40,249
	85 05 29.837	326 30 36.5	146 31 31.4	Crane (U. S. L. S.)	3.476782	2,997.7	9,835
		356 57 49.7	176 58 28.2	Goodhart (U. S. L. S.)	4.341176	21,936.9	71,971
Cross Village (U. S. L. S.), 1902, r. 1924 (d. m.)	45 37 44.400	9 03 11.0	189 02 48.3	Goodhart (U. S. L. S.)	3.640146	4,366.6	14,326
	85 04 04.538	122 55 05.1	302 50 36.6	Skilligallee Lighthouse (U. S. L. S.)	3.985963	9,682.0	31,765
		179 16 55.0	359 16 48.7	Crane (U. S. L. S.)	4.178832	15,095.0	49,524
Sturgeon (U. S. L. S.), 1924 (d. m.)	45 40 52.037	46 35 50.8	226 32 28.7	Cross Village (U. S. L. S.)	3.925644	8,426.4	27,646
	84 59 21.910	87 54 27.2	267 46 36.4	Skilligallee Lighthouse (U. S. L. S.)	4.153937	14,254.0	46,765
		145 54 41.4	325 51 12.8	Crane (U. S. L. S.)	4.050548	11,234.4	36,858

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Point La Barbe (U. S. L. S.), 1906, r. 1926 (d. m.)	45 50 24.282	259 12 08.0	79 17 56.2	C. Mackinac Island (U. S. L. S.)	4.027687	10,658.3	34,968
	84 45 03.481	271 41 18.4	91 47 04.9	Round Island Lighthouse (U.S.L.S.)	4.018160	10,427.0	34,209
		344 04 30.5	164 05 25.8	Old Mackinac Point Lighthouse (U. S. L. S.).	3.783237	6,070.7	19,917
Green (U. S. L. S.), 1926 (d. m.)	45 50 07.333	166 14 01.9	346 13 57.6	Point La Barbe (U. S. L. S.)	2.731396	538.8	1,768
	84 44 57.541	268 47 55.9	88 53 38.1	Round Island Lighthouse (U.S.L.S.)	4.012691	10,296.5	33,781
		343 51 58.1	163 52 49.1	Old Mackinac Point Lighthouse (U. S. L. S.).	3.742908	5,532.3	18,151
McGulpin Point Lighthouse (U. S. L. S.)	45 47 13.599	196 11 28.0	16 12 24.8	Point La Barbe (U. S. L. S.)	3.787500	6,130.6	20,113
	84 46 22.696	237 04 19.5	57 11 04.3	C. Mackinac Island (U. S. L. S.)	4.161647	14,509.3	47,603
		269 08 56.0	89 10 48.1	Old Mackinac Point Lighthouse (U. S. L. S.).	3.528542	3,377.1	11,080
McGulpin (U. S. L. S.), 1918 (d. m.)	45 46 47.585	78 50 37.4	258 44 21.0	Waugoshance Reef (U. S. L. S.)	4.063369	11,570.9	37,962
	84 47 33.993	146 37 47.4	326 34 44.5	St. Helena Lighthouse (U. S. L. S.)	3.999973	9,999.4	32,806
Big Stone (U. S. L. S.), 1918 (d. m.)	45 45 23.698	187 39 37.7	7 40 26.6	St. Helena Lighthouse (U. S. L. S.)	4.042851	11,037.0	36,211
	84 52 57.126	249 36 59.0	69 40 50.6	McGulpin (U. S. L. S.)	3.871986	7,447.1	24,433
Cecil (U. S. L. S.), 1918 (d. m.)	45 45 17.876	92 25 57.3	272 23 35.9	Big Stone (U. S. L. S.)	3.630359	4,269.3	14,007
	84 49 39.763	165 55 46.5	345 54 13.9	St. Helena Lighthouse (U. S. L. S.)	4.059283	11,462.6	37,607
		224 26 39.8	44 28 10.0	McGulpin (U. S. L. S.)	3.588866	3,880.3	12,731
Fuyards (U. S. L. S.), 1904, r. 1924 (d. m.)	45 55 55.673	13 55 55.4	193 54 03.9	Bois Blanc Lighthouse (U. S. L. S.)	4.143786	13,924.7	45,685
	84 22 39.733	81 18 39.1	261 16 15.7	Goose Island (U. S. L. S.)	3.638473	4,349.8	14,271
Penny (U. S. L. S.), 1905 (d. m.)	45 57 13.943	328 48 50.4	148 55 34.3	Spectacle Reef Lighthouse (U. S. L. S.)	4.370741	23,482.3	77,042
	84 17 39.587						
		31 41 41.0	211 36 14.0	Bois Blanc Lighthouse (U. S. L. S.)	4.272215	18,716.1	61,404
		69 32 06.7	249 28 31.0	Fuyards (U. S. L. S.)	3.838983	6,902.1	22,645
Buoy S (U. S. L. S.)	45 54 49.796	119 25 50.1	299 23 49.9	Fuyards (U. S. L. S.)	3.617152	4,141.4	13,587
	84 19 52.313	212 42 26.3	32 44 01.7	Penny (U. S. L. S.)	3.723450	5,289.9	17,355
Marq (U. S. L. S.), 1926 (d. m.)	45 56 42.485	256 14 23.6	76 16 36.1	Penny (U. S. L. S.)	3.611586	4,088.7	13,414
	84 20 43.991	342 14 56.2	162 15 33.3	Buoy S (U. S. L. S.)	3.562659	3,653.1	11,985
		21 21 54.8	201 18 40.2	Bois Blanc Lighthouse (U. S. L. S.)	4.205810	16,062.4	52,698
Nuns Creek (U. S. L. S.), 1918 (d. m.)	46 01 20.990	8 04 27.8	188 03 01.4	C. Mackinac Island (U. S. L. S.)	4.266476	18,470.4	60,598
	84 34 57.922	43 56 33.4	223 50 33.1	Rabbit Back (U. S. L. S.)	4.192097	15,563.1	51,060
		55 09 59.5	235 05 34.8	Grosse Point (U. S. L. S.)	3.984692	9,653.7	31,672
Brabb (U. S. L. S.) 1919 (d. m.)	45 58 50.267	45 39 26.1	225 35 42.2	Rabbit Back (U. S. L. S.)	3.972338	9,382.9	30,784
	84 38 07.700	77 18 30.2	257 16 22.0	Grosse Point (U. S. L. S.)	3.594870	3,934.3	12,908
		221 14 53.5	41 17 10.0	Nuns Creek (U. S. L. S.)	3.791779	6,191.3	20,313
Charles (U. S. L. S.), 1919 (d. m.)	46 00 17.582	305 28 35.2	125 30 41.5	Brabb (U. S. L. S.)	3.666810	4,643.1	15,233
	84 41 03.357	0 54 32.9	180 54 31.0	Grosse Point (U. S. L. S.)	3.551682	3,561.9	11,686
Jamieson (U. S. L. S.), 1919 (d. m.)	46 02 26.216	1 00 37.9	181 00 34.0	Brabb (U. S. L. S.)	3.824030	6,668.5	21,878
	84 38 02.236	27 42 33.0	207 40 20.8	Grosse Point (U. S. L. S.)	3.929799	8,507.4	27,911
		44 27 57.6	224 25 47.3	Charles (U. S. L. S.)	3.745337	5,563.4	18,253
St. Martin Point (U. S. L. S.), 1904 (d. m.)	45 58 16.468	308 26 22.8	128 29 53.0	Goose Island (U. S. L. S.)	3.905612	8,046.6	26,400
	84 30 51.801	32 07 45.8	212 03 22.6	C. Mackinac Island (U. S. L. S.)	4.172069	14,861.7	48,759
Little St. Martin (U. S. L. S.) 1918 (d. m.)	45 56 46.272	234 16 25.9	54 18 35.2	St. Martin Point (U. S. L. S.)	3.678639	4,771.3	15,654
	84 33 51.715	282 15 46.3	102 21 25.7	Goose Island (U. S. L. S.)	4.017736	10,416.8	34,176
		22 18 26.6	202 16 12.6	C. Mackinac Island (U. S. L. S.)	4.025210	10,597.7	34,769
Detachee (U. S. L. S.), 1926 (d. m.)	45 48 37.679	162 46 23.1	342 43 47.3	Little St. Martin (U. S. L. S.)	4.198531	15,795.4	51,822
	84 30 14.532	203 08 35.8	23 11 39.0	Goose Island (U. S. L. S.)	4.145901	13,992.7	45,908
		269 54 33.7	89 58 08.5	Bois Blanc Lighthouse (U. S. L. S.)	3.810715	6,467.2	21,218
Coats (U. S. L. S.), 1904 (d. m.)	45 57 36.477	2 17 02.9	182 16 57.9	Goose Island (U. S. L. S.)	3.576798	3,774.0	12,382
	84 25 52.313	51 42 47.7	231 34 49.5	C. Mackinac Island (U. S. L. S.)	4.262476	18,301.1	60,043
Brulee (U. S. L. S.), 1904 (d. m.)	45 58 09.552	292 58 33.7	112 59 54.0	Coats (U. S. L. S.)	3.417463	2,614.9	8,579
	84 27 44.115	334 45 48.8	154 47 04.1	Goose Island (U. S. L. S.)	3.724060	5,297.4	17,380
		44 01 40.2	223 55 02.2	C. Mackinac Island (U. S. L. S.)	4.235485	17,198.3	56,425
Point St. Martin (U. S. L. S.), 1919 (d. m.)	45 58 11.873	98 30 08.0	278 25 42.0	Brabb (U. S. L. S.)	3.905926	8,052.4	26,419
	84 31 57.728	135 04 23.2	315 00 01.0	Jamieson (U. S. L. S.)	4.045266	11,098.5	36,412
		146 25 46.5	326 23 36.9	Nuns Creek (U. S. L. S.)	3.845677	7,009.3	22,996
Isle St. Martin (U. S. L. S.), 1919 (d. m.)	45 58 11.658	149 36 52.1	329 34 21.9	Jamieson (U. S. L. S.)	3.959653	9,112.8	29,898
	84 34 27.877	173 41 28.9	353 41 07.3	Nuns Creek (U. S. L. S.)	3.769474	5,881.3	19,296
		269 52 02.1	89 53 50.1	Point St. Martin (U. S. L. S.)	3.509565	3,232.7	10,606
Nine (U. S. L. S.), 1908 (d. m.)	45 38 05.790	144 14 24.2	324 08 21.8	La Fayette (U. S. L. S.)	4.272321	18,720.7	61,419
	84 12 56.300	201 28 29.7	21 31 49.7	Spectacle Reef Lighthouse (U. S. L. S.)	4.217362	16,495.4	54,119
74 (U. S. L. S.), 1907, r. 1927 (d. m.)	45 39 50.757	169 51 33.9	349 50 23.1	La Fayette (U. S. L. S.)	4.083893	12,130.9	39,799
	84 19 43.784	230 45 24.0	50 53 35.8	Spectacle Reef Lighthouse (U. S. L. S.)	4.282518	19,165.4	62,878
		290 07 35.6	110 12 27.0	Nine (U. S. L. S.)	3.973120	9,399.8	30,839

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
57 (U. S. L. S.), 1907, r. 1927 (d. m.)	45 43 13.214	254 55 28.6	75 07 34.1	Spectacle Reef Lighthouse (U. S. L. S.)	4.355327	22,663.5	74,355
	84 25 09.647	311 31 29.6	131 35 22.8	74 (U. S. L. S.)	3.974165	9,422.5	30,914
Cheboygan Point Lighthouse (U. S. L. S.), 1907 (d.)[1]	45 40 08.43	180 21 32	0 21 33	57 (U. S. L. S.)	3.756250	5,704.9	18,717
	84 25 11.30	274 22 10	94 26 04	74 (U. S. L. S.)	3.851915	7,110.7	23,329
64 (U. S. L. S.)[1]	45 40 22.01	229 22 25	49 25 49	57 (U. S. L. S.)	3.909679	8,122.3	26,648
	84 29 54.70	273 52 54	93 56 16	Cheboygan Point Lighthouse (U. S. L. S.)	3.788775	6,148.6	20,173
Poe Reef Lighthouse (U. S. L. S.)[1]	45 41 41.21	322 44 36	142 46 02	74 (U. S. L. S.)	3.631820	4,283.7	14,054
	84 21 43.58	57 30 59	237 28 30	Cheboygan Point Lighthouse (U. S. L. S.)	3.726755	5,330.3	17,488
78 (U. S. L. S.), 1909 (d. m.)	45 37 16.564	135 00 47.0	314 59 56.9	Nine (U. S. L. S.)	3.332246	2,149.0	7,051
	84 11 46.157	195 00 38.5	15 03 08.3	Spectacle Reef Lighthouse (U. S. L. S.)	4.242160	17,464.7	57,299
Mast 1909 (U. S. L. S.), 1909 (d. m.)	45 34 28.804	140 04 39.9	320 02 16.9	78 (U. S. L. S.)	3.829644	6,755.3	22,163
	84 08 26.052	180 31 09.7	0 31 16.3	Spectacle Reef Lighthouse (U. S. L. S.)	4.343354	22,047.2	72,333
Hammond (U. S. L. S.), 1908 (d. m.)	45 29 25.056	138 49 21.1	318 44 51.0	Mast 1909 (U. S. L. S.)	4.095730	12,466.1	40,899
	84 02 07.517	165 45 19.1	345 40 55.1	Spectacle Reef Lighthouse (U. S. L. S.)	4.510892	32,425.9	106,384
Forty Mile Point (U. S. L. S.), 1903 (d. m.)	45 28 50.179	96 14 14.2	276 08 48.4	Hammond (U. S. L. S.)	3.999243	9,982.6	32,751
	83 54 30.527	151 14 20.2	331 04 29.6	Spectacle Reef Lighthouse (U. S. L. S.)	4.569414	37,103.4	121,730
Adams Point (U. S. L. S.), 1905 (d. m.)	45 24 51.601	83 35 42.0	263 26 55.9	Bruder (U. S. L. S.)	4.208716	16,170.2	53,052
	83 42 59.500	116 11 42.3	296 03 29.9	Forty Mile Point (U. S. L. S.)	4.223392	16,726.0	54,875
Rogers, courthouse (U. S. L. S.)	45 25 16.557	72 31 07.4	252 26 38.2	Bruder (U. S. L. S.)	3.935516	8,620.2	28,281
	83 49 00.288	132 36 58.2	312 33 02.9	Forty Mile Point (U. S. L. S.)	3.988840	9,746.3	31,976
		275 34 24.9	95 38 41.9	Adams Point (U. S. L. S.)	3.896650	7,882.2	25,860
Twin Lakes (U. S. L. S.), 1904 (d. m.)	45 29 11.574	353 41 03.1	173 41 38.8	Bruder (U. S. L. S.)	3.996089	9,910.4	32,514
	83 56 08.430	97 41 23.1	277 28 17.4	Phillips Hill (U. S. L. S.)	4.382481	24,125.8	79,153
Bootjack (U. S. L. S.), 1905 (d. m.)	45 57 21.829	334 32 54.9	154 38 16.4	Spectacle Reef Lighthouse (U. S. L. S.)	4.352618	22,522.6	73,893
	84 15 44.777	37 17 49.6	217 11 00.2	Bois Blanc Lighthouse (U. S. L. S.)	4.307901	20,318.9	66,663
Beaver Tail (U. S. L. S.), 1903; r. 1919 (d. m.)	45 57 56.676	353 10 08.2	173 11 33.4	Spectacle Reef Lighthouse (U. S. L. S.)	4.333907	21,572.8	70,777
	84 10 15.562	48 26 03.7	228 15 17.9	Bois Blanc Lighthouse (U. S. L. S.)	4.414245	25,956.4	85,159
		81 24 11.3	261 20 14.6	Bootjack (U. S. L. S.)	3.855537	7,170.3	23,525
St. Vital (U. S. L. S.), 1905 (d. m.)	45 56 48.992	29 37 45.6	209 31 40.6	Spectacle Reef Lighthouse (U. S. L. S.)	4.346883	22,227.1	72,923
	83 59 48.204	92 54 46.1	272 43 18.6	Bootjack (U. S. L. S.)	4.314429	20,626.7	67,673
		98 51 19.1	278 43 48.2	Beaver Tail (U. S. L. S.)	4.135797	13,670.9	44,852
Albany (U. S. L. S.), 1905 (d. m.)	45 58 03.098	7 36 30.0	187 34 54.1	Spectacle Reef Lighthouse (U. S. L. S.)	4.338652	21,809.8	71,554
	84 06 03.153	87 56 08.3	267 53 06.9	Beaver Tail (U. S. L. S.)	3.735460	5,438.3	17,842
Saddlebag (U. S. L. S.), 1905 (d. m.)	45 57 09.714	282 24 54.4	102 26 31.3	St. Vital (U. S. L. S.)	3.473139	2,972.6	9,753
	84 02 02.989	22 01 31.0	201 57 02.7	Spectacle Reef Lighthouse (U. S. L. S.)	4.333181	21,536.8	70,659
		107 42 05.6	287 39 12.9	Albany (U. S. L. S.)	3.734633	5,427.9	17,808
Huron Point (U. S. L. S.), 1916 (d. m.)	45 57 56.051	290 09 02.3	110 12 10.4	St. Vital (U. S. L. S.)	3.778354	6,002.8	19,694
	84 04 09.839	297 37 50.3	117 39 21.5	Saddlebag (U. S. L. S.)	3.489053	3,083.6	10,117
		95 06 26.1	275 05 04.6	Albany (U. S. L. S.)	3.389072	2,449.5	8,036
□59 Neebish (U. S. L. S.), 1894	46 18 39.613	213 15 01.2	33 18 55.2	Laird (U. S. L. S.)	4.100250	12,596.5	41,327
	84 07 40.199	319 39 42.4	139 45 51.9	Salters Hill (U. S. L. S.)	4.228932	16,940.7	55,580
19 Hay Lake (U. S. L. S.), 1894 (d. m.)	46 22 01.645	254 07 46.8	74 16 20.8	Laird (U. S. L. S.)	4.197689	15,764.8	51,722
	84 14 06.769	306 59 51.4	127 04 31.1	□59 Neebish (U. S. L. S.)	4.015226	10,356.8	33,979
		314 48 52.3	134 59 41.4	Salters Hill (U. S. L. S.)	4.433652	27,142.6	89,050
Ross (U. S. L. S.), 1894 (d. m.)	46 14 47.230	161 40 37.2	341 39 16.9	□59 Neebish (U. S. L. S.)	3.878460	7,558.9	24,799
	84 05 49.142	194 21 48.6	14 24 22.1	Laird (U. S. L. S.)	4.261943	18,278.6	59,969
		303 46 32.2	123 51 21.3	Salters Hill (U. S. L. S.)	4.013991	10,327.4	33,892
Winter Point (U. S. L. S.), 1894 (d. m.)	46 12 56.983	231 05 14.3	51 07 36.5	Ross (U. S. L. S.)	3.734124	5,421.6	17,787
	84 09 06.063	280 18 41.3	100 25 52.4	Salters Hill (U. S. L. S.)	4.114513	13,017.1	42,707
Rocky Point (U. S. L. S.), 1894 (d. m.)	46 10 44.190	150 38 54.3	330 37 36.7	Winter Point (U. S. L. S.)	3.672515	4,704.5	15,435
	84 07 18.479	194 18 24.5	14 19 29.0	Ross (U. S. L. S.)	3.889003	7,744.7	25,409
		260 27 14.9	80 33 08.3	Salters Hill (U. S. L. S.)	4.027243	10,647.4	34,932

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Point aux Frenes (U. S. L. S.), 1894 (d. m.)	46 07 54.511	126 07 47.0	306 03 45.5	Rocky Point (U. S. L. S.)	3.949028	8,892.6	29,175
	84 01 43.616	134 34 58.2	314 29 39.1	Winter Point (U. S. L. S.)	4.124349	13,315.2	43,685
		205 22 56.6	25 24 48.3	Salters Hill (U. S. L. S.)	3.888977	7,744.2	25,407
Raber (U. S. L. S.), 1894 (d. m.)	46 03 57.368	181 32 12.4	1 32 19.0	Point aux Frenes (U. S. L. S.)	3.864784	7,324.6	24,031
	84 01 52.766	193 47 43.9	13 49 42.1	Salters Hill (U. S. L. S.)	4.168616	14,744.0	48,373
Fort St. Joe (U. S. L. S.) (Canada), 1894 (d. m.)	46 03 47.484	92 41 48.9	272 38 09.3	Raber (U. S. L. S.)	3.816892	6,559.8	21,522
	83 56 47.892	140 14 25.3	320 10 52.2	Point aux Frenes (U. S. L. S.)	3.996772	9,925.9	32,565
		168 19 33.7	348 17 52.1	Salters Hill (U. S. L. S.)	4.174133	14,932.5	48,991
Bacon Island (U. S. L. S.), 1894 (d. m.)	46 03 28.513	45 09 22.9	225 05 34.7	Detour (U. S. L. S.)	3.983284	9,622.4	31,569
	83 49 35.096	93 38 45.5	273 33 33.8	Fort St. Joe (U. S. L. S.)	3.969474	9,321.2	30,581
		141 03 16.0	320 56 22.4	Salters Hill (U. S. L. S.)	4.291605	19,570.6	64,208
Drummond (U. S. L. S.), 1894 (d. m.)	46 00 04.518	82 39 33.4	262 37 26.4	Detour (U. S. L. S.)	3.583464	3,832.3	12,573
	83 51 55.512	137 37 16.7	317 33 46.3	Fort St. Joe (U. S. L. S.)	3.969580	9,323.5	30,589
		156 38 34.3	336 33 22.1	Salters Hill (U. S. L. S.)	4.369855	23,434.5	76,885
		205 36 08.0	25 37 49.1	Bacon Island (U. S. L. S.)	3.844165	6,985.0	22,917
Burnt Point (No. 220) (U. S. L. S.) (Canada), 1894 (d. m.).	46 05 44.902	316 40 30.1	136 42 43.1	Bacon Island (U. S. L. S.)	3.762445	5,786.9	18,986
	83 52 39.811	354 49 02.8	174 49 34.6	Drummond (U. S. L. S.)	4.023358	10,552.6	34,621
		14 30 51.7	194 29 16.4	Detour (U. S. L. S.)	4.055467	11,362.3	37,278
Harbor Island (No. 281) (U. S. L. S.), 1894 (d. m.)	46 03 09.317	61 50 32.3	241 44 05.8	Detour (U. S. L. S.)	4.117543	13,108.2	43,006
	83 45 55.097	97 09 54.2	277 07 15.8	Bacon Island (U. S. L. S.)	3.678178	4,766.3	15,637
		118 57 15.0	298 52 23.5	Burnt Point (U. S. L. S.)	3.997192	9,935.6	32,597
Detour Lighthouse (U. S. L. S.), 1894 [1]	45 57 20.94	181 07 14	1 07 17	Detour (U. S. L. S.)	3.659010	4,560.5	14,962
	83 54 56.28	217 35 47	37 37 57	Drummond (U. S. L. S.)	3.804529	6,375.7	20,918
Parisian Island (U. S. L. S.) (Canada), 1895 (d. m.)	46 40 03.062	279 47 54.9	100 00 41.8	Pennefather (U. S. L. S.)	4.357297	22,766.5	74,693
	84 43 43.444	345 57 57.1	166 01 01.8	Iroquois (U. S. L. S.)	4.349847	22,379.3	73,423
Havilland (U. S. L. S.) (Canada), 1895 (d. m.)	46 47 16.953	23 05 48.4	202 57 18.4	Iroquois (U. S. L. S.)	4.581512	38,151.5	125,169
	84 27 47.562	56 40 06.2	236 28 30.2	Parisian Island (U. S. L. S.)	4.385978	24,320.8	79,792
		353 04 50.5	173 06 02.4	Pennefather (U. S. L. S.)	4.241573	17,441.1	57,221
North Sandy (1895) (U. S. L. S.) (Canada), 1895 (d. m.).	46 49 28.551	17 33 01.7	197 29 52.5	Parisian Island (U. S. L. S.)	4.262729	18,311.7	60,078
	84 39 23.692	285 19 20.1	105 27 47.6	Havilland (U. S. L. S.)	4.184964	15,309.6	50,228
		321 37 35.9	141 47 14.7	Pennefather (U. S. L. S.)	4.435180	27,238.3	89,364
Batchewana west base (U. S. L. S.) (Canada), 1895 (d. m.).	46 52 40.296	32 16 27.2	212 08 01.5	Parisian Island (U. S. L. S.)	4.441448	27,634.3	90,664
	84 32 09.309	57 17 12.4	237 11 55.6	North Sandy (1895) (U. S. L. S.)	4.039138	10,943.0	35,902
		330 55 05.5	150 58 16.5	Havilland (U. S. L. S.)	4.057751	11,422.2	37,474
Batchewana east base (U. S. L. S.) (Canada), 1895 (d. m.).	46 53 26.685	4 55 12.1	184 54 38.3	Havilland (U. S. L. S.)	4.059162	11,459.4	37,596
	84 27 01.226	65 01 00.9	244 51 59.2	North Sandy (1895) (U. S. L. S.)	4.239602	17,362.1	56,962
		77 38 43.3	257 34 58.3	Batchewana west base (U. S. L. S.).	3.824676	6,678.5	21,911
Mamainse (U. S. L. S.) (Canada), 1869; r. 1895 (d. m.).	47 01 35.816	3 35 01.9	183 32 50.0	Iroquois (U. S. L. S.)	4.790660	61,753.3	202,602
	84 36 28.135	13 03 12.5	192 57 54.9	Parisian Island (U. S. L. S.)	4.612483	40,971.6	134,421
		337 23 20.1	157 29 40.2	Havilland (U. S. L. S.)	4.458171	28,719.1	94,223
Crisp (U. S. L. S.), 1895 (d. m.)	46 43 44.178	235 50 40.7	56 18 56.9	Mamainse (U. S. L. S.)	4.773061	59,300.9	194,556
	85 15 12.011	263 30 02.0	84 04 34.1	Havilland (U. S. L. S.)	4.783347	60,722.1	199,219
		279 27 58.8	99 50 53.2	Parisian Island (U. S. L. S.)	4.609607	40,701.2	133,534
		301 49 12.9	122 15 09.9	Iroquois (U. S. L. S.)	4.730821	53,804.8	176,525
Caribou Island Lighthouse (U. S. L. S.) (Canada), 1895.	47 20 21.912	290 11 39.4	111 05 15.6	Mamainse (U. S. L. S.)	4.994083	98,646.8	323,644
	85 49 32.607	327 07 41.3	147 32 49.2	Crisp (U. S. L. S.)	4.906418	80,615.4	264,486
Whitefish Point (U. S. L. S.), 1895; l. 1910 (d. m.)	46 46 12.814	78 33 53.4	258 21 02.2	Crisp (U. S. L. S.)	4.360565	22,938.5	75,257
	84 57 33.177	223 05 04.8	43 20 28.5	Mamainse (U. S. L. S.)	4.592263	39,107.8	128,306
		255 13 46.3	75 27 00.5	North Sandy (1895) (U. S. L. S.)	4.378075	23,882.2	78,354
		302 51 22.7	123 01 26.8	Parisian Island (U. S. L. S.)	4.322165	20,997.4	68,889
Korah (U. S. L. S.) (Canada), 1893, r. 1894 (d. m.)	46 34 12.976	0 33 06.5	180 33 02.5	Larke (U. S. L. S.)	4.090197	12,308.3	40,381
	84 23 14.411	62 24 20.9	242 12 33.7	Iroquois (U. S. L. S.)	4.370376	23,462.6	76,977
		268 47 53.3	88 54 39.2	Rankin Mountain (U. S. L. S.)	4.075733	11,905.1	39,059
Azimuth (U. S. L. S.) (Canada), 1893 (d. m.)	46 34 26.415	12 23 59.0	192 22 23.9	Larke (U. S. L. S.)	4.114807	13,025.9	42,736
	84 21 08.892	81 11 17.2	261 09 46.0	Korah (U. S. L. S.)	3.432169	2,705.0	8,875
Mirron (U. S. L. S.), 1893 (d. m.)	46 29 03.549	77 18 12.2	257 11 18.9	Larke (U. S. L. S.)	4.095902	12,471.0	40,915
	84 13 49.843	128 30 30.0	308 23 40.3	Korah (U. S. L. S.)	4.186522	15,364.6	50,409
		136 51 33.1	316 46 14.5	Azimuth (U. S. L. S.)	4.135858	13,672.8	44,858
		179 17 49.5	359 17 45.4	Rankin Mountain (U. S. L. S.)	3.990927	9,793.3	32,130
Soo east base (U. S. L. S.), 1893 (d. m.)	46 29 12.836	146 04 56.9	326 01 24.5	Korah (U. S. L. S.)	4.048130	11,172.0	36,653
	84 18 21.684	210 48 10.1	30 51 23.3	Rankin Mountain (U. S. L. S.)	4.044148	11,070.0	36,319
		272 48 14.5	92 51 31.7	Mirron (U. S. L. S.)	3.763821	5,805.3	19,046
Ste. Marie (U. S. L. S.) (Canada), 1893 (d. m.)	46 31 04.573	10 17 24.9	190 17 03.6	Soo east base (U. S. L. S.)	3.544883	3,506.6	11,505
	84 17 52.315	47 08 56.3	227 04 58.7	Larke (U. S. L. S.)	3.979415	9,537.1	31,290
		219 46 46.1	39 49 38.0	Rankin Mountain (U. S. L. S.)	3.896653	7,882.3	25,861
		305 50 03.1	125 52 59.0	Mirron (U. S. L. S.)	3.804779	6,379.4	20,930
Soo west base (U. S. L. S.), 1893 (d. m.)	46 29 58.130	239 38 07.3	59 40 06.5	Ste. Marie (U. S. L. S.)	3.608587	4,060.6	13,322
	84 20 36.674	295 53 52.2	115 55 30.1	Soo east base (U. S. L. S.)	3.505229	3,200.6	10,501

GEOGRAPHIC POSITIONS—Continued

Northern Michigan—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Soo (U. S. L. S.), 1893 (d. m.)	46 29 08.614	211 38 04.1	31 38 36.1	Soo west base (U. S. L. S.)	3.254282	1,795.9	5,892
	84 21 20.847	231 08 09.4	51 10 40.6	Ste. Marie (U. S. L. S.)	3.756556	5,708.9	18,730
		268 01 40.3	88 03 50.2	Soo east base (U. S. L. S.)	3.582471	3,823.6	12,545
Ant (U. S. L. S.) (Canada), 1904 (d. m.)	45 50 06.331	341 07 51.1	161 11 38.6	Duck Island (U. S. L. S.)	4.327529	21,258.3	69,745
	83 03 09.535	113 19 17.1	293 06 47.9	Reid (U. S. L. S.)	4.388991	24,490.1	80,348
Lynn (U. S. L. S.) (Canada), 1904 (d. m.)	45 51 40.221	116 51 45.1	296 44 18.7	Reid (U. S. L. S.)	4.176598	15,017.5	49,270
	83 10 11.481	287 31 51.4	107 36 54.1	Ant (U. S. L. S.)	3.980003	9,550.0	31,332
		325 08 11.4	145 17 01.2	Duck Island (U. S. L. S.)	4.447309	28,009.7	91,895
Boom Point (U. S. L. S.) (Canada), 1904 (d. m.)	45 50 59.500	264 57 10.1	85 05 09.9	Lynn (U. S. L. S.)	4.160804	14,481.2	47,510
	83 21 20.174	305 24 15.8	125 41 04.5	Duck Island (U. S. L. S.)	4.572947	37,406.5	122,724
Lime (U. S. L. S.) (Canada), 1904 (d. m.)	45 52 29.560	291 38 00.3	111 40 08.0	Lynn (U. S. L. S.)	3.615821	4,128.8	13,546
	83 13 09.395	320 57 38.7	141 08 36.0	Duck Island (U. S. L. S.)	4.498810	31,536.2	103,465
		75 19 59.0	255 14 06.8	Boom Point (U. S. L. S.)	4.039252	10,945.9	35,912
Western Duck (U. S. L. S.) (Canada), 1904 (d. m.)	45 45 52.802	355 30 45.5	175 31 17.5	Duck Island (U. S. L. S.)	4.090414	12,314.4	40,401
	82 58 36.504	143 05 29.3	323 02 13.6	Ant (U. S. L. S.)	3.991762	9,812.1	32,192
Walkhouse (U. S. L. S.) (Canada), 1904 (d. m.)	45 47 02.962	27 27 07.3	207 22 59.3	Duck Island (U. S. L. S.)	4.211400	16,270.5	53,381
	82 52 05.580	75 39 16.8	255 34 36.5	Western Duck (U. S. L. S.)	3.940489	8,719.4	28,607
Burnt Point (U. S. L. S.) (Canada), 1904 (d. m.)	45 48 18.553	289 52 15.7	109 55 49.8	Walkhouse (U. S. L. S.)	3.836086	6,856.2	22,494
	82 57 04.075	23 56 08.7	203 55 02.4	Western Duck (U. S. L. S.)	3.692223	4,923.0	16,152
		113 00 00.6	292 55 38.5	Ant (U. S. L. S.)	3.932905	8,568.5	28,112
Misery (U. S. L. S.) (Canada), 1904 (d. m.)	45 46 36.130	50 09 58.8	230 01 00.0	Duck Island (U. S. L. S.)	4.326760	21,220.7	69,622
	82 45 19.390	95 26 00.8	275 21 09.7	Walkhouse (U. S. L. S.)	3.945174	8,814.0	28,917
Gatacre (U. S. L. S.) (Canada), 1904 (d. m.)	45 45 21.826	66 23 10.6	246 08 58.6	Duck Island (U. S. L. S.)	4.449138	28,127.9	92,283
	82 38 01.682	103 40 37.6	283 35 24.0	Misery (U. S. L. S.)	3.988224	9,732.5	31,931

Chicago to Toledo

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Logarithm (meters)	Meters	Feet
Principal points							
Michigan City (U. S. L. S.) (Ind.), 1874, l. 1935 (d. m.)	41 44 07.633						
	86 52 20.178						
Springville (U. S. L. S.) (Ind.), 1874, r. 1935 (d. m.)	41 39 52.662	125 55 50.70	305 50 37.92	Michigan City (U. S. L. S.)	4.1277279	13,419.24	44,026.3
	86 44 29.992						
Bald Tom (U. S. L. S.), 1874, r. 1877 (d. m.)	41 54 19.190	23 52 12.18	203 46 31.57	Springville (U. S. L. S.)	4.4657410	29,224.09	95,879.4
	86 35 58.827	50 17 40.63	230 06 46.27	Michigan City (U. S. L. S.)	4.4695028	29,478.33	96,713.5
Galena (U. S. L. S.) (Ind.), 1877, r. 1935 (d. m.)	41 41 45.730	105 01 39.05	284 53 47.48	Michigan City (U. S. L. S.)	4.2293493	16,957.01	55,633.1
	86 40 31.513	195 07 40.42	15 10 42.17	Bald Tom (U. S. L. S.)	4.3817147	24,083.23	79,013.1
		45 04 36		Azimuth mark.			
Carlisle (U. S. L. S.) (Ind.), 1877, r. 1935 (d. m.)	41 40 05.005	101 40 51.81	281 33 37.35	Galena (U. S. L. S.)	4.1882862	15,427.17	50,614.0
	86 29 38.178	161 35 23.90	341 31 10.25	Bald Tom (U. S. L. S.)	4.4437413	27,780.58	91,143.5
		203 24 07		Azimuth mark.			
Bertrand (U. S. L. S.), 1877, r. 1932 (d. m.)	41 46 44.811	38 08 28.07	218 03 49.56	Carlisle (U. S. L. S.)	4.1952044	15,674.89	51,426.7
	86 22 39.710	69 40 00.52	249 28 07.00	Galena (U. S. L. S.)	4.4221177	26,431.25	86,716.5
		127 19 19.38	307 10 26.30	Bald Tom (U. S. L. S.)	4.3647603	23,161.16	75,987.9
Penn (U. S. L. S.) (Ind.), 1877, r. 1935 (d. m.)	41 38 52.988	95 24 39.16	275 13 13.15	Carlisle (U. S. L. S.)	4.3799055	23,983.11	78,684.6
	86 12 26.089	135 47 46.92	315 40 58.62	Bertrand (U. S. L. S.)	4.3080382	20,325.36	66,684.1
Milton (U. S. L. S.), 1877, r. 1920 (d. m.)	41 48 09.211	8 57 49.68	188 56 31.83	Penn (U. S. L. S.)	4.2398528	17,372.12	56,995.0
	86 10 29.122	60 44 44.73	240 31 59.81	Carlisle (U. S. L. S.)	4.4838450	30,468.08	99,960.7
		81 17 33.95	261 09 27.08	Bertrand (U. S. L. S.)	4.2322086	17,069.02	56,000.6
Jefferson (U. S. L. S.) (Ind.), 1878, r. 1935 (d. m.)	41 40 59.910	83 24 47.96	263 08 52.92	Penn (U. S. L. S.)	4.5246021	33,465.87	109,795.9
	85 48 29.465	113 35 58.25	293 21 19.64	Milton (U. S. L. S.)	4.5217349	33,245.66	109,073.5
Calvin (U. S. L. S.), 1878, r. 1935 (d. m.)	41 50 10.236	330 23 09.77	150 27 47.56	Jefferson (U. S. L. S.)	4.2905300	19,522.26	64,049.3
	85 55 26.569	48 31 26.62	228 20 07.84	Penn (U. S. L. S.)	4.4981623	31,489.28	103,311.1
		79 55 16.44	259 45 14.63	Milton (U. S. L. S.)	4.3255703	21,162.66	69,431.2
Porter (U. S. L. S.) 1878, r. 1935 (d. m.)	41 49 22.346	12 36 50.20	192 35 10.33	Jefferson (U. S. L. S.)	4.2009509	15,883.67	52,111.7
	85 45 59.490	96 29 39.93	276 23 21.74	Calvin (U. S. L. S.)	4.1195555	13,169.08	43,205.6
Sherman (U. S. L. S.), 1878, r. 1935 (d. m.)	41 50 48.456	58 30 55.37	238 16 44.38	Jefferson (U. S. L. S.)	4.5397080	34,650.38	113,682.1
	85 27 11.854	84 16 28.19	264 03 56.07	Porter (U. S. L. S.)	4.4175467	26,154.52	85,808.6
		88 25 46.64	268 06 56.14	Calvin (U. S. L. S.)	4.5923742	39,117.78	128,338.9
Van Buren (U. S. L. S.) (Ind.), 1878, r. 1935 (d. m.)	41 42 29.658	80 24 11.40	260 16 23.56	Jefferson (U. S. L. S.)	4.2174316	16,498.01	54,127.2
	85 36 46.127	118 52 28.67	298 40 02.27	Calvin (U. S. L. S.)	4.4701607	29,523.01	96,860.1
		134 56 20.73	314 50 12.14	Porter (U. S. L. S.)	4.2562707	18,041.42	59,190.9
		220 42 09.78	40 48 32.39	Sherman (U. S. L. S.)	4.3078264	20,315.45	66,651.6

GEOGRAPHIC POSITIONS—Continued

Chicago to Toledo—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Mongo (U. S. L. S.) (Ind.), 1878, r. 1935 (d. m.)	41 41 34.446	93 31 11.96	273 17 27.37	Van Buren (U. S. L. S.)	4.4575298	28,676.74	94,083.6
	85 16 08.096	138 10 13.85	318 02 51.70	Sherman (U. S. L. S.)	4.3609836	22,960.62	75,330.0
Bronson (U. S. L. S.), 1878 (d. m.)	41 51 22.333	6 31 27.36	186 30 27.60	Mongo (U. S. L. S.)	4.2613925	18,255.45	59,893.1
	85 14 38.399	86 37 42.33	266 29 19.63	Sherman (U. S. L. S.)	4.2408542	17,412.22	57,126.6
Fremont (U. S. L. S.) (Ind.), 1878, r. 1935 (d. m.)	41 42 31.981	86 04 15.45	265 52 10.52	Mongo (U. S. L. S.)	4.4024177	25,259.09	82,870.9
	84 57 58.378	125 24 40.94	305 13 34.62	Bronson (U. S. L. S.)	4.4518252	28,302.53	92,855.9
		161 14 04		Azimuth mark.			
Quincy (U. S. L. S.), 1878 (d. m.)	41 57 39.906	7 28 19.51	187 26 33.52	Fremont (U. S. L. S.)	4.4510274	28,250.58	92,685.4
	84 55 19.473	66 32 39.22	246 19 45.12	Bronson (U. S. L. S.)	4.4644925	29,140.20	95,604.1
Reading (U. S. L. S.), 1878; r. 1932 (d. m.)	41 50 05.966	53 09 55.64	233 00 57.77	Fremont (U. S. L. S.)	4.3677752	23,322.51	76,517.3
	84 44 30.974	133 11 37.19	313 04 24.12	Quincy (U. S. L. S.)	4.3114257	20,484.51	67,206.3
Hillsdale (U. S. L. S.), 1878, r. 1879 (d. m.)	41 55 14.163	38 44 19.59	218 40 38.99	Reading (U. S. L. S.)	4.0858350	12,185.27	39,977.8
	84 39 00.509	101 22 02.62	281 11 08.32	Quincy (U. S. L. S.)	4.3616403	22,995.37	75,444.0
Pittsford (U. S. L. S.), 1879, r. 1935 (d. m.)	41 49 33.170	92 46 57.45	272 36 36.50	Reading (U. S. L. S.)	4.3326111	21,508.55	70,566.0
	84 28 59.920	127 16 35.45	307 09 54.56	Hillsdale (U. S. L. S.)	4.2403609	17,392.46	57,061.8
		310 08 10		Azimuth mark.			
Wheatland (U. S. L. S.), 1879, r. 1935 (d. m.)	41 55 06.245	12 46 59.39	192 45 51.96	Pittsford (U. S. L. S.)	4.0227173	10,537.01	34,570.2
	84 27 18.893	68 49 33.01	248 38 04.06	Reading (U. S. L. S.)	4.4071950	25,538.48	83,787.5
		90 55 50.67	270 48 01.93	Hillsdale (U. S. L. S.)	4.2087013	16,169.68	53,050.0
Bunday (U. S. L. S.), 1879, r. 1932 (d. m.)	42 03 15.965	358 01 20.12	178 01 35.27	Wheatland (U. S. L. S.)	4.1795061	15,118.41	49,601.0
	84 27 41.535	46 29 56.03	226 22 21.82	Hillsdale (U. S. L. S.)	4.3338441	21,569.70	70,766.6
		95 54 31		Azimuth mark.			
Woodstock (U. S. L. S.), 1879, r. 1935 (d. m.)	41 59 12.486	46 08 09.81	225 59 12.30	Pittsford (U. S. L. S.)	4.4109202	25,758.48	84,509.3
	84 15 35.169	64 57 04.38	244 49 13.92	Wheatland (U. S. L. S.)	4.2528589	17,900.24	58,727.7
		114 16 19.51	294 08 13.27	Bunday (U. S. L. S.)	4.2629843	18,322.48	60,113.0
Fairfield (U. S. L. S.), 1879, l. 1935 (d. m.)	41 48 56.062	91 56 27.17	271 38 51.26	Pittsford (U. S. L. S.)	4.5630606	36,564.58	119,962.3
	84 02 36.387	108 36 31.94	288 20 02.50	Wheatland (U. S. L. S.)	4.5568753	36,047.51	118,265.9
		136 43 32.44	316 34 52.33	Woodstock (U. S. L. S.)	4.4175092	26,152.26	85,801.2
Raisin (U. S. L. S.), 1879, r. 1935 (d. m.)	41 57 11.449	32 49 05.97	212 44 20.98	Fairfield (U. S. L. S.)	4.2595606	18,178.61	59,641.0
	83 55 29.527	97 46 24.29	277 32 58.02	Woodstock (U. S. L. S.)	4.4473222	28,010.59	91,898.1
Blissfield (U. S. L. S.), 1879, l. 1935 (d. m.)	41 51 08.340	78 18 46.88	258 09 20.52	Fairfield (U. S. L. S.)	4.3013372	20,014.15	65,663.1
	83 48 27.238	111 51 45.31	291 33 37.71	Woodstock (U. S. L. S.)	4.6061447	40,377.99	132,473.5
		139 03 12.36	318 58 30.33	Raisin (U. S. L. S.)	4.1714572	14,840.80	48,690.2
Dundee (U. S. L. S.), 1879, l. 1935 (d. m.)	41 55 28.045	54 54 52.06	234 49 22.27	Blissfield (U. S. L. S.)	4.1437636	13,923.99	45,682.3
	83 40 13.307	98 40 49.15	278 30 36.81	Raisin (U. S. L. S.)	4.3293262	21,346.48	70,034.2
Bedford (U. S. L. S,.)1879, l. 1935 (d. m.)	41 49 11.110	103 00 43.56	282 53 08.85	Blissfield (U. S. L. S.)	4.2079167	16,140.49	52,954.3
	83 37 05.508	120 18 40.14	300 06 23.04	Raisin (U. S. L. S.)	4.4691395	29,453.68	96,632.6
		159 35 31.50	339 33 26.15	Dundee (U. S. L. S.)	4.0937589	12,409.63	40,713.9
Monroe (U. S. L. S.), 1879 (d. m.)	41 55 04.480	48 18 57.12	228 13 03.40	Bedford (U. S. L. S.)	4.2142648	16,378.15	53,734.0
	83 28 15.534	92 35 01.09	272 27 01.54	Dundee (U. S. L. S.)	4.2189474	16,555.69	54,316.5
Cedar Point (U. S. L. S.) (Ohio), 1877, p. l. 1932 (d. m.)	41 42 37.734	117 21 31.94	297 10 12.87	Bedford (U. S. L. S.)	4.4231299	26,492.93	86,918.9
	83 20 06.009	153 55 13.39	333 49 47.01	Monroe (U. S. L. S.)	4.4092622	25,660.33	84,187.3
		240 59 44.41	61 13 03.17	Middle Sister (U. S. L. S.)	4.5000091	31,623.44	103,751.2
		298 54 56.40	119 04 05.01	Locust Point (U. S. L. S.)	4.3390376	21,829.19	71,617.9
Stony Point (U. S. L. S.), 1877, r. 1879 (d. m.)	41 55 53.827	13 30 54.86	193 28 04.61	Cedar Point (U. S. L. S.)	4.4024044	25,258.31	82,868.3
	83 15 50.677	84 59 58.87	264 51 41.19	Monroe (U. S. L. S.)	4.2362919	17,230.26	56,529.6
		293 01 09.00	113 11 39.01	Middle Sister (U. S. L. S.)	4.3738340	23,650.16	77,592.2
Supplementary points							
Airway beacon No. 6 (Ind.), 1932 [1]	41 33 23.46	159 31 18	339 28 32	Galena (U. S. L. S.)	4.218627	16,543.5	54,276
	86 36 21.22	216 57 12	37 01 40	Carlisle (U. S. L. S.)	4.190604	15,509.7	50,885
Carlisle (U. S. L. S.), latitude station (Ind.), 1908 (d. m.).	41 40 04.596 86 29 37.190	118 55 14.1	298 55 13.4	Carlisle (U. S. L. S.)	1.416923	26.12	85.7
South Bend, Bendix Corporation, center of neon sign (Ind.), 1932.	41 41 00.88	84 04 04	263 56 12	Carlisle (U. S. L. S.)	4.217377	16,495.9	54,120
	86 17 48.93	147 40 48	327 37 34	Bertrand (U. S. L. S.)	4.098992	12,560.1	41,208
South Bend, Bendix Corporation, stack (Ind.), 1932	41 40 48.42	85 31 22	265 23 18	Carlisle (U. S. L. S.)	4.228037	16,905.8	55,465
	86 17 29.63	146 55 57	326 52 31	Bertrand (U. S. L. S.)	4.118085	13,124.6	43,060
South Bend, Studebaker Corporation, slowly revolving light on tank (Ind.), 1932.[1]	41 40 06.28	89 57 57	269 48 25	Carlisle (U. S. L. S.)	4.298694	19,892.7	65,265
	86 15 18.28	140 21 13	320 16 19	Bertrand (U. S. L. S.)	4.203506	15,977.4	52,419
South Bend, Notre Dame University, Administration Building, tip of gold dome (Ind.), 1932, r. 1935.	41 42 10.73	79 43 48	259 33 37	Carlisle (U. S. L. S.)	4.334049	21,579.9	70,800
	86 14 20.30	126 16 39	306 11 06	Bertrand (U. S. L. S.)	4.155537	14,306.6	46,938
South Bend, Notre Dame University, Sacred Heart Church, tip of steeple (Ind.), 1932.	41 42 08.12	79 54 43	259 44 34	Carlisle (U. S. L. S.)	4.332548	21,505.4	70,556
	86 14 22.94	126 40 56	306 35 25	Bertrand (U. S. L. S.)	4.155501	14,305.4	46,934
Sherman (U. S. L. S.), latitude station, 1908 (d.)	41 50 47.465 85 27 11.084	149 51 00.5	329 51 00.0	Sherman (U. S. L. S.)	1.5484017	35.351	115.98

[1] No check on this position.

77720°—30——4

GEOGRAPHIC POSITIONS—Continued

Indiana-Ohio Boundary

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points	° ′ ″	° ′ ″	° ′ ″				
Shaull (Ohio), 1932 (d. m.)	41 33 29.146 84 35 38.451	83 07 07		Azimuth mark.			
Alvarado (Ind.), 1932 (d. m.)	41 33 50.523 84 49 00.927	271 57 26.10 346 25 27	92 06 18.48	Shaull Azimuth mark.	4.2696715	18,606.79	61,045.8
Dury, 1932 (d. m.)	41 42 16.344 84 36 42.832	354 45 32.45 47 39 29.55 143 18 34.39 218 23 10.98 219 08 43	174 46 15.22 227 31 19.18 323 13 22.55 38 28 19.32	Shaull Alvarado Reading (U. S. L. S.) Pittsford (U. S. L. S.) Azimuth mark.	4.2130614 4.3643322 4.2571698 4.2356208	16,332.83 23,138.34 18,078.81 17,203.66	53,585.3 75,913.0 59,313.6 56,442.3
Watts (Ind.), 1932 (d. m.)	41 41 51.861 84 48 41.832	267 19 55.82 310 28 01.22 1 42 23.73 95 32 44.92 200 47 21.39 242 21 31.01 75 47 08	87 27 54.13 130 36 41.61 181 42 11.04 275 26 34.66 20 50 08.48 62 34 38.21	Dury Shaull Alvarado Fremont (U. S. L. S.) Reading (U. S. L. S.) Pittsford (U. S. L. S.) Azimuth mark.	4.2212032 4.3777007 4.1719151 4.1115138 4.2124076 4.4884011	16,641.91 23,861.66 14,856.45 12,927.48 16,308.26 30,789.39	54,599.3 78,286.1 48,741.5 42,412.9 53,504.7 101,014.9
Supplementary points							
Airway beacon No. 14 (Ind.), 1932	41 33 32.933 84 59 46.192	224 54 47.4 267 51 43.2	45 02 08.7 87 58 51.2	Watts Alvarado	4.337631 4.174992	21,758.6 14,962.1	71,386 49,088
Airway beacon No. 15 (Ohio), 1932	41 33 57.264 84 46 07.894	87 02 48.0	267 00 53.2	Alvarado	3.603654	4,014.7	13,172
Airway beacon No. 17 (Ohio), 1932 [1]	41 33 53.28 84 33 19.39	77 00 19	256 58 37	Shaull	3.519453	3,307.1	10,850
Ohio-Michigan boundary monument No. 1 (Ohio-Mich.), 1932 (d. m.)	41 41 45.881 84 48 21.398	111 19 43.7	291 19 28.9	Watts	2.7052169	507.244	1,664.18
Ohio-Michigan boundary monument No. 9 (Ohio-Mich.), 1932 (d. m.).	41 42 04.743 84 36 42.787	179 50 06.1	359 50 06.1	Dury	2.5537834	357.918	1,174.27
Montpelier, municipal power plant, brick stack (Ohio), 1932.	41 34 49.466 84 36 31.160	333 45 33.7 84 05 34.1	153 46 08.7 263 57 16.6	Shaull Alvarado	3.441311 4.242185	2,762.6 17,465.7	9,064 57,302
Reading, municipal water tank, finial, 1932 [1]	41 50 34.31 84 44 53.56	274 48 40 323 32 14	94 59 16 143 37 41	Pittsford (U. S. L. S.) Dury	4.344105 4.280841	22,085.4 19,091.5	72,459 62,636
Reading eccentric, 1932 (d. m.)	41 50 06.078 84 44 30.582	272 37 13.7 69 07 27.8 211 55 48	92 47 34.4 249 07 27.6	Pittsford (U. S. L. S.) Reading (U. S. L. S.) Azimuth mark.	4.332432 0.985471	21,499.7 9.671	70,537 31.73
Reading, Acme Chair Co., red tank, 1932	41 50 05.576 84 44 30.782	196 37	16 37	Reading eccentric	1.208978	16.18	53.1

Lake Erie to Lake St. Clair

Principal points							
Middle Sister (U. S. L. S.) (Canada), 1877, r. 1911 (d. m.)	41 50 52.999 83 00 07.133						
Point Pelée (U. S. L. S.) (Canada), 1877, r. 1911 (d.m.)	41 48 50.686 82 41 01.868	98 13 57.11	278 01 13.29	Middle Sister (U. S. L. S.)	4.4264398	26,695.61	87,583.8
Middle Bass Island (U. S. L. S.) (Ohio), 1877, r. 1928 (d. m.).	41 41 47.830 82 47 14.450	133 22 29.67 213 22 55.85	313 13 54.93 33 27 03.97	Middle Sister (U. S. L. S.) Point Pelée (U. S. L. S.)	4.3895777 4.1939504	24,523.23 15,629.69	80,456.6 51,278.4
Locust Point (U. S. L. S.) (Ohio), 1877, l. 1932 (d. m.)	41 36 54.791 83 06 20.720	198 25 41.77 251 04 18.56	18 29 50.45 71 17 00.44	Middle Sister (U. S. L. S.) Middle Bass Island (U. S. L. S.)	4.4355813 4.4474868	27,263.48 28,021.21	89,446.9 91,932.9
Mettawas (U. S. L. S.) (Canada), 1910 (d. m.)	42 01 36.213 82 44 19.868	349 02 53.09 47 48 18.10	169 05 05.37 227 37 45.02	Point Pelée (U. S. L. S.) Middle Sister (U. S. L. S.)	4.3812112 4.4697698	24,055.32 29,496.46	78,921.5 96,773.0
Colchester (U. S. L. S.) (Canada), 1910 (d. m.)	42 00 34.919 82 56 09.849	263 19 49.31 315 59 33.47 16 57 28.53	83 27 44.55 136 09 39.99 196 54 49.97	Mettawas (U. S. L. S.) Point Pelée (U. S. L. S.) Middle Sister (U. S. L. S.)	4.2160200 4.4795138 4.2734140	16,444.47 30,165.73 18,767.83	53,951.6 98,968.7 61,574.1
Miner (U. S. L. S.) (Canada), 1910 (d. m.)	42 04 32.584 82 45 04.091	349 24 36.76 64 28 21.17	169 25 06.38 244 20 55.32	Mettawas (U. S. L. S.) Colchester (U. S. L. S.)	3.7431875 4.2298674	5,535.89 16,977.25	18,162.3 55,699.5
Cottam (U. S. L. S.) (Canada) 1909 (d. m.)	42 09 06.684 82 43 45.986	3 12 35.47 11 59 10.73 47 20 50.51	183 12 12.76 191 58 18.35 227 12 31.99	Mettawas (U. S. L. S.) Miner (U. S. L. S.) Colchester (U. S. L. S.)	4.1436550 3.9367799 4.3668653	13,920.51 8,645.30 23,273.69	45,670.9 28,363.8 76,357.1
Maidstone (U. S. L. S.) (Canada), 1909 (d. m.)	42 11 49.233 82 55 16.009	287 30 26.97 313 44 03.85 3 24 28.44	107 38 10.24 133 50 54.38 183 23 52.34	Cottam (U. S. L. S.) Miner (U. S. L. S.) Colchester (U. S. L. S.)	4.2204326 4.2893147 4.3189371	16,612.41 19,467.70 20,841.89	54,502.5 63,870.3 68,378.8

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Erie to Lake St. Clair—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued.	° ′ ″	° ′ ″	° ′ ″				
Deerbrook (U. S. L. S.) (Canada), 1909, r. 1932 (d. m.)	42 17 38.634	28 28 20.80	208 24 10.14	Cottam (U. S. L. S.)	4.2543907	17,963.49	58,935.2
	82 37 32.995	66 14 11.81	246 02 17.14	Maidstone (U. S. L. S.)	4.4256758	26,648.69	87,429.9
		110 59 05		Azimuth mark.			
Tecumseh (U. S. L. S.) (Canada), 1910, r. 1934 (d. m.)	42 19 56.535	281 00 05.82	101 10 43.89	Deerbrook (U. S. L. S.)	4.3447868	22,120.09	72,572.3
	82 53 20.836	326 37 43.33	146 44 09.78	Cottam (U. S. L. S.)	4.3801142	23,994.64	78,722.4
		9 58 05.50	189 56 48.04	Maidstone (U. S. L. S.)	4.1837110	15,265.50	50,083.6
Walpole (U. S. L. S.) (Canada), 1909, r. 1932 (d. m.)	42 33 25.092	15 09 07.36	195 05 14.51	Deerbrook (U. S. L. S)	4.4807353	30,250.69	99,247.5
	82 31 47.841	49 56 50.28	229 42 17.67	Tecumseh (U. S. L. S.)	4.5874109	38,673.27	126,880.6
		91 53 15		Azimuth mark.			
Mount Clemens (U. S. L. S.), 1909, r. 1932 (d. m.)	42 34 26.108	274 33 36.97	94 45 02.59	Walpole (U. S. L. S.)	4.3654212	23,196.43	76,103.6
	82 48 41.433	333 45 47.07	153 53 18.09	Deerbrook (U. S. L. S.)	4.5395543	34,638.12	113,641.9
		13 24 39.22	193 21 30.63	Tecumseh (U. S. L. S.)	4.4406017	27,580.47	90,486.9
		183 50 10		Red barn, cupola.			
Supplementary points							
Green Island Lighthouse (U. S. L. S.) (Ohio), 1910 [1]	41 38 43.92	153 37 06	333 31 44	Middle Sister (U. S. L. S.)	4.399989	25,118.2	82,409
	82 52 03.32	229 38 20	49 41 32	Middle Bass Island (U. S. L. S.)	3.942818	8,766.3	28,761
Middle Island Lighthouse (U. S. L. S.) (Ohio), 1910 [1]	41 41 00.17	8 39 20	188 38 42	Kellys Island (U. S. L. S.)	3.945172	8,814.0	28,917
	82 40 47.33	99 21 48	279 17 30	Middle Bass Island (U. S. L. S.)	3.957727	9,072.5	29,765
South Bass Island Lighthouse (U. S. L. S.) (Ohio), 1910.[1]	41 37 44.31	151 18 55	331 12 31	Middle Sister (U. S. L. S.)	4.443274	27,750.7	91,045
	82 50 29.75	282 20 33	102 26 22	Kellys Island (U. S. L. S.)	4.095098	12,448.0	40,840
Pelée Island Lighthouse (U. S. L. S.) (Canada), 1910.	41 49 54.744	61 58 41.3	241 56 54.1	Point Pelée (U. S. L. S.)	3.623726	4,204.6	13,795
	82 38 21.060	128 49 39.7	308 37 45.7	Colchester (U. S. L. S.)	4.499275	31,570.0	103,576
		159 07 38.7	339 03 39.0	Mettawas (U. S. L. S.)	4.364879	23,167.5	76,009
Pelée Passage Lighthouse (U. S. L. S.) (Canada), 1910.	41 51 08.226	63 08 07.1	243 04 05.3	Point Pelée (U. S. L. S.)	3.972188	9,379.7	30,773
	82 34 59.355	120 58 04.5	300 43 55.5	Colchester (U. S. L. S.)	4.532701	34,095.8	111,863
		146 22 16.5	326 16 01.9	Mettawas (U. S. L. S.)	4.367050	23,283.6	76,390
Colchester Reef Lighthouse (U. S. L. S.) (Canada), 1910.	41 55 56.403	230 24 19.7	50 30 28.6	Mettawas (U. S. L. S.)	4.216626	16,467.4	54,027
	82 53 31.458	307 09 34.4	127 17 54.7	Point Pelée (U. S. L. S.)	4.336655	21,709.8	71,226
		44 17 47.3	224 13 23.0	Middle Sister (U. S. L. S.)	4.116289	13,070.4	42,882
West Sister Lighthouse (U. S. L. S.), 1910	41 44 13.090	205 30 37.1	25 37 36.5	Colchester (U. S. L. S.)	4.526086	33,580.4	110,172
	83 06 38.331	216 10 16.3	36 14 36.9	Middle Sister (U. S. L. S.)	4.184435	15,291.0	50,167
		279 20 57.6	99 33 52.1	Middle Bass Island (U. S. L. S.)	4.435773	27,275.5	89,486
Bar Point (1910) (U. S. L. S.) (Canada), 1910	42 03 17.880	288 33 18.9	108 40 33.4	Colchester (U. S. L. S.)	4.197300	15,750.7	51,675
	83 06 58.747	337 32 41.2	157 37 16.5	Middle Sister (U. S. L. S.)	4.395508	24,860.4	81,563
Pointe Mouillée (1910) (U. S. L. S.), 1910	42 00 49.806	229 49 34.8	49 52 12.4	Bar Point (1910) (U. S. L. S.)	3.850347	7,085.1	23,245
	83 10 54.177	271 12 39.1	91 22 31.0	Colchester (U. S. L. S.)	4.308650	20,354.0	66,778
		320 56 44.5	141 03 57.0	Middle Sister (U. S. L. S.)	4.374591	23,691.4	77,728
Kingsville power house stack (U. S. L. S.) (Canada), 1910.	42 01 44.284	350 14 12.7	170 16 11.5	Point Pelée (U. S. L. S.)	4.384125	24,217.3	79,453
	82 43 59.787	61 40 16.9	241 40 03.2	Mettawas (U. S. L. S.)	2.719996	524.8	1,722
		82 48 24.7	262 40 16.0	Colchester (U. S. L. S.)	4.228731	16,932.9	55,554
Leamington Lighthouse (U. S. L. S.) (Canada), 1910.[1]	42 01 49.00	15 35 24	195 32 10	Point Pelée (U. S. L. S.)	4.396674	24,927.2	81,782
	82 36 11.63	88 01 59	267 56 32	Mettawas (U. S. L. S.)	4.050715	11,238.7	36,872
Stony Point Catholic Church (U. S. L. S.) (Canada), 1910.	42 18 15.733	79 59 44.2	259 56 34.0	Deerbrook (U. S. L. S.)	3.817687	6,571.8	21,561
	82 32 50.483	96 24 52.1	276 11 03.9	Tecumseh (U. S. L. S.)	4.452489	28,345.8	92,998
		182 54 56.1	2 55 38.3	Walpole (U. S. L. S.)	4.448635	28,095.4	92,176
Belle River Catholic Church (U. S. L. S.) (Canada), 1910.[1]	42 17 30.46	206 04 40	26 11 46	Walpole (U. S. L. S.)	4.516015	32,810.7	107,646
	82 42 20.08	267 46 41	87 49 54	Deerbrook (U. S. L. S.)	3.818331	6,581.6	21,593
Thames River rear range light (U. S. L. S.) (Canada), 1910.[1]	42 19 02.77	79 42 45	259 35 47	Deerbrook (U. S. L. S.)	4.160057	14,456.3	47,429
	82 27 12.09	166 41 58	346 38 52	Walpole (U. S. L. S.)	4.436856	27,343.6	89,710
Mount Clemens, Catholic Church (U. S. L. S.) 1909.	42 36 00.290	198 05 11.4	18 09 13.6	Lenox (U. S. L. S.)	4.417040	26,124.0	85,708
	82 52 43.843	279 22 24.3	99 36 34.1	Walpole (U. S. L. S.)	4.463008	29,040.8	95,278
		297 42 40.3	117 45 24.9	Mount Clemens (U. S. L. S.)	3.795527	6,244.9	20,488
Colony Tower Lighthouse, 1932	42 37 55.200	319 46 55.1	139 50 24.2	Walpole (U. S. L. S.)	4.037836	10,910.3	35,795
	82 36 56.646	1 16 14.8	181 15 50.3	Deerbrook (U. S. L. S.)	4.574579	37,547.3	123,186
		68 11 13.9	248 03 16.9	Mount Clemens (U. S. L. S.)	4.238386	17,313.5	56,803
New Baltimore, standpipe (U. S. L. S.) 1909 [1]	42 40 41.00	28 27 34	208 24 28	Mount Clemens (U. S. L. S.)	4.119082	13,154.7	43,158
	82 44 06.57	167 18 45	347 16 56	Lenox (U. S. L. S.)	4.219385	16,572.4	54,371
New Baltimore, Catholic Church (U. S. L. S.) 1909.[1]	42 40 44.04	27 49 45	207 46 42	Mount Clemens (U. S. L. S.)	4.120035	13,183.6	43,253
	82 44 11.58	167 37 37	347 35 51	Lenox (U. S. L. S.)	4.216329	16,456.2	53,990
Richmond, standpipe (U. S. L. S.) 1909 [1]	42 48 39.84	10 05 28	190 03 09	Mount Clemens (U. S. L. S.)	4.427420	26,755.9	87,782
	82 45 15.88	123 57 56	303 56 54	Lenox (U. S. L. S.)	3.396262	2,490.4	8,171

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake St. Clair to Thunder Bay

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points	° ′ ″	° ′ ″	° ′ ″				
Lenox (U. S. L. S.), 1909, r. 1932 (d. m.)	42 49 24.917	325 16 20.62	145 26 30.15	Walpole (U. S. L. S.)	4.5562985	35,999.68	118,109.0
	82 46 46.808	5 23 05.51	185 21 47.78	Mount Clemens (U. S. L. S.)	4.4449356	27,857.08	91,394.4
Casco (U. S. L. S.), 1909, r. 1932 (d. m.)	42 43 21.400	336 34 35.81	156 38 32.44	Walpole (U. S. L. S.)	4.3020627	20,047.61	65,772.9
	82 37 37.176	42 33 19.12	222 25 49.09	Mount Clemens (U. S. L. S.)	4.3502600	22,400.62	73,492.7
		131 57 59.57	311 51 46.32	Lenox (U. S. L. S.)	4.2250941	16,791.68	55,090.7
St. Clair (U. S. L. S.), 1909, r. 1932 (d. m.)	42 49 46.763	6 47 38.54	186 45 51.28	Walpole (U. S. L. S.)	4.4843674	30,504.75	100,081.0
	82 29 09.653	44 10 57.24	224 05 12.57	Casco (U. S. L. S.)	4.2192853	16,568.58	54,358.7
		88 29 30.36	268 17 31.73	Lenox (U. S. L. S.)	4.3806120	24,022.16	78,812.7
Avoca (U. S. L. S.), 1909, r. 1932 (d. m.)	43 02 12.339	318 04 02.45	138 14 21.39	St. Clair (U. S. L. S.)	4.4897469	30,884.95	101,328.4
	82 44 18.328	8 06 21.96	188 04 40.83	Lenox (U. S. L. S.)	4.3787525	23,919.52	78,476.0
Atkins (U. S. L. S.), 1909 (d. m.)	43 03 39.720	345 21 18.28	165 24 39.72	St. Clair (U. S. L. S.)	4.4242850	26,563.48	87,150.4
	82 34 05.337	33 16 35.60	213 07 56.83	Lenox (U. S. L. S.)	4.4986581	31,525.22	103,429.0
		79 03 33.47	258 56 35.02	Avoca (U. S. L. S.)	4.1502462	14,133.38	46,369.3
Speaker (U. S. L. S.), 1909 (d. m.)	43 11 31.691	306 55 58.75	127 05 42.98	Atkins (U. S. L. S.)	4.3836968	24,193.40	79,374.5
	82 48 19.957	342 24 54.70	162 27 39.84	Avoca (U. S. L. S.)	4.2578003	18,105.08	59,399.7
Worth (U. S. L. S.), 1908, r. 1932 (d. m.)	43 13 23.502	355 11 49.61	175 12 35.36	Atkins (U. S. L. S.)	4.2571629	18,078.52	59,312.6
	82 35 12.230	30 50 43.64	210 44 30.30	Avoca (U. S. L. S.)	4.3822137	24,110.92	79,103.9
		79 05 37.87	258 56 38.56	Speaker (U. S. L. S.)	4.2580186	18,114.18	59,429.6
Cash (U. S. L. S.), 1908, r. 1932 (d. m.)	43 20 00.247	307 08 55.95	127 17 06.06	Worth (U. S. L. S.)	4.3062733	20,242.93	66,413.7
	82 47 07.158	5 58 46.23	185 57 56.34	Speaker (U. S. L. S.)	4.1981016	15,779.77	51,770.8
Applegate (U. S. L. S.), 1908, r. 1932 (d. m.)	43 21 29.341	356 04 04.07	176 04 35.38	Worth (U. S. L. S.)	4.1769139	15,028.44	49,305.8
	82 35 57.895	42 17 13.03	222 08 44.35	Speaker (U. S. L. S.)	4.3962539	24,903.13	81,703.0
		79 43 36.38	259 35 57.00	Cash (U. S. L. S.)	4.1853390	15,322.83	50,271.7
Custer (U. S. L. S.), 1908, r. 1932 (d. m.)	43 27 53.641	300 15 09.47	120 25 28.44	Applegate (U. S. L. S.)	4.3706936	23,479.76	77,033.2
	82 50 58.566	340 21 33.04	160 24 12.04	Cash (U. S. L. S.)	4.1906046	15,509.74	50,884.9
		86 56 43		Azimuth mark.			
McGregor (U. S. L. S.), 1908, r. 1932 (d. m.)	43 28 39.184	326 30 30.06	146 34 57.85	Applegate (U. S. L. S.)	4.2013851	15,899.56	52,163.8
	82 42 27.506	21 28 39.01	201 25 26.85	Cash (U. S. L. S.)	4.2356995	17,206.77	56,452.5
		83 04 22.72	262 58 31.12	Custer (U. S. L. S.)	4.0634378	11,572.78	37,968.4
Argyle (U. S. L. S.), 1908, r. 1932 (d. m.)	43 35 36.546	307 48 59.90	127 57 27.71	McGregor (U. S. L. S.)	4.3216868	20,974.27	68,813.1
	82 54 44.744	340 24 25.65	160 27 01.42	Custer (U. S. L. S.)	4.1807562	15,161.99	49,744.0
		97 10 27		Azimuth mark.			
Palms (U. S. L. S.), 1908, r. 1932 (d. m.)	43 36 40.429	345 15 02.23	165 17 02.07	McGregor (U. S. L. S.)	4.1863047	15,356.94	50,383.6
	82 45 21.468	24 59 46.68	204 55 54.47	Custer (U. S. L. S.)	4.2536529	17,933.00	58,835.2
		81 11 02.29	261 04 33.83	Argyle (U. S. L. S.)	4.1067441	12,786.28	41,949.7
Appin (U. S. L. S.), 1906, r. 1932 (d. m.)	43 41 10.288	293 26 51.14	113 36 40.23	Palms (U. S. L. S.)	4.3193539	20,861.90	68,444.4
	82 59 34.943	327 41 56.56	147 45 16.83	Argyle (U. S. L. S.)	4.0857186	12,182.00	39,967.1
Pollum (U. S. L. S.), 1906, r. 1932 (d. m.)	43 41 13.687	327 17 54.64	147 20 41.25	Palms (U. S. L. S.)	4.0008370	10,019.29	32,871.6
	82 49 22.852	34 46 08.57	214 42 26.42	Argyle (U. S. L. S.)	4.1024922	12,661.71	41,541.0
		89 37 12.99	269 30 10.21	Appin (U. S. L. S.)	4.1370196	13,709.44	44,978.4
Bingham (U. S. L. S.), 1906, r. 1932 (d. m.)	43 44 42.128	306 44 20.52	126 48 46.22	Pollum (U. S. L. S.)	4.0312169	10,745.26	35,253.4
	82 55 47.321	37 57 15.31	217 54 38.01	Appin (U. S. L. S.)	3.9185103	8,289.16	27,195.4
Popple (U. S. L. S.), 1906, r. 1932 (d. m.)	43 45 47.598	277 28 31.96	97 36 23.78	Bingham (U. S. L. S.)	4.1874201	15,396.43	50,513.1
	83 07 09.572	310 01 19.76	130 06 34.00	Appin (U. S. L. S.)	4.1237384	13,296.53	43,623.7
Verona (U. S. L. S.), 1906, r. 1932 (d. m.)	43 49 01.933	339 59 36.70	160 02 19.15	Pollum (U. S. L. S.)	4.1868794	15,377.21	50,450.1
	82 53 17.749	22 39 25.15	202 37 41.67	Bingham (U. S. L. S.)	3.9389184	8,687.97	28,503.8
		30 08 20.05	210 03 59.22	Appin (U. S. L. S.)	4.2259705	16,825.60	55,202.0
		72 12 21.62	252 02 45.99	Popple (U. S. L. S.)	4.2909576	19,541.49	64,112.4
Oak Point (U. S. L. S.), 1906, r. 1932 (d. m.)	43 58 29.269	300 23 31.88	120 38 54.59	Verona (U. S. L. S.)	4.5375552	34,479.05	113,120.0
	83 15 28.540	334 35 36.15	154 41 21.95	Popple (U. S. L. S.)	4.4152142	26,014.43	85,349.0
Port Austin (U. S. L. S.), 1906, r. 1932 (d. m.)	44 01 53.364	338 56 25.14	159 01 09.64	Verona (U. S. L. S.)	4.4066534	25,506.65	83,683.1
	83 00 07.870	17 33 52.13	197 28 59.74	Popple (U. S. L. S.)	4.4949564	31,257.65	102,551.1
		73 01 00.54	252 50 20.95	Oak Point (U. S. L. S.)	4.3315701	21,457.05	70,397.0
Point Lookout (U. S. L. S.), 1906, r. 1932 (d. m.)	44 03 05.603	272 32 04.10	92 56 20.46	Port Austin (U. S. L. S.)	4.6692822	46,696.27	153,202.7
	83 35 02.815	287 56 44.89	108 10 20.80	Oak Point (U. S. L. S.)	4.4395306	27,512.54	90,264.1
Sand Point west base (U. S. L. S.), 1906, r. 1932 (d. m.)	43 54 38.079	136 26 11.04	316 18 25.80	Point Lookout (U. S. L. S.)	4.3352715	21,640.70	70,999.5
	83 23 52.852	237 33 33.29	57 39 23.24	Oak Point (U. S. L. S.)	4.1244870	13,319.47	43,699.0
Sand Point east base (U. S. L. S.), 1906, r. 1932 (d. m.)	43 54 54.077	85 26 38.54	265 23 27.07	Sand Point west base (U. S. L. S.)	3.7909769	6,179.84	20,275.0
	83 19 16.774	125 49 38.91	305 38 41.94	Point Lookout (U. S. L. S.)	4.4145460	25,974.43	85,217.8
		217 26 33.19	37 29 11.58	Oak Point (U. S. L. S.)	3.9226034	8,367.65	27,452.9
Charity (U. S. L. S.), 1906, r. 1932 (d. m.)	44 01 30.914	291 20 27.61	111 27 53.57	Oak Point (U. S. L. S.)	4.1864775	15,363.05	50,403.6
	83 26 10.528	322 58 45.38	143 03 32.64	Sand Point east base (U. S. L. S.)	4.1856073	15,332.30	50,302.7
		346 26 38.58	166 28 14.17	Sand Point west base (U. S. L. S.)	4.1174754	13,106.16	42,999.1
		103 54 12.60	283 48 02.59	Point Lookout (U. S. L. S.)	4.0866011	12,206.50	40,047.5

GEOGRAPHIC POSITIONS—Continued

Lake St. Clair to Thunder Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Point au Sable (U. S. L. S.), 1905, r. 1932 (d. m.)	44 20 28.933	322 14 02.08	142 27 55.72	Port Austin (U. S. L. S.)	4.6383744	43,488.50	142,678.5
	83 20 03.917	351 25 46.76	171 28 58.60	Oak Point (U. S. L. S.)	4.6147770	41,188.60	135,132.9
		31 52 49.80	211 42 23.16	Point Lookout (U. S. L. S.)	4.5784961	37,887.51	124,302.6
Laidlaw (U. S. L. S.), 1906, r. 1932 (d. m.)	44 18 30.016	260 05 08.66	80 16 17.25	Point au Sable (U. S. L. S.)	4.3327998	21,517.90	70,596.6
	83 36 00.788	357 24 36.85	177 25 17.26	Point Lookout (U. S. L. S.)	4.4557769	28,561.23	93,704.6
Wilber (U. S. L. S.), 1905, r. 1932 (d. m.)	44 23 40.378	290 09 44.32	110 18 10.64	Point au Sable (U. S. L. S.)	4.2326614	17,086.83	56,095.0
	83 32 07.995	5 49 49.97	185 47 48.04	Point Lookout (U. S. L. S.)	4.5832995	38,308.88	125,685.0
		28 18 45.21	208 16 02.47	Laidlaw (U. S. L. S.)	4.0365912	10,879.06	35,692.4
Greenbush (U. S. L. S.), 1905, r. 1932 (d. m.)	44 35 28.164	358 17 24.34	178 17 50.54	Point au Sable (U. S. L. S.)	4.4435550	27,768.67	91,104.4
	83 20 41.321	34 50 42.93	214 42 41.69	Wilber (U. S. L. S.)	4.4248588	26,598.60	87,265.6
Hayes (U. S. L. S.), 1905, r. 1932 (d. m.)	44 36 43.693	274 47 24.69	95 01 48.73	Greenbush (U. S. L. S.)	4.4351682	27,237.56	89,361.9
	83 41 11.842	316 54 43.46	137 09 31.79	Point au Sable (U. S. L. S.)	4.6140099	41,115.91	134,894.4
		333 31 28.74	153 37 49.95	Wilber (U. S. L. S.)	4.4313459	26,998.89	88,578.9
Henry (U. S. L. S.), 1905, r. 1932 (d. m.)	44 46 20.059	351 07 21.26	171 09 01.45	Greenbush (U. S. L. S.)	4.3089028	20,365.86	66,817.0
	83 23 03.805	53 30 31.28	233 17 46.06	Hayes (U. S. L. S.)	4.4748202	29,841.47	97,904.9
Mills (U. S. L. S.), 1905, r. 1932 (d. m.)	44 43 16.952	248 07 24.20	68 14 56.10	Henry (U. S. L. S.)	4.1821515	15,210.78	49,904.0
	83 33 45.733	309 51 41.78	130 00 53.10	Greenbush (U. S. L. S.)	4.3529729	22,540.98	73,953.2
		39 02 09.86	218 56 56.25	Hayes (U. S. L. S.)	4.1936363	15,618.39	51,241.3
Comstock (U. S. L. S.), 1905, r. 1932 (d. m.)	44 46 12.656	269 18 54.10	89 30 50.35	Henry (U. S. L. S.)	4.3495594	22,364.51	73,374.2
	83 40 00.805	303 16 50.71	123 21 14.75	Mills (U. S. L. S.)	3.9945023	9,874.21	32,395.6
		5 05 47.45	185 04 57.49	Hayes (U. S. L. S.)	4.2463079	17,632.26	57,848.5
Supplementary points							
Port Huron, Methodist Church (U. S. L. S.), 1909 [1]	42 58 32.69	15 36 10	195 33 54	St. Clair (U. S. L. S.)	4.226561	16,848.5	55,277
	82 25 50.14	130 14 34	310 08 56	Atkins (U. S. L. S.)	4.166732	14,680.2	48,163
Port Huron, St. Clair County Courthouse (U. S. L. S.), 1909.[1]	42 58 44.30	16 43 52	196 41 23	St. Clair (U. S. L. S.)	4.238518	17,318.8	56,820
	82 25 30.15	128 03 18	307 57 26	Atkins (U. S. L. S.)	4.170417	14,805.3	48,574
Port Huron, K. O. T. M. Temple, dome (U. S. L. S.), 1909.[1]	42 58 48.36	16 40 50	196 38 20	St. Clair (U. S. L. S.)	4.241674	17,445.1	57,234
	82 25 29.19	127 37 11	307 31 19	Atkins (U. S. L. S.)	4.168656	14,745.4	48,377
Port Huron, post office building (U. S. L. S.)[1]	42 58 30.11	16 56 18	196 53 51	St. Clair (U. S. L. S.)	4.227373	16,880.0	55,380
	82 25 33.13	129 31 42	309 25 53	Atkins (U. S. L. S.)	4.176870	15,026.9	49,301
Emmett, Catholic Church (U. S. L. S.), 1909	42 59 37.169	244 54 17.3	65 02 20.4	Atkins (U. S. L. S.)	4.247778	17,692.0	58,045
	82 45 53.383	308 34 18.5	128 45 41.8	St. Clair (U. S. L. S.)	4.464788	29,160.0	95,669
		3 40 30.7	183 39 53.8	Lenox (U. S. L. S.)	4.277192	18,931.8	62,112
Port Huron, Tunnel Power Co., stack (U. S. L. S.), 1909.	42 57 34.381	18 38 18.1	198 35 52.4	St. Clair (U. S. L. S.)	4.182605	15,226.7	49,956
	82 25 35.403	62 29 09.4	242 14 44.0	Lenox (U. S. L. S.)	4.512733	32,563.6	106,836
		108 44 27.7	288 31 42.6	Avoca (U. S. L. S.)	4.428837	26,843.4	88,069
Hillock (U. S. L. S.), 1909 (d. m.)	43 09 08.033	29 30 24.8	209 27 31.7	Atkins (U. S. L. S.)	4.065904	11,638.7	38,185
	82 29 52.011	137 30 09.4	317 26 30.2	Worth (U. S. L. S.)	4.029292	10,697.7	35,097
Blackwell (U. S. L. S.), 1909 [1]	43 01 33.12	100 33 53	280 23 16	Atkins (U. S. L. S.)	4.332150	21,485.7	70,491
	82 18 31.93	132 26 57	312 19 12	Hillock (U. S. L. S.)	4.318586	20,825.0	68,323
Fort Gratiot Lighthouse (U. S. L. S.), 1909 [1]	43 00 22.63	117 11 12	297 05 14	Atkins (U. S. L. S.)	4.124972	13,334.4	43,748
	82 25 21.16	159 19 28	339 16 23	Hillock (U. S. L. S.)	4.238864	17,332.6	56,865
Linda (U. S. L. S.), 1909 (d. m.)	43 05 12.275	163 30 39.5	343 29 34.4	Hillock (U. S. L. S.)	3.880111	7,587.7	24,894
	82 28 16.696	297 00 50.3	117 07 29.5	Blackwell (U. S. L. S.)	4.172056	14,861.3	48,757
Nun (U. S. L. S.), 1909 (d. m.)	43 17 54.555	28 30 22.9	208 28 05.0	Worth (U. S. L. S.)	3.978500	9,517.0	31,224
	82 31 50.977	140 01 03.8	319 58 14.4	Applegate (U. S. L. S.)	3.937193	8,653.5	28,391
Hyde (U. S. L. S.), 1909 (d. m.)	43 19 27.732	1 38 05.4	181 38 02.9	Nun (U. S. L. S.)	3.458886	2,876.6	9,438
	82 31 47.336	123 38 46.2	303 35 54.3	Applegate (U. S. L. S.)	3.831086	6,777.8	22,237
Jackman (U. S. L. S.), 1909 (d. m.)	43 14 25.954	69 20 08.1	249 17 33.2	Worth (U. S. L. S.)	3.736863	5,455.9	17,900
	82 31 26.040	175 00 35.0	355 00 17.9	Nun (U. S. L. S.)	3.810366	6,462.0	21,201
		169 23 39		Lexington, tallest church			
Croswell, Croswell Sugar Co., stack (U. S. L. S.), 1908.	43 15 58.789	61 52 33.8	241 44 47.3	Speaker (U. S. L. S.)	4.241777	17,449.3	57,248
	82 36 58.429	118 33 46.9	298 26 49.4	Cash (U. S. L. S.)	4.193509	15,613.8	51,226
		187 36 40.3	7 37 21.8	Applegate (U. S. L. S.)	4.012491	10,291.8	33,766
Port Sanilac, Catholic Church (U. S. L. S.), 1908 [1]	43 25 44.36	122 22 23	302 18 02	McGregor (U. S. L. S.)	4.003750	10,086.7	33,093
	82 36 08.46	358 16 09	178 16 16	Applegate (U. S. L. S.)	3.896175	7,873.6	25,832
Port Sanilac, Methodist Church (U. S. L. S.), 1908 [1]	43 25 51.56	28 50 57	208 48 41	Applegate (U. S. L. S.)	3.965538	9,237.2	30,306
	82 32 39.97	107 29 00	287 26 11	Basler (U. S. L. S.)	3.762839	5,792.1	19,003
Port Sanilac, Congregational Church (U. S. L. S.), 1908 [1]	43 25 50.16	27 42 56	207 40 47	Applegate (U. S. L. S.)	3.958601	9,090.8	29,825
	82 32 50.14	108 36 28	288 33 46	Basler (U. S. L. S.)	3.747256	5,588.0	18,333
Port Sanilac Lighthouse (U. S. L. S.), 1908 [1]	43 25 44.44	31 22 41	211 20 15	Applegate (U. S. L. S.)	3.964692	9,219.2	30,247
	82 32 24.74	108 28 21	288 25 21	Basler (U. S. L. S.)	3.791416	6,186.1	20,296

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake St. Clair to Thunder Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Greenan (U. S. L. S.), 1909 (d. m.)	43 31 58.413	34 24 21.0	214 22 12.1	McGregor (U. S. L. S.)	3.872195	7,450.7	24,445
	82 39 20.183	137 03 59.5	316 59 50.5	Palms (U. S. L. S.)	4.075342	11,894.4	39,024
Basler (U. S. L. S.), 1909 (d. m.)	43 26 47.870	353 45 19.3	173 45 52.2	Applegate (U. S. L. S.)	3.995138	9,888.7	32,443
	82 36 45.661	114 07 06.4	294 03 11.3	McGregor (U. S. L. S.)	3.925194	8,417.7	27,617
		160 05 58.6	340 04 12.2	Greenan (U. S. L. S.)	4.008320	10,193.4	33,443
Wendt (U. S. L. S.), 1909 (d. m.)	43 39 23.501	3 57 13.7	183 53 44.9	Greenan (U. S. L. S.)	4.138876	13,768.2	45,171
	82 38 38.438	60 55 06.7	240 50 28.6	Palms (U. S. L. S.)	4.014595	10,341.8	33,930
Quast (U. S. L. S.), 1909 (d. m.)	43 37 01.730	26 26 22.5	206 23 59.6	Greenan (U. S. L. S.)	4.019222	10,452.5	34,293
	82 35 52.915	139 43 06.0	319 41 11.8	Wendt (U. S. L. S.)	3.758667	5,736.8	18,821
Conklin (U. S. L. S.), 1909 (d. m.)	43 31 52.963	91 34 30.1	271 31 19.2	Greenan (U. S. L. S.)	3.794120	6,224.7	20,422
	82 34 43.069	170 40 00.4	350 39 12.2	Quast (U. S. L. S.)	3.984847	9,657.1	31,683
Forester, church (U. S. L. S.), 1909 [1]	43 30 06.28	116 23 25	296 19 51	Greenan (U. S. L. S.)	3.891771	7,794.2	25,571
	82 34 09.24	167 00 34	347 00 11	Conklin (U. S. L. S.)	3.528799	3,379.1	11,086
Forester, town hall (U. S. L. S.), 1908 [1]	43 30 06.90	9 02 55	189 01 37	Applegate (U. S. L. S.)	4.208795	16,173.2	53,062
	82 34 04.94	115 57 11	295 53 34	Greenan (U. S. L. S.)	3.896107	7,872.4	25,828
Deckerville, Presbyterian Church (U. S. L. S.), 1908 [1]	43 31 34.88	117 58 09	297 50 57	Argyle (U. S. L. S.)	4.202320	15,933.8	52,276
	82 44 17.38	171 20 06	351 19 21	Palms (U. S. L. S.)	3.979492	9,538.8	31,295
Deckerville, school (U. S. L. S.), 1908 [1]	43 31 37.82	116 34 07	296 26 33	Argyle (U. S. L. S.)	4.217709	16,508.6	54,162
	82 43 46.51	167 09 22	347 08 17	Palms (U. S. L. S.)	3.981325	9,579.1	31,427
Richmondville, church (U. S. L. S.), 1909 [1]	43 34 23.86	344 48 51	164 49 30	Conklin (U. S. L. S.)	3.683539	4,825.5	15,832
	82 35 39.36	47 51 24	227 48 52	Greenan (U. S. L. S.)	3.825246	6,687.2	21,940
Richmondville, school (U. S. L. S.), 1909 [1]	43 34 22.43	342 03 59	162 04 45	Conklin (U. S. L. S.)	3.685570	4,848.1	15,906
	82 35 49.55	46 47 27	226 45 02	Greenan (U. S. L. S.)	3.812182	6,489.1	21,290
Argyle, Catholic Church (U. S. L. S.), 1906 [1]	43 33 44.98	161 22 37	341 20 14	Appin (U. S. L. S.)	4.161498	14,504.3	47,586
	82 56 08.14	213 13 56	33 18 36	Pollum (U. S. L. S.)	4.219143	16,563.2	54,341
Palms, Catholic Church (U. S. L. S.), 1906 [1]	43 36 50.51	150 07 24	330 05 00	Pollum (U. S. L. S.)	3.971690	9,368.9	30,738
	82 45 54.48	292 48 05	112 48 28	Palms (U. S. L. S.)	2.904682	802.9	2,634
Freiburger, Lutheran Church (U. S. L. S.), 1906 [1]	43 37 25.41	0 17 41	180 17 40	Argyle (U. S. L. S.)	3.526306	3,359.7	11,023
	82 54 43.97	225 34 31	45 38 13	Pollum (U. S. L. S.)	4.003055	10,070.6	33,040
Forestville, Lutheran Church (U. S. L. S.), 1909 [1]	43 39 39.35	5 38 18	185 37 35	Greenan (U. S. L. S.)	4.155166	14,294.4	46,898
	82 38 17.64	59 52 29	239 47 36	Palms (U. S. L. S.)	4.040944	10,988.6	36,052
Forestville, Methodist Church (U. S. L. S.), 1909 [1]	43 39 38.66	290 22 18	110 22 57	Wendt (U. S. L. S.)	3.128199	1,343.4	4,407
	82 39 34.64	54 45 13	234 41 14	Palms (U. S. L. S.)	3.978799	9,523.6	31,245
Parisville, Catholic Church (U. S. L. S.), 1906	43 43 23.211	25 29 52.4	205 28 52.6	Pollum (U. S. L. S.)	3.646256	4,428.5	14,529
	82 47 57.738	75 20 35.1	255 12 33.4	Appin (U. S. L. S.)	4.207922	16,140.7	52,955
		145 37 58.9	325 34 17.5	Verona (U. S. L. S.)	4.102755	12,669.4	41,566
German Lutheran Church (U. S. L. S.) [1]	43 45 12.54	94 00 50	273 52 45	Popple (U. S. L. S.)	4.196504	15,721.9	51,581
	82 55 28.44	202 24 59	22 26 29	Verona (U. S. L. S.)	3.884183	7,659.2	25,129
Page Milk Co., stack (U. S. L. S.) [1]	43 42 46.73	59 39 33	239 36 56	Appin (U. S. L. S.)	3.769993	5,888.3	19,319
	82 55 48.05	180 15 40	0 15 41	Bingham (U. S. L. S.)	3.551647	3,561.6	11,685
Bad Axe, church (U. S. L. S.), 1906 [1]	43 48 16.62	321 37 34	141 40 16	Bingham (U. S. L. S.)	3.926401	8,441.1	27,694
	82 59 41.52	65 23 09	245 17 59	Popple (U. S. L. S.)	4.042342	11,024.1	36,168
Bad Axe, standpipe (U. S. L. S.), 1906 [1]	43 48 05.59	258 43 21	78 47 52	Verona (U. S. L. S.)	3.950431	8,921.4	29,270
	82 59 49.24	319 13 42	139 16 29	Bingham (U. S. L. S.)	3.918487	8,288.7	27,194
Bad Axe, school (U. S. L. S.), 1906 [1]	43 48 14.27	260 15 05	80 19 31	Verona (U. S. L. S.)	3.940542	8,720.5	28,611
	82 59 42.32	321 13 21	141 16 04	Bingham (U. S. L. S.)	3.924050	8,395.7	27,545
Stafford (U. S. L. S.), 1908 (d. m.) [1]	43 58 32.58	23 01 44	202 57 52	Verona (U. S. L. S.)	4.281777	19,132.7	62,771
	82 47 42.84	110 32 43	290 24 05	Port Austin (U. S. L. S.)	4.248400	17,717.4	58,128
Port Hope (U. S. L. S.), 1908 (d. m.)	43 56 41.223	29 35 37.3	209 31 27.7	Verona (U. S. L. S.)	4.212089	16,296.3	53,465
	82 47 17.641	170 43 02.9	350 42 45.3	Stafford (U. S. L. S.)	3.541898	3,482.6	11,426
Rubicon (U. S. L. S.), 1908 (d. m.)	43 53 24.742	54 06 59.8	234 01 12.6	Verona (U. S. L. S.)	4.140579	13,822.3	45,349
	82 44 56.642	152 35 42.3	332 34 04.5	Port Hope (U. S. L. S.)	3.834518	6,831.5	22,413
Huron (U. S. L. S.), 1908 (d. m.)	44 01 11.908	348 53 15.9	168 53 46.0	Stafford (U. S. L. S.)	3.699959	5,011.4	16,442
	82 48 26.177	94 44 55.1	274 36 47.3	Port Austin (U. S. L. S.)	4.195328	15,679.3	51,441
Port Hope, Lutheran Church, (U. S. L. S.) [1]	43 56 26.85	23 34 26	203 33 09	Rubicon (U. S. L. S.)	3.787591	6,131.8	20,117
	82 43 06.78	94 33 26	274 30 32	Port Hope (U. S. L. S.)	3.749133	5,612.2	18,413
Port Hope, Methodist Church (U. S. L. S.) [1]	43 56 22.10	25 41 54	205 40 32	Rubicon (U. S. L. S.)	3.783477	6,074.0	19,928
	82 42 58.64	95 51 38	275 48 39	Port Hope (U. S. L. S.)	3.763894	5,806.2	19,049
Port Hope, Presbyterian Church (U. S. L. S.) [1]	43 56 29.93	25 12 26	205 11 02	Rubicon (U. S. L. S.)	3.800483	6,316.6	20,724
	82 42 56.12	93 26 41	273 23 39	Port Hope (U. S. L. S.)	3.766612	5,842.7	19,169

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake St. Clair to Thunder Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Port Austin Lighthouse (U. S. L. S.)	44 04 55.300	15 46 45.2	195 45 55.7	Port Austin (U. S. L. S.)	3.766044	5,835.0	19,144
	82 58 56.615	61 45 16.4	241 33 47.0	Oak Point (U. S. L. S.)	4.399640	25,098.1	82,343
		135 48 30.8	315 33 47.1	Point au Sable (U. S. L. S.)	4.605024	40,273.9	132,132
Pointe aux Barques (U. S. L. S.), 1908 (d. m.)	44 04 04.672	40 14 44.0	220 12 56.9	Port Austin (U. S. L. S.)	3.724969	5,308.5	17,416
	82 57 33.857	130 19 25.8	310 18 28.2	Port Austin Lighthouse (U. S. L. S.)	3.382944	2,415.1	7,924
Port Austin, Roman Catholic Church (U. S. L. S.)[1]	44 02 42.32	182 33 23	2 33 28	Port Austin Lighthouse (U. S. L. S.)	3.613693	4,108.6	13,480
	82 59 04.85	218 32 23	38 33 26	Pointe aux Barques (U. S. L. S.)	3.511906	3,250.2	10,663
Tovey (U. S. L. S.), 1905 (d. m.)[1]	44 41 09.16	15 47 50	195 46 15	Greenbush (U. S. L. S.)	4.038941	10,938.1	35,886
	83 18 26.32	147 33 38	327 30 23	Henry (U. S. L. S.)	4.055946	11,374.9	37,319
Pierson (U. S. L. S.), 1905 (d. m.)[1]	44 43 27.31	11 12 44	191 11 11	Greenbush (U. S. L. S.)	4.178326	15,077.4	49,466
	83 18 28.41	131 22 52	311 19 38	Henry (U. S. L. S.)	3.906912	8,070.7	26,479
East shore of Lake Michigan, southern section							
Principal points							
Bald Tom 2, 1932 (d. m.)	41 54 19.264	307 11 05.27	127 19 58.23	Bertrand (U. S. L. S.)	4.3647233	23,159.19	75,981.4
	86 35 58.644	341 31 45.38	161 35 58.91	Carlisle (U. S. L. S.)	4.4437544	27,781.42	91,146.2
		15 11 11.96	195 08 10.09	Galena (U. S. L. S.)	4.3817743	24,086.53	79,023.9
		0 13 02		Azimuth mark.			
David, 1932 (d. m.)	41 54 32.624	9 55 13.23	189 54 00.32	Bertrand (U. S. L. S.)	4.1658910	14,651.80	48,070.1
	86 20 50.410	88 57 22.24	268 47 15.60	Bald Tom 2	4.3209178	20,937.16	68,691.3
Stephensville, 1932 (d. m.)	42 00 55.435	308 04 46.76	128 12 03.49	David	4.2815826	19,124.17	62,743.2
	86 31 43.569	334 24 55.99	154 30 59.18	Bertrand (U. S. L. S.)	4.4636657	29,084.77	95,422.3
		25 41 29.44	205 38 38.89	Bald Tom 2	4.1323019	13,561.32	44,492.4
		358 29 04		Azimuth mark.			
Divis, 1932 (d. m.)	42 06 08.574	21 08 09.67	201 04 08.70	David	4.3620269	23,015.85	75,511.2
	86 14 50.322	67 34 15.93	247 22 57.16	Stephensville	4.4017778	25,221.90	82,748.9
		228 31 00		Azimuth mark.			
Henley, 1932 (d. m.)	42 08 56.302	287 07 36.38	107 15 44.75	Divis	4.2431858	17,505.96	57,434.1
	86 26 58.402	342 20 30.10	162 24 36.47	David	4.4465334	27,959.76	91,731.3
		23 51 42.49	203 48 31.37	Stephensville	4.2100485	16,219.91	53,214.8
		358 11 19		Azimuth mark.			
Van Auken, 1932 (d. m.)	42 14 42.999	30 25 58.55	210 21 26.21	Divis	4.2648483	18,401.29	60,371.6
	86 08 04.679	67 45 04.63	247 32 23.13	Henley	4.4490971	28,125.30	92,274.4
		83 28 28		Azimuth mark.			
Thunder, 1932 (d. m.)	42 15 21.923	273 49 46.44	93 58 22.98	Van Auken	4.2467907	17,651.87	57,912.8
	86 20 52.906	333 58 55.21	154 02 58.67	Divis	4.2785954	18,993.08	62,313.1
		35 12 28.97	215 08 23.45	Henley	4.1630387	14,555.89	47,755.4
		291 34 16		Azimuth mark.			
Bangor, 1932, r. 1934 (d. m.)	42 19 12.708	24 24 58.82	204 23 07.97	Van Auken	3.9608542	9,138.06	29,980.5
	86 05 19.918	71 39 45.42	251 29 17.65	Thunder	4.3527653	22,530.21	73,917.9
		314 57 46		Azimuth mark.			
Brandywine, 1932, l. 1937 (d. m.)	42 19 32.028	271 48 51.30	91 57 43.03	Bangor	4.2575096	18,092.96	59,360.0
	86 18 29.643	301 51 23.73	121 58 24.22	Van Auken	4.2270875	16,868.93	55,344.1
		23 03 14.50	203 01 38.10	Thunder	3.9235501	8,385.91	27,512.8
		242 32 04		Azimuth mark.			
Leifsen, 1932 (d. m.)	42 26 53.910	27 55 15.80	207 51 33.86	Bangor	4.2068452	16,100.71	52,823.7
	85 59 50.680	62 03 41.85	241 51 07.52	Brandywine	4.4624118	29,000.92	95,147.2
		214 52 18		Azimuth mark.			
Catt, 1932 (d. m.)	42 29 01.422	280 54 48.73	101 04 47.09	Leifsen	4.3144196	20,626.22	67,671.2
	86 14 36.938	324 54 24.60	145 00 40.21	Bangor	4.3460892	22,186.52	72,790.3
		16 52 23.72	196 49 46.79	Brandywine	4.2638059	18,357.18	60,226.8
		187 29 30		Azimuth mark.			
Walker, 1932 (d. m.)	42 32 09.112	357 46 57.37	177 47 08.50	Leifsen	3.9882532	9,733.15	31,932.8
	86 00 07.159	73 49 20.04	253 39 32.31	Catt	4.3156441	20,684.46	67,862.3
Johnston, 1932 (d. m.)	42 36 13.653	293 35 29.38	113 44 00.13	Walker	4.2741755	18,800.77	61,682.2
	86 12 42.153	314 22 27.74	134 31 09.20	Leifsen	4.3920787	24,664.86	80,921.3
		11 07 16.19	191 05 58.58	Catt	4.1332758	13,591.76	44,592.3
		182 19 04		Azimuth mark.			
Kotman, 1932 (d. m.)	42 40 54.304	327 32 58.13	147 38 03.68	Walker	4.2831938	19,195.25	62,976.4
	86 07 38.488	38 38 53.06	218 35 27.35	Johnston	4.0446953	11,083.97	36,364.7
		243 05 40		Azimuth mark.			
Meiste, 1932 (d. m.)	42 42 38.272	2 38 56.08	182 38 29.43	Walker	4.2885736	19,434.51	63,761.4
	85 59 27.801	74 01 13.05	253 55 40.31	Kotman	4.0652329	11,620.72	38,125.6
		90 47 07		Azimuth mark.			

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, southern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued.	° ′ ″	° ′ ″	° ′ ″				
Haddock, 1932 (d. m.)	42 42 24.887	268 19 35.28	88 26 52.48	Meiste	4.1665777	14,674.99	48,146.2
	86 10 12.385	308 34 17.69	128 36 02.04	Kotman	3.6514332	4,481.60	14,703.4
		323 58 00.88	144 04 50.71	Walker	4.3706820	23,479.13	77,031.1
		16 35 50.59	196 34 09.11	Johnston	4.0774504	11,952.27	39,213.4
		139 44 48		Azimuth mark.			
Primary traverse station No. 39 Y (U. S. G. S.), 1932 (d. m.).	41 53 05.580	104 36 52.33	284 32 39.14	Bald Tom 2	3.9557453	9,031.20	29,629.9
	86 29 39.492	168 51 33.32	348 50 10.38	Stephensville	4.1695406	14,775.45	48,475.8
		266 08 45		Glendora, Trinity Lutheran Church, base of cross on steeple.			
Primary traverse station No. 37 Y (U. S. G. S.) eccentric, 1932 (d. m.).	42 08 14.977	96 16 44.90	276 11 03.70	Henley	4.0698928	11,746.08	38,536.9
	86 18 29.904	166 01 38.73	346 00 02.67	Thunder	4.1327581	13,575.57	44,539.2
		307 41 25.03	127 43 52.30	Divis	3.8045483	6,376.00	20,918.6
		259 18 27		Reference mark No. 1.			
St. Joe, 1932 (d. m.)	42 05 45.678	212 02 41.36	32 04 28.92	Henley	3.8413498	6,939.85	22,768.5
	86 29 38.768	253 14 58.21	73 22 26.78	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.2052365	16,041.19	52,628.5
		17 46 49.22	197 45 25.63	Stephensville	3.9732961	9,403.64	30,851.8
		183 19 29		Azimuth mark.			
Saugatuck, 1932 (d. m.)	42 39 40.641	212 12 11.43	32 13 46.53	Haddock	3.7774570	5,990.42	19,653.6
	86 12 32.661	251 13 44.72	71 17 04.11	Kotman	3.8496531	7,073.80	23,208.0
		1 56 25.55	181 56 19.12	Johnston	3.8055450	6,390.65	20,966.7
		272 44 19		Azimuth mark.			
Primary traverse station No. 53 Y (U. S. G. S.) eccentric 1932 (d.).	42 22 29.991	43 45 12.49	223 42 37.87	Brandywine	3.8807711	7,599.26	24,931.9
	86 14 40.124	180 20 42.70	0 20 44.85	Catt	4.0819970	12,078.06	39,626.1
		295 20 32.80	115 26 50.17	Bangor	4.1521079	14,194.10	46,568.5
South Haven, 1932 (d. m.)	42 25 08.908	197 13 04.44	17 14 10.15	Catt	3.8757179	7,511.35	24,643.5
	86 16 14.286	306 13 09.26	126 20 30.25	Bangor	4.2688933	18,573.48	60,936.5
		16 36 13.20	196 34 41.98	Brandywine	4.0352731	10,846.09	35,584.2
		201 22 04		Azimuth mark.			
Zeeland, 1932, r. 1934 (d. m.)	42 50 21.835	1 01 18.77	181 01 11.15	Meiste	4.1555386	14,306.67	46,937.8
	85 59 16.589	45 25 55.83	225 18 30.48	Haddock	4.3211717	20,949.41	68,731.5
		169 51 16		Azimuth mark.			
Park, 1932, r. 1934 (d. m.)	42 47 05.102	251 19 51.85	71 28 51.62	Zeeland	4.2796418	19,038.90	62,463.5
	86 12 30.835	294 44 20.24	114 53 11.74	Meiste	4.2927003	19,620.06	64,370.1
		339 58 35.84	160 00 09.82	Haddock	3.9638925	9,202.22	30,191.0
		253 28 12		Reference mark No. 1.			
De Junge, 1932, r. 1934 (d. m.)	42 57 37.118	358 08 17.11	178 08 30.20	Zeeland	4.1283703	13,439.10	44,091.4
	85 59 35.817	42 07 23.24	221 58 35.94	Park	4.4193628	26,264.12	86,168.2
		24 38 43		Azimuth mark.			
Olive, 1932 (d. m.)	42 54 33.853	251 56 21.23	72 05 04.46	De Junge	4.2627478	18,312.51	60,080.3
	86 12 23.956	293 26 33.15	113 35 28.87	Zeeland	4.2898028	19,489.59	63,942.1
		0 38 49.13	180 38 44.45	Park	4.1413989	13,848.38	45,434.2
		238 58 33		Azimuth mark.			
Crisp, 1932 (d. m.)	42 52 40.976	43 15 15.76	223 10 24.30	Park	4.1529311	14,221.03	46,656.8
	86 05 22.111	110 02 11.99	289 57 24.87	Olive	4.0079896	10,185.67	33,417.5
		220 38 42.61	40 42 38.43	De Junge	4.0809817	12,049.85	39,533.5
		297 19 21.40	117 23 30.03	Zeeland	3.9705010	9,343.32	30,653.9
		271 12 45		Azimuth mark.			
Rosymound, 1932, r. 1934 (d. m.)	43 01 23.561	290 22 21.48	110 31 45.51	De Junge	4.3010040	19,998.80	65,612.7
	86 13 22.972	353 57 19.98	173 58 00.20	Olive	4.1042660	12,713.53	41,711.0
		300 03 43		Azimuth mark.			
Aebig, 1932, r. 1934 (d. m.)	43 06 20.918	2 10 08.42	182 09 49.99	De Junge	4.2088562	16,175.44	53,068.9
	85 59 08.807	39 36 36.82	219 27 34.45	Olive	4.4516493	28,291.07	92,818.3
		64 41 01.58	244 31 18.34	Rosymound	4.3303135	21,395.06	70,193.6
		295 58 09		Azimuth mark.			
Jones, 1932, r. 1934 (d. m.)	43 12 44.331	337 07 50.11	157 10 21.05	Aebig	4.1085451	12,839.41	42,124.0
	86 02 49.478	34 20 36.33	214 13 23.33	Rosymound	4.4052692	25,425.48	83,416.8
		177 11 18		Azimuth mark.			
Norton, 1932, r. 1934 (d. m.)	43 08 51.231	249 24 30.76	69 34 13.38	Jones	4.3123960	20,530.33	67,356.6
	86 17 00.889	280 44 02.59	100 56 15.48	Aebig	4.3922326	24,673.60	80,950.0
		340 20 33.38	160 23 02.24	Rosymound	4.1663640	14,667.77	48,122.5
		313 09 26		Reference mark No. 2.			
Grand Haven, 1932, r. 1934 (d. m.)	43 03 23.125	159 28 57.54	339 27 02.94	Norton	4.0339067	10,812.02	35,472.4
	86 14 13.187	221 40 36.25	41 48 23.71	Jones	4.3656821	23,210.37	76,149.4
		254 54 05.61	75 04 23.33	Aebig	4.3259460	21,180.98	69,491.3
		342 52 21.35	162 52 55.62	Rosymound	3.5866693	3,860.73	12,666.4
		274 24 53		Azimuth mark.			
Casnovia, 1932 (d. m.)	43 15 32.463	34 11 29.95	214 05 40.20	Aebig	4.3131322	20,565.17	67,470.9
	85 50 37.713	72 37 30.01	252 29 08.76	Jones	4.2382385	17,307.67	56,783.6
		274 15 32		Azimuth mark.			

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, southern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Dietrich, 1932 (d. m.)	43 07 06.697	84 02 58.96	263 56 13.13	Aebig	4.1303361	13,500.07	44,291.5
	85 49 14.992	119 35 58.78	299 26 41.59	Jones	4.3251994	21,144.60	69,371.9
		173 10 59.10	353 10 02.48	Casnovia	4.1964308	15,719.21	51,572.1
		336 40 51		Azimuth mark.			
Kent, 1931, r. 1932 (d. m.)	43 14 37.944	23 35 06.87	203 32 02.89	Dietrich	4.1816058	15,191.68	49,841.4
	85 44 46.124	102 00 36.34	281 56 35.43	Casnovia	3.9089005	8,107.75	26,600.2
		253 34 29		Reference mark No. 1.			
Ballards, 1931, r. 1934 (d. m.)	43 06 55.982	92 23 04.76	272 19 01.28	Dietrich	3.9063704	8,060.66	26,445.7
	85 43 18.750	148 09 46.22	328 04 45.80	Casnovia	4.2734535	18,769.53	61,579.7
		172 07 38.86	352 06 39.07	Kent	4.1581190	14,391.93	47,217.5
		259 00 24		Church spire.			
Dake, 1932 (d. m.)	43 19 50.402	163 31 40.90	343 28 44.79	Claybank	4.3075026	20,300.31	66,601.9
	86 24 02.270	204 13 56.84	24 19 31.43	Middlecamp	4.4251123	26,614.13	87,316.5
		258 37 38.05	78 47 40.02	Twin Lake	4.3040791	20,140.91	66,079.0
		294 29 28.19	114 44 00.64	Jones	4.4992880	31,570.98	103,579.1
		334 54 33.12	154 59 21.78	Norton	4.3512982	22,454.23	73,668.6
		328 19 28		Azimuth mark.			
Whitehall, 1932 (d. m.)	43 23 32.371	42 02 59.68	221 59 51.46	Dake	3.9647869	9,221.19	30,253.2
	86 19 28.129	91 06 34.97	271 02 08.65	Montague	3.9408414	8,726.53	28,630.3
		195 19 07.98	15 21 34.16	Middlecamp	4.2565552	18,053.24	59,229.7
		282 02 06.20	102 09 00.23	Twin Lake	4.1423252	13,877.95	45,531.2
		88 50 05		Azimuth mark.			
Montague, 1932 (d. m.)	43 23 37.665	165 33 47.68	345 32 09.55	Claybank	4.1091726	12,857.98	42,184.9
	86 25 55.803	271 02 08.65	91 06 34.97	Whitehall	3.9408414	8,726.53	28,630.3
		277 44 48.88	97 56 09.18	Twin Lake	4.3523206	22,507.16	73,842.2
		339 57 43.17	159 59 01.12	Dake	3.8730236	7,464.89	24,491.1
Muskegon, 1932, r. 1934 (d. m.)	43 15 31.995	5 26 37.72	185 26 02.01	Norton	4.0942423	12,423.45	40,759.3
	86 16 08.731	126 48 23.95	306 42 59.22	Dake	4.1246504	13,324.48	43,715.4
		217 18 00.75	37 22 37.48	Twin Lake	4.1757762	14,989.12	49,176.8
		285 55 55.71	106 05 03.20	Jones	4.2732798	18,762.03	61,555.1
		169 31 26		Azimuth mark.			
Supplementary points							
New Carlisle, municipal tank, finial light (Ind.), 1932	41 42 26.207	162 00 36.1	341 57 09.5	Bald Tom 2	4.364250	23,134.0	75,899
	86 30 48.653	234 43 33.2	54 48 58.7	Bertrand (U. S. L. S.)	4.140858	13,831.1	45,378
		339 28 49.7	159 29 36.6	Carlisle (U. S. L. S.)	3.667566	4,651.2	15,260
Three Oaks, Warren Featherbone Co., water tank, 1932.	41 48 10.384	24 15 44.9	204 13 11.0	Galena (U. S. L. S.)	4.114439	13,014.8	42,699
	86 36 40.236	184 48 53.2	4 49 21.0	Bald Tom 2	4.057713	11,421.2	37,471
		226 47 08.9	46 51 49.6	Primary traverse station No. 39 Y (U. S. G. S.).	4.124197	13,310.6	43,670
Niles, municipal standpipe, 1932 [1]	41 50 41.49	55 22 33	235 17 28	Bertrand (U. S. L. S.)	4.108491	12,837.8	42,119
	86 15 02.27	131 38 49	311 34 56	David	4.030909	10,737.6	35,228
Bridgeman, municipal water tank, finial, 1932	41 56 33.572	189 54 27.4	9 55 08.4	Stephensville	3.913908	8,201.8	26,909
	86 32 44.901	282 42 17.7	102 50 15.1	David	4.227386	16,880.5	55,382
		322 24 13.0	142 30 56.9	Bertrand (U. S. L. S.)	4.359997	22,908.5	75,159
Benton Harbor, black municipal standpipe, finial, 1932.[1]	42 06 56.93	29 55 38	209 52 31	Stephensville	4.109447	12,866.1	42,212
	86 27 04.60	182 12 44	2 12 48	Henley	3.566535	3,685.8	12,092
Benton Harbor, Baker Vawter Co., white stack, 1932	42 07 37.155	43 44 45.7	223 43 09.6	St. Joe	3.677604	4,760.0	15,617
	86 27 15.541	189 09 17.2	9 09 28.7	Henley	3.393325	2,473.6	8,115
		264 25 46.2	84 31 38.8	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.083811	12,128.6	39,792
Benton Harbor, High School, stack, 1932 [1]	42 06 08.50	76 57 49	256 56 20	St. Joe	3.494005	3,118.9	10,233
	86 27 26.54	187 06 50	7 07 09	Henley	3.717461	5,217.5	17,118
Saint Joseph, municipal standpipe, finial, 1932	42 06 41.217	211 02 55.8	31 04 09.1	Henley	3.687121	4,865.4	15,963
	86 28 47.693	258 25 12.3	78 32 06.7	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.160840	14,482.4	47,514
Saint Joseph, Berrien County, courthouse, dome, 1932	42 06 31.855	206 51 11.5	26 52 17.4	Henley	3.698611	4,995.9	16,391
	86 28 36.685	257 05 03.7	77 11 50.7	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.155229	14,296.5	46,904
		45 02 34.4	225 01 52.7	St. Joe	3.304517	2,016.1	6,614
Saint Joseph, Catholic Church, Steeple, 1932	42 06 30.546	44 25 17.9	224 24 38.3	St. Joe	3.287365	1,938.1	6,359
	86 28 39.738	207 21 16.0	27 22 24.0	Henley	3.704476	5,063.8	16,613
		256 59 21.7	77 06 10.8	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.157575	14,373.9	47,158

[1] No check on this position.

77720°—39——5

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, southern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Saint Joseph, J. Wallace Sons & Co., western stack, 1932.	42 06 39.937	26 17 37.8	206 17 13.6	St. Joe	3.271192	1,867.2	6,126
	86 29 02.776	214 09 44.8	34 11 08.2	Henley	3.706335	5,085.5	16,685
		258 32 11.3	78 39 15.8	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.171135	14,829.8	48,654
Saint Joseph, lighthouse, 1932 [1]	42 06 57.81	224 46 52	44 48 38	Henley	3.711969	5,151.9	16,903
	86 29 36.45	1 22 09	181 22 07	St. Joe	3.347564	2,226.2	7,304
Saint Joseph, pierhead front range light, 1932 [1]	42 06 58.76	225 43 16	45 45 05	Henley	3.715671	5,196.0	17,047
	86 29 40.42	359 02 07	179 02 08	St. Joe	3.353181	2,255.2	7,399
Saint Joseph, south pierhead, light, 1932 [1]	42 06 54.84	224 35 30	44 37 18	Henley	3.721308	5,263.9	17,270
	86 29 39.35	359 38 27	179 38 27	St. Joe	3.329177	2,133.9	7,001
Saint Joseph, Whitcomb Hotel, spire on dome, 1932	42 06 38.593	32 09 35.5	212 09 05.5	St. Joe	3.285199	1,928.4	6,327
	86 28 54.100	212 00 43.4	32 02 01.0	Henley	3.699962	5,011.4	16,442
		258 13 26.8	78 20 25.5	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	4.165628	14,642.9	48,041
Primary traverse station No. 37 Y (U. S. G. S.), 1932 (d. m.).	42 08 15.429	61 09 05.1	241 09 03.2	Primary traverse station No. 37 Y (U. S. G. S.) eccentric.	1.8784643	75.59	248.0
	86 18 27.021						
Primary traverse station No. 53 Y (U. S. G. S.), 1932 (d. m.).	42 22 29.304	114 59 21.5	294 59 20.2	Primary traverse station No. 53 Y (U. S. G. S.) eccentric.	1.7004874	50.175	164.62
	86 14 38.136						
Watervliet, silver municipal tank, finial, 1932	42 11 09.352	165 55 57.2	345 54 03.1	Brandywine	4.203863	15,990.5	52,462
	86 15 39.895	237 41 30.0	57 46 35.9	Van Auken	4.091597	12,348.0	40,512
		353 00 08.2	173 00 41.5	Divis	3.970800	9,349.8	30,675
Bangor, black municipal tank, finial, 1932	42 18 49.963	211 55 06.2	31 59 40.6	Leifsen	4.245501	17,599.5	57,741
	86 06 37.859	248 31 42.2	68 32 34.7	Bangor	3.282818	1,917.9	6,292
		14 38 23.6	194 37 25.3	Van Auken	3.896275	7,875.4	25,838
South Haven, rear range light, 1932 [1]	42 24 06.10	200 29 48	20 31 28	Catt	3.988074	9,729.1	31,920
	86 17 06.09	211 25 53	31 26 28	South Haven	3.356290	2,271.4	7,452
South Haven, pierhead front range light, 1932 [1]	42 24 04.83	201 43 43	21 45 31	Catt	3.993555	9,852.7	32,325
	86 17 16.64	11 13 55	191 13 06	Brandywine	3.933659	8,581.4	28,154
South Haven, Everett Piano Co., water tank, 1932 [1]	42 23 30.21	18 17 13	198 16 02	Brandywine	3.888712	7,739.5	25,392
	86 16 43.58	195 48 08	15 49 33	Catt	4.026202	10,621.9	34,849
South Haven, Everett Piano Co., south stack, 1932	42 23 30.064	18 30 44.2	198 29 31.9	Brandywine	3.889021	7,745.0	25,410
	86 16 42.245	195 38 13.7	15 39 38.3	Catt	4.026036	10,617.8	34,835
		254 41 26.9	74 52 49.3	Leifsen	4.379618	23,967.2	78,632
South Haven, St. Basil's Catholic Church, steeple, 1932.	42 23 57.967	198 50 02.1	18 51 36.5	Catt	3.995362	9,893.8	32,460
	86 16 56.781	203 56 00.1	23 56 28.8	South Haven	3.379292	2,394.9	7,857
		14 31 39.7	194 30 37.2	Brandywine	3.928206	8,476.3	27,809
South Haven, municipal concrete storage tank, 1932	42 24 06.605	151 11 10.0	331 10 38.8	South Haven	3.341264	2,194.1	7,198
	86 15 28.033	187 18 37.0	7 19 11.5	Catt	3.962437	9,171.4	30,090
		256 22 02.8	76 32 35.2	Leifsen	4.343247	22,041.8	72,315
South Haven, municipal standpipe, 1932	42 24 14.691	186 54 19.4	6 54 25.4	South Haven	3.226630	1,685.1	5,529
	86 16 23.148	195 19 56.0	15 21 07.7	Catt	3.962569	9,174.2	30,099
		257 41 21.1	77 52 30.7	Leifsen	4.365752	23,214.1	76,162
Fennville, black municipal water tank, finial, 1932	42 35 42.003	307 05 50.8	127 10 08.1	Walker	4.036703	10,881.9	35,702
	86 06 27.494	42 08 48.2	222 03 17.3	Catt	4.221649	16,659.0	54,655
		96 33 28.8	276 29 15.2	Johnston	3.934344	8,596.9	28,205
Douglas, municipal tank, finial, 1932	42 38 35.282	206 05 49.0	26 07 32.3	Haddock	3.897088	7,890.2	25,886
	86 12 44.893	238 23 25.7	58 26 53.3	Kotman	3.913355	8,191.3	26,874
		359 10 52.2	179 10 54.0	Johnston	3.640545	4,370.6	14,339
Saugatuck Lighthouse, 1932 [1]	42 40 36.48	182 57 12	2 57 30	Park	4.079464	12,007.8	39,396
	86 12 58.05	341 26 45	161 27 02	Saugatuck	3.259458	1,817.4	5,963
East Saugatuck, church steeple, 1932 [1]	42 41 50.58	260 02 50	80 07 01	Meiste	3.931694	8,544.6	28,033
	86 05 37.62	57 45 15	237 43 53	Kotman	3.512355	3,253.5	10,674
Belvedere Farm, gray water tank, 1932	42 41 11.927	51 35 10.1	231 33 24.4	Saugatuck	3.656286	4,532.0	14,869
	86 09 56.744	171 00 55.7	351 00 45.1	Haddock	3.357806	2,279.3	7,478
		279 47 18.8	99 48 52.5	Kotman	3.504369	3,194.3	10,480
Overisel, church steeple, 1932 [1]	42 43 41.20	324 12 17	144 12 59	Meiste	3.379118	2,394.0	7,854
	86 00 29.33	62 14 19	242 09 28	Kotman	4.043040	11,041.8	36,226
Holland, north of State park zoo, Getz farm, tank, 1932. [1]	42 48 18.91	300 38 01	120 46 50	Meiste	4.313524	20,583.7	67,532
	86 12 26.08	2 43 10	182 43 06	Park	3.357936	2,280.0	7,480
Holland, Holland Furance Co., tank, 1932 [1]	42 46 38.92	309 51 36	129 56 01	Meiste	4.063610	11,577.4	37,984
	86 05 58.32	36 25 19	216 22 27	Haddock	3.988501	9,738.7	31,951
Holland, Bush Lane Piano Co., tank, 1932 [1]	42 46 38.06	310 04 57	130 09 19	Meiste	4.060043	11,482.7	37,673
	86 05 53.86	36 59 34	216 56 39	Haddock	3.990244	9,777.9	32,080

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, southern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Holland, Heinz Canning Co., stack, 1932 [1]	42 47 00.50	22 01 07	201 59 24	Haddock	3.962498	9,172.7	30,094
	86 07 41.28	91 15 53	271 12 36	Park	3.818434	6,583.2	21,598
Holland, Holland Shoe Co., stack, 1932	42 47 04.787	306 51 08.9	126 56 35.8	Meiste	4.136646	13,697.6	44,940
	86 07 29.440	23 14 20.3	203 12 29.7	Haddock	3.973059	9,398.5	30,835
		90 06 34.8	270 03 10.0	Park	3.835731	6,850.6	22,476
Holland, City Light Co., stack, 1932	42 47 35.678	241 09 53.4	61 14 32.4	Zeeland	4.027108	10,644.1	34,922
	86 06 07.175	315 15 34.1	135 20 05.2	Meiste	4.110983	12,911.7	42,361
		30 12 04.0	210 09 17.6	Haddock	4.045078	11,093.7	36,397
Holland, municipal standpipe, 1932	42 47 32.397	84 28 09.1	264 23 50.8	Park	3.938658	8,682.8	28,487
	86 06 10.614	146 56 18.8	326 52 04.8	Olive	4.191003	15,524.0	50,932
		186 35 39.6	6 36 12.6	Crisp	3.981618	9,585.6	31,449
Holland, Black Lake, front range light, 1932	42 46 21.059	182 48 15.9	2 48 38.2	Olive	4.182553	15,224.8	49,950
	86 12 56.794	203 28 02.3	23 28 19.9	Park	3.170745	1,481.6	4,861
		357 27 10.9	177 27 27.3	Saugatuck	4.092297	12,367.9	40,577
Holland, Black Lake, rear range light, 1932	42 46 21.613	181 47 47.2	1 48 01.5	Olive	4.181756	15,196.9	49,858
	86 12 44.957	193 27 08.0	13 27 17.6	Park	3.139822	1,379.8	4,527
		358 42 19.7	178 42 21.4	Saugatuck	4.092581	12,376.0	40,604
Graafschap, church steeple, 1932 [1]	42 45 09.20	291 41 25	111 47 14	Meiste	4.099492	12,574.5	41,255
	86 07 59.24	356 13 57	176 14 12	Kotman	3.896662	7,882.5	25,861
Zeeland, municipal tank, west side, 1932	42 48 42.284	147 23 45.6	327 22 23.5	Crisp	3.971691	9,369.0	30,738
	86 01 54.619	229 25 44.1	49 27 31.5	Zeeland	3.674368	4,724.6	15,501
		343 26 01.2	163 27 40.9	Meiste	4.068857	11,718.1	38,445
Zeeland, Mead Johnson Co., tank, 1932	42 48 47.453	135 13 36.7	315 10 02.4	Crisp	4.006720	10,155.9	33,320
	86 00 06.948	201 26 17.0	21 26 51.2	Zeeland	3.495405	3,129.0	10,266
		355 31 42.8	175 32 09.4	Meiste	4.057921	11,426.7	37,489
Primary traverse station No. 108 Y (U. S. G. S.), 1932 (d. m.).[1]	42 57 26.538	174 05 05.6	354 05 04.6	De Junge	2.5161992	328.246	1,076.92
	85 59 34.325						
Coopersville, municipal tank, finial, 1932	43 03 45.662	24 26 36.4	204 24 00.9	De Junge	4.096575	12,490.4	40,979
	85 55 47.785	136 30 56.2	316 28 38.9	Aebig	3.819895	6,605.3	21,671
		235 02 09.1	55 06 37.5	Dietrich	4.034858	10,835.7	35,550
Thompson Aeronautical Corporation, west of Coopersville, airway beacon, 1932.	43 03 34.439	239 37 04.2	59 42 42.3	Dietrich	4.112908	12,969.0	42,549
	85 57 29.877	14 30 52.6	194 29 26.7	De Junge	4.056500	11,389.4	37,367
		50 36 46.0	230 26 36.4	Olive	4.418989	26,241.5	86,094
Grand Haven, pierhead front range light, 1932 [1]	43 03 24.91	167 25 06	347 23 58	Norton	4.013602	10,318.2	33,852
	86 15 21.42	172 02 15	92 03 01	Grand Haven	3.188967	1,545.1	5,069
Grand Haven, pierhead rear range light, 1932	43 03 25.935	166 25 36.6	346 24 23.3	Norton	4.013985	10,327.3	33,882
	86 15 13.631	273 37 17.3	93 37 58.5	Grand Haven	3.136911	1,370.6	4,497
		326 25 57.5	146 27 13.0	Rosymound	3.656248	4,531.6	14,867
Grand Haven, First Congregational Church, steeple, 1932.[1]	43 03 44.08	358 15 22	178 15 26	Rosymound	3.637333	4,338.4	14,234
	86 13 28.80	57 13 20	237 12 50	Grand Haven	3.077230	1,194.6	3,919
Grand Haven, Eagle Ottawa Leather Co., stack, 1932 [1]	43 03 49.93	17 57 45	197 57 01	Rosymound	3.676514	4,748.0	15,577
	86 12 18.30	72 21 40	252 20 21	Grand Haven	3.435860	2,728.1	8,950
Challenge Refrigerator Co., stack, 1932	43 04 03.963	3 52 05.0	183 51 54.8	Rosymound	3.695578	4,961.1	16,277
	86 13 08.191	49 24 50.3	229 24 05.8	Grand Haven	3.287081	1,936.8	6,354
		149 19 53.9	329 17 14.9	Norton	4.013208	10,308.8	33,821
Spring Lake, municipal tank, 1932	43 04 31.258	20 11 30.5	200 10 26.2	Rosymound	3.790361	6,171.1	20,246
	86 11 48.899	57 13 53.6	237 12 15.0	Grand Haven	3.589190	3,883.2	12,740
		138 42 18.7	318 38 45.5	Norton	4.028684	10,682.8	35,048
Spring Lake, Holland Church, white steeple, 1932 [1]	43 04 28.98	59 21 38	239 19 55	Grand Haven	3.600513	3,985.8	13,077
	86 11 41.65	138 18 03	318 14 25	Norton	4.035197	10,844.2	35,578
Dietrich, Lutheran Church steeple, 1 mile north of, 1932.	43 07 59.811	115 55 17.1	295 46 08.0	Jones	4.304077	20,140.8	66,079
	85 49 26.982	173 29 04.4	353 28 16.0	Casnovia	4.147978	14,059.8	46,128
		350 36 33.9	170 36 42.1	Dietrich	3.220456	1,661.3	5,450
Primary traverse station No. 16 F (U. S. G. S.), eccentric, 1932.	43 07 55.896	22 30 41.0	202 28 09.7	Rosymound	4.117396	13,103.8	42,991
	86 09 41.397	36 09 51.9	216 06 46.2	Grand Haven	4.017992	10,423.0	34,196
		281 31 19.6	101 38 32.0	Aebig	4.164302	14,598.3	47,895
Primary traverse station No. 16 F (U. S. G. S.), 1932 (d. m.).	43 07 55.900	88 20 59.7	268 20 59.6	Primary traverse station No. 16 F (U. S. G. S.) eccentric.	0.615634	4.127	13.54
	86 09 41.215						
Muskegon, American Showcase Co., stack, 1932 [1]	43 12 55.25	271 13 27	91 21 02	Jones	4.176035	14,998.1	49,206
	86 13 53.76	29 19 11	209 17 03	Norton	3.936275	8,635.3	28,331
Muskegon, courthouse, tip of spire, 1932	43 14 05.711	18 24 33.5	198 22 55.7	Norton	4.009767	10,227.4	33,554
	86 14 37.954	129 57 01.4	309 50 34.5	Dake	4.219697	16,584.3	54,410
		278 51 32.1	98 59 37.3	Jones	4.209122	16,185.3	53,101

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, southern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Muskegon, Central Paper Co., tall stack, 1932	43 12 52.009	148 51 31.5	328 47 34.1	Dake	4.178714	15,090.9	49,511
	86 18 15.863	210 08 43.3	30 10 10.4	Muskegon	3.756638	5,710.0	18,734
		347 09 19.4	167 10 10.7	Norton	3.882003	7,620.8	25,003
Muskegon breakwater, front range light, 1932	43 13 26.697	159 47 38.9	339 45 26.3	Dake	4.101034	12,619.3	41,402
	86 20 48.804	238 30 36.7	58 33 48.6	Muskegon	3.869713	7,408.2	24,305
		328 47 06.3	148 49 42.3	Norton	3.997278	9,937.5	32,603
Muskegon, north breakwater light, 1932	43 13 31.839	159 57 42.0	339 54 32.2	Dake	4.094754	12,438.1	40,807
	86 20 52.946	239 57 02.0	59 59 16.7	Muskegon	3.869661	7,407.3	24,302
		328 48 50.2	148 50 29.0	Norton	4.005252	10,121.7	33,208
Muskegon pierhead, rear range light, 1932 [1]	43 13 31.95	237 23 21	57 26 17	Muskegon	3.837504	6,878.7	22,568
	86 20 25.62	331 53 32	151 55 52	Norton	3.992084	9,819.4	32,216
Muskegon, Campbell-Wyant Foundry, water tank, finial, 1932.	43 12 10.725	13 01 41.0	193 00 57.9	Norton	3.800636	6,318.8	20,731
	86 15 57.851	142 26 41.8	322 21 09.8	Dake	4.252974	17,905.0	58,743
		266 35 23.9	86 44 23.6	Jones	4.251086	17,827.3	58,488
Muskegon, municipal standpipe, center, 1932	43 12 15.789	24 28 04.8	204 26 37.8	Norton	3.841034	6,934.8	22,752
	86 14 53.777	138 38 58.0	318 32 42.0	Dake	4.271933	18,703.9	61,364
		266 50 51.2	86 59 07.1	Jones	4.214161	16,374.2	53,721
Muskegon, Bennet Pump Co., water tank, finial, 1932.	43 12 05.953	34 04 13.3	214 02 10.3	Norton	3.860506	7,252.8	23,795
	86 14 01.079	136 38 51.2	316 31 59.1	Dake	4.295125	19,729.9	64,731
		265 28 10.0	85 35 49.8	Jones	4.182055	15,207.4	49,893
Muskegon, Brunswick Radio Corporation, brick stack, 1932.	43 13 15.674	15 00 21.9	194 59 15.7	Norton	3.926774	8,448.4	27,718
	86 15 24.084	136 14 29.4	316 08 34.2	Dake	4.227362	16,879.6	55,379
		166 32 17.9	346 31 47.3	Muskegon	3.636068	4,325.8	14,192
Muskegon, Piston Rings Co., tallest stack, 1932	43 12 56.070	21 42 57.8	201 41 26.7	Norton	3.910205	8,132.1	26,680
	86 14 47.730	135 41 24.1	315 35 04.0	Dake	4.252485	17,884.8	58,677
		159 12 34.9	339 11 39.4	Muskegon	3.711577	5,147.3	16,887
White River, pierhead light, 1932 [1]	43 22 29.67	174 14 47	354 14 41	Montague	3.324060	2,108.9	6,919
	86 25 46.41	334 28 54	154 30 06	Dake	3.736083	5,446.1	17,868
White River Lighthouse, 1932	43 22 29.250	163 14 53.1	343 14 33.6	Montague	3.343400	2,205.0	7,234
	86 25 27.564	256 25 42.4	76 29 49.3	White hall	3.920224	8,321.9	27,303
Whitehall, Eagle Ottawa Leather Co., stack, 1932	43 24 03.739	293 12 30.2	113 13 39.1	Whitehall	3.390148	2,455.5	8,056
	86 21 08.404	26 36 53.8	206 34 54.4	Dake	3.941686	8,743.5	28,686
		82 56 07.7	262 52 50.3	Montague	3.814087	6,517.6	21,383
Whitehall, municipal standpipe finial, 1932	43 24 20.177	328 29 03.1	148 29 30.7	Whitehall	3.238180	1,730.5	5,677
	86 20 08.323	32 20 35.5	212 17 54.9	Dake	3.993516	9,851.8	32,322
		80 30 31.8	260 26 33.1	Montague	3.899210	7,928.8	26,013

East shore of Lake Michigan, northern section

Principal points							
Sleeping Bear, 1932 (d. m.)	44 52 22.970	234 57 26.22	55 15 21.41	Swenson	4.6089033	40,635.28	133,317.6
	86 04 07.037	291 54 39.51	112 10 10.06	Whiting	4.4954257	31,291.45	102,662.0
		170 12 27		Reference mark No. 1.			
Cedar, 1932 (d. m.)	44 50 39.812	100 13 22.47	280 03 50.68	Sleeping Bear	4.2572281	18,081.24	59,321.5
	85 50 36.398	210 26 08.21	30 34 30.29	Swenson	4.4867994	30,676.05	100,643.0
		307 20 28.78	127 26 27.83	Whiting	4.1490034	14,093.00	46,236.8
Pyramid, 1932 (d. m.)	44 58 03.865	47 23 08.11	227 17 00.52	Sleeping Bear	4.1910988	15,527.40	50,942.8
	85 55 26.463	239 45 15.34	59 57 03.15	Swenson	4.4036683	25,331.93	83,109.8
		335 04 08.90	155 07 33.67	Cedar	4.1793399	15,112.62	49,582.0
Barnard, 1932 (d. m.)	44 35 55.028	158 27 11.26	338 20 45.02	Sleeping Bear	4.5158658	32,799.39	107,609.3
	85 54 58.268	222 05 47.26	42 14 49.68	Whiting	4.4031870	25,303.87	83,017.8
		339 47 41		Azimuth mark.			
Kirby, 1932 (d. m.)	44 38 50.358	203 56 17.52	24 02 14.87	Sleeping Bear	4.4386255	27,455.26	90,076.1
	86 12 34.533	251 28 32.25	71 49 57.97	Whiting	4.6272373	42,387.45	139,066.2
		282 58 51.42	103 11 13.38	Barnard	4.3785201	23,906.73	78,434.0
		267 05 56		Azimuth mark.			
Honor, 1932 (d. m.)	44 38 33.933	298 48 48.92	118 53 32.56	Barnard	4.0070854	10,164.48	33,348.0
	86 01 42.080	92 04 59.25	271 57 20.76	Kirby	4.1579780	14,387.26	47,202.2
Downs, 1932 (d. m.)	44 41 51.422	289 44 07.99	109 53 08.08	Honor	4.2549625	17,987.16	59,012.9
	86 14 30.320	335 27 36.83	155 28 58.23	Kirby	3.7884152	6,143.49	20,155.8
		291 50 45		Azimuth mark.			

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, northern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Buck, 1932 (d. m.)	44 31 24.969	129 26 43.15	309 17 50.01	Kirby	4.3359150	21,672.80	71,104.8
	85 59 55.046	135 08 24.45	314 58 09.76	Downs	4.4364905	27,320.62	89,634.4
		169 53 57.21	349 52 42.08	Honor	4.1287194	13,449.91	44,126.9
		218 07 40.44	38 11 08.68	Barnard	4.0253571	10,601.25	34,780.9
		267 34 07		Azimuth mark.			
Lemley, 1932 (d. m.)	44 31 48.517	177 01 56.48	357 01 34.97	Kirby	4.1152336	13,038.68	42,777.7
	86 12 03.900	227 33 53.83	47 41 10.33	Honor	4.2687594	18,567.76	60,917.7
		251 19 04.65	71 31 04.34	Barnard	4.3780038	23,878.32	78,340.8
		272 30 53.28	92 39 24.38	Buck	4.2071221	16,110.99	52,857.5
		8 39 18		Azimuth mark.			
Glover, 1932 (d. m.)	44 29 11.444	113 38 11.49	293 32 19.10	Lemley	4.0833714	12,116.34	39,751.7
	86 03 41.207	230 27 23.08	50 30 01.61	Buck	3.8113475	6,476.61	21,248.7
		38 47 56		Azimuth mark.			
Brethren, 1932, r. 1936 (d. m.)	44 20 00.375	162 11 30.61	342 08 37.56	Glover	4.2520753	17,867.98	58,621.9
	85 59 33.911	178 44 04.81	358 43 50.02	Buck	4.3250276	21,136.23	69,344.4
		144 38 44		Azimuth mark.			
Onekama, 1932 (d. m.)	44 24 20.269	194 41 13.07	14 43 08.13	Lemley	4.1554685	14,304.36	46,930.2
	86 14 48.147	238 34 33.91	58 42 20.93	Glover	4.2373065	17,270.56	56,661.8
		291 31 45.38	111 42 24.69	Brethren	4.3379388	21,774.03	71,437.0
		201 46 09		Azimuth mark.			
Scott, 1932, r. 1936 (d. m.)	44 19 36.336	155 04 08.41	335 01 59.66	Onekama	3.9852431	9,665.92	31,712.3
	86 11 44.015	267 18 10.48	87 26 40.67	Brethren	4.2093370	16,193.36	53,127.7
		179 54 33		Azimuth mark.			
Wellston, 1932, r. 1936 (d. m.)	44 11 07.708	150 06 15.55	330 01 31.16	Scott	4.2580610	18,115.95	59,435.4
	86 04 56.505	151 51 31.25	331 44 38.07	Onekama	4.4433795	27,757.45	91,067.6
		203 29 24.07	23 33 09.21	Brethren	4.2536031	17,930.94	58,828.4
		346 43 41		Azimuth mark.			
Manistee, 1932 (d. m.)	44 15 51.384	200 55 42.25	20 58 52.00	Onekama	4.2258170	16,819.65	55,182.5
	86 19 19.660	235 27 08.95	55 32 27.15	Scott	4.0884020	12,257.50	40,214.8
		294 28 39.84	114 38 41.87	Wellston	4.3235491	21,064.40	69,108.8
		292 59 38		Azimuth mark.			
Gun, 1932, r. 1936 (d. m.)	44 05 16.133	152 19 16.41	332 13 53.16	Manistee	4.3453718	22,149.90	72,670.1
	86 11 35.798	219 14 34.30	39 19 12.36	Wellston	4.1467170	14,019.00	45,994.0
Hamlin, 1932 (d. m.)	44 04 02.414	199 56 14.83	20 00 24.21	Manistee	4.3670329	23,282.68	76,386.6
	86 25 17.589	244 04 38.32	64 18 48.49	Wellston	4.4793599	30,155.04	98,933.7
		262 49 39.82	82 59 11.48	Gun	4.2654492	18,426.77	60,455.2
		342 55 36		Azimuth mark.			
Tamarack, 1932, r.1936 (d. m.)	44 14 24.560	20 02 11.27	199 58 32.12	Hamlin	4.3103896	20,435.70	67,046.1
	86 20 02.979	199 43 28.51	19 43 58.74	Manistee	3.4543887	2,847.01	9,340.6
		286 42 44.80	106 53 16.91	Wellston	4.3226587	21,021.26	68,967.3
		326 17 53.46	146 23 46.82	Gun	4.3082479	20,335.17	66,716.3
		60 40 24		Azimuth mark.			
Kintner, 1932 (d. m.)	43 54 50.438	138 16 56.39	318 09 01.91	Hamlin	4.3588292	22,847.00	74,957.2
	86 13 54.425	189 04 23.66	9 05 59.96	Gun	4.2913024	19,557.01	64,163.3
		322 58 42		Azimuth mark.			
Summit, 1932 (d. m.)	43 54 11.876	183 05 48.06	3 06 18.84	Hamlin	4.2613386	18,253.18	59,885.6
	86 26 01.897	223 11 04.03	43 21 05.63	Gun	4.4495662	28,155.69	92,374.1
		265 44 11.77	85 52 36.28	Kintner	4.2115633	16,276.58	53,400.7
		181 32 17		Azimuth mark.			
McDonald, 1932 (d. m.)	43 55 22.173	35 24 50.43	215 24 02.50	Summit	3.4252047	2,661.98	8,733.5
	86 24 52.774	178 01 48.39	358 01 31.14	Hamlin	4.2059164	16,066.32	52,710.9
		273 45 06.02	93 52 42.68	Kintner	4.1679316	14,720.81	48,296.5
		172 29 34		Azimuth mark.			
Crystal, 1932, r. 1937 (d. m.)	43 45 07.098	131 36 34.41	311 26 46.01	Summit	4.4041576	25,360.49	83,203.5
	86 11 52.216	171 23 16.79	351 21 52.15	Kintner	4.2603022	18,209.68	59,742.9
		173 21 01		Azimuth mark.			
Pentwater, 1932 (d. m.)	43 46 26.523	181 44 29.60	1 44 43.15	Summit	4.1574266	14,369.00	47,142.3
	86 26 21.465	226 56 40.91	47 05 18.38	Kintner	4.3581518	22,811.39	74,840.4
		277 06 06.46	97 16 07.70	Crystal	4.2922074	19,597.80	64,297.1
		233 05 02		Azimuth mark.			
Bald, 1932 (d. m.)	43 48 14.802	12 48 10.33	192 47 46.83	Pentwater	3.5349136	3,427.00	11,243.4
	86 25 47.509	178 19 52.14	358 19 42.18	Summit	4.0423864	11,025.20	36,171.8
		287 08 59.62	107 18 37.53	Crystal	4.2913101	19,557.36	64,164.4
		256 52 50		Azimuth mark.			
Shelby, 1932 (d. m.)	43 37 30.887	143 19 11.25	323 12 50.62	Pentwater	4.3144357	20,626.98	67,673.7
	86 17 10.526	206 49 25.38	26 53 05.25	Crystal	4.1981554	15,781.76	51,777.3

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, northern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Benona, 1932 (d. m.)	43 38 36.455	199 39 28.74	19 42 08.88	Pentwater	4.1877328	15,407.52	50,549.5
	86 30 13.223	243 50 08.41	64 02 49.04	Crystal	4.4384581	27,444.68	90,041.4
		276 30 14.75	96 39 14.85	Shelby	4.2470310	17,661.64	57,944.9
Rose, 1932 (d. m.)	43 35 18.783	113 52 17.54	293 45 12.28	Benona	4.1792633	15,109.96	49,573.3
	86 19 56.737	222 25 13.90	42 27 08.54	Shelby	3.7422671	5,524.17	18,123.9
		20 38 12		Azimuth mark.			
Middlecamp, 1932 (d. m.)	43 32 56.512	129 05 10.21	309 02 24.06	Rose	3.8430764	6,967.49	22,859.2
	86 15 55.662	168 47 18.97	348 46 27.36	Shelby	3.9361456	8,632.68	28,322.4
		126 24 24		Azimuth mark.			
Claybank, 1932 (d. m.)	43 30 21.123	170 27 09.17	350 25 50.10	Benona	4.1903901	15,502.09	50,859.8
	86 28 18.503	228 26 05.56	48 33 45.92	Shelby	4.3013758	20,015.93	65,668.9
		230 45 12.31	50 50 58.00	Rose	4.1624164	14,535.05	47,687.1
		253 53 24.41	74 01 56.00	Middlecamp	4.2394749	17,357.01	56,945.5
		311 35 05		Azimuth mark.			
Twin Lake, 1932, r. 1934 (d. m.)	43 21 58.164	22 58 44.07	202 53 31.87	Norton	4.4211020	26,369.51	86,514.0
	86 09 25.315	121 27 05.62	301 14 06.51	Claybank	4.4748018	29,840.21	97,900.8
		156 40 33.84	336 36 05.35	Middlecamp	4.3450153	22,131.73	72,610.5
		332 23 31.03	152 28 02.45	Jones	4.2851272	19,280.89	63,257.4
		254 13 43		Azimuth mark.			
Transit traverse station No. 36 Tex, (U. S. G. S.,) 1932 (d. m.).	43 49 09.538	33 20 33.12	213 18 50.70	Pentwater	3.7797018	6,021.46	19,755.4
	86 23 53.478	56 28 24.39	236 27 05.45	Bald	3.4853902	3,057.67	10,031.7
Anderson, 1932 (d. m.)	43 40 59.971	44 34 53.30	224 32 38.88	Benona	3.7935549	6,216.63	20,395.7
	86 26 58.534	184 42 08.92	4 42 34.54	Pentwater	4.0048533	10,112.38	33,177.0
		249 18 37.07	69 29 03.42	Crystal	4.3359518	21,674.64	71,110.9
		85 54 27		Azimuth mark.			
Portage, 1932 (d. m.)	44 20 59.134	22 17 35.50	202 17 02.45	Scott	3.4412257	2,762.01	9,061.7
	86 10 56.728	140 29 31.93	320 26 50.08	Onekama	3.9057551	8,049.24	26,408.2
		178 50 23		Azimuth mark.			
Denton, 1932 (d. m.)	44 38 49.432	162 54 25.57	342 53 30.41	Downs	3.7691921	5,877.49	19,283.1
	86 13 11.859	268 00 23.38	88 00 49.61	Kirby	2.9154124	823.02	2,700.2
		177 57 10		Azimuth mark.			
Supplementary points							
North Manitou Island Lighthouse, 1932	45 03 47.357	265 02 20.5	85 15 49.0	Swenson	4.399131	25,068.7	82,246
	85 57 47.800	343 42 55.6	163 44 35.6	Pyramid	4.043201	11,045.9	36,240
		21 30 39.7	201 26 11.7	Sleeping Bear	4.356075	22,702.6	74,483
South Manitou Island Lighthouse, 1932	45 00 27.233	256 36 15.4	76 55 15.8	Swenson	4.559096	36,232.3	118,872
	86 05 37.453	288 14 10.1	108 21 22.0	Pyramid	4.149151	14,097.8	46,253
		352 26 13.4	172 27 17.2	Sleeping Bear	4.178394	15,079.7	49,474
Mission Point Lighthouse, 1932 [1]	44 59 28.69	127 37 54	307 30 49	Swenson	4.219326	16,570.1	54,364
	85 28 45.89	240 02 15	60 10 04	Central Lake	4.223858	16,744.0	54,934
Day Forest estate, water tank, 1932	44 53 20.318	71 16 09.1	251 13 21.5	Sleeping Bear	3.740855	5,506.2	18,065
	86 00 09.477	215 18 42.3	35 22 02.2	Pyramid	4.030600	10,730.0	35,203
		291 26 21.9	111 33 06.2	Cedar	4.131023	13,521.4	44,361
Cedar, fire lookout tower, 1932	44 50 39.557	155 08 56.8	335 05 32.2	Pyramid	4.179508	15,118.5	49,601
	85 50 36.538	201 20 45.2	21 20 45.3	Cedar	0.928396	8.5	28
		307 18 29.8	127 24 28.9	Whiting	4.148932	14,090.7	46,229
Point Betsie Lighthouse, 1932	44 41 28.531	236 28 14.0	56 28 48.1	Downs	3.106998	1,279.4	4,197
	86 15 18.758	323 26 52.7	143 28 48.2	Kirby	3.783664	6,076.6	19,936
		330 20 20.4	150 21 49.7	Denton	3.752117	5,650.9	18,540
Honor, fire lookout tower, 1932 (d.) [1]	44 38 34.174	355 31 48.9	175 31 48.9	Honor	0.872739	7.46	24.5
	86 01 42.106						
Frankfort, south breakwater light eccentric, 1932 (d. m.).	44 37 45.671	239 21 26.3	59 23 13.8	Kirby	3.593211	3,919.3	12,859
	86 15 07.553	339 48 08.5	159 50 17.4	Lemley	4.069868	11,745.4	38,535
Transit traverse station No. 22 W (U. S. G. S.), 1932 (d. m.).	44 36 08.107	106 41 40.5	286 32 45.8	Kirby	4.243279	17,509.7	57,446
	85 59 53.444	151 59 41.4	331 58 25.1	Honor	3.707467	5,098.8	16,728
		273 31 11.7	93 34 39.0	Barnard	3.814407	6,522.4	21,399
Portage Lake, pierhead light, 1932 [1]	44 21 37.47	198 41 00	18 41 54	Onekama	3.724666	5,304.8	17,404
	86 16 04.94	279 48 17	99 51 52	Portage	3.840594	6,927.8	22,729
Manistee, pierhead light, 1932	44 15 06.502	205 00 54.1	25 05 06.0	Onekama	4.275709	18,867.3	61,900
	86 20 48.695	234 56 42.5	54 57 44.5	Manistee	3.382467	2,412.5	7,915
		321 54 55.7	141 55 27.5	Tamarack	3.216060	1,644.6	5,396
Manistee, breakwater light, 1932	44 15 05.276	205 37 35.2	25 41 54.8	Onekama	4.278869	19,005.0	62,352
	86 20, 59.613	237 17 45.3	57 18 55.0	Manistee	3.420736	2,634.7	8,644
		314 59 52.5	135 00 32.0	Tamarack	3.249730	1,777.2	5,831
Manistee, Guardian Angel Catholic Church, spire, 1932.	44 14 31.466	180 06 45.9	0 06 46.0	Manistee	3.392125	2,466.7	8,093
	86 19 19.879	227 00 14.4	47 05 32.7	Scott	4.140201	13,810.2	45,309
		288 04 55.6	108 14 57.7	Wellston	4.304755	20,172.3	66,182

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, northern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Manistee, Ruggles & Rademaker Salt Co., stack, 1932	44 14 35.363	157 52 32.1	337 52 02.0	Manistee	3.403638	2,533.0	8,310
	86 18 36.651	224 31 27.1	44 36 15.2	Scott	4.115240	13,038.9	42,778
		289 18 50.3	109 28 22.2	Wellston	4.285608	19,302.3	63,328
Manistee, Mercy Hospital, cupola finial, 1932 [1]	44 14 05.57	109 02 01	289 01 08	Tamarack	3.254719	1,797.7	5,898
	86 18 46.39	167 16 09	347 15 46	Manistee	3.524825	3,348.3	10,985
Manistee, Woodrow Wilson High School, 1932 [1]	44 14 43.96	47 32 43	227 32 22	Tamarack	2.948040	887.2	2,911
	86 19 33.48	188 22 45	8 22 55	Manistee	3.322927	2,103.4	6,901
Manistee, First Congregational Church, spire, 1932	44 14 36.402	21 30 32.6	201 26 31.2	Hamlin	4.322797	21,028.0	68,989
	86 19 31.156	62 38 08.4	242 37 46.2	Tamarack	2.900433	795.1	2,609
		186 17 15.5	6 17 23.5	Manistee	3.367056	2,328.4	7,639
Filer City, Fiber Paper Co., taller of two stacks, 1932	44 12 54.904	150 50 43.0	330 49 07.4	Manistee	3.795060	6,238.2	20,466
	86 17 02.648	281 31 32.7	101 39 58.9	Wellston	4.216429	16,460.0	54,003
		332 48 42.2	152 52 29.8	Gun	4.201788	15,914.3	52,212
Wellston, fire lookout tower, 1932 [1]	44 11 07.69	93 22 12	273 22 12	Wellston	0.915400	8.23	27.0
	86 04 56.14						
Transit traverse station No. 2 W (U. S. G. S.), 1932 (d. m.).	44 10 37.829	183 53 25.8	3 53 46.5	Manistee	3.986789	9,700.4	31,825
	86 19 49.332	267 15 04.1	87 25 26.3	Wellston	4.297828	19,853.1	65,135
		312 05 49.4	132 11 33.1	Gun	4.170184	14,797.4	48,548
Big Sable Lighthouse, 1932	44 03 27.839	213 45 30.7	33 53 32.9	Manistee	4.441311	27,625.6	90,635
	86 30 51.572	261 48 09.1	81 52 01.5	Hamlin	3.875845	7,513.5	24,651
		339 20 29.8	159 23 51.2	Summit	4.263282	18,335.0	60,154
Dunbar, fire lookout tower, 1932 [1]	43 58 20.92	60 15 59	240 10 06	Kintner	4.116565	13,078.7	42,909
	86 05 25.43	147 16 17	327 11 59	Gun	4.182981	15,239.9	50,000
Scottville, western municipal water tank, finial, 1932	43 57 23.398	320 38 19.1	140 40 19.5	Kintner	3.785653	6,104.5	20,028
	86 16 47.941	64 29 17.8	244 22 53.5	Summit	4.136651	13,697.8	44,940
		137 22 41.3	317 16 47.1	Hamlin	4.224008	16,749.7	54,953
Scottville, eastern municipal water tank, 1932	43 57 23.413	64 30 47.1	244 24 22.4	Summit	4.137078	13,711.3	44,984
	86 16 47.281	70 58 56.6	250 53 19.8	McDonald	4.059038	11,456.1	37,586
		137 20 24.4	317 14 29.8	Hamlin	4.224257	16,759.3	54,984
Ludington, Emanuel Lutheran Church, spire, 1932 [1]	43 57 05.92	187 11 46	7 12 37	Hamlin	4.112508	12,957.1	42,510
	86 26 30.52	283 51 07	103 59 52	Kintner	4.239939	17,375.6	57,006
Ludington, high school belfry, finial, 1932	43 57 10.876	187 07 38.5	7 08 28.1	Hamlin	4.107242	12,800.9	41,998
	86 26 28.956	284 22 10.9	104 30 54.4	Kintner	4.240026	17,379.0	57,018
		353 45 42.8	173 46 01.6	Summit	3.744880	5,557.5	18,233
Ludington, north pierhead, rear range light, 1932	43 57 10.562	194 27 49.8	14 29 32.2	Hamlin	4.118213	13,128.4	43,072
	86 27 44.931	337 21 56.7	157 23 08.3	Summit	3.776317	5,974.7	19,602
		354 38 05.9	174 39 03.8	Pentwater	4.300258	19,964.5	65,500
Ludington, Morton Salt Co., white brick stack, 1932	43 56 18.327	184 12 24.5	4 12 57.4	Hamlin	4.157229	14,362.5	47,121
	86 26 04.931	279 22 49.2	99 31 16.0	Kintner	4.218014	16,520.2	54,200
		359 00 22.0	179 00 24.1	Summit	3.591440	3,903.4	12,806
Ludington, north breakwater, front range light, 1932	43 57 13.002	196 51 55.1	16 53 54.7	Hamlin	4.120748	13,205.3	43,324
	86 28 09.737	332 57 37.0	152 59 05.8	Summit	3.797656	6,275.6	20,589
		353 04 48.6	173 06 03.7	Pentwater	4.303175	20,099.0	65,941
Ludington, Mason County Courthouse, cupola, finial, 1932.	43 57 18.107	188 16 46.8	8 17 43.4	Hamlin	4.100727	12,610.3	41,372
	86 26 39.187	284 53 08.0	105 01 58.6	Kintner	4.246895	17,656.1	57,927
		351 45 42.1	171 46 08.0	Summit	3.764002	5,807.7	19,054
Ludington, south pierhead light, 1932	43 57 07.969	310 23 25.2	130 25 24.5	McDonald	3.702194	5,037.3	16,527
	86 27 44.750	350 57 02.2	170 58 23.4	Bald	4.221734	16,662.3	54,666
		354 37 30.1	174 38 27.8	Pentwater	4.298512	19,884.4	65,237
Ludington, Pere Marquette Co., radio mast, 1932 [1]	43 56 22.13	184 17 31	4 18 04	Hamlin	4.153701	14,246.3	46,740
	86 26 05.50	279 46 27	99 54 54	Kintner	4.218855	16,552.2	54,305
Ludington, Carrom Co., tank, 1932 [1]	43 58 09.54	189 58 40	9 59 40	Hamlin	4.043700	11,058.6	36,281
	86 26 43.69	352 45 15	172 45 44	Summit	3.868900	7,394.4	24,260
Ludington, south breakwater light, 1932	43 57 08.294	332 13 41.9	152 15 11.0	Summit	3.789093	6,153.1	20,187
	86 28 10.369	349 01 24.6	169 03 03.6	Bald	4.224572	16,771.5	55,024
		352 59 22.9	173 00 38.4	Pentwater	4.300074	19,956.0	65,472
Pentwater, municipal tank, finial, 1932	43 46 39.475	54 41 16.9	234 40 59.4	Pentwater	2.839792	691.5	2,269
	86 25 56.235	179 28 53.3	359 28 49.4	Summit	4.144985	13,963.2	45,811
		183 47 33.9	3 47 39.9	Bald	3.469611	2,948.6	9,674
Pentwater, pierhead light, 1932 [1]	43 46 54.768	204 27 08.7	24 27 43.5	Bald	3.433546	2,713.6	8,903
	86 26 37.759	337 18 47.8	157 18 59.1	Pentwater	2.975360	944.8	3,100
Pentwater, fire lookout tower, 1932 [1]	43 46 26.11	125 14 32.4	305 14 31.8	Pentwater	1.340444	21.9	72
	86 26 20.66						

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

East shore of Lake Michigan, northern section—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Transit traverse station No. 10 (U. S. G. S.), 1932 (d. m.).	43 45 37.933 86 19 05.982	98 47 39.3 202 10 28.9 275 33 33.8	278 42 38.0 22 14 04.7 95 38 33.8	Pentwater Kintner Crystal	3.993667 4.265243 3.989022	9,855.2 18,418.0 9,750.4	32,333 60,426 31,989
Hart, Catholic Church spire 3 miles NNE. of, 1932	43 44 46.743 86 20 16.576	52 09 49.3 110 42 19.2 130 58 39.6	232 05 11.5 290 38 06.8 310 54 50.4	Anderson Pentwater Bald	4.056897 3.940718 3.991155	11,399.8 8,724.0 9,798.4	37,401 28,622 32,147
Little Sable Lighthouse, 1932 [1]	43 39 43.25 86 30 34.55	243 54 30 346 56 37	63 56 59 166 56 51	Anderson Benona	3.731387 3.325560	5,387.5 2,116.2	17,675 6,943
Transit traverse station No. 1 Tex (U. S. G. S.), 1932 (d. m.).[1]	43 30 30.87 86 28 17.80	3 17 31	183 17 30	Claybank	2.478885	301.221	988.26
Fremont, water tank, finial, 1932	43 28 00.351 85 57 06.104	56 09 54.0 113 51 42.0 123 11 15.8	236 01 25.9 293 35 58.0 302 57 26.0	Twin Lake Rose Shelby	4.301843 4.526622 4.508747	20,037.5 33,621.9 32,263.1	65,740 110,308 105,860
Blue Lake, fire lookout tower and primary traverse station No. 53 F (U. S. G. S.) eccentric, 1932.	43 27 20.938 86 13 27.665	49 00 48.0 162 12 55.0 331 16 50.1	228 56 40.2 342 11 13.2 151 19 36.6	Whitehall Middlecamp Twin Lake	4.031297 4.036506 4.055221	10,747.2 10,876.9 11,355.9	35,260 35,685 37,257
Primary traverse station No. 53 F (U. S. G. S.), 1932 (d. m.).	43 27 21.164 86 13 27.544	21 20 48.1	201 20 48.0	Blue Lake, fire lookout tower and primary traverse station No. 53 F (U. S. G. S.) eccentric.	0.874772	7.495	24.59
Twin Lake, fire lookout tower, 1932 [1]	43 21 58.51 86 09 25.79	315 18 31	135 18 31	Twin Lake	1.180413	15.15	49.7

[1] No check on this position.

Sturgis to Big Rapids

Principal points						
Sturgis west base, 1931 (d. m.)	41 47 18.746 85 33 27.805	27 12 39.94 102 27 49.67 233 15 18.99 261 59 34	207 10 27.88 282 19 28.59 53 19 29.66	Van Buren (U. S. L. S.) Porter (U. S. L. S.) Sherman (U. S. L. S.) Reference mark No. 2.	4.0011783 4.2496000 4.0343760	10,027.17 17,766.42 10,823.71	32,897.5 58,288.7 35,510.8
Sturgis east base, 1931 (d. m.)	41 48 07.541 85 25 59.855	55 08 15.74 81 45 35.08 161 30 06.96 262 22 28	235 01 05.35 261 40 36.54 341 29 18.95	Van Buren (U. S. L. S.) Sturgis west base Sherman (U. S. L. S.) Reference mark No. 2.	4.2603014 4.0191749 3.7189392	18,209.64 10,451.411 5,235.27	59,742.8 34,289.34 17,176.0
Jewell, 1931 (d. m.)	41 59 33.932 85 42 48.530	306 49 25.82 13 08 50.05 300 11 23	126 59 51.60 193 06 42.50	Sherman (U. S. L. S.) Porter (U. S. L. S.) Reference mark No. 1.	4.4312827 4.2872551	26,994.96 19,375.60	88,566.0 63,568.1
Mendon, 1931 (d. m.)	42 02 33.332 85 26 20.052	3 08 43.23 48 10 56.70 76 24 48.87	183 08 08.60 227 57 48.52 256 13 47.22	Sherman (U. S. L. S.) Porter (U. S. L. S.) Jewell	4.3380623 4.5625672 4.3693479	21,780.22 36,523.07 23,407.11	71,457.3 119,826.1 76,794.8
Stevens, 1931 (d. m.)	42 11 19.614 85 42 51.174	305 24 08.51 359 50 23.58 52 47 46	125 35 13.18 179 50 25.35	Mendon Jewell Reference mark No. 2.	4.4466299 4.3379190	27,965.97 21,773.04	91,751.7 71,433.7
McKain, 1931 (d. m.)	42 09 41.760 85 25 41.002	3 53 12.96 51 38 47.59 97 22 22.82 179 03 02	183 52 46.77 231 27 19.00 277 10 51.16	Mendon Jewell Stevens Reference mark No. 1.	4.1221853 4.4794231 4.3772327	13,249.07 30,159.43 23,835.96	43,468.0 98,948.1 78,201.8
Berky, 1931, r. 1934 (d. m.)	42 18 51.702 85 42 18.014	306 29 30.42 3 07 20.32 152 28 32	126 40 40.62 183 06 58.02	McKain Stevens Reference mark No. 2.	4.4543795 4.1451874	28,469.48 13,969.71	93,403.6 45,832.3
Comstock, 1931 (d. m.)	42 17 34.143 85 30 01.494	337 41 19.77 56 51 13.10 98 08 33.51 253 35 24	157 44 14.84 236 42 35.68 278 00 17.79	McKain Stevens Berky Reference mark No. 1.	4.1973312 4.3241588 4.2314413	15,751.84 21,094.00 17,038.89	51,679.2 69,205.9 55,901.8
Otsego, 1931 (d. m.)	42 28 22.124 85 40 11.380	325 02 05.54 9 21 24.99 325 33 54	145 08 56.65 189 19 59.61	Comstock Berky Plainwell, stack.	4.3870401 4.2513292	24,380.36 17,837.30	79,987.9 58,521.2
Doster, 1931 (d. m.)	42 27 53.320 85 29 20.571	2 48 33.56 46 51 05.97 93 28 55.15 29 01 54	182 48 05.97 226 42 21.84 273 21 35.73	Comstock Berky Otsego Reference mark No. 2.	4.2816655 4.3874489 4.1730196	19,127.82 24,403.32 14,894.28	62,755.2 80,063.2 48,865.7

GEOGRAPHIC POSITIONS—Continued

Sturgis to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Fox, 1931 (d. m.)	42 37 12.875	324 02 06.49	144 08 17.01	Doster	4.3287514	21,318.24	69,941.6
	85 38 28.575	8 09 38.47	188 08 28.95	Otsego	4.2186437	16,544.12	54,278.5
		11 49 40		Reference mark No. 1.			
French, 1931, r. 1936 (d. m.)	42 37 08.644	14 20 46.41	194 18 36.72	Doster	4.2476126	17,685.30	58,022.5
	85 26 08.766	49 52 49.50	229 43 19.73	Otsego	4.4009008	25,171.02	82,581.9
		90 30 47.72	270 22 26.77	Fox	4.2268788	16,860.82	55,317.5
		354 55 14		Reference mark No. 1.			
Dias, 1931, r. 1934 (d. m.)	42 47 47.892	318 15 38.50	138 24 21.67	French	4.4216892	26,405.18	86,631.0
	85 39 00.104	357 53 59.56	177 54 20.94	Fox	4.2924320	19,607.94	64,330.4
		100 12 04		Reference mark No. 2.			
Barnes, 1931 (d. m.)	42 43 42.961	2 42 24.34	182 42 07.23	French	4.0856823	12,180.98	39,963.8
	85 25 43.526	55 25 43.72	235 17 05.14	Fox	4.3258091	21,174.30	69,469.3
		112 43 29.23	292 34 28.38	Dias	4.2928351	19,626.15	64,390.1
		339 39 31		Reference mark No. 2.			
Barry, 1931, r. 1933 (d. m.)	42 45 15.917	37 54 03.73	217 52 57.12	Barnes	3.5604653	3,634.67	11,924.7
	85 24 05.363	103 04 03.53	282 53 55.90	Dias	4.3195945	20,873.46	68,482.3
Dygert, 1931 (d. m.)	42 50 28.007	351 26 50.66	171 27 33.93	Barry	3.9884918	9,738.49	31,950.4
	85 25 09.069	3 35 19.64	183 34 56.24	Barnes	4.0977169	12,523.24	41,086.7
		75 24 45.20	255 15 20.36	Dias	4.2903618	19,514.70	64,024.5
		279 07 58		Reference mark No. 1.			
Alpine, 1931, r. 1934 (d. m.)	43 01 57.302	168 49 47.52	348 48 52.54	Ballards	3.9729071	9,395.22	30,824.2
	85 41 58.246	242 09 23.34	62 18 48.99	Hammond	4.3258017	21,173.94	69,468.2
		312 48 50.46	133 00 17.90	Dygert	4.4947307	31,241.42	102,497.9
		351 13 10.57	171 15 11.87	Dias	4.4235886	26,520.92	87,010.7
		313 28 59		Reference mark No. 2.			
Randall, 1931 (d. m.)	43 00 04.194	348 58 21.36	169 00 05.25	Dygert	4.2580078	18,113.73	59,428.1
	85 27 41.640	34 10 51.87	214 03 10.03	Dias	4.4384504	27,444.19	90,039.8
		100 16 54.30	280 07 09.91	Alpine	4.2946667	19,709.10	64,662.3
		121 01 12.05	300 50 32.24	Ballards	4.3930856	24,722.11	81,109.1
		177 14 50.26	357 14 30.87	Hammond	4.1261198	13,369.64	43,863.6
		259 20 05		Reference mark No. 1.			
Hammond, 1931 (d. m.)	43 07 16.942	88 16 58.56	268 06 37.45	Ballards	4.3128883	20,553.62	67,433.0
	85 28 10.043	121 16 04.15	301 04 42.51	Kent	4.4198155	26,291.51	86,258.1
		43 32 13		Reference mark No. 1.			
Grannis, 1931 (d. m.)	43 14 06.254	2 27 38.06	182 27 21.63	Hammond	4.1018461	12,642.88	41,479.2
	85 27 46.032	57 51 57.80	237 41 19.60	Ballards	4.3962352	24,902.06	81,699.5
		92 31 48.33	272 20 09.52	Kent	4.3624224	23,036.81	75,579.9
		90 49 26		Reference mark No. 2.			
Fisk, 1931, r. 1932 (d. m.)	43 16 59.247	293 39 06.71	113 45 16.16	Grannis	4.1232017	13,280.11	43,569.8
	85 36 45.138	68 08 49.19	248 03 19.55	Kent	4.0678778	11,691.70	38,358.5
		185 04 35		Reference mark No. 1.			
Howard south base, 1931, r. 1932 (d. m.)	43 18 26.348	336 43 01.99	156 44 46.90	Grannis	3.9413721	8,737.20	28,665.3
	85 30 19.085	72 52 19.78	252 47 55.04	Fisk	3.9594295	9,108.14	29,882.3
		23 03 58		Reference mark No. 2.			
Ensley, 1931, r. 1932 (d. m.)	43 21 56.681	309 18 22.60	129 22 23.86	Howard south base	4.0102783	10,239.49	33,594.1
	85 36 10.630	321 52 30.09	141 58 16.16	Grannis	4.2658174	18,442.40	60,506.4
		4 50 41.91	184 50 18.23	Fisk	3.9643466	9,211.84	30,222.5
		40 40 56.67	220 35 03.11	Kent	4.2514253	17,841.25	58,534.2
		103 52 12		Reference mark No. 2.			
Howard north base, 1931, r. 1932 (d. m.)	43 24 40.352	15 17 44.02	195 16 07.87	Howard south base	4.0779164	11,965.102	39,255.51
	85 27 59.036	65 30 36.75	245 24 59.06	Ensley	4.0850412	12,163.01	39,904.8
		287 29 04		Reference mark No. 1.			
Lakeview, 1931, r. 1932 (d. m.)	43 24 59.383	26 51 08.16	206 45 57.97	Grannis	4.3537874	22,583.30	74,092.0
	85 20 13.963	48 22 59.51	228 16 04.02	Howard south base	4.2610819	18,242.39	59,850.2
		56 31 11.55	236 19 51.15	Fisk	4.4280258	26,793.28	87,904.3
		75 25 01.25	255 14 04.04	Ensley	4.3474754	22,257.45	73,023.0
		86 49 53.77	266 44 34.13	Howard north base	4.0203552	10,479.85	34,382.6
		33 29 39		Reference mark No. 2.			
Huston, 1931, r. 1932 (d. m.)	43 36 53.854	354 31 01.11	174 32 05.89	Lakeview	4.3453878	22,150.72	72,672.8
	85 21 48.041	35 04 31.92	214 54 38.26	Ensley	4.5288904	33,797.95	110,885.4
		4 06 48		Reference mark No. 1.			
Spicer, 1931, r. 1937 (d. m.)	43 40 38.515	289 43 39.50	109 53 32.26	Huston	4.3108809	20,458.83	67,122.0
	85 36 06.868	323 28 43.40	143 39 39.90	Lakeview	4.5565758	36,022.66	118,184.3
		0 08 24.78	180 08 22.19	Ensley	4.5393484	34,621.70	113,588.0
Howard base A station, 1931, r. 1932 (d. m.)	43 20 06.353	24 54 53.11	204 54 09.48	Howard south base	3.5318267	3,402.724	11,163.77
	85 29 15.482	191 29 50.04	11 30 42.54	Howard north base	3.9359692	8,629.174	28,310.88
Supplementary points							
Sturgis, water tank, 1931 [1]	41 47 56.26	95 28 10	275 14 32	Porter (U. S. L. S.)	4.454131	28,453.2	93,350
	85 25 32.21	156 36 11	336 35 05	Sherman (U. S. L. S.)	3.762599	5,788.9	18,992
White Pigeon, tall stack, 1931 [1]	41 47 19.94	110 49 18	290 44 31	Porter (U. S. L. S.)	4.027107	10,644.1	34,922
	85 38 48.40	248 07 33	68 15 17	Sherman (U. S. L. S.)	4.238444	17,315.9	56,811

[1] No check on this position.

77729°—30——6

GEOGRAPHIC POSITIONS—Continued

Sturgis to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Three Rivers, Eddy Paper Co., stack, 1931 [1]	41 55 52.42	42 54 21	222 48 58	Porter (U. S. L. S.)	4.215331	16,418.4	53,866
	85 37 55.16	135 21 30	315 18 14	Jewell	3.982719	9,609.9	31,528
Schoolcraft, water tank, 1931	42 06 55.690	26 12 12.9	206 08 57.8	Jewell	4.181485	15,187.5	49,828
	85 37 57.176	140 22 15.1	320 18 57.8	Stevens	4.024367	10,577.1	34,702
		296 44 09.0	116 51 56.3	Mendon	4.254131	17,952.8	58,900
Vicksburg, water tank, 1931	42 07 22.039	46 11 46.9	226 04 29.0	Jewell	4.318946	20,842.3	68,380
	85 31 55.013	187 50 24.3	7 51 40.5	Comstock	4.280232	19,064.8	62,548
		319 07 53.1	139 11 37.5	Mendon	4.070916	11,773.8	38,628
Kalamazoo, State Hospital, standpipe, 1931	42 16 44.458	42 08 26.3	222 04 00.8	Stevens	4.130631	13,509.2	44,321
	85 36 16.167	115 22 41.7	295 18 38.2	Berky	3.962455	9,171.8	30,091
		259 50 23.3	79 54 35.4	Comstock	3.940521	8,720.1	28,609
Grand Rapids, silver water tank, 1931	42 56 08.366	150 59 29.1	330 56 29.3	Alpine	4.090444	12,315.3	40,404
	85 37 34.444	158 43 22.6	338 39 27.7	Ballards	4.331454	21,451.3	70,378
		241 29 59.5	61 36 43.6	Randall	4.184090	15,278.8	50,127
Grand Rapids, National Bank, red light on dome, 1931	42 57 58.102	354 41 36.2	174 42 28.6	Dias	4.276708	18,910.7	62,043
	85 40 17.065	162 45 37.7	342 44 28.7	Alpine	3.888125	7,729.0	25,358
		166 06 04.5	346 04 00.4	Ballards	4.233004	17,100.3	56,103
Grand Rapids, black water tank, 1931 [1]	42 59 22.13	184 39 36	4 40 10	Ballards	4.147738	14,052.0	46,102
	85 44 09.25	211 46 05	31 47 34	Alpine	3.750740	5,633.0	18,481
Primary traverse station No. 4 (U. S. G. S.), 1931 (d. m.).	43 07 03.181	181 11 38.7	1 11 47.6	Kent	4.147272	14,036.9	46,053
	85 44 59.090	211 10 48.7	31 16 26.8	Fisk	4.332661	21,511.0	70,574
		275 34 59.7	95 36 08.3	Ballards	3.357808	2,279.3	7,478
Cedar Springs, water tank, 1931	43 13 31.887	329 46 25.8	149 49 49.8	Hammond	4.126697	13,387.4	43,922
	85 33 08.165	48 31 20.5	228 24 22.7	Ballards	4.265411	18,425.1	60,450
		97 26 30.0	277 18 31.9	Kent	4.200864	15,880.5	52,101
Primary traverse station No. 2 (U. S. G. S.) eccentric, 1931 (d. m.).	43 14 54.826	87 19 42.7	267 14 09.4	Kent	4.040894	10,987.4	36,048
	85 36 39.647	178 09 11.4	358 09 07.6	Fisk	3.584518	3,841.7	12,604
		180 07 32		Reference mark No. 1.			
Primary traverse station No. 2 (U. S. G. S.), 1931 (d. m.).	43 14 54.169	87 25 42.0	267 20 09.5	Kent	4.039917	10,962.7	35,967
	85 36 40.702	178 30 56.4	358 30 53.4	Fisk	3.586725	3,861.2	12,668
		229 34 54.9	49 34 55.6	Primary traverse station No. 2 (U. S. G. S.) eccentric.	1.495044	31.26	102.6
Fisk Knob, scenic lookout tower, 1931	43 16 59.440	184 56 07.2	4 56 31.3	Ensley	3.964127	9,207.2	30,207
	85 36 45.810	291 31 33.6	111 31 34.0	Fisk	1.211654	16.28	53.4
Howard City, municipal water tank, 1931	43 23 58.150	259 46 28.6	79 51 50.0	Lakeview	4.029024	10,691.1	35,076
	85 28 01.632	16 50 00.7	196 48 26.4	Howard south base	4.029275	10,697.3	35,096
		71 14 23.3	251 08 47.4	Ensley	4.065508	11,628.1	38,150

Grand Traverse Bay to Big Rapids

Principal points							
Charlevoix 2, 1931 (d. m.)	45 20 04.822	60 06 10.33	239 50 19.04	Cathead (U. S. L. S.)	4.5280009	33,728.80	110,658.6
	85 14 45.951	144 05 46.80	323 52 17.93	Beaver Island (U. S. L. S.)	4.6221272	41,891.63	137,439.5
		204 56 44.50	25 03 59.10	Goodhart (U. S. L. S.)	4.4960540	31,336.75	102,810.7
Ellsworth, 1931 (d. m.)	45 09 22.675	96 08 34.74	275 53 27.56	Cathead (U. S. L. S.)	4.4485312	28,088.67	92,154.2
	85 15 46.082	183 46 43.68	3 47 26.38	Charlevoix 2	4.2981339	19,867.07	65,180.5
		30 49 08		Reference mark No. 1.			
Central Lake, 1931, r. 1932 (d. m.)	45 03 59.050	117 05 50.35	296 52 06.61	Cathead (U. S. L. S.)	4.4549641	28,507.82	93,529.4
	85 17 42.823	194 19 04.32	14 20 27.03	Ellsworth	4.0133083	10,311.18	33,829.3
		194 59 56		Reference mark No. 1.			
Swenson, 1931, r. 1932 (d. m.)	45 04 55.996	191 07 26.12	11 08 37.46	Cathead (U. S. L. S.)	4.0565707	11,391.23	37,372.7
	85 38 45.896	228 05 55.52	48 22 57.42	Charlevoix 2	4.6245509	42,126.07	138,208.6
		254 35 45.94	74 52 03.65	Ellsworth	4.4950179	31,262.08	102,565.7
		273 30 59.00	93 45 53.29	Central Lake	4.4422380	27,684.59	90,828.5
		297 05 11		Reference mark No. 1.			
Fulford, 1931, r. 1932 (d. m.)	44 45 07.160	144 14 05.39	323 59 50.73	Swenson	4.6560503	42,295.00	138,762.8
	85 18 35.480	181 53 18.13	1 53 55.31	Central Lake	4.5435667	34,959.62	114,696.7
		99 44 01		Reference mark No. 2.			
Whiting, 1931, r. 1932 (d. m.)	44 46 02.571	187 09 40.36	7 12 02.30	Swenson	4.5473388	35,264.59	115,697.2
	85 42 06.896	223 52 38.63	44 09 52.39	Central Lake	4.6647485	46,211.33	151,611.7
		273 00 56.83	93 17 30.66	Fulford	4.4926153	31,089.61	101,999.8
		44 46 31		Reference mark No. 2.			
Garfield, 1931 (d. m.)	44 35 41.412	115 49 23.78	295 28 08.71	Whiting	4.6464076	44,300.40	145,342.2
	85 11 53.570	153 09 26.97	333 04 44.40	Fulford	4.2917936	19,579.14	64,235.9

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Grand Traverse Bay to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Kingsley, 1931 (d. m.)	44 34 29.005	155 51 03.79	335 45 56.82	Whiting	4.3705136	23,470.03	77,001.3
	85 34 50.272	227 22 32.28	47 33 57.50	Fulford	4.4645063	29,141.12	95,607.2
		265 39 24.82	85 55 31.22	Garfield	4.4836207	30,452.34	99,909.1
Manton, 1931 (d. m.)	44 21 06.803	153 09 43.21	333 03 05.28	Kingsley	4.4434820	27,764.00	91,089.1
	85 25 22.170	213 25 34.89	33 35 01.38	Garfield	4.5102230	32,375.99	106,220.2
		111 26 57		Reference mark No. 2.			
Brier Hill, 1931 (d. m.)	44 21 57.607	198 40 56.14	18 45 05.19	Kingsley	4.3889582	24,488.28	80,342.0
	85 40 45.787	236 14 15.33	56 34 29.04	Garfield	4.6623509	45,956.92	150,777.0
		274 17 39.72	94 28 25.47	Manton	4.3120473	20,513.85	67,302.5
		313 34 24		Reference mark No. 2.			
Selma, 1931 (d. m.)	44 19 36.996	112 23 21.00	292 17 47.76	Brier Hill	4.0575475	11,416.88	37,456.9
	85 32 49.049	254 18 49.59	74 24 01.92	Manton	4.0120089	10,280.37	33,728.2
		28 02 05		Reference mark No. 1.			
Cadillac, 1931 (d. m.)	44 11 18.909	133 25 03.47	313 14 05.49	Brier Hill	4.4583513	28,731.04	94,261.8
	85 25 03.302	146 08 32.01	326 03 06.97	Selma	4.2677106	18,522.97	60,770.8
		178 40 50.75	358 40 37.58	Manton	4.2588910	18,150.60	59,549.1
		346 27 01		Reference mark No. 1.			
Harrietta, 1931 (d. m.)	44 14 34.586	184 51 48.34	4 52 25.04	Brier Hill	4.1374732	13,723.76	45,025.4
	85 41 38.332	231 27 06.46	51 33 16.02	Selma	4.1759540	14,995.26	49,196.9
		285 11 45.09	105 23 19.09	Cadillac	4.3598301	22,899.72	75,130.2
		46 26 34		Reference mark No. 2.			
LeRoy, 1931, r. 1932 (d. m.)	44 01 45.010	133 26 07.11	313 12 58.20	Harrietta	4.5392998	34,617.83	113,575.3
	85 22 45.440	170 11 36.24	350 10 00.29	Cadillac	4.2547094	17,976.68	58,978.5
		119 04 52		Reference mark No. 2.			
Luther, 1931 (d. m.)	44 02 16.347	166 33 17.55	346 30 26.56	Harrietta	4.3697747	23,430.13	76,870.4
	85 37 32.814	224 47 33.72	44 56 15.44	Cadillac	4.3734081	23,626.97	77,516.2
		272 42 59.88	92 53 16.67	LeRoy	4.2962992	19,783.32	64,905.8
Hersey, 1931 (d. m.)	43 55 14.790	124 55 40.16	304 45 57.93	Luther	4.3573793	22,770.85	74,707.4
	85 23 34.348	185 10 02.19	5 10 36.15	Le Roy	4.0825344	12,093.01	39,675.2
		256 38 10		Reference mark No. 1.			
Orono, 1931 (d. m.)	43 55 43.506	172 22 29.79	352 21 39.16	Luther	4.0875351	12,233.06	40,134.6
	85 36 19.913	238 20 42.28	58 30 07.84	LeRoy	4.3285373	21,307.74	69,907.1
		272 53 48.98	93 02 40.06	Hersey	4.2330319	17,101.41	56,106.9
Boyd, 1931 (d. m.)	43 49 06.718	359 59 01.79	179 59 01.99	Huston	4.3544564	22,618.11	74,206.2
	85 21 48.325	50 51 01.59	230 41 07.93	Spicer	4.3944372	24,799.17	81,361.9
		122 15 57.17	302 05 53.10	Orono	4.3615934	22,992.88	75,435.8
		168 14 18.36	348 13 04.88	Hersey	4.0646090	11,604.03	38,070.9
Paris, 1931, r. 1937 (d. m.)	43 46 22.350	181 33 20.24	1 33 34.85	Orono	4.2386878	17,325.58	56,842.3
	85 36 41.000	226 50 32.85	46 59 37.79	Hersey	4.3812657	24,058.34	78,931.4
		255 39 07.63	75 49 25.44	Boyd	4.3136912	20,591.65	67,557.8
		311 10 38.60	131 20 55.46	Huston	4.4249312	26,603.04	87,280.1
		355 52 44.30	175 53 07.90	Spicer	4.0269053	10,639.11	34,905.1
		236 23 00		Reference mark No. 1.			
Supplementary points							
Beaver Island Lighthouse, 1932	45 34 32.26	4 35 53	184 33 58	Cathead (U. S. L. S.)	4.641464	43,799.0	143,697
	85 34 24.42	316 09 59	136 23 59	Charlevoix 2	4.568807	37,051.6	121,560
Charlevoix, water tank, 1932	45 19 07.83	61 43 52	241 28 41	Cathead (U. S. L. S.)	4.502351	31,794.4	104,312
	85 15 42.64	215 03 18	35 03 58	Charlevoix 2	3.332300	2,149.3	7,051
Garfield, fire lookout tower, 1932 [1]	44 35 41.18	151 24 01	331 24 01	Garfield	0.904174	8.02	26.3
	85 11 53.40						
Kingsley, fire lookout tower, 1932 [1]	44 34 28.68	256 06 46	76 06 47	Kingsley	1.621176	41.80	137.1
	85 34 52.11						
Brier Hill, fire lookout tower, 1932 [1]	44 21 57.95	333 22 56	153 22 56	Brier Hill	1.075547	11.90	39.0
	85 40 46.03						
Selma, fire lookout tower, 1932 [1]	44 19 37.36	356 45 28	176 45 28	Selma	1.049218	11.20	36.7
	85 32 49.08						
Cadillac, white stack, 1932 [1]	44 15 53.34	5 12 27	185 12 03	Cadillac	3.929706	8,505.62	27,905.5
	85 24 28.54	173 00 05	352 59 27	Manton	3.988913	9,747.95	31,981.4

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Huron to Big Rapids

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points	° ′ ″	° ′ ″	° ′ ″				
Nichol, 1932 (d. m.)	43 35 59.014	274 39 28.67	94 43 48.29	Argyle (U. S. L. S.)	3.9280492	8,473.23	27,799.3
	83 01 01.232	317 50 51.06	137 57 46.15	Custer (U. S. L. S.)	4.3050695	20,186.89	66,229.8
		181 16 50		Azimuth mark.			
Arnold, 1932 (d. m.)	43 28 05.199	173 15 08.83	353 14 15.70	Nichol	4.1680533	14,724.93	48,310.0
	82 59 44.096	205 43 55.75	25 47 21.93	Argyle (U. S. L. S.)	4.1893898	15,466.42	50,742.7
		271 40 45.54	91 46 47.07	Custer (U. S. L. S.)	4.0725680	11,818.65	38,775.0
		301 14 42		Azimuth mark.			
Cass, 1932 (d. m.)	43 36 35.392	274 59 30.94	95 06 01.93	Nichol	4.1059802	12,763.81	41,875.9
	83 10 28.141	317 22 30.33	137 29 53.98	Arnold	4.3299629	21,377.79	70,137.0
		191 11 05		Azimuth mark.			
Wilmot, 1932 (d. m.)	43 28 31.214	164 53 52.18	344 51 48.30	Cass	4.1897249	15,478.36	50,781.9
	83 07 28.313	212 07 39.32	32 12 05.96	Nichol	4.2128655	16,325.46	53,561.1
		274 21 20.06	94 26 39.44	Arnold	4.0197380	10,464.97	34,333.8
		39 39 46		Azimuth mark.			
Caro, 1932 (d. m.)	43 32 36.413	242 23 34.15	62 30 48.54	Cass	4.2026943	15,947.56	52,321.3
	83 20 58.307	292 30 17.90	112 39 35.56	Wilmot	4.2945914	19,705.68	64,651.1
		184 12 47		Azimuth mark.			
Tuscola, 1932 (d. m.)	43 24 02.599	170 23 31.26	350 22 09.00	Caro	4.2063695	16,083.09	52,765.9
	83 18 58.738	206 13 39.78	26 19 31.29	Cass	4.4134602	25,909.57	85,005.0
		241 50 13.33	61 58 08.05	Wilmot	4.2455499	17,601.51	57,747.6
		190 04 56		Azimuth mark.			
Carpenter, 1932 (d. m.)	43 28 50.234	228 11 46.15	48 15 45.70	Caro	4.0202964	10,478.43	34,378.0
	83 26 46.230	310 07 52.96	130 13 14.41	Tuscola	4.1386011	13,759.45	45,142.5
		266 23 08		Azimuth mark.			
Bernie, 1932 (d. m.)	43 33 58.039	279 01 25.98	99 09 29.27	Caro	4.2025843	15,943.52	52,308.0
	83 32 39.689	320 04 59.53	140 09 02.94	Carpenter	4.0926964	12,379.31	40,614.5
		272 01 50		Azimuth mark.			
Cole, 1932 (d. m.)	43 26 54.121	172 30 41.25	352 29 48.49	Bernie	4.1204262	13,195.51	43,292.3
	83 31 23.058	232 58 35.37	53 05 45.39	Caro	4.2447138	17,567.66	57,636.6
		240 02 19.16	60 05 29.59	Carpenter	3.8561824	7,180.96	23,559.5
		287 28 24.25	107 36 55.89	Tuscola	4.2445197	17,559.81	57,610.8
		203 50 53		Azimuth mark.			
Grew, 1932 (d. m.)	43 33 04.082	261 27 37.49	81 33 19.90	Bernie	4.0521673	11,276.32	36,995.7
	83 40 56.587	311 29 21.48	131 35 56.27	Cole	4.2359303	17,215.92	56,482.6
		94 27 30		Azimuth mark.			
Bernthal, 1932 (d. m.)	43 26 21.067	171 36 45.57	351 35 49.34	Grew	4.0994169	12,572.36	41,247.8
	83 39 34.891	213 26 28.10	33 31 13.92	Bernie	4.2281037	16,908.45	55,473.8
		264 41 00.13	84 46 38.34	Cole	4.0455929	11,106.90	36,439.9
		170 21 26		Azimuth mark.			
Jonas, 1932 (d. m.)	43 33 32.578	274 55 02.75	95 00 13.78	Grew	4.0073270	10,170.14	33,366.5
	83 48 27.985	317 58 55.29	138 05 02.24	Bernthal	4.2531099	17,910.59	58,761.7
		184 17 07		Azimuth mark.			
Kaul, 1932 (d. m.)	43 25 44.156	168 10 54.97	348 09 22.21	Jonas	4.1693786	14,769.94	48,457.7
	83 46 13.210	207 37 31.30	27 41 09.21	Grew	4.1854829	15,327.91	50,288.3
		262 42 55.82	82 47 29.67	Bernthal	3.9557188	9,901.91	32,486.5
		271 40 44		Azimuth mark.			
Appold, 1932 (d. m.)	43 33 37.411	270 37 18.40	90 43 46.69	Jonas	4.1019995	12,647.35	41,493.8
	83 57 51.447	312 53 09.32	133 01 09.91	Kaul	4.3311125	21,434.46	70,322.9
		195 49 31		Azimuth mark.			
Saginaw, 1932 (d. m.)	43 25 50.387	172 20 08.17	352 19 08.68	Appold	4.1626608	14,543.23	47,713.9
	83 56 25.026	216 52 36.11	36 58 04.45	Jonas	4.2514454	17,842.08	58,536.9
		270 44 31.93	90 51 32.53	Kaul	4.1386987	13,762.54	45,152.6
De Shone, 1932 (d. m.)	43 29 03.867	213 51 32.00	33 54 25.83	Appold	4.0072747	10,168.92	33,362.5
	84 02 03.880	308 03 23.43	128 07 16.50	Saginaw	3.9858453	9,679.33	31,756.3
		180 35 27		Azimuth mark.			
Bay City, 1932 (d. m.)	43 34 20.753	280 00 34.75	100 04 52.49	Jonas	3.9306185	8,523.51	27,964.2
	83 54 41.964	8 22 21.06	188 21 10.12	Saginaw	4.2019402	15,919.89	52,230.5
		72 33 24.43	252 31 13.84	Appold	3.6491145	4,457.74	14,625.1
Freeland, 1932 (d. m.)	43 31 22.215	247 43 26.94	67 48 40.15	Appold	4.0424741	11,027.42	36,179.1
	84 05 26.110	310 02 56.21	130 09 08.52	Saginaw	4.2013519	15,898.34	52,159.8
		313 12 11.72	133 14 30.94	De Shone	3.7948045	6,234.54	20,454.5
		2 34 49		Azimuth mark.			
Borm, 1932 (d. m.)	43 24 02.114	173 27 26.48	353 26 38.77	Freeland	4.1358098	13,671.30	44,853.3
	84 04 16.747	197 46 33.60	17 48 04.97	De Shone	3.9903406	9,780.04	32,086.7
		252 28 41.19	72 34 05.40	Saginaw	4.0463478	11,126.22	36,503.3
		176 49 37		Azimuth mark.			

GEOGRAPHIC POSITIONS—Continued

Lake Huron to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Sand, 1932 (d. m.)	43 30 37.383	263 29 09.44	83 35 23.93	Freeland	4.0896753	12,293.49	40,332.9
	84 14 29.978	311 26 34.40	131 33 36.17	Borm	4.2650294	18,408.97	60,396.8
		92 38 20		Azimuth mark.			
Wilkins, 1932 (d. m.)	43 23 28.469	185 40 04.21	5 40 44.43	Sand	4.1239167	13,301.99	43,641.6
	84 15 28.462	222 45 00.54	42 51 54.84	Freeland	4.2994767	19,928.60	65,382.4
		266 00 23.99	86 08 05.48	Borm	4.1804850	15,152.52	49,712.9
		97 48 40		Azimuth mark.			
Poplar, 1932 (d. m.)	43 31 09.388	274 02 35.93	94 09 38.13	Sand	4.1401322	13,808.04	45,301.9
	84 24 43.163	318 42 16.11	138 48 37.62	Wilkins	4.2768631	18,917.47	62,065.1
Wheeler, 1932 (d. m.)	43 24 54.952	190 56 59.12	10 58 07.60	Poplar	4.0707854	11,770.24	38,616.2
	84 26 22.709	236 31 27.13	56 39 37.40	Sand	4.2831564	19,193.60	62,971.0
		280 12 47.29	100 20 16.84	Wilkins	4.1749887	14,961.97	49,087.7
		88 04 04		Azimuth mark.			
Silvernail, 1932 (d. m.)	43 32 11.794	277 40 32.45	97 47 47.26	Poplar	4.1555700	14,307.71	46,941.2
	84 35 14.508	318 23 23.78	138 29 29.69	Wheeler	4.2556809	18,016.93	59,110.5
		244 47 00		Azimuth mark.			
St. Louis, 1932 (d. m.)	43 24 07.142	184 54 58.38	4 55 37.80	Silvernail	4.1764488	15,012.35	49,253.0
	84 36 11.807	229 50 46.23	49 58 39.92	Poplar	4.3061170	20,235.64	66,389.8
		263 35 31.50	83 42 16.33	Wheeler	4.1250487	13,336.71	43,755.5
		290 06 06		Azimuth mark.			
Thomas, 1932 (d. m.)	43 28 56.651	232 38 18.84	52 42 20.90	Silvernail	3.9970312	9,931.87	32,584.8
	84 41 06.093	323 26 40.19	143 30 02.55	St. Louis	4.0460483	11,118.55	36,478.1
		158 47 02		Azimuth mark.			
O'Brien, 1932 (d. m.)	43 32 35.551	272 06 14.86	92 16 04.18	Silvernail	4.2837869	19,221.48	63,062.5
	84 49 30.015	300 46 56.44	120 52 43.39	Thomas	4.1199698	13,181.65	43,246.8
		311 05 41.44	131 14 50.61	St. Louis	4.3771965	23,833.98	78,195.3
		134 40 05		Azimuth mark.			
Guild, 1932 (d. m.)	43 24 08.076	191 44 44.30	11 46 24.10	O'Brien	4.2040413	15,997.10	52,483.8
	84 51 55.067	238 32 42.34	58 40 08.59	Thomas	4.2329117	17,096.68	56,091.4
		269 59 16.03	90 10 04.16	St. Louis	4.3268654	21,225.86	69,638.5
		61 22 22		Azimuth mark.			
Bundy, 1932 (d. m.)	43 37 03.688	294 24 31.15	114 33 49.43	O'Brien	4.3002828	19,965.62	65,503.9
	85 02 59.852	327 58 42.25	148 06 19.94	Guild	4.4504427	28,212.57	92,560.7
		46 11 46.53	225 59 54.47	Lakeview	4.5083321	32,235.33	105,758.7
		89 25 15.00	269 12 16.74	Huston	4.4031107	25,299.43	83,003.2
		350 04 23		Azimuth mark.			
Edmore, 1932 (d. m.)	43 25 15.630	84 27 19.75	264 15 12.29	Lakeview	4.3787440	23,919.05	78,474.4
	85 02 35.739	178 27 05.27	358 26 48.66	Bundy	4.3011922	20,007.47	65,641.2
		236 20 11.64	56 29 12.40	O'Brien	4.3262091	21,193.81	69,533.4
		285 12 54.76	105 20 15.12	Guild	4.1743645	14,940.48	49,017.2
		176 14 35		Azimuth mark.			
Mason, 1932 (d. m.)	43 30 29.887	53 58 43.19	233 51 34.89	Lakeview	4.2385295	17,319.27	56,821.6
	85 09 51.320	126 26 47.80	306 18 33.88	Huston	4.3005799	19,979.28	65,548.7
		217 11 22.19	37 16 05.76	Bundy	4.1836614	15,263.75	50,077.8
		308 40 11.84	128 45 11.53	Edmore	4.0985316	12,546.76	41,163.8
		267 41 34		Azimuth mark.			
Supplementary points							
Sandusky, Borden Milk Co., stack, 1932 [1]	43 25 27.21	110 55 02	290 48 31	Arnold	4.136437	13,691.1	44,918
	82 50 15.16	167 48 53	347 48 23	Custer (U. S. L. S.)	3.664957	4,623.4	15,169
Sandusky, municipal water tank, 1932 [1]	43 25 30.26	109 54 17	289 47 32	Arnold	4.148690	14,082.8	46,203
	82 49 55.01	162 06 25	342 05 41	Custer (U. S. L. S.)	3.667448	4,649.9	15,256
Cass City, municipal water tank, 1932	43 35 58.444	204 15 58.5	24 16 14.3	Cass	3.097204	1,250.8	4,104
	83 10 51.063	269 52 02.1	89 58 48.9	Nichol	4.121546	13,229.6	43,404
		341 43 37.2	161 45 56.9	Wilmot	4.162373	14,533.6	47,682
Caro, W. N. Clark Co., stack, 1932 [1]	43 29 14.01	81 12 27	261 10 02	Carpenter	3.680341	4,790.1	15,716
	83 23 15.59	206 15 37	26 17 11	Caro	3.842983	6,966.0	22,854
Caro, Michigan Sugar Co., north stack, 1932	43 28 49.198	90 28 16.5	270 26 13.1	Carpenter	3.605786	4,034.5	13,237
	83 23 46.715	208 19 44.0	28 21 40.0	Caro	3.901319	7,967.4	26,140
		323 45 39.0	143 48 57.1	Tuscola	4.039899	10,962.2	35,965
Caro, Michigan Sugar Co., south stack, 1932	43 28 48.102	90 57 30.3	270 55 27.8	Carpenter	3.602328	4,002.5	13,132
	83 23 48.158	208 25 05.0	28 27 01.9	Caro	3.903772	8,012.6	26,288
		323 31 09.6	143 34 28.6	Tuscola	4.039583	10,954.3	35,939
Caro, municipal standpipe, 1932	43 29 43.902	324 59 18.6	145 03 04.0	Tuscola	4.109083	12,855.3	42,176
	83 24 26.497	62 12 08.5	242 10 32.4	Carpenter	3.550224	3,550.0	11,647
		125 21 12.4	305 15 32.7	Bernie	4.132598	13,570.6	44,523
Wahjamega, Epileptic Institute, stack, 1932 [1]	43 27 12.70	84 56 43	264 53 26	Cole	3.811108	6,473.0	21,237
	83 26 36.30	175 45 38	355 45 31	Carpenter	3.479759	3,018.3	9,903

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Huron to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Primary traverse station No. 13 (U. S. G. S.), 1932	43 22 46.007	111 13 16.1	291 05 47.2	Saginaw	4.197672	15,764.2	51,720
	83 45 31.674	170 21 21.0	350 20 52.5	Kaul	3.746380	5,576.7	18,296
		230 22 45.3	50 27 09.6	Bernthal	4.017717	10,416.4	34,174
Munger, Merritt Lutheran Church, 1932 [1]	43 31 19.89	312 41 13	132 46 19	Bernthal	4.133254	13,591.1	44,590
	83 46 59.13	354 18 28	174 18 59	Kaul	4.017552	10,412.4	34,161
Bay City, Eastern High School, tip of dome, 1932	43 35 18.369	301 25 51.0	121 28 35.0	Jonas	3.796362	6,256.9	20,528
	83 52 25.855	17 03 46.2	197 01 01.6	Saginaw	4.263248	18,333.6	60,149
		59 48 06.4	239 46 32.8	Bay City	3.548243	3,533.8	11,594
Bay City, Murray Body Co., plant, stack, 1932	43 34 33.117	288 09 38.4	108 12 33.1	Jonas	3.777184	5,986.7	19,641
	83 52 41.430	17 18 59.4	197 16 25.5	Saginaw	4.227788	16,896.2	55,434
		76 08 57.3	256 05 23.6	Appold	3.855300	7,166.4	23,512
Bay City, City Hall, 1932	43 35 35.650	300 04 08.3	120 07 29.6	Jonas	3.879342	7,574.3	24,850
	83 53 20.037	38 29 58.3	218 29 01.7	Bay City	3.470297	2,953.2	9,689
		59 05 44.5	239 02 37.4	Appold	3.851225	7,099.5	23,292
Bay City, red light, tip of tall transmission tower, 1932.[1]	43 32 22.88	111 10 55	291 07 53	Appold	3.804360	6,373.2	20,909
	83 53 26.67	252 11 03	72 14 29	Jonas	3.847666	7,041.5	23,102
Bay City, Columbia Sugar Co., stack, 1932	43 34 29.347	6 13 03.2	186 12 09.8	Saginaw	4.207106	16,110.4	52,856
	83 55 07.451	42 59 28.8	222 54 42.0	De Shone	4.137473	13,723.8	45,026
		66 28 53.5	246 27 00.5	Appold	3.603596	4,014.2	13,170
Bay City, First Baptist Church, clock tower, spire, 1932.[1]	43 35 51.04	304 37 09	124 40 19	Jonas	3.876020	7,516.6	24,661
	83 53 03.59	57 28 07	237 24 49	Appold	3.884404	7,663.1	25,141
Bay City, Bigelow Flooring Co., water tank finial, 1932.[1]	43 36 50.94	316 58 02	137 00 58	Jonas	3.922820	8,371.8	27,466
	83 52 42.53	49 16 25	229 12 52	Appold	3.961372	9,149.0	30,016
Bay City, water works stack, 1932 [1]	43 39 45.90	6 50 30	186 49 53	Bay City	4.004602	10,106.5	33,158
	83 53 48.31	25 38 18	205 35 30	Appold	4.100776	12,611.8	41,377
Bay City, James Clements Airport, beacon, 1932	43 32 49.057	258 39 45.3	78 43 11.4	Jonas	3.835651	6,849.4	22,472
	83 53 27.199	323 19 13.7	143 24 12.4	Kaul	4.213301	16,341.8	53,615
		104 08 50.4	284 05 48.2	Appold	3.786486	6,116.3	20,067
Bay City, St. Stanislaus Church, north steeple, 1932	43 34 49.538	291 47 50.0	111 50 52.2	Jonas	3.805456	6,389.3	20,962
	83 52 52.305	16 02 38.8	196 00 12.4	Saginaw	4.238337	17,311.6	56,796
		70 09 30.1	250 08 14.6	Bay City	3.417638	2,616.0	8,583
Bay City, St. Stanislaus Church, south steeple, 1932	43 34 48.955	331 53 39.0	151 58 13.7	Kaul	4.279991	19,054.2	62,514
	83 52 52.293	16 03 41.2	196 01 14.7	Saginaw	4.237905	17,294.4	56,740
		70 31 54.8	250 30 39.2	Bay City	3.416673	2,610.2	8,564
Saginaw, Consumers Power Co., north stack, 1932	43 29 11.382	18 36 59.3	198 35 55.4	Saginaw	3.815915	6,545.1	21,473
	83 54 52.131	153 53 21.5	333 51 18.0	Appold	3.961161	9,144.5	30,002
		298 40 51.5	118 46 48.3	Kaul	4.123992	13,304.3	43,649
Saginaw, Holy Family Catholic Church, belfry, 1932	43 24 59.047	79 54 35.6	259 49 35.4	Borm	3.999476	9,987.9	32,769
	83 56 59.766	137 52 58.4	317 49 29.3	De Shone	4.008186	10,190.3	33,433
		206 15 01.6	26 15 25.6	Saginaw	3.247155	1,766.7	5,796
Saginaw, Consumers Power Co., south stack, 1932	43 29 07.585	18 25 07.6	198 24 05.6	Saginaw	3.807132	6,414.0	21,043
	83 54 54.924	154 33 33.3	334 31 31.7	Appold	3.964860	9,222.7	30,258
		298 06 28.7	118 12 27.5	Kaul	4.123975	13,303.8	43,648
Saginaw, Chevrolet Foundry, stack, 1932	43 26 59.509	112 47 26.8	292 42 46.8	De Shone	3.996666	9,923.5	32,557
	83 55 16.766	164 12 53.4	344 11 06.9	Appold	4.105919	12,762.0	41,870
		65 47 22.3	245 41 11.1	Borm	4.124607	13,323.2	43,711
Saginaw, Bean Co., sign, letter A, 1932	43 25 51.359	129 13 31.7	309 09 48.8	De Shone	3.973175	9,401.0	30,843
	83 56 39.807	173 37 17.2	353 36 27.9	Appold	4.160553	14,472.8	47,483
		275 09 17.4	95 09 27.6	Saginaw	2.523510	333.8	1,095
Saginaw, Consumers Heating Co., stack, 1932	43 25 49.156	127 34 12.1	307 30 12.8	De Shone	3.993993	9,862.6	32,358
	83 56 16.018	171 34 10.9	351 33 05.1	Appold	4.164627	14,609.2	47,930
		270 35 40.2	90 42 34.5	Kaul	4.132244	13,559.5	44,486
Saginaw, City Hall, foot of flagpole, 1932	43 25 09.907	135 44 28.6	315 40 53.1	De Shone	4.003743	10,086.6	33,092
	83 56 50.630	204 44 55.0	24 45 12.6	Saginaw	3.138502	1,375.6	4,513
		265 43 23.6	85 50 41.8	Kaul	4.157678	14,377.3	47,170
Saginaw, Sonora Talking Machine Co., flagpole, 1932 [1]	43 24 20.51	85 42 53	265 39 04	Borm	3.877466	7,541.6	24,743
	83 58 42.55	152 38 52	332 36 34	De Shone	3.993312	9,847.2	32,307
Saginaw, Sacred Heart Church, 1932 [1]	43 25 39.12	107 17 35	287 17 01	Saginaw	3.068181	1,170.0	3,839
	83 55 35.36	125 55 06	305 50 39	De Shone	4.032652	10,780.8	35,370
Saginaw, courthouse, 1932	43 25 03.644	77 33 58.3	257 29 36.0	Borm	3.944184	8,794.0	28,852
	83 57 55.126	142 59 28.6	322 56 37.6	De Shone	3.967864	9,286.8	30,468
		194 08 54.7	14 11 07.8	Bay City	4.248770	17,732.5	58,177

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Lake Huron to Big Rapids—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Frankenlust, St. Paul's German Lutheran Church, spire, 1932.	43 33 46.964	247 28 41.9	67 29 59.3	Bay City	3.435154	2,723.7	8,936
	83 56 34.085	359 12 22.4	179 12 28.7	Saginaw	4.167590	14,709.2	48,258
		40 19 12.7	220 15 25.6	De Shone	4.058945	11,453.7	37,578
Mike Hagle's Estate, water tank, 1932	43 27 18.940	14 00 48.0	194 00 01.7	Borm	3.796601	6,260.4	20,539
	84 03 09.381	66 54 31.7	246 46 03.7	Wilkins	4.257271	18,083.0	59,327
		286 41 20.7	106 45 58.7	Saginaw	3.977483	9,494.7	31,151
Primary traverse station No. 14 (U. S. G. S.), 1932	43 30 38.139	272 05 30.6	92 05 50.1	Sand	2.8049031	638.121	2,093.57
	84 14 58.367						
Midland, municipal water tank, 1932	43 37 01.286	356 16 11.4	176 16 35.1	Sand	4.074562	11,873.0	38,953
	84 15 04.365	67 02 41.7	246 44 45.6	Thomas	4.581093	38,114.7	125,048
		117 26 09.0	297 12 17.7	Coleman	4.482117	30,347.1	99,564
Midland, Dow Chemical Co., northern stack, 1932	43 36 24.116	308 06 20.4	128 12 24.5	Freeland	4.178433	15,081.1	49,479
	84 14 14.518	1 51 31.7	181 51 21.0	Sand	4.029645	10,706.4	35,126
		55 30 53.4	235 23 40.1	Poplar	4.233730	17,128.9	56,197
Midland, Dow Chemical Co., largest stack, 1932	43 36 14.261	2 18 20.2	182 18 07.4	Sand	4.017244	10,405.0	34,137
	84 14 11.343	56 29 43.3	236 22 27.9	Poplar	4.230905	17,017.9	55,833
		75 19 58.6	255 05 27.7	Silvernail	4.467118	29,316.9	96,184
Transit traverse (B. M. 693) (U. S. G. S.), 1932	43 29 43.190	36 28 53.4	216 24 59.1	St. Louis	4.110349	12,892.9	42,299
	84 30 31.155	125 48 15.0	305 44 59.8	Silvernail	3.894566	7,844.5	25,736
		251 10 23.6	71 14 23.2	Poplar	3.916844	8,257.4	27,091
Northwest corner of Ezra Haskens' tombstone, 1932 (d.).[1]	43 24 54.41	111 16 54	291 16 53	Wheeler	1.662947	46.02	151.0
	84 26 20.80						
St. Louis, Great Lakes Sugar Co., brick stack, 1932	43 24 37.596	87 41 34.6	267 30 30.6	Guild	4.337690	21,761.6	71,396
	84 35 48.780	128 42 32.4	308 33 07.4	O'Brien	4.373411	23,627.1	77,517
		138 16 55.0	318 13 16.8	Thomas	4.030021	10,715.7	35,156
St. Louis, Great Lakes Sugar Co., tall concrete stack, 1932.	43 24 38.490	28 01 33.2	208 01 17.4	St. Louis	3.039780	1,095.9	3,595
	84 35 48.924	87 37 11.9	267 26 08.0	Guild	4.337648	21,759.5	71,389
		128 39 41.8	308 30 16.9	O'Brien	4.373047	23,607.3	77,452
Alma, municipal water tank, 1932	43 22 44.780	98 38 38.6	278 29 58.1	Guild	4.236710	17,246.9	56,584
	84 39 17.334	142 59 19.9	322 52 18.5	O'Brien	4.358883	22,849.8	74,966
		167 58 39.8	347 57 25.1	Thomas	4.069453	11,734.2	38,498
Alma, Consumers Light and Power Co., stack, 1932[1]	43 22 38.38	167 14 54	347 13 33	Thomas	4.078081	11,969.6	39,270
	84 39 08.53	235 25 40	55 27 41	St. Louis	3.683908	4,829.6	15,845
Shepherd, municipal water tank, finial, 1932	43 31 25.563	101 45 50.2	281 40 30.7	O'Brien	4.026684	10,633.7	34,887
	84 41 46.310	260 45 04.0	80 49 33.8	Silvernail	3.950021	8,912.9	29,242
		348 52 26.6	168 52 54.2	Thomas	3.670584	4,683.6	15,366
Primary traverse station No. 9 (U. S. G. S.), 1932 (d. m.).	43 30 37.712	133 46 50.3	313 40 27.9	Bundy	4.236360	17,233.0	56,539
	84 53 44.963	237 33 05.9	57 36 01.5	O'Brien	3.831397	6,782.6	22,253
		348 22 42.2	168 23 57.8	Guild	4.089052	12,275.9	40,275
Edmore, Hart Canning Co., taliest stack, 1932[1]	43 24 20.11	138 04 22	317 59 08	Mason	4.186083	15,349.1	50,358
	85 02 14.75	172 27 28	352 27 14	Edmore	3.555846	3,596.2	11,799
Edmore, Danish Lutheran Church, spire, 1932[1]	43 24 31.82	137 48 07	317 43 00	Mason	4.173954	14,926.4	48,971
	85 02 24.99	175 41 08	355 41 00	Edmore	3.506876	3,212.7	10,540
Lakeview, municipal water tank, 1932[1]	43 26 38.78	55 35 21	235 33 04	Lakeview	3.734431	5,425.4	17,800
	85 16 55.01	160 54 33	340 51 11	Huston	4.302988	20,090.4	65,913
Mecosta, fire-lookout tower, 1932	43 39 50.662	281 15 02.7	101 28 12.4	Bundy	4.417652	26,160.9	85,830
	85 22 04.147	316 23 59.4	136 32 24.6	Mason	4.377864	23,870.6	78,315
		356 12 48.3	176 12 59.3	Huston	3.737874	5,468.6	17,942

Hillsdale to Saginaw

Principal points							
Hatt, 1932, r. 1934 (d. m.)	42 09 21.448	329 20 40.64	149 26 04.65	Woodstock (U. S. L. S.)	4.3390695	21,830.79	71,623.2
	84 23 38.712	26 20 50.47	206 18 07.66	Bunday (U. S. L. S.)	4.0997247	12,581.28	41,277.1
Lammon, 1932, r. 1934 (d. m.)	42 11 03.360	26 25 25.91	206 20 08.71	Woodstock (U. S. L. S.)	4.3888555	24,482.49	80,323.0
	84 07 41.879	62 29 20.69	212 15 56.11	Bunday (U. S. L. S.)	4.4928054	31,103.22	102,044.5
		81 56 29.23	261 45 46.88	Hatt	4.3460880	22,186.46	72,790.1
		122 26 48		Azimuth mark.			
Sackrider, 1932, r. 1934 (d. m.)	42 18 07.349	332 57 36.95	153 00 52.51	Lammon	4.1668422	14,683.93	48,175.5
	84 12 32.770	43 19 31.83	223 12 04.26	Hatt	4.3479651	22,282.56	73,105.4
		260 31 27		Azimuth mark.			
Prospect, 1932, r. 1934 (d. m.)	42 19 29.438	354 37 49.92	174 38 32.93	Lammon	4.1954438	15,683.53	51,455.0
	84 08 45.833	47 34 58.78	227 24 58.56	Hatt	4.4435289	27,766.99	91,098.9
		64 02 20.19	243 59 47.43	Sackrider	3.7620429	5,781.53	18,968.2
		309 03 59		Azimuth mark.			

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Hillsdale to Saginaw—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Peck, 1932, r. 1934 (d. m.)	42 21 25.189	281 23 19.93	101 31 58.25	Prospect	4.2546563	17,974.48	58,971.3
	84 21 35.381	296 07 00.74	116 13 06.14	Sackrider	4.1412021	13,842.11	45,413.7
		7 13 35.95	187 12 13.03	Hatt	4.3523566	22,509.02	73,848.3
		162 06 32		Azimuth mark.			
Hicks, 1932, r. 1934 (d. m.)	42 28 12.028	6 21 22.09	186 20 29.20	Prospect	4.2101648	16,224.26	53,229.1
	84 07 27.389	57 09 33.70	237 00 01.75	Peck	4.3635810	23,098.35	75,781.8
		238 51 30		Azimuth mark.			
Zakrzewski, 1932, r. 1934 (d. m.)	42 26 26.033	261 31 04.35	81 41 59.33	Hicks	4.3504758	22,411.75	73,529.2
	84 23 37.712	302 07 41.17	122 17 42.37	Prospect	4.3822781	24,114.49	79,115.6
		343 12 56.97	163 14 19.46	Peck	3.9865545	9,695.15	31,808.2
		356 57 32		Azimuth mark.			
Jackson, 1932, r. 1934 (d. m.)	42 14 51.535	248 10 17.77	68 20 49.23	Prospect	4.3645358	23,149.19	75,948.6
	84 24 24.347	249 36 09.81	69 44 08.48	Sackrider	4.2402850	17,389.12	57,051.8
		354 07 35.47	174 08 06.13	Hatt	4.0102287	10,238.32	33,590.2
		260 28 52		Jackson, Motor Shaft Co., finial of tank.			
Wemple, 1932, r. 1934 (d. m.)	42 30 51.622	288 08 44.53	108 16 07.37	Hicks	4.1975691	15,760.47	51,707.5
	84 18 22.978	41 17 19.09	221 13 46.55	Zakrzewski	4.0374839	10,901.44	35,765.8
		7 40 23		Azimuth mark.			
Warner, 1932, r. 1934 (d. m.)	42 37 35.156	314 12 27.81	134 21 15.87	Hicks	4.3959829	24,887.59	81,652.0
	84 20 28.310	347 03 30.68	167 04 55.47	Wemple	4.1063779	12,775.50	41,914.3
		11 50 31.51	191 48 23.47	Zakrzewski	4.3241627	21,094.18	69,206.5
		253 40 06		Azimuth mark.			
Grostick, 1932 (d. m.)	42 36 49.270	1 23 56.70	181 23 45.16	Hicks	4.2031653	15,964.87	52,378.1
	84 07 10.326	54 20 16.39	234 12 41.40	Wemple	4.2764604	18,899.94	62,007.6
		94 31 36.83	274 22 36.49	Warner	4.2610502	18,241.07	59,845.9
		93 33 06		Azimuth mark.			
Clark, 1932, r. 1934 (d. m.)	42 46 09.298	319 48 19.90	139 55 33.86	Grostick	4.3541655	22,602.97	74,156.6
	84 17 50.349	12 47 02.64	192 45 15.52	Warner	4.2113138	16,267.24	53,370.1
		265 04 26		Azimuth mark.			
Graham, 1932, r. 1934 (d. m.)	42 45 03.064	5 19 38.38	185 18 56.11	Grostick	4.1847756	15,302.96	50,206.5
	84 06 07.989	54 52 14.60	234 42 31.28	Warner	4.3796833	23,970.81	78,644.3
		97 21 31.67	277 13 34.81	Clark	4.2068556	16,101.10	52,825.0
		86 57 41		Azimuth mark.			
Laingsburg, 1932 (d. m.)	42 53 56.083	317 22 54.88	137 30 26.79	Graham	4.3488605	22,328.55	73,256.3
	84 17 12.781	3 23 36.92	183 23 11.38	Clark	4.1592427	14,429.22	47,339.9
		2 35 03		Azimuth mark.			
Teichman, 1932 (d. m.)	42 53 46.243	5 07 40.73	185 06 57.44	Graham	4.2097522	16,208.85	53,178.5
	84 05 04.285	51 03 02.85	230 54 22.03	Clark	4.3501549	22,395.20	73,474.9
		91 07 16.85	270 59 00.97	Laingsburg	4.2183059	16,531.26	54,236.3
		185 20 44		Azimuth mark.			
Harryman, 1932 (d. m.)	43 00 50.961	310 51 05.42	130 58 40.03	Teichman	4.3012778	20,011.41	65,654.1
	84 16 11.427	6 12 19.29	186 11 37.48	Laingsburg	4.1098428	12,877.83	42,250.0
		262 05 33		Azimuth mark.			
Lansing, 1932, r. 1934 (d. m.)	42 43 57.837	229 40 05.88	49 50 58.45	Laingsburg	4.4560067	28,576.35	93,754.2
	84 33 12.938	258 58 14.28	79 08 40.55	Clark	4.3298086	21,370.20	70,112.1
		304 04 34.86	124 13 13.20	Warner	4.3229659	21,036.13	69,016.0
State, 1932, r. 1934 (d. m.)	42 43 50.501	315 24 49.63	135 30 28.96	Warner	4.2108334	16,249.25	53,311.1
	84 28 48.875	92 10 58.31	272 07 59.13	Lansing	3.7789826	6,011.50	19,722.7
		253 58 43.59	74 06 10.60	Clark	4.1924810	15,576.90	51,105.2
		98 15 56		Azimuth mark.			
Corunna, 1932 (d. m.)	42 57 20.874	356 28 02.58	176 28 14.85	Teichman	3.8218915	6,635.77	21,770.9
	84 05 22.306	68 39 02.48	248 30 58.59	Laingsburg	4.2382184	17,306.86	56,780.9
		113 51 00.60	293 43 38.02	Harryman	4.2060772	16,072.27	52,730.4
		252 04 10		Azimuth mark.			
Primary traverse station No. 8 (U. S. G. S.) eccentric, 1932 (d. m.).	43 06 55.180	324 12 28.79	144 18 53.25	Corunna	4.3391334	21,834.01	71,633.7
	84 14 45.654	9 48 18.57	189 47 20.00	Harryman	4.0571258	11,405.80	37,420.5
		265 47 14		Azimuth mark.			
Jenkinson, 1932 (d. m.)	43 05 37.364	8 37 25.18	188 36 15.25	Corunna	4.1902172	15,495.91	50,839.5
	84 03 39.800	62 36 56.88	242 28 23.76	Harryman	4.2826030	19,169.15	62,890.8
		99 07 29.40	278 59 54.41	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.1831813	15,246.89	50,022.5
		7 15 30		Azimuth mark.			
Micklos, 1932 (d. m.)	43 15 32.985	181 42 14.39	1 42 27.70	Wilkins	4.1667312	14,680.17	48,163.2
	84 15 47.857	224 40 28.67	44 48 22.91	Borm	4.3447875	22,120.12	72,572.4
		318 06 50.50	138 15 08.67	Jenkinson	4.3920413	24,662.74	80,914.3
		354 58 13.27	174 58 55.85	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.2052305	16,040.97	52,627.7
		308 22 40		Azimuth mark.			

GEOGRAPHIC POSITIONS—Continued

Hillsdale to Saginaw—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Mair, 1932 (d. m.)	43 15 19.329	354 51 22.43	174 52 11.33	Jenkinson	4.2560362	18,031.68	59,158.9
	84 04 51.280	40 50 32.79	220 43 46.03	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.3127661	20,547.83	67,414.0
		91 41 32.86	271 34 02.92	Micklos	4.1707269	14,815.86	48,608.4
		136 29 47.73	316 22 30.55	Wilkins	4.3187351	20,832.20	68,347.0
		182 45 27.71	2 45 51.40	Borm	4.2082308	16,152.17	52,992.6
		264 32 57		Azimuth mark.			
Supplementary points							
Airway beacon No. 20, 1932	42 15 08.890	51 56 14.5	231 49 34.4	Hatt	4.239712	17,366.5	56,977
	84 13 43.146	87 58 25.2	267 51 14.1	Jackson	4.167581	14,708.9	48,257
		196 19 01.4	16 19 48.8	Sackrider	3.758732	5,737.6	18,824
Near N. Y. C. R. R., brick stack, 1932 [1]	42 14 21.55	6 31 17	186 30 46	Hatt	3.969403	9,319.7	30,576
	84 22 52.61	113 45 05	293 44 03	Jackson	3.361305	2,297.8	7,539
Jackson, Michigan State Prison, tank, 1932	42 13 16.324	121 22 11.9	301 19 50.5	Jackson	3.751778	5,646.5	18,525
	84 20 54.051	231 56 39.1	52 02 16.2	Sackrider	4.163821	14,582.1	47,841
Jackson, Lefere Co., tall concrete stack, 1932 [1]	42 14 30.56	0 24 26	180 24 24	Hatt	3.979446	9,537.8	31,292
	84 23 35.76	120 09 32	300 09 00	Jackson	3.109999	1,288.2	4,226
Jackson, City Bank and Trust Co., tip of flagpole, 1932.[1]	42 14 50.21	251 50 24	71 50 28	Jackson	2.118318	131.3	431
	84 24 29.79	353 24 20	173 24 54	Hatt	4.009076	10,211.2	33,501
Jackson, Reynolds Field, airport beacon, 1932	42 15 18.427	215 59 43.1	36 03 45.0	Peck	4.145910	13,993.0	45,909
	84 27 34.730	255 45 42.3	75 55 49.1	Sackrider	4.328678	21,314.6	69,930
		333 48 02.4	153 50 40.9	Hatt	4.088959	12,273.2	40,266
Jackson, old State prison, flagpole, 1932	42 15 24.933	198 56 58.8	18 58 51.1	Peck	4.070175	11,753.7	38,562
	84 24 22.161	354 55 02.3	174 55 31.5	Hatt	4.051512	11,259.3	36,940
		2 47 07.9	182 47 06.5	Jackson	3.013552	1,031.7	3,385
Jackson, Hayes Wheel Co., stack, 1932	42 14 53.554	8 56 51.9	188 56 04.7	Hatt	4.015903	10,373.0	34,032
	84 22 28.440	88 40 06.7	268 38 48.8	Jackson	3.424543	2,657.9	8,720
		185 44 18.0	5 44 53.7	Peck	4.084392	12,144.8	39,845
Jackson, southwest, Automotive Fan and Bearing Co., tank, 1932.[1]	42 15 14.45	207 05 03	27 07 55	Peck	4.108930	12,850.8	42,161
	84 25 51.04	344 24 49	164 26 18	Hatt	4.053340	11,306.8	37,096
Jackson, Mackling Grinding Wheel Co., tank, 1932 [1]	42 15 06.49	209 24 07	29 27 21	Peck	4.127617	13,415.8	44,015
	84 26 23.17	340 28 15	160 30 05	Hatt	4.052879	11,294.8	37,056
Grass Lake, tallest church steeple, 1932 [1]	42 15 05.35	179 08 55	359 08 53	Sackrider	3.749439	5,616.2	18,426
	84 12 29.13	212 06 04	32 08 34	Prospect	3.983229	9,621.2	31,566
Stockbridge, black water tank, finial, 1932	42 26 59.547	86 42 50.8	266 34 10.4	Zakrzewski	4.246834	17,653.6	57,919
	84 10 46.573	243 48 39.4	63 50 53.9	Hicks	3.705080	5,070.8	16,636
		348 44 28.8	168 45 50.2	Prospect	4.151071	14,160.3	46,458
Primary traverse station No. 17 (U. S. G. S.), 1932	42 30 51.418	236 38 13.3	56 38 13.6	Wemple	1.058274	11.436	37.52
	84 18 23.396						
Dansville, Ingham Agricultural School, stack, 1932 [1]	42 33 12.40	29 42 27	209 38 56	Zakrzewski	4.159323	14,431.9	47,349
	84 18 24.79	160 51 20	340 49 56	Warner	3.933645	8,583.1	28,160
Mason, courthouse, 1932	42 34 46.753	209 23 33.5	29 29 27.6	Clark	4.383538	24,184.6	79,346
	84 26 32.422	237 55 03.6	57 59 10.1	Warner	3.990904	9,792.7	32,128
		345 30 29.3	165 32 27.4	Zakrzewski	4.202946	15,956.8	52,352
Mason, S. M. A. Corporation, tank, 1932	42 35 03.557	211 18 44.1	31 24 56.9	Clark	4.381262	24,058.1	78,931
	84 27 00.285	242 19 47.5	62 24 12.9	Warner	4.003702	10,085.6	33,089
		343 49 47.7	163 52 04.7	Zakrzewski	4.220760	16,624.9	54,544
Michigan State Sanitarium, water tank, 1932	42 35 10.263	350 45 33.2	170 46 34.9	Pinckney	4.115439	13,044.8	42,798
	83 58 30.132	43 35 12.9	223 29 09.8	Hicks	4.250460	17,801.6	58,404
		104 29 42.0	284 23 49.9	Grostick	4.088001	12,246.2	40,178
Fowlerville, water tank, 1932	42 39 41.086	34 42 18.8	214 40 29.8	Grostick	3.809413	6,447.8	21,154
	84 04 29.258	123 23 10.7	303 14 07.3	Clark	4.338710	21,812.7	71,564
		167 15 56.7	347 14 49.9	Graham	4.008015	10,186.3	33,420
County farm, water tank, 1932	42 41 38.823	109 47 59.0	289 42 03.0	Lansing	4.103599	12,694.0	41,647
	84 24 27.918	227 15 42.6	47 20 12.4	Clark	4.090147	12,306.9	40,377
		324 00 19.1	144 03 01.5	Warner	3.968037	9,290.5	30,481
Lansing, Reo Motor Co., old duplex plant, tank, 1932	42 42 56.585	184 37 49.1	4 37 53.6	Lansing	3.277901	1,896.3	6,221
	84 33 19.667	254 11 58.6	74 22 29.3	Clark	4.341595	21,958.1	72,041
Lansing, city power plant, southeast stack, 1932	42 43 06.551	192 23 39.2	12 23 49.6	Lansing	3.209606	1,620.3	5,316
	84 33 28.226	227 47 01.1	47 58 04.0	Laingsburg	4.475408	29,881.9	98,038
		255 06 14.7	75 16 51.3	Clark	4.343695	22,064.5	72,390
Lansing, city power plant, northwest stack, 1932	42 43 07.420	193 34 46.3	13 34 57.5	Lansing	3.204254	1,600.5	5,251
	84 33 29.457	227 51 27.3	48 02 31.0	Laingsburg	4.475448	29,884.6	98,046
		255 11 23.3	75 22 00.7	Clark	4.344093	22,084.8	72,457

[1] No check on this position.

77726°—30——7

GEOGRAPHIC POSITIONS—Continued

Hillsdale to Saginaw—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Lansing, Reo Motor Co., tank, 1932	42 43 08.168	157 28 30.6	337 28 11.6	Lansing	3.219917	1,659.3	5,444
	84 32 44.997	254 33 24.5	74 43 31.7	Clark	4.324326	21,102.1	69,232
		256 18 39.5	76 21 19.7	State	3.742625	5,528.7	18,139
Lansing, Olds Motor Co., stack, 1932	42 43 16.276	228 37 36.5	48 48 49.3	Laingsburg	4.476043	29,925.6	98,181
	84 33 42.587	256 03 43.6	76 14 30.0	Clark	4.348427	22,306.3	73,183
		300 07 27.6	120 16 25.9	Warner	4.320686	20,926.0	68,655
Lansing, Michigan State College, power plant stack, 1932.	42 43 48.431	198 45 42.4	18 45 43.1	State	1.829015	67.5	221
	84 28 49.828	253 46 31.0	73 53 58.7	Clark	4.193555	15,615.5	51,232
		315 12 02.3	135 17 42.2	Warner	4.210027	16,219.1	53,212
Lansing, Michigan State College memorial, finial, 1932.	42 43 55.009	90 52 48.8	270 49 54.6	Lansing	3.766450	5,840.5	19,162
	84 28 56.230	254 38 02.0	74 45 34.0	Clark	4.195910	15,700.4	51,510
		309 43 58.9	129 44 03.9	State	2.337693	217.6	714
Lansing, municipal standpipe 1932 [1]	42 43 57.75	305 01 50	125 10 10	Warner	4.312420	20,531.5	67,360
	84 32 46.08	90 15 23	270 15 05	Lansing	2.785963	610.9	2,004
Michigan State College south base No. 2, 1932 (d. m.)	42 43 24.839	99 22 25.5	279 19 21.1	Lansing	3.797164	6,268.5	20,566
	84 28 41.065	167 21 11.9	347 21 06.6	State	2.909312	811.5	2,662
Michigan State College bench mark, 1934, r. 1937 (d. m.) [2]	42 43 50.108						
	84 28 54.481						
Lansing, Capital National Bank Bldg., steel mast 1932 [1].	42 43 57.92	272 09 29	92 12 28	State	3.779150	6,013.8	19,730
	84 33 13.04	279 20 37	99 23 42	Michigan State College south base No. 2.	3.797346	6,271.1	20,574
Lansing, Indian school tank, 1932 [1]	42 44 45.24	322 05 43	142 06 22	State	3.330548	2,140.7	7,023
	84 29 46.68	72 42 08	252 39 48	Lansing	3.691464	4,914.3	16,123
Lansing, Capital City Airport, beacon, 1932	42 46 35.122	271 43 48.9	91 56 12.4	Clark	4.396299	24,905.7	81,711
	84 36 05.308	297 03 46.5	117 08 42.9	State	4.047254	11,149.5	36,580
		307 54 41.1	128 05 16.7	Warner	4.432382	27,063.4	88,791
Lansing, State Capital, tip of dome, 1932	42 44 00.871	230 00 39.6	50 11 36.8	Laingsburg	4.456892	28,634.7	93,946
	84 33 19.767	259 17 36.2	79 28 07.1	Clark	4.332542	21,505.1	70,555
		272 56 49.0	92 59 52.8	State	3.790344	6,170.8	20,245
East Lansing, municipal tank, 1932 [1]	42 44 11.71	41 03 49	221 03 32	State	2.938531	868.0	2,848
	84 28 23.81	86 18 10	266 14 54	Lansing	3.818954	6,591.0	21,624
Primary traverse station No. 3 (U. S. G. S.), 1932, r. 1934 (d. m.).	42 44 21.369	47 36 01.4	227 29 13.4	Warner	4.268786	18,568.9	60,921
	84 10 26.563	108 18 17.1	288 13 15.8	Clark	4.026428	10,627.4	34,867
		257 38 08.4	77 41 03.9	Graham	3.779612	6,020.2	19,751
Lansing, Burton Dixie Co., tank, 1932 [1]	42 44 31.84	279 43 10	99 46 51	State	3.876901	7,531.8	24,711
	84 34 15.20	306 31 31	126 32 13	Lansing	3.246135	1,762.5	5,782
Perry, water tank, 1932	42 49 27.134	46 33 24.3	226 30 11.8	Clark	3.948096	8,873.5	29,112
	84 13 06.974	146 06 25.4	326 03 38.2	Laingsburg	4.000034	10,000.8	32,811
		233 50 17.0	53 55 45.5	Teichman	4.132419	13,564.9	44,504
Bancroft, water tank, 1932	42 52 31.531	12 45 13.8	192 43 40.2	Graham	4.151921	14,188.0	46,548
	84 03 50.264	58 21 37.7	238 12 06.6	Clark	4.350911	22,434.2	73,603
		98 13 45.1	278 04 38.9	Laingsburg	4.264745	18,396.9	60,357
Pittsburg, white church steeple, 1932 [1]	42 53 33.11	24 30 06	204 26 59	Clark	4.177461	15,047.4	49,368
	84 13 15.87	97 31 02	277 29 21	Laingsburg	3.734147	5,421.8	17,788
Laingsburg, St. Catherine Church, steeple, 1932 [1]	42 53 40.50	264 48 37	84 51 16	Laingsburg	3.727488	5,339.3	17,517
	84 21 07.15	342 10 57	162 13 10	Clark	4.165036	14,623.0	47,976
Primary traverse station No. 21 (U. S. G. S.), 1932 (d. m.).	42 54 06.012	88 44 24.5	268 37 44.1	Laingsburg	4.125376	13,346.8	43,789
	84 07 24.648	136 21 11.4	316 15 12.4	Harryman	4.237632	17,283.5	56,704
		204 45 22.5	24 46 45.8	Corunna	3.821008	6,622.3	21,727
Durand, water tank, 1932	42 54 41.409	78 09 28.8	258 05 25.9	Teichman	3.917620	8,272.2	27,140
	83 59 07.455	120 06 12.4	300 01 57.1	Corunna	3.992178	9,821.5	32,223
		163 04 39.1	343 01 33.3	Jenkinson	3.919337	8,304.9	27,247
Corunna, Corunna Weatherproof Body Corp., water tank, 1932.	42 58 30.514	314 40 29.9	134 41 35.3	Corunna	3.485151	3,056.0	10,026
	84 06 58.177	343 35 06.6	163 36 24.2	Teichman	3.961154	9,144.4	30,001
		58 46 17.5	238 39 18.9	Laingsburg	4.212371	16,306.9	53,500
Owosso, Owosso Weatherproof Body Corp., water tank, 1932.	42 59 31.135	218 50 40.6	38 55 15.4	Jenkinson	4.161914	14,518.2	47,632
	84 10 22.427	300 33 24.0	120 36 48.6	Corunna	3.897626	7,900.0	25,919
		42 01 10.0	221 56 30.4	Laingsburg	4.143280	13,908.5	45.631
Owosso, American Malleable Co., water tank, 1932	42 59 36.099	219 17 00.5	39 21 35.9	Jenkinson	4.158690	14,410.9	47,280
	84 10 23.238	301 26 06.7	121 29 31.8	Corunna	3.902799	7,994.6	26,229
		41 32 38.4	221 27 59.4	Laingsburg	4.146454	14,010.5	45,966

[1] No check on this position.
See description on p. 302.

GEOGRAPHIC POSITIONS—Continued

Hillsdale to Saginaw—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Owosso, St. Pauls Catholic Church, 1932	42 59 51.938	103 59 02.8	283 55 22.0	Harryman	3.878143	7,553.4	24,781
	84 10 47.765	157 37 18.9	337 34 36.5	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.150045	14,126.8	46,348
		222 13 18.3	42 18 10.4	Jenkinson	4.158462	14,403.3	47,255
Owosso, Owosso Manufacturing Co., water tank, 1932.	42 59 55.461	36 41 02.6	216 36 54.6	Laingsburg	4.140589	13,822.6	45,350
	84 11 08.817	104 03 32.1	284 00 05.7	Harryman	3.849077	7,064.4	23,177
		159 16 15.3	339 13 47.3	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.141466	13,850.5	45,441
Owosso, Owosso Manufacturing Co., stack, 1932	42 59 57.168	103 44 32.2	283 41 07.3	Harryman	3.845223	7,002.0	22,972
	84 11 11.079	159 23 32.3	339 21 05.8	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.139348	13,783.1	45,220
		224 10 18.7	44 15 26.7	Jenkinson	4.165754	14,647.2	48,055
Owosso, Michigan Sugar Co., stack, 1932	43 00 07.445	101 49 53.0	281 46 39.5	Harryman	3.817176	6,564.1	21,536
	84 11 27.723	160 25 26.8	340 23 11.7	Primary traverse station No. 8 (U. S. G. S.) eccentric.	4.125668	13,355.7	43,818
		226 05 08.1	46 10 27.5	Jenkinson	4.167040	14,690.6	48,197
Flushing, municipal water tank, 1932 [1]	43 04 00.19	59 35 33	239 25 03	Corunna	4.385291	24,282.4	79,667
	83 49 58.40	99 14 43	279 05 22	Jenkinson	4.274658	18,821.7	61,751
Primary traverse station No. 8 (U. S. G. S.), 1932 (d. m.).	43 06 55.356 84 14 45.204	61 53 48.5	241 53 48.2	Primary traverse station No. 8 (U. S. G. S.) eccentric.	1.061754	11.528	37.82
Chesaning, municipal water tank, 1932	43 11 07.260	124 07 36.0	304 01 28.1	Micklos	4.165418	14,635.9	48,018
	84 06 50.712	188 14 38.9	8 16 24.4	Borm	4.383148	24,162.8	79,274
		199 06 04.0	19 07 25.8	Mair	3.915539	8,232.6	27,010
Chesaning, G. M. P. Packing Co., water tank, 1932	43 11 46.637	120 09 04.7	300 02 59.0	Micklos	4.143885	13,927.9	45,695
	84 06 53.909	188 51 22.6	8 53 10.3	Borm	4.361196	22,971.9	75,367
		202 51 01.0	22 52 25.0	Mair	3.852677	7,123.2	23,370
Saint Charles, municipal water tank, 1932	43 17 56.714	136 33 07.7	316 28 11.7	Wilkins	4.149580	14,111.7	46,298
	84 08 17.277	205 38 12.3	25 40 57.4	Borm	4.097264	12,510.2	41,044
		316 15 30.2	136 17 51.4	Mair	3.827405	6,720.6	22,019
Saint Charles, R. Gage Coal Co., No. 8 stack, 1932	43 18 51.316	139 00 18.8	318 56 31.8	Wilkins	4.054519	11,337.5	37,196
	84 09 58.013	218 40 13.9	38 44 08.1	Borm	4.089568	12,290.5	40,323
		313 22 49.9	133 26 20.1	Mair	3.978619	9,519.6	31,232
Primary traverse station No. 16 (U. S. G. S.), 1932 (d. m.).	43 22 47.337	349 51 22.8	169 52 38.1	Mair	4.147516	14,044.8	46,079
	84 06 40.937	42 38 50.7	222 32 35.5	Micklos	4.260276	18,208.6	59,739
		96 09 08.3	276 03 06.0	Wilkins	4.077062	11,941.6	39,178

Detroit to Jackson

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points							
Grant (Canada), 1932 (d. m.)	42 19 26.390	188 36 09.97	8 38 14.26	Mount Clemens (U. S. L. S.)	4.4483754	28,078.60	92,121.2
	82 51 45.592	226 29 50.27	46 43 18.53	Walpole (U. S. L. S.)	4.5760056	37,670.87	123,591.8
		279 34 59.41	99 44 33.31	Deerbrook (U. S. L. S.)	4.2968430	19,808.11	64,987.1
		100 16 52		Azimuth mark.			
Whittier, 1932 (d. m.)	42 21 09.996	210 36 57.90	30 44 08.47	Mount Clemens (U. S. L. S.)	4.4557778	28,561.29	93,704.8
	82 59 19.215	287 04 05.02	107 09 10.54	Grant	4.0360471	10,865.44	35,647.7
Penobscot, 1932, r. 1934 (d. m.)	42 19 48.782	215 35 00.17	35 44 33.96	Mount Clemens (U. S. L. S.)	4.5226939	33,319.15	109,314.6
	83 02 51.529	242 42 17.24	62 44 40.25	Whittier	3.7378374	5,468.11	17,940.0
		272 31 55.97	92 39 24.39	Grant	4.1836474	15,263.26	50,076.2
Twelve Mile, 1932, r. 1934 (d. m.)	42 30 22.604	247 46 46.64	67 55 53.67	Mount Clemens (U. S. L. S.)	4.2995724	19,932.99	65,396.8
	83 02 10.522	347 02 58.79	167 04 54.38	Whittier	4.2429126	17,494.95	57,398.0
		2 44 54.72	182 44 27.06	Penobscot	4.2917988	19,579.37	64,236.6
		115 55 25		Azimuth mark.			
General, 1932, r. 1934 (d. m.)	42 22 07.982	191 53 12.62	11 54 47.56	Twelve Mile	4.1930431	15,597.07	51,171.4
	83 04 31.234	284 02 16.77	104 05 47.01	Whittier	3.8669416	7,361.08	24,150.5
		332 00 27.07	152 01 34.23	Penobscot	3.6869642	4,863.67	15,956.9
Rouge, 1932, r. 1934 (d. m.)	42 20 34.621	258 48 57.84	78 56 09.14	General	4.1740875	14,930.95	48,986.0
	83 15 11.381	274 42 15.00	94 50 33.28	Penobscot	4.2303576	16,996.43	55,762.5
		203 38 50		Azimuth mark.			
Purdy, 1932 (d. m.)	42 28 30.402	256 16 15.08	76 23 16.08	Twelve Mile	4.1657997	14,648.72	48,060.0
	83 12 33.794	316 52 47.90	136 58 13.44	General	4.2082758	16,153.84	52,998.1
		320 20 35.40	140 27 08.04	Penobscot	4.3199201	20,889.12	68,533.7
		13 48 21.80	193 46 35.52	Rouge	4.1794443	15,116.26	49,593.9
		265 49 38		Azimuth mark.			
Niemshack, 1932, r. 1934 (d. m.)	42 20 18.360	223 22 12.36	43 29 16.20	Purdy	4.3202622	20,905.58	68,587.7
	83 23 02.266	267 17 27.26	87 22 44.42	Rouge	4.0330605	10,790.97	35,403.4
		162 32 00		Azimuth mark.			

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Detroit to Jackson—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
Sorson, 1932, r. 1934 (d. m.)	42 28 29.549	269 50 18.05	89 57 47.70	Purdy	4.1821478	15,210.65	49,903.6
	83 23 39.677	321 31 56.00	141 37 38.80	Rouge	4.2719347	18,704.01	61,364.7
		356 45 56.72	176 46 21.95	Niemshack	4.1812719	15,180.00	49,803.0
		9 39 32		Azimuth mark.			
Dix, 1932, r. 1934 (d. m.)	42 20 02.682	225 48 13.09	45 56 08.50	Sorson	4.3514341	22,461.26	73,691.6
	83 35 24.656	268 18 00.60	88 26 20.58	Niemshack	4.2305136	17,002.53	55,782.5
		186 49 33		Azimuth mark.			
Hamilton, 1932 (d. m.)	42 27 38.840	262 43 38.95	82 49 43.88	Sorson	4.0950525	12,446.65	40,835.4
	83 32 40.176	315 44 44.69	135 51 14.37	Niemshack	4.2777932	18,958.03	62,198.1
		14 58 44.67	194 56 53.77	Dix	4.1634293	14,568.99	47,798.4
Naylor, 1932, r. 1934 (d. m.)	42 21 35.047	219 59 45.49	40 04 23.64	Hamilton	4.1661533	14,660.65	48,099.1
	83 39 32.594	296 38 29.74	116 41 16.76	Dix	3.8028095	6,350.52	20,835.0
		66 33 03		Azimuth mark.			
Barton, 1932, r. 1934 (d. m.)	42 19 26.551	230 38 38.69	50 47 46.11	Hamilton	4.3800716	23,992.28	78,714.7
	83 46 12.125	246 31 31.91	66 36 01.01	Naylor	3.9986129	9,968.11	32,703.7
		265 38 19.67	85 45 35.67	Dix	4.1721990	14,866.17	48,773.4
		201 46 21		Azimuth mark.			
Hamburg, 1932 (d. m.)	42 27 35.026	269 35 04.63	89 45 04.63	Hamilton	4.3076582	20,307.58	66,625.8
	83 47 28.968	315 30 48.53	135 36 09.81	Naylor	4.1919352	15,557.33	51,041.0
		353 20 28.50	173 21 20.31	Barton	4.1811061	15,174.21	49,784.1
		67 39 28		Azimuth mark.			
Dexter, 1932, r. 1934 (d. m.)	42 19 58.220	87 11 15.11	267 02 36.74	Prospect	4.2466829	17,647.49	57,898.5
	83 55 56.036	219 24 00.63	39 29 42.52	Hamburg	4.2613297	18,252.81	59,884.4
		274 07 32.36	94 14 05.55	Barton	4.1272635	13,404.90	43,979.2
		107 59 08		Azimuth mark.			
Stofer, 1932 (d. m.)	42 22 19.123	155 20 18.70	335 17 51.04	Hicks	4.0786011	11,983.98	39,317.4
	84 03 48.501	291 51 30.64	111 56 48.94	Dexter	4.0665011	11,654.70	38,237.1
		52 27 21.66	232 24 01.37	Prospect	3.9338140	8,586.46	28,170.7
		92 07 48		Azimuth mark.			
Pinckney, 1932 (d. m.)	42 28 12.976	275 05 22.74	95 11 47.21	Hamburg	4.1160369	13,062.82	42,856.9
	83 56 58.433	317 38 10.07	137 45 25.86	Barton	4.3416753	21,962.17	72,054.2
		354 39 14.16	174 39 56.24	Dexter	4.1856119	15,332.46	50,303.2
		40 41 23.06	220 36 46.44	Stofer	4.1580930	14,391.07	47,214.7
		45 06 37.40	224 58 40.43	Prospect	4.3591287	22,862.76	75,008.9
		89 56 32.93	269 49 28.25	Hicks	4.1574029	14,368.22	47,139.7
		271 47 21		Azimuth mark.			
Supplementary points							
Belle Isle, William Livingstone Memorial Lighthouse, 1932.[1]	42 20 49.33	76 19 29	256 15 44	Penobscot	3.896763	7,884.3	25,867
	82 57 16.93	102 50 46	282 49 23	Whittier	3.457974	2,870.6	9,418
Belle River, municipal water tank (Canada), 1932 [1]	42 17 48.80	103 11 12	283 04 52	Grant	4.122282	13,252.0	43,478
	82 42 22.10	272 41 02	92 44 16	Deerbrook (U. S. L. S.)	3.821531	6,630.3	21,753
Mount Clemens, Selfridge Field, beacon, 1932	42 36 39.411	350 56 54.4	170 57 13.9	Mount Clemens (U. S. L. S.)	3.619628	4,165.1	13,665
	82 49 10.165	31 06 46.0	210 57 31.5	Penobscot	4.561026	36,393.7	119,402
		56 55 24.8	236 46 37.0	Twelve Mile	4.327611	21,262.3	69,758
Mount Clemens Macomb County Bldg., highest point, 1932.	42 35 48.919	295 07 49.4	115 10 30.9	Mount Clemens (U. S. L. S.)	3.779015	6,011.9	19,724
	82 52 40.086	25 18 10.6	205 11 17.8	Penobscot	4.515267	32,754.2	107,461
		52 19 32.3	232 13 06.5	Twelve Mile	4.216291	16,454.7	53,985
Mount Clemens eccentric, 1932 (d. m.)[1]	42 34 26.378	300 10 00	120 10 00	Mount Clemens (U. S. L. S.)	1.2188505	16.552	54.30
	82 31 42.060	148 30 28		Azimuth mark.			
Mount Clemens, black water tank, 1932 [1]	42 35 42.00	288 39 48	108 43 13	Mount Clemens (U. S. L. S.)	3.863738	7,307.0	23,973
	82 53 44.97	49 32 08	229 26 26	Twelve Mile	4.181020	15,171.2	49,774
Tecumseh, Catholic Church, cross (Canada), 1932	42 18 40.646	99 02 55.3	278 56 24.8	Penobscot	4.128633	13,447.2	44,118
	82 53 11.503	118 43 47.0	298 39 39.4	Whittier	3.982152	9,597.4	31,487
		234 20 08.0	54 21 05.8	Grant	3.384044	2,421.3	7,944
Grosse Pointe High School, finial, 1932	42 23 26.541	59 16 20.8	239 12 52.2	Whittier	3.915852	8,238.6	27,029
	82 54 09.787	80 22 57.2	260 15 58.3	General	4.159032	14,422.2	47,317
		200 11 54.6	20 15 35.9	Mount Clemens (U. S. L. S.)	4.336247	21,689.4	71,159
Windsor, General Motors Co., stack (Canada), 1932 [1]	42 18 28.91	122 12 04	302 10 09	Penobscot	3.665297	4,627.0	15,180
	83 00 00.52	190 46 09	10 46 37	Whittier	3.704119	5,059.6	16,600
Windsor, General Motors Co., water tank (Canada), 1932.[1]	42 18 28.93	191 15 57	11 16 26	Whittier	3.704795	5,067.5	16,626
	83 00 02.47	261 05 49	81 11 24	Grant	4.061304	11,516.1	37,782
Windsor, Hotel Dieu, steeple (Canada), 1932 [1]	42 17 46.33	156 07 20	336 06 31	Penobscot	3.616178	4,132.2	13,557
	83 01 38.47	206 53 27	26 55 01	Whittier	3.847996	7,046.9	23,120
Sandwich, Assumption Church, spire (Canada), 1932	42 18 27.070	104 39 48.0	284 32 23.8	Rouge	4.193442	15,611.4	51,218
	83 04 11.597	176 13 42.9	356 13 29.7	General	3.834490	6,831.1	22,412
		233 04 03.0	53 07 19.9	Whittier	3.922810	8,371.6	27,466

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Detroit to Jackson—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Ojibway Steel Co., concrete stack (Canada), 1932	42 16 03.773	123 26 04.1	303 19 51.4	Rouge	4.181506	15,188.2	49,830
	83 05 57.673	189 58 53.8	9 59 52.0	General	4.057311	11,410.7	37,437
		211 32 22.5	31 34 27.8	Penobscot	3.911023	8,147.5	26,731
Detroit, Penobscot Bldg., red ball, 1932 [1]	42 19 48.79	94 50 30	274 42 12	Rouge	4.230359	16,996.5	55,763
	83 02 51.53	182 44 26	2 44 54	Twelve Mile	4.291793	19,579.1	64,236
Detroit, Union Guardian Bldg., flagpole, 1932	42 19 47.072	94 59 21.1	274 50 59.7	Rouge	4.233196	17,107.9	56,128
	83 02 46.841	151 13 05.7	331 11 55.4	General	3.695579	4,961.1	16,277
		241 41 07.8	61 43 27.6	Whittier	3.732216	5,397.8	17,709
Detroit, Hudson Bldg., flagpole, 1932	42 20 02.178	93 27 06.6	273 18 48.4	Rouge	4.229557	16,965.1	55,660
	83 02 51.590	149 34 25.5	329 33 18.4	General	3.653414	4,502.1	14,771
		246 41 29.0	66 43 52.0	Whittier	3.723670	5,292.6	17,364
Detroit, Fisher Bldg., west finial, 1932	42 22 09.314	78 40 16.3	258 33 09.2	Rouge	4.170177	14,797.1	48,547
	83 04 37.552	137 14 48.7	317 09 27.4	Purdy	4.204808	16,025.4	52,577
		192 26 12.4	12 27 51.6	Twelve Mile	4.192773	15,587.4	51,140
Detroit, Fisher Bldg., east finial, 1932	42 22 09.381	330 49 17.2	150 50 28.5	Penobscot	3.696201	4,968.2	16,300
	83 04 37.321	78 40 02.4	258 32 55.2	Rouge	4.170341	14,802.7	48,565
		137 13 40.7	317 08 19.3	Purdy	4.204864	16,027.4	52,583
Highland Park, Ford Plant, southeast stack, 1932	42 24 32.611	334 16 43.8	154 18 48.0	Penobscot	3.987636	9,719.3	31,887
	83 05 55.762	60 02 18.4	239 56 03.9	Rouge	4.166738	14,680.4	48,164
		128 55 32.7	308 51 04.1	Purdy	4.067708	11,687.1	38,343
Bell Telephone Bldg., flagpole, 1932	42 24 09.226	319 32 15.2	139 33 49.1	General	3.691615	4,916.0	16,129
	83 06 50.660	60 01 10.3	239 55 32.8	Rouge	4.121639	13,232.4	43,413
		135 48 39.3	315 44 47.7	Purdy	4.050962	11,245.1	36,893
Detroit University, clock tower, 1932	42 24 48.929	50 23 30.8	230 18 52.8	Rouge	4.089836	12,298.0	40,348
	83 08 17.470	139 25 11.0	319 22 19.0	Purdy	3.954285	9,000.9	29,530
		313 47 59.3	133 50 32.8	General	3.855650	7,172.2	23,531
Zoological Gardens, water tank, 1932	42 28 34.793	333 25 13.9	153 28 09.9	General	4.125249	13,342.9	43,776
	83 08 52.150	30 22 32.7	210 18 16.9	Rouge	4.234698	17,167.1	56,322
		88 29 16.6	268 26 46.9	Purdy	3.704555	5,064.7	16,616
Marygrove College, stack, 1932 [1]	42 24 52.69	44 40 35	224 36 43	Rouge	4.048895	11,191.7	36,718
	83 09 27.62	65 39 03	245 29 54	Niemshack	4.311116	20,469.9	67,158
Marygrove College, silver water tank, 1932	42 24 52.367	147 55 30.7	327 53 26.1	Purdy	3.899879	7,941.1	26,053
	83 09 29.188	224 29 07.4	44 34 03.5	Twelve Mile	4.155118	14,292.8	46,892
		306 37 50.0	126 41 10.8	General	3.929185	8,495.4	27,872
Redford, St. Mary's Church, cross on belfry, 1932	42 23 47.621	33 20 31.4	213 18 36.0	Rouge	3.852903	7,126.9	23,382
	83 12 20.254	177 58 11.6	357 58 02.5	Purdy	3.941063	8,731.0	28,645
		299 28 02.5	119 34 25.7	Penobscot	4.174813	14,955.9	49,068
Birmingham, silver municipal water tank, 1932	42 32 54.613	358 21 44.9	178 21 51.7	Purdy	3.911468	8,155.8	26,758
	83 12 43.997	8 24 19.3	188 22 39.8	Rouge	4.363237	23,080.1	75,722
		61 24 35.1	241 17 12.0	Sorson	4.231915	17,057.5	55,963
Detroit, city water tank, 1932	42 26 26.104	171 56 41.5	351 56 25.4	Purdy	3.588110	3,873.6	12,709
	83 12 10.032	241 53 33.1	62 00 17.9	Twelve Mile	4.190829	15,517.8	50,911
		307 09 33.5	127 14 42.7	General	4.119667	13,172.5	43,217
Detroit, Peach Island front range light, 1932 [1]	42 21 37.98	318 08 22	138 10 09	Grant	3.736431	5,450.4	17,882
	82 54 24.44	73 51 38	253 45 56	Penobscot	4.082297	12,086.4	39,653
Detroit, municipal waterworks, spire, 1932 [1]	42 21 34.43	40 35 59	220 35 40	Whittier	2.996922	992.9	3,258
	82 58 50.98	91 36 20	277 32 31	General	3.895120	7,854.5	25,769
Detroit, Windmill Point Lighthouse, 1932 [1]	42 21 30.09	304 31 34	124 34 17	Grant	3.828018	6,730.0	22,080
	82 55 47.74	82 43 16	262 40 54	Whittier	3.688360	4,879.3	16,008
Detroit, U. S. Marine Hospital, stack, 1932 [1]	42 21 32.86	71 42 18	251 37 33	Penobscot	4.008953	10,208.3	33,492
	82 55 48.20	81 42 37	261 40 15	Whittier	3.688469	4,880.6	16,012
Detroit, Edison Co. plant, north stack, 1932	42 21 31.771	66 15 57.4	246 12 25.0	Penobscot	3.896849	7,885.9	25,872
	82 57 36.229	74 05 57.2	254 04 47.8	Whittier	3.389314	2,450.8	8,041
		96 44 56.8	276 40 17.2	General	3.980555	9,562.1	31,372
Detroit, Chrysler Co. plant, stack, 1932	42 22 17.453	46 09 44.0	226 08 40.1	Whittier	3.477795	3,004.7	9,858
	82 57 44.521	56 53 27.7	236 50 00.8	Penobscot	3.923843	8,391.6	27,531
		88 14 21.8	268 09 47.7	General	3.968974	9,310.5	30,546
Detroit, Briggs Body Co., stack, 1932	42 23 11.942	9 00 51.3	189 00 33.7	Whittier	3.580890	3,809.7	12,499
	82 58 53.135	41 03 22.8	221 00 42.1	Penobscot	3.919610	8,310.2	27,264
		75 43 07.9	255 39 20.0	General	3.902159	7,982.9	26,191
Detroit, Detroit City Gas Co., Lynch Road plant, gas tank, 1932.	42 24 29.291	20 02 33.6	200 01 00.7	Penobscot	3.964373	9,212.4	30,224
	83 00 33.629	114 23 25.8	294 15 19.8	Purdy	4.256780	18,062.6	59,260
		168 31 46.4	348 30 41.0	Twelve Mile	4.046271	11,124.3	36,497

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Detroit to Jackson—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Detroit, stem of Y in Chrysler sign, 1932 [1]	42 22 14.73	47 27 48	227 26 44	Whittier	3.470392	2,953.9	9,691
	82 57 44.12	119 45 44	299 35 44	Purdy	4.369415	23,410.7	76,807
Detroit, City Airport, beacon, 1932	42 24 22.084	350 02 34.0	170 03 04.6	Whittier	3.779415	6,017.5	19,742
	83 00 04.677	55 51 49.6	235 48 49.9	General	3.867396	7,368.8	24,176
		165 31 06.9	345 29 41.9	Twelve Mile	4.060311	11,489.8	37,696
Detroit, WXYZ Radio Station, east mast, 1932	42 21 27.135	146 16 28.3	326 16 03.6	General	3.180532	1,515.4	4,972
	83 03 54.462	274 46 23.0	94 49 28.5	Whittier	3.800825	6,321.6	20,740
		334 36 00.9	154 36 43.4	Penobscot	3.526245	3,359.3	11,021
Detroit, City College, belfry, 1932 [1]	42 21 18.55	155 26 57	335 26 36	General	3.224472	1,676.8	5,501
	83 04 00.78	272 19 12	92 22 22	Whittier	3.809536	6,949.6	22,800
Detroit, Hupmobile Motor Co., water tank, 1932 [1]	42 22 57.74	310 22 41	130 24 36	Whittier	3.710103	5,129.8	16,830
	83 02 09.96	64 36 28	244 34 53	General	3.553673	3,578.3	11,740
Detroit, Sweetest Heart of Mary Catholic Church, cross on north spire, 1932 [1]	42 21 29.54	117 57 32	297 56 26	General	3.403225	2,530.6	8,302
	83 02 53.55	276 59 22	97 01 46	Whittier	3.693916	4,942.2	16,215
Detroit, St. Josephat Catholic Church, cross on spire, 1932 [1]	42 20 45.33	126 34 31	306 32 50	General	3.631592	4,281.5	14,047
	83 02 00.97	258 21 59	78 23 48	Whittier	3.577454	3,779.7	12,401
Detroit, Lee Plaza Hotel, north finial, 1932	42 21 33.166	81 47 57.6	261 41 51.0	Rouge	4.099905	12,586.5	41,294
	83 06 07.152	243 54 43.1	63 55 47.7	General	3.388046	2,443.7	8,017
		305 42 29.0	125 44 40.8	Penobscot	3.741611	5,515.8	18,096
Detroit, Lincoln Motor Co., stack, 1932 [1]	42 20 52.88	243 38 26	63 40 44	General	3.717906	5,222.8	17,135
	83 07 55.76	285 49 27	105 52 52	Penobscot	3.859728	7,239.8	23,753
Detroit, Detroit City Gas Co., Coolidge Station, gas tank finial, 1932	42 23 33.143	163 06 48.5	343 05 26.3	Purdy	3.981638	9,586.0	31,450
	83 10 31.895	222 09 23.5	42 15 01.9	Twelve Mile	4.231869	17,055.7	55,957
		303 15 58.2	123 21 08.5	Penobscot	4.100576	12,606.0	41,358
Kelvinator Building, finial 1932 [1]	42 22 23.95	273 06 28	93 10 52	General	3.953487	8,984.4	29,476
	83 11 03.31	59 17 13	239 15 26	Rouge	3.819801	6,603.9	21,666
Kelvinator Co., stack, 1932	42 22 34.195	275 06 52.1	95 11 16.4	General	3.954640	9,008.2	29,554
	83 11 03.361	294 20 38.3	114 26 09.6	Penobscot	4.092004	12,359.6	40,550
		56 59 53.5	236 57 06.3	Rouge	3.830564	6,769.6	22,210
Beverly Hills, Suburban Development Co., water tank, 1932	42 31 33.609	279 04 54.5	99 11 37.7	Twelve Mile	4.139753	13,796.0	45,262
	83 12 07.202	6 07 59.7	186 07 41.7	Purdy	3.754772	5,685.5	18,653
		11 42 52.8	191 40 48.5	Rouge	4.317326	20,764.7	68,126
Berkley, municipal water tank, 1932	42 30 05.736	267 42 07.1	87 48 40.3	Twelve Mile	4.123739	13,296.6	43,624
	83 11 52.434	14 29 27.7	194 27 13.5	Rouge	4.260061	18,199.6	59,710
		17 48 22.5	197 47 54.6	Purdy	3.489894	3,089.5	10,136
Dearborn, Ford Airport, stack, 1932 [1]	42 18 21.80	162 12 14	342 11 36	Rouge	3.633883	4,304.1	14,121
	83 14 13.91	242 19 41	62 26 13	General	4.177664	15,054.4	49,391
Dearborn, municipal water tank, 1932 [1]	42 17 50.20	116 25 24	296 20 53	Niemshack	4.012274	10,286.7	33,749
	83 16 19.86	197 10 12	17 10 58	Rouge	3.725103	5,310.1	17,422
Dearborn, Ford Airport, beacon, 1932	42 18 00.464	145 38 25.3	325 36 49.5	Rouge	3.760634	5,762.8	18,907
	83 12 49.295	181 02 37.2	1 02 47.6	Purdy	4.288701	19,440.2	63,780
		256 13 27.1	76 20 09.4	Penobscot	4.148955	14,091.4	46,232
Dearborn, Ford Airport, checkered water tank, 1932	42 18 26.048	105 42 02.8	285 35 59.1	Niemshack	4.108766	12,845.9	42,145
	83 14 02.059	158 11 59.0	338 11 12.3	Rouge	3.630722	4,272.9	14,019
		242 17 26.9	62 23 51.2	General	4.168884	14,753.1	48,402
Rouge Park, Detroit municipal water tank, 1932	42 22 19.565	271 16 57.0	91 24 25.3	General	4.182664	15,228.7	49,963
	83 15 36.621	349 53 00.3	169 53 17.3	Rouge	3.517089	3,289.2	10,791
		69 54 17.2	249 49 17.0	Niemshack	4.035958	10,863.2	35,640
Redford, Detroit municipal water tank, 1932	42 25 10.122	225 44 07.8	45 47 15.2	Purdy	3.947338	8,858.0	29,062
	83 17 11.496	342 04 30.8	162 05 51.9	Rouge	3.951035	8,933.8	29,310
		41 44 48.6	221 40 52.2	Niemshack	4.081344	12,059.9	39,567
Detroit, Duns Scotus Church, belfry, 1932	42 27 36.940	240 12 08.1	60 13 33.3	Purdy	3.521249	3,320.8	10,895
	83 14 39.952	3 09 36.6	183 09 15.4	Rouge	4.115631	13,050.6	42,817
		40 22 32.6	220 16 53.9	Niemshack	4.249228	17,751.2	58,239
Pontiac, Insane Asylum, stack, 1932	42 36 52.163	343 54 05.7	163 56 18.0	Purdy	4.207162	16,112.5	52,862
	83 15 49.383	358 20 52.9	178 21 18.6	Rouge	4.479648	30,175.0	98,999
		34 43 30.5	214 38 12.5	Sorson	4.275519	18,859.0	61,873
Bloomingfield Hills Country Club, tank, 1932 [1]	42 34 55.56	343 27 22	163 29 06	Purdy	4.093304	12,396.6	40,671
	83 15 08.33	0 09 03	180 09 01	Rouge	4.424308	26,564.9	87,155
Oakland Hills Country Club, silver water tank, 1932	42 32 43.217	324 34 15.7	144 36 59.8	Purdy	3.980950	9,570.8	31,400
	83 16 36.678	355 02 10.3	175 03 07.8	Rouge	4.353448	22,565.7	74,034
		51 00 52.0	230 56 06.1	Sorson	4.094498	12,430.8	40,783
Knollwood Country Club, tank, 1932 [1]	42 32 38.43	307 43 57	127 48 49	Purdy	4.096705	12,494.1	40,991
	83 19 46.37	344 15 27	164 18 32	Rouge	4.365506	23,201.0	76,119

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Detroit to Jackson—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Airway beacon No. 27, 1932	42 32 29.117	302 42 58.1	122 48 36.9	Purdy	4.133886	13,610.9	44,655
	83 20 55.118	310 21 18.2	130 32 22.5	General	4.470444	29,542.3	96,923
		313 20 45.4	133 32 56.6	Penobscot	4.532945	34,115.0	111,926
Farmington, Children's Hospital, water tank, 1932 [1]	42 27 02.83	11 06 13	191 05 01	Niemshack	4.104413	12,717.8	41,725
	83 21 15.28	129 03 23	309 01 46	Sorson	3.628160	4,247.8	13,936
Wayne, Graham Body Co., stack, 1932 [1]	42 16 45.94	187 20 39	7 21 04	Niemshack	3.820098	6,608.4	21,681
	83 23 39.17	238 42 22	58 48 04	Rouge	4.133621	13,602.6	44,628
Wayne County Airport, beacon, 1932	42 14 12.890	117 00 40.5	296 50 16.4	Dix	4.377208	23,834.6	78,197
	83 19 57.131	200 56 20.5	21 01 19.2	Purdy	4.452360	28,337.4	92,970
		209 02 21.4	29 05 33.6	Rouge	4.129539	13,475.3	44,210
Wayne County Training School, water tank, 1932	42 23 57.882	221 09 27.4	41 13 03.9	Sorson	4.016833	11,138.7	36,544
	83 28 00.598	288 12 50.9	108 22 09.7	Rouge	4.300652	19,982.6	65,560
		309 31 37.8	129 35 39.3	Niemshack	4.026739	10,635.0	34,892
Wayne County Training School, stack, 1932	42 24 11.586	138 16 08.9	318 13 20.4	Hamilton	3.933094	8,572.2	28,124
	83 28 30.440	290 02 11.5	110 11 10.0	Rouge	4.289354	19,469.5	63,876
		313 45 05.5	133 48 46.7	Niemshack	4.017050	10,400.4	34,122
Wayne, municipal water tank, 1932	42 16 52.316	177 52 34.1	357 52 10.6	Sorson	4.333007	21,528.2	70,630
	83 23 04.750	180 30 45.1	0 30 46.8	Niemshack	3.803303	6,357.7	20,859
		237 38 02.1	57 43 20.8	Rouge	4.108186	12,828.8	42,089
Flat Rock, airway beacon No. 11 B, 1932	42 06 01.665	136 55 14.1	316 43 20.7	Dix	4.551260	35,584.4	116,746
	83 17 43.044	164 32 52.0	344 29 17.5	Niemshack	4.438196	27,428.1	89,987
		168 55 05.5	348 51 05.5	Sorson	4.627200	42,383.8	139,054
Eloise, hospital, large brick stack, 1932	42 17 15.740	149 07 11.8	329 05 32.8	Niemshack	3.817327	6,566.4	21,543
	83 20 35.049	168 32 01.2	348 29 56.8	Sorson	4.326650	21,215.3	69,604
		230 20 55.7	50 24 33.6	Rouge	3.983301	9,622.8	31,571
Coventry Gardens, water tank, 1932	42 23 51.799	6 47 37.9	186 47 14.8	Niemshack	3.821660	6,632.2	21,759
	83 22 27.994	169 11 00.3	349 10 11.9	Sorson	3.940784	8,725.4	28,627
		301 18 02.3	121 22 56.5	Rouge	4.068068	11,696.8	38,375
Detroit, Home of Correction, men's division, stack, 1932.	42 23 22.697	283 10 48.4	103 21 36.0	Rouge	4.353971	22,592.8	74,123
	83 31 12.370	296 50 45.7	116 56 16.0	Neimshack	4.099505	12,574.9	41,256
		43 06 51.0	223 04 01.0	Dix	3.926904	8,450.9	27,726
Detroit, Home of Correction, women's division, water tank, 1932.[1]	42 23 55.98	285 36 49	105 47 40	Rouge	4.360871	22,954.7	75,311
	83 31 17.17	38 12 53	218 10 06	Dix	3.961854	9,159.1	30,049
Detroit, Home of Correction, men's division, water tank, 1932.	42 23 21.796	249 28 05.9	69 40 40.6	Purdy	4.435898	27,283.4	89,512
	83 31 12.326	283 06 43.4	103 17 31.0	Rouge	4.353831	22,585.6	74,100
		296 44 06.1	116 49 36.4	Niemshack	4.099042	12,561.5	41,212
Newport, airway beacon No. 24, 1932	42 14 27.938	152 14 11.2	332 11 31.3	Dix	4.067241	11,674.6	38,302
	83 31 27.113	202 20 42.8	22 25 57.7	Sorson	4.448477	28,085.2	92,143
		226 52 56.0	46 58 35.7	Niemshack	4.199558	15,832.8	51,945
Maybury Sanitarium, tall red brick stack, 1932	42 25 40.708	166 29 04.5	346 28 38.7	Hamilton	3.573905	3,748.9	12,300
	83 32 01.829	245 32 03.4	65 37 42.5	Sorson	4.100444	12,602.1	41,345
		308 48 41.3	128 54 45.2	Niemshack	4.200078	15,851.8	52,007
South Lyon, municipal water tank, 1932 [1]	42 27 43.20	270 44 15	90 49 08	Hamilton	3.995464	9,896.1	32,467
	83 39 53.27	336 35 37	156 38 38	Dix	4.189786	15,480.5	50,789
Ypsilanti, Hall-Doyle Co., tank, 1932 [1]	42 14 41.08	132 16 02	312 11 17	Barton	4.117464	13,105.8	42,998
	83 39 08.56	207 18 59	27 21 29	Dix	4.048071	11,170.5	36,649
Ypsilanti, municipal water tank, dome, 1932 [1]	42 14 43.81	126 06 12	306 00 20	Barton	4.170919	14,822.4	48,630
	83 37 29.11	196 08 59	16 10 23	Dix	4.010445	10,243.4	33,607
Ypsilanti, old normal school, spire, 1932	42 14 47.274	125 23 49.7	305 17 52.9	Barton	4.173029	14,894.6	48,867
	83 37 21.875	166 37 34.8	346 36 06.8	Naylor	4.111705	12,933.2	42,432
		195 24 56.4	15 26 15.3	Dix	4.004133	10,095.6	33,122
Ann Arbor, municipal airport, beacon, 1932 [1]	42 16 33.76	120 15 47	302 11 38	Barton	3.999866	9,996.9	32,798
	83 40 02.94	224 39 05	44 42 12	Dix	3.957383	9,065.3	29,742
Ann Arbor, University of Michigan, power plant stack, 1932.	42 16 51.758	109 30 29.4	289 22 30.5	Dexter	4.237671	17,285.1	56,710
	83 44 04.386	148 31 11.6	328 29 45.7	Barton	3.748275	5,601.1	18,376
		215 25 35.3	35 28 38.3	Naylor	4.030609	10,730.2	35,204
Ann Arbor, First Methodist Church, spire, 1932	42 16 49.282	153 49 15.7	333 48 05.5	Barton	3.733009	5,407.7	17,742
	83 44 27.933	217 27 40.3	37 30 59.1	Naylor	4.045802	11,112.2	36,457
		244 19 41.2	64 25 46.9	Dix	4.139878	13,800.0	45,275
North Ann Arbor, Barton Hills Golf Club, tank, 1932	42 19 21.400	94 47 17.4	274 40 33.7	Dexter	4.138978	13,771.4	45,182
	83 45 56.616	172 06 45.7	352 05 43.4	Hamburg	4.186866	15,376.8	50,449
		244 49 59.5	64 54 18.4	Naylor	3.987218	9,710.0	31,857
Ann Arbor, college hospital, flagstaff, 1932 [1]	42 16 58.46	214 50 43	34 53 38	Naylor	4.017105	10,401.7	34,126
	83 43 52.29	243 53 55	63 59 37	Dix	4.111992	12,941.7	42,460

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Detroit to Jackson—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
St. Patricks' Catholic Church, spire, 1932 [1]	42 21 28.27	22 22 19	202 21 34	Barton	3.608650	4,061.2	13,324
	83 45 04.62	163 45 08	343 43 31	Hamburg	4.071440	11,788.0	38,674
Dodge Bros. Estate, black tank, yellow top, 1932	42 34 10.742	356 01 28.1	176 02 16.0	Naylor	4.368725	23,373.6	76,685
	83 40 43.403	15 25 33.0	195 21 51.2	Barton	4.451750	28,297.6	92,840
		37 12 32.9	217 07 58.9	Hamburg	4.185355	15,323.4	50,274
Chelsea, municipal water tank, 1932	42 18 59.695	95 04 14.5	274 59 07.9	Prospect	4.019999	10,471.3	34,355
	84 01 10.307	149 32 21.1	329 30 34.5	Stofer	3.853685	7,139.8	23,424
		255 53 00.0	75 56 31.6	Dexter	3.870351	7,419.1	24,341
Chelsea, Tower Building, finial, 1932 [1]	42 19 09.92	148 44 14	328 42 30	Stofer	3.834685	6,834.2	22,422
	84 01 13.49	258 21 38	78 25 12	Dexter	3.870434	7,420.5	24,345
Pinckney, St. Mary's Catholic Church, tip of cross, 1932.[1]	42 27 36.96	149 51 48	329 51 29	Pinckney	3.108848	1,284.8	4,215
	83 56 30.20	270 13 36	90 19 41	Hamburg	4.092238	12,366.3	40,572

Thunder Bay to Grand Traverse Bay

Principal points							
Pikes Peak, 1932 (d. m.)	44 49 49.935	202 04 36.50	22 10 11.69	Flanders (U. S. L. S.)	4.4412473	27,621.50	90,621.5
	83 51 28.239	249 30 59.95	69 39 51.04	Stovel (U. S. L. S.)	4.2464850	17,639.45	57,872.1
Atlanta, 1932 (d. m.)	45 00 23.040	255 54 44.15	76 07 48.97	Flanders (U. S. L. S.)	4.3983255	25,022.20	82,093.7
	84 02 03.001	293 37 21.87	113 53 42.21	Stovel (U. S. L. S.)	4.5216468	33,238.92	109,051.4
		324 28 19.02	144 35 47.23	Pikes Peak	4.3801303	23,995.52	78,725.3
Comins, 1932 (d. m.)	44 50 44.950	194 17 45.94	14 20 12.59	Atlanta	4.2652230	18,417.17	60,423.7
	84 05 30.663	275 09 41.39	95 19 35.39	Pikes Peak	4.2690653	18,580.84	60,960.6
Bigelow, 1932 (d. m.)	44 59 57.392	267 43 43.10	87 54 55.27	Atlanta	4.3187594	20,833.36	68,350.8
	84 17 53.546	298 10 48.83	118 29 28.15	Pikes Peak	4.5966770	39,507.27	129,616.8
		316 14 00.96	136 22 45.55	Comins	4.3726468	23,585.59	77,380.4
Lewiston, 1932 (d. m.)	44 51 22.624	185 28 26.49	5 29 15.59	Bigelow	4.2031280	15,963.50	52,373.6
	84 19 03.073	273 39 00.58	93 48 33.55	Comins	4.2523129	17,877.75	58,653.9
		274 20 21.45	94 39 48.40	Pikes Peak	4.5617696	36,456.05	119,606.2
		125 13 34		Azimuth mark.			
Johannes, 1932 (d. m.)	45 01 22.125	286 09 08.97	106 13 59.88	Bigelow	3.9721836	9,379.58	30,772.8
	84 24 44.878	337 55 13.79	157 59 15.23	Lewiston	4.3002926	19,966.07	65,505.3
Chub Lake, 1932 (d. m.)	44 54 40.044	233 21 09.78	53 30 09.26	Johannes	4.3187150	20,831.23	68,343.8
	84 37 28.263	219 03 19.55	69 17 09.55	Bigelow	4.4401193	27,549.85	90,386.5
		283 59 43.03	104 12 42.93	Lewiston	4.3981004	25,009.24	82,051.1
Hudson, 1932 (d. m.)	45 10 16.195	301 33 36.00	121 48 01.41	Johannes	4.4968414	31,393.62	102,997.2
	84 45 06.668	340 48 32.98	160 53 57.32	Chub Lake	4.4855934	30,590.98	100,363.9
Hayes, 1932 (d. m.)	44 56 28.064	184 39 53.00	4 41 00.61	Hudson	4.4090823	25,649.70	84,152.4
	84 46 42.191	252 24 40.72	72 40 11.92	Johannes	4.4808022	30,255.35	99,262.8
		285 17 41.45	105 24 12.64	Chub Lake	4.1002779	12,597.31	41,329.7
Elmira, 1932 (d. m.)	45 01 30.486	212 45 54.62	32 51 33.59	Hudson	4.2857728	19,309.58	63,351.5
	84 53 05.221	318 00 36.09	138 05 06.85	Hayes	4.0987459	12,552.95	41,184.1
Jordan, 1932 (d. m.)	45 06 03.280	246 57 44.03	67 07 41.99	Hudson	4.3014479	20,019.25	65,679.8
	84 59 10.304	316 28 41.19	136 32 59.63	Elmira	4.0647091	11,606.71	38,079.7
		81 09 08.94	260 56 01.12	Central Lake	4.3914975	24,631.88	80,813.1
		25 35 36		Azimuth mark.			
Mancelona, 1932 (d. m.)	44 53 34.697	54 17 51.24	234 06 14.24	Fulford	4.4278687	26,783.59	87,872.5
	85 02 06.707	133 18 39.13	313 07 37.43	Central Lake	4.4494037	28,145.16	92,339.6
		189 28 30.35	9 30 35.08	Jordan	4.3697598	23,429.32	76,867.7
		215 44 18.05	35 56 19.74	Hudson	4.5813398	38,136.41	125,119.2
		218 53 14.75	38 59 37.37	Elmira	4.2760764	18,883.23	61,952.7
		255 07 31.59	75 18 24.38	Hayes	4.3216557	20,972.76	68,808.1
Wildfong, 1932 (d. m.)	44 58 27.561	36 37 10.36	216 27 22.12	Fulford	4.4878624	30,751.23	100,889.7
	85 04 41.585	120 57 59.22	300 48 46.61	Central Lake	4.2995571	19,932.28	65,394.5
		207 14 08.43	27 18 02.84	Jordan	4.1993930	15,826.80	51,925.1
		339 23 44.96	159 25 34.35	Mancelona	3.9848589	9,657.37	31,684.2
		271 52 58		Azimuth mark.			
Supplementary points							
Alpena, Huron Portland Cement Co., flashing white light, 1932.[1]	45 03 34.71	42 41 51	222 32 18	Stovel (U. S. L. S.)	4.418945	26,238.9	86,085
	83 25 24.51	53 33 13	233 14 48	Pikes Peak	4.630452	42,702.4	140,099
Curran, fire lookout tower, 1932	44 42 55.703	144 47 11.5	324 42 22.1	Pikes Peak	4.194751	15,658.5	51,373
	83 44 37.210	182 04 19.6	2 05 04.4	Flanders (U. S. L. S.)	4.584331	38,400.0	125,984
		201 36 36.3	21 40 37.2	Stovel (U. S. L. S.)	4.309091	20,374.7	66,846
Pikes Peak, fire lookout tower, 1932 (d.)[1]	44 49 49.63	202 40 48	22 40 48	Pikes Peak	1.011570	10.27	33.7
	83 51 28.42						

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Thunder Bay to Grand Traverse Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Lake Emma, fire lookout tower, 1932	45 14 05.728	314 22 05.1	134 32 45.1	Flanders (U. S. L. S.)	4.441401	27,631.3	90,654
	83 58 36.545	10 05 43.1	190 03 16.8	Atlanta	4.411526	25,794.4	84,627
		44 06 48.9	223 53 09.2	Bigelow	4.561172	36,405.9	119,442
Turtle Lake, fire lookout tower, 1932	44 53 10.710	134 15 03.5	314 07 41.1	Atlanta	4.282086	19,146.3	62,816
	83 51 36.778	208 34 52.4	28 40 33.8	Flanders (U. S. L. S.)	4.344212	22,090.8	72,476
		358 15 59.0	178 16 05.0	Pikes Peak	3.792435	6,200.6	20,343
East Atlanta, fire lookout tower, 1932 (d.) [1]	45 00 22.77	222 11 44	42 11 44	Atlanta	1.045323	11.10	36.4
	84 02 03.34						
West Atlanta, fire lookout tower, 1932 (d.) [1]	44 59 57.55	62 29 23	242 29 23	Bigelow	1.012837	10.30	33.8
	84 17 53.13						
South Pigeon River, fire lookout tower, 1932	45 07 37.270	11 48 15.5	191 46 57.2	Johannes	4.073003	11,830.5	38,814
	84 22 54.338	335 06 00.3	155 09 33.2	Bigelow	4.194448	15,647.6	51,337
Chub Lake, fire lookout tower, 1932 (d.) [1]	44 54 39.59	253 25 38	73 25 39	Chub Lake	1.693551	49.38	162.0
	84 37 30.42						
Gaylord, municipal water tank, finial, 1932	45 01 14.933	342 26 41.4	162 28 45.6	Chub Lake	4.106676	12,784.3	41,943
	84 40 24.047	43 07 51.3	223 03 24.0	Hayes	4.083750	12,126.9	39,786
		159 43 51.4	339 40 31.2	Hudson	4.250787	17,815.0	58,448
Gaylord, St. Mary's Church, spire, 1932	45 01 44.521	342 20 30.8	162 22 45.2	Chub Lake	4.138299	13,749.9	45,111
	84 40 38.398	39 14 43.4	219 10 26.2	Hayes	4.100634	12,607.6	41,363
		159 39 15.3	339 36 05.2	Hudson	4.226585	16,849.4	55,280
Hudson, fire lookout tower, 1932 (d.) [1]	45 10 16.41	4 17 19	184 17 19	Hudson	0.822822	6.65	21.8
	84 45 06.64						
Jordan, fire lookout tower, 1932 [1]	45 06 04.18	316 13 44	136 13 44	Jordan	1.583992	38.4	126
	84 59 11.52	27 10 10	207 06 15	Wildfong	4.199736	15,839.3	51,966
Bear Creek, fire lookout tower, 1932 [1]	45 19 32.97	329 54 03	149 59 27	Hudson	4.297941	19,858.3	65,152
	84 52 42.72	18 43 55	198 39 20	Jordan	4.421407	26,388.0	86,575
Pickerel Lake, fire lookout tower, 1932 [1]	44 47 50.22	79 00 27	258 46 46	Fulford	4.417119	26,128.8	85,724
	84 59 09.43	159 54 30	339 52 25	Mancelona	4.054003	11,324.1	37,152
Mancelona, fire lookout tower, 1932	44 53 34.270	54 19 09.1	234 07 32.1	Fulford	4.427731	26,775.1	87,845
	85 02 06.753	159 27 32.7	339 25 43.4	Wildfong	3.985396	9,669.3	31,723
		184 16 59.3	4 16 59.3	Mancelona	1.120574	13.20	43.3
Kalkaska, Church of Christ, spire, 1932 [1]	44 44 08.01	99 57 31	279 51 57	Fulford	4.025624	10,607.8	34,802
	85 10 40.51	212 47 15	32 53 17	Mancelona	4.318478	20,819.9	68,307

Gaylord to Mt. Pleasant

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points							
Bald Hill, 1932 (d. m.)	44 43 31.669	152 28 29.89	332 22 44.26	Chub Lake	4.3668981	23,275.45	76,362.9
	84 29 17.917	222 51 11.29	42 58 24.46	Lewiston	4.2977560	19,849.79	65,123.9
Elk Hill, 1932 (d. m.)	44 43 41.646	88 18 08.04	268 12 44.34	Bald Hill	4.0054926	10,127.28	33,225.9
	84 21 37.932	193 26 18.04	13 28 07.15	Lewiston	4.1652802	14,631.21	48,002.6
Down River, 1932 (d. m.)	44 42 31.661	173 51 29.39	353 50 11.66	Chub Lake	4.3543862	22,614.46	74,194.3
	84 35 37.966	233 03 26.82	53 15 07.65	Lewiston	4.4366770	27,332.35	89,672.9
		257 28 36.26	77 33 03.67	Bald Hill	3.9328554	8,567.53	28,108.6
		263 15 12.31	83 25 03.38	Elk Hill	4.2698518	18,614.52	61,071.1
		136 56 41		Azimuth mark.			
Crawford, 1932 (d. m.)	44 31 00.126	142 40 46.25	322 32 06.56	Down River	4.4292261	26,867.43	88,147.6
	84 23 18.002	185 21 06.83	5 22 17.12	Elk Hill	4.3730887	23,609.60	77,459.2
Cheney, 1932 (d. m.)	44 34 21.256	206 35 35.69	26 39 37.65	Down River	4.2287487	16,933.58	55,556.3
	84 41 22.322	236 20 53.18	56 34 45.54	Elk Hill	4.4956894	31,310.46	102,724.4
		284 26 03.80	104 38 44.41	Crawford	4.3932013	24,728.70	81,130.7
		128 06 45		Azimuth mark.			
Indian, 1932 (d. m.)	44 17 58.478	142 26 14.94	322 13 53.67	Cheney	4.5834414	38,321.40	125,726.1
	84 23 43.543	181 20 21.67	1 20 39.54	Crawford	4.3826167	24,133.30	79,177.3
Houghton, 1932 (d. m.)	44 15 36.289	179 43 09.77	359 43 04.37	Cheney	4.5406320	34,724.18	113,924.2
	84 41 14.615	219 46 50.24	39 59 23.35	Crawford	4.5700964	37,161.77	121,921.6
		259 14 03.64	79 26 17.46	Indian	4.3750645	23,717.26	77,812.4
Berry, 1932 (d. m.)	44 10 43.593	148 41 11.40	328 38 18.57	Houghton	4.0243713	10,577.21	34,702.1
	84 37 06.799	232 56 25.21	53 05 45.61	Indian	4.3485674	22,313.48	73,206.8
		174 00 19		Azimuth mark.			
Greer, 1932 (d. m.)	44 01 00.613	149 15 38.89	329 10 03.51	Berry	4.3210791	20,944.94	68,716.9
	84 29 04.850	192 46 20.94	12 50 04.78	Indian	4.5080927	32,217.56	105,700.4
		15 44 10		Azimuth mark.			

[1] No check on this position.

77720°—30——8

GEOGRAPHIC POSITIONS—Continued

Gaylord to Mt. Pleasant—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Principal points—Continued	° ′ ″	° ′ ″	° ′ ″				
McGonigal, 1932, r. 1936 (d. m.)	44 07 18.694	192 06 09.18	12 07 52.67	Houghton	4.1961315	15,708.38	51,536.6
	84 43 43.085	233 19 36.31	53 33 32.75	Indian	4.5205321	33,153.71	108,771.8
		234 16 47.37	54 21 23.40	Berry	4.0351274	10,842.45	35,572.3
		300 45 18.53	120 55 29.37	Greer	4.3572300	22,763.03	74,681.7
Wilson, 1932 (d. m.)	44 02 18.554	186 06 17.74	6 06 48.74	McGonigal	3.9692604	9,316.66	30,566.4
	84 44 27.648	212 07 32.38	32 12 39.22	Berry	4.2651688	18,414.88	60,416.2
		276 35 14.43	96 45 55.78	Greer	4.3157774	20,690.80	67,883.1
		36 24 10		Azimuth mark.			
Williams, 1932 (d. m.)	43 50 42.359	140 38 10.86	320 29 00.90	Wilson	4.4443990	27,822.68	91,281.6
	84 31 15.118	188 38 45.29	8 40 15.67	Greer	4.2855939	19,301.63	63,325.4
		321 47 16		Azimuth mark.			
Dover, 1932 (d. m.)	43 54 19.477	188 13 46.27	8 14 52.95	Wilson	4.1743618	14,940.38	49,016.9
	84 46 03.694	241 18 33.69	61 30 20.94	Greer	4.4127913	25,869.70	84,874.2
		288 34 40.18	108 44 56.04	Williams	4.3209800	20,940.16	68,701.2
		175 54 17		Azimuth mark.			
Coleman, 1932 (d. m.)	43 44 32.589	141 05 42.02	320 58 08.02	Dover	4.3672980	23,296.89	76,433.2
	84 35 08.044	204 30 19.67	24 33 00.86	Williams	4.0984451	12,544.26	41,155.6
		0 21 49.24	180 21 44.78	Silvernail	4.3591343	22,863.06	75,009.9
		41 12 16.72	221 02 21.82	O'Brien	4.4679953	29,376.18	96,378.4
		92 14 11		Azimuth mark.			
Little, 1932 (d. m.)	43 44 10.920	189 43 30.62	9 45 10.50	Dover	4.2800471	19,056.68	62,521.8
	84 48 27.948	242 17 02.15	62 28 56.89	Williams	4.4160004	26,061.56	85,503.6
		267 47 00.77	87 56 13.81	Coleman	4.2531508	17,912.28	58,767.2
		321 12 58.23	141 22 05.77	Silvernail	4.4539448	28,440.99	93,310.1
		3 42 54.01	183 42 11.18	O'Brien	4.3325539	21,505.72	70,556.7
		182 00 11		Azimuth mark.			
Supplementary points							
Mt. Tom, fire lookout tower, 1932	44 44 45.307	83 50 01.5	263 40 26.9	Elk Hill	4.256757	18,061.6	59,257
	84 08 01.914	130 13 48.0	310 06 02.1	Lewiston	4.279098	19,015.1	62,385
		196 39 22.1	16 41 08.8	Comins	4.064038	11,588.8	38,021
Elk Hill, fire lookout tower, 1932 [1]	44 43 41.71	83 42 08	263 42 07	Elk Hill	1.244524	17.56	57.6
	84 21 37.14						
Down River, fire lookout tower, 1932 [1]	44 42 31.58	238 58 11	58 58 11	Down River	0.714330	5.18	17.0
	84 35 38.17						
Mack Lake, fire lookout tower, 1932	44 37 00.144	65 48 34.6	245 35 31.9	Crawford	4.431452	27,005.5	88,601
	84 04 42.623	110 32 38.3	290 15 21.1	Bald Hill	4.539972	34,671.4	113,751
		119 05 34.6	298 53 40.8	Elk Hill	4.407707	25,568.6	83,886
Portage Lake, fire lookout tower, 1932	44 34 41.832	228 04 22.3	48 12 58.5	Down River	4.337153	21,734.7	71,308
	84 47 52.547	274 10 51.7	94 15 25.6	Cheney	3.936171	8,633.2	28,324
		281 43 46.8	102 01 01.1	Crawford	4.521936	33,261.1	109,124
Grass Lake, fire lookout tower, 1932	44 31 04.453	246 32 54.9	66 40 21.3	Cheney	4.184760	15,302.4	50,205
	84 51 58.560	270 02 01.8	90 22 08.1	Crawford	4.579781	37,999.8	124,671
		333 29 12.1	153 36 42.5	Houghton	4.505132	31,998.7	104,982
Roscommon, fire lookout tower, 1932	44 31 39.113	107 23 30.2	287 15 00.2	Cheney	4.225584	16,810.6	55,153
	84 29 15.274	157 18 33.6	337 14 04.9	Down River	4.339220	21,838.4	71,648
		278 38 14.1	98 42 24.7	Crawford	3.902669	7,981.2	26,185
Ogemaw, fire lookout tower, 1932 [1]	44 29 14.16	133 38 12	313 24 27	Down River	4.553239	35,747.0	117,280
	84 16 02.71	164 36 00	344 32 04	Elk Hill	4.443711	27,778.6	91,137
Rose City, fire lookout tower, 1932	44 26 04.743	47 30 05.3	227 21 29.3	Indian	4.346093	22,186.7	72,791
	84 11 25.617	120 08 37.7	300 00 18.5	Crawford	4.259930	18,194.1	59,692
		157 34 00.2	337 26 50.3	Elk Hill	4.547897	35,309.9	115,846
Indian Springs, fire lookout tower, 1932 [1]	44 17 58.51	85 24 00	265 23 59	Indian	1.121560	13.23	43.4
	84 23 42.95						
Houghton Lake, fire lookout tower, 1932	44 17 37.365	268 34 06.6	88 49 06.9	Indian	4.456119	28,583.7	93,778
	84 45 12.576	305 16 54.0	125 19 40.2	Houghton	3.810657	6,466.3	21,215
		354 03 03.6	174 04 06.0	McGonigal	4.283269	19,198.6	62,987
Gladwin Game Refuge, fire lookout tower, 1932	44 09 04.918	344 21 18.9	164 23 29.6	Greer	4.190937	15,521.6	50,924
	84 32 12.772	52 34 25.0	232 25 53.6	Wilson	4.313957	20,604.3	67,599
		115 01 25.9	294 58 01.1	Berry	3.857806	7,207.9	23,648
Harrison, fire lookout tower, 1932	44 01 57.710	225 06 22.4	45 11 33.6	McGonigal	4.147597	14,047.4	46,087
	84 51 10.652	229 03 48.7	49 13 36.0	Berry	4.394678	24,812.9	81,407
		265 51 37.7	85 56 17.8	Wilson	3.954081	8,996.7	29,517
Farwell, fire lookout tower, 1932	43 51 19.483	250 15 57.5	70 24 00.1	Dover	4.217652	16,506.4	54,155
	84 57 39.935	271 42 04.8	92 00 22.7	Williams	4.549213	35,417.1	116,198
		316 55 56.6	137 02 18.6	Little	4.257429	18,089.6	59,349
Clare, municipal water tank, 1932 [1]	43 49 09.08	181 37 54	1 38 03	Dover	3.981532	9,583.7	31,443
	84 46 15.92	261 46 24	81 56 48	Williams	4.308167	20,331.4	66,704

[1] *No check on this position.*

GEOGRAPHIC POSITIONS—Continued

Gaylord to Mt. Pleasant—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Edenville, fire lookout tower, 1932	43 48 00.348 84 22 59.063	68 36 05.1 114 19 36.0 161 18 41.6	248 27 40.8 294 13 52.5 341 14 27.9	Coleman Williams Greer	4.243525 4.084956 4.405304	17,519.6 12,160.6 25,427.5	57,479 39,897 83,423
Mount Pleasant Sugar Co., stack, 1932	43 36 48.677 84 46 40.695	227 14 00.2 298 57 50.3 332 41 29.3	47 21 58.5 119 05 43.3 152 45 19.8	Coleman Silvernail Thomas	4.324532 4.245742 4.214581	21,112.1 17,609.3 16,390.1	69,265 57,773 53,773
Mount Pleasant Indian School, stack, 1932	43 36 48.938 84 47 26.222	174 13 03.9 229 03 25.3 297 26 49.1	354 12 21.3 49 11 55.1 117 35 13.5	Little Coleman Silvernail	4.137055 4.339795 4.267475	13,710.6 21,867.3 18,512.9	44,982 71,743 60,738
Vicinity of Menominee							
Principal points							
Menominee R. M. No. 2 (Wis.), 1934 (d. m.)	45 05 12.886 87 35 33.124	69 28 06.32 207 53 14.06 251 55 15.63 306 30 30	249 28 05.72 27 59 52.26 72 10 22.83	Menominee (U. S. L. S.) Rochereau (U. S. L. S.) Eagle Bluff (U. S. L. S.) Azimuth mark.	1.2949730 4.4174281 4.4684548	19.723 26,147.37 29,407.28	64.71 85,785.2 96,480.4
Beach, 1934 (d. m.)	45 06 16.773 87 36 05.739	211 28 20.68 255 58 57.58 340 07 00.51 307 04 51	31 35 22.08 76 14 28.03 160 07 23.61	Rochereau (U. S. L. S.) Eagle Bluff (U. S. L. S.) Menominee R. M. No. 2 Azimuth mark.	4.3942126 4.4705210 3.3216385	24,786.35 29,547.52 2,097.19	81,319.9 96,940.5 6,880.5
Sven (Wis.), 1934 (d. m.)	45 09 14.834 87 14 20.058	75 05 58.89 135 15 19.96 185 30 41.75 195 30 05	254 50 56.80 315 06 54.68 5 30 46.75	Menominee R. M. No. 2 Rochereau (U. S. L. S.) Eagle Bluff (U. S. L. S.) Azimuth mark.	4.4595412 4.3430750 3.2048911	28,809.86 22,033.07 1,602.84	94,520.3 72,286.8 5,258.7
Feich, 1934 (d. m.)	45 17 19.310 87 33 36.486	265 58 39.82 300 32 39.16 6 29 22.23 96 19 30	86 03 55.82 120 46 20.03 186 27 59.48	Rochereau (U. S. L. S.) Sven Menominee R. M. No. 2 Azimuth mark.	3.9873242 4.4673222 4.3535187	9,712.35 29,330.68 22,569.33	31,864.6 96,229.1 74,046.2
Inlet (Wis.), 1934 (d. m.)	45 18 00.431 87 50 21.034	273 13 11.92 320 37 47.28 332 50 08	93 25 05.88 140 48 17.24	Feich Menominee R. M. No. 2 Azimuth mark.	4.3409585 4.4858917	21,925.95 30,612.00	71,935.4 100,432.9
Sundre (Wis.), 1934 (d. m.)	45 07 47.151 87 49 20.949	176 02 40.21 229 18 39.50 284 39 41.12 250 12 20	356 01 57.56 49 29 49.77 104 49 27.58	Inlet Feich Menominee R. M. No. 2 Azimuth mark.	4.2782464 4.4336696 4.2721515	18,977.82 27,143.74 18,713.35	62,263.1 89,054.1 61,395.4
Supplementary points							
Stephenson Lookout, 1934 (d.)	45 25 11.490 87 34 37.665	354 46 26.9 30 55 57.2 57 08 42.4	174 47 10.4 210 45 29.6 236 57 31.1	Feich Sundre Inlet	4.165472 4.574626 4.388593	14,637.7 37,551.4 24,467.7	48,024 123,200 80,274
Menominee, pierhead front range light, 1934 (d.)	45 05 50.214 87 35 09.083	24 31 32.5 123 30 18.4 253 47 46.1	204 31 15.5 303 29 38.3 74 02 36.3	Menominee R. M. No. 2 Beach Eagle Bluff (U. S. L. S.)	3.102637 3.171866 4.455837	1,266.6 1,485.5 28,565.2	4,156 4,874 93,718
Menominee, Epiphany Church spire, 1934 (d.)	45 06 28.676 87 36 53.418	98 30 26.0 140 32 38.6 192 03 35.9 289 24 49.5 323 06 28.7	278 21 36.4 320 23 05.6 12 05 55.7 109 25 23.3 143 07 25.6	Sundre Inlet Feich Beach Menominee R. M. No. 2	4.217945 4.442315 4.312608 3.043455 3.466145	16,517.5 27,689.5 20,540.4 1,105.2 2,925.1	54,191 90,845 67,390 3,626 9,597
Menominee, Menominee County Courthouse, tower, 1934 (d.).	45 06 26.304 87 36 47.750	98 41 40.3 287 45 26.2 324 14 24.4	278 32 46.7 107 45 56.0 144 15 17.3	Sundre Beach Menominee R. M. No. 2	4.221441 2.984271 3.446026	16,651.0 964.4 2,792.7	54,629 3,164 9,162
Menominee, Lloyd's Department Store, tank, 1934 (d.).	45 06 23.857 87 36 18.485	308 07 17.1 335 38 19.0 98 37 37.7 139 32 53.7	128 07 26.1 155 38 51.1 278 28 23.3 319 22 55.8	Beach Menominee R. M. No. 2 Sundre Inlet	2.549279 3.381106 4.237918 4.451694	354.2 2,404.9 17,294.9 28,294.0	1,162 7,890 56,742 92,828
Menominee, M. & M., Paper Co., Plant No. 2, tank, 1934 (d.).	45 06 27.401 87 38 10.037	276 52 19.2 303 49 28.1 99 35 46.4 143 21 36.4	96 53 47.2 123 51 19.2 279 27 51.0 323 12 57.7	Beach Menominee R. M. No. 2 Sundre Inlet	3.437299 3.616028 4.172297 4.426314	2,737.2 4,130.7 14,869.5 26,687.9	8,980 13,552 48,784 87,559
Menominee, Hoskin-Morainville Paper Co., stack, 1934 (d.).	45 05 51.555 87 35 43.554	349 10 55.2 139 40 57.3 148 04 37.0 187 25 50.3	169 11 02.6 319 30 34.7 328 04 21.3 7 27 20.5	Menominee R. M. No. 2 Inlet Beach Feich	3.084693 4.470534 2.962474 4.330656	1,215.3 29,548.4 917.2 21,411.9	3,987 96,943 3,009 70,249
Menominee, Hoskin-Morainville Paper Co., tank, 1934 (d.).	45 05 52.158 87 35 45.779	347 08 26.0 139 43 50.8 150 07 59.3 187 33 56.9	167 08 35.0 319 33 29.8 330 07 45.2 7 35 28.7	Menominee R. M. No. 2 Inlet Beach Feich	3.094656 4.469862 2.942636 4.330410	1,243.5 29,502.7 876.3 21,399.8	4,080 96,793 2,875 70,209
Menominee, Superior Sugar Refining Co., brick stack, 1934 (d.).	45 05 58.495 87 36 33.078	141 02 41.0 190 22 32.0 317 02 07.4	320 52 53.6 10 24 37.3 137 02 49.9	Inlet Feich Menominee R. M. No. 2	4.457770 4.329761 3.284159	28,692.6 21,367.9 1,923.8	94,136 70,105 6,312

[1] No check on this position.

GEOGRAPHIC POSITIONS—Continued

Vicinity of Menominee—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
Supplementary points—Continued	° ′ ″	° ′ ″	° ′ ″				
Menominee, Superior Sugar Refining Co., concrete stack, 1934 (d.).	45 05 59.857	190 45 32.8	10 47 42.5	Feich	4.329435	21,351.8	70,052
	87 36 39.393	234 37 55.1	54 38 18.9	Beach	2.955338	902.3	2,960
		315 00 41.5	135 01 28.4	Menominee R. M. No. 2	3.311746	2,050.0	6,726
Menominee, John Davis School, stack, 1934 (d.)	45 06 37.174	297 07 09.2	117 07 49.1	Beach	3.140287	1,381.3	4,532
	87 37 01.974	97 41 26.2	277 32 42.6	Sundre	4.212066	16,295.4	53,462
		140 29 44.5	320 20 17.5	Inlet	4.437245	27,368.1	89,790
Menominee, Christ Evangelical Lutheran Church, spire, 1934 (d.).	45 06 31.726	304 12 21.0	124 12 43.0	Beach	2.914370	821.1	2,694
	87 36 36.798	98 00 41.4	277 51 39.9	Sundre	4.226950	16,863.6	55,327
		139 50 49.5	319 41 04.6	Inlet	4.444822	27,849.8	91,371
Menominee, St. Adelbert's Church, spire, 1934 (d.)	45 06 36.583	294 42 18.9	114 43 02.0	Beach	3.165208	1,462.9	4,800
	87 37 06.527	321 40 03.0	141 41 09.2	Menominee R. M. No. 2	3.517646	3,293.4	10,805
		97 48 02.5	277 39 22.2	Sundre	4.209495	16,199.3	53,147
Menominee, Lloyd Manufacturing Co., tank, 1934 (d.).	45 07 34.907	341 36 40.9	161 37 28.1	Menominee R. M. No. 2	3.664637	4,619.9	15,157
	87 36 39.766	342 51 31.2	162 51 55.3	Beach	3.402103	2,524.1	8,281
		91 22 35.9	271 13 36.5	Sundre	4.221126	16,639.0	54,590
Chambers Island Lighthouse (Wis.), 1934 (d.)	45 12 08.146	54 29 51.4	234 20 10.0	Menominee R. M. No. 2	4.343026	22,030.6	72,279
	87 21 53.034	59 52 11.5	239 42 06.9	Beach	4.333542	21,554.7	70,717
		151 15 20.1	331 12 16.3	Rochereau (U. S. L. S.)	4.069204	11,727.5	38,476
Marinette, M. & M. Paper Co., Plant No. 1, tank (Wis.), 1934 (d.).	45 06 18.784	101 25 31.7	281 18 11.7	Sundre	4.141261	13,844.0	45,420
	87 39 00.000	145 36 30.8	325 28 27.6	Inlet	4.419457	26,269.8	86,187
		270 54 58.7	90 57 02.1	Beach	3.580958	3,810.3	12,501
		294 11 37.5	114 14 04.0	Menominee R. M. No. 2	3.695472	4,959.9	16,273
Marinette, M. & M. Paper Co., Plant No. 1, stack (Wis.), 1934 (d).	45 06 20.166	145 45 38.3	325 37 38.8	Inlet	4.417809	26,170.3	85,860
	87 39 05.211	271 30 41.0	91 32 48.1	Beach	3.593852	3,925.1	12,878
		294 06 18.0	114 08 48.2	Menominee R. M. No. 2	3.705976	5,081.3	16,671
Marinette, Evangelical Lutheran Church, steeple (Wis.), 1934 (n. d.).	45 05 36.266	144 03 40.8	323 54 38.0	Inlet	4.453336	28,401.2	93,180
	87 37 35.969	237 37 25.0	57 38 28.9	Beach	3.368432	2,335.8	7,663
		285 01 35.5	105 03 02.5	Menominee R. M. No. 2	3.444306	2,781.7	9,126
Marinette, tall steel stack (Wis.), 1934 (d.)	45 05 36.476	103 19 05.3	283 09 50.7	Sundre	4.245799	17,611.6	57,781
	87 36 16.713	141 20 16.5	321 10 17.5	Inlet	4.469034	29,446.5	96,609
		190 54 53.9	10 55 01.7	Beach	3.102746	1,266.9	4,156
Marinette, Pioneer Presbyterian Church, spire (Wis.), 1934 (d.).	45 05 46.248	103 32 07.6	283 23 42.5	Sundre	4.204891	16,028.4	52,587
	87 37 27.856	242 17 56.6	62 18 54.8	Beach	3.307004	2,027.7	6,653
		292 18 22.5	112 19 43.8	Menominee R. M. No. 2	3.433300	2,712.1	8,898
Marinette, Gram Methodist Episcopal Church, spire (Wis.), 1934 (d.).	45 05 54.422	102 48 54.5	282 40 35.9	Sundre	4.197914	15,773.0	51,749
	87 37 37.151	250 56 42.7	70 57 47.4	Beach	3.325181	2,114.4	6,937
		295 17 30.3	115 18 58.1	Menominee R. M. No. 2	3.477116	3,000.0	9,842
Marinette, Lauerman's Department Store, tank (Wis.), 1934 (d.).[1]	45 05 57.17	255 05 51	75 07 05	Beach	3.371843	2,354.2	7,724
	87 37 49.80	294 34 07	114 35 44	Menominee R. M. No. 2	3.516738	3,286.5	10,782
Marinette, French Church of St. Joseph, statue on dome (Wis.), 1934 (d.).[1]	45 05 32.84	229 33 24	49 34 15	Beach	3.320370	2,091.1	6,861
	87 37 18.53	284 57 01	104 58 16	Menominee R. M. No. 2	3.377657	2,385.9	7,828
Marinette, Sacred Heart Church, spire (Wis.), 1934 (d.).[1]	45 05 25.02	216 24 04	36 24 42	Beach	3.297805	1,985.2	6,513
	87 36 59.62	281 11 20	101 12 21	Menominee R. M. No. 2	3.285190	1,928.4	6,327
Marinette, Marinette County Courthouse, dome (Wis.) 1934 (d.).[1]	45 06 00.35	258 32 07	78 33 28	Beach	3.407115	2,553.4	8,377
	87 38 00.20	294 28 43	114 30 27	Menominee R. M. No. 2	3.548282	3,534.1	11,595
Sven observation tower (Wis.), 1934 (d.)[1]	45 09 14.491	142 37	322 37	Sven	1.12509	13.338	43.76
	87 14 19.687						
Middle Inlet lookout tower (Wis.), 1934 (d.)[1]	45 18 00.623	18 09	198 09	Inlet	0.79532	6.242	20.48
	87 50 20.945						
Eagle Bluff Lighthouse (Wis.), 1934 (d.)[1]	45 10 07.369	48 29 24	228 29 23	Eagle Bluff (U. S. L. S.)	1.599457	39.761	130.45
	87 14 11.645						

[1] No check on this position.

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED

Lake Superior

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Bayfield (U. S. L. S.) (Wis.)	46 50 03.16	208 58 43	29 36 45	Farquhars Knob (U. S. L. S.)	5.123986	133,041.2	436,486
	90 51 05.12	273 21 02	94 10 04	Porcupine Mountains (U. S. L. S.)	4.933147	85,732.8	281,275
Michigan Island Lighthouse (U. S. L. S.)	46 52 16.37	279 10 31	99 44 02	Porcupine Mountains (U. S. L. S.)	4.772765	59,260.5	194,424
	90 29 48.23	81 28 57	261 13 25	Bayfield (U. S. L. S.)	4.437152	27,362.3	89,771
Franklin shaft house No. 2 (U. S. L. S.)	47 08 33.51	333 27 35	153 36 13	Quaquaming (U. S. L S.)	4.525988	33,572.8	110,147
	88 34 09.62	42 08 01	222 03 56	Wheal Kate (U. S. L. S.)	4.022730	10,537.3	34,571
Lamson's tree (U. S. L. S.)	47 12 25.56	316 22 35	136 26 33	Franklin shaft house No. 2 (U. S. L. S.)	3.995364	9,893.8	32,460
	88 39 33.57	0 53 43	180 53 35	Wheal Kate (U. S. L. S.)	4.175693	14,986.3	49,168
Granite Island Lighthouse (U. S. L. S.)	46 43 15.03						
	87 24 43.04						
Observatory post, Thones Hill (U. S. L. S.)	46 31 53.92	160 15 00	340 13 20	Triloba (U. S. L. S.)	3.937705	8,663.7	28,424
	87 27 03.68	252 05 22	72 08 05	Marquette, old schoolhouse (U. S. L. S.).	3.701811	5,032.8	16,512
Marquette Catholic Church (U. S. L. S.)	46 32 28.90	333 20 54	153 21 43	Carp (U. S. L. S.)	3.502958	3,183.9	10,446
	87 23 54.96	1 26 13	181 26 11	Mount Mesnard (U. S. L. S.)	3.492216	3,106.1	10,191
Marquette, dome of City Hall (U. S. L. S.)	46 32 30.02	336 25 26	156 26 09	Carp (U. S. L. S.)	3.497298	3,142.7	10,311
	87 23 46.93	4 32 12	184 32 04	Mount Mesnard (U. S. L. S.)	3.498269	3,149.7	10,334
Marquette, M. E. Church (U. S. L. S.)	46 32 43.40	344 25 18	164 25 49	Carp (U. S. L. S.)	3.533900	3,419.0	11,217
	87 23 31.04	9 23 46	189 23 26	Mount Mesnard (U. S. L. S.)	3.556438	3,601.1	11,815
Marquette, old schoolhouse (U. S. L. S.)	46 32 43.98	13 20 14	193 19 46	Mount Mesnard (U. S. L. S.)	3.564624	3,669.6	12,039
	87 23 18.91	130 36 47	310 32 24	Triloba (U. S. L. S.)	4.006816	10,158.2	33,327
Marquette Lighthouse (U. S. L. S.)	46 32 47.92	285 29 18	105 46 12	Shelter Bay (U. S. L. S.)	4.490605	30,946.0	101,529
	87 22 34.09	26 00 53	205 59 52	Mount Mesnard (U. S. L. S.)	3.613687	4,108.5	13,479
Carp (U. S. L. S.)	46 30 56.74	80 14 11	260 13 20	Mount Mesnard (U. S. L. S.)	3.184204	1,528.3	5,014
	87 22 47.96	184 55 21	4 55 31	Marquette Lighthouse (U. S. L. S.)	3.537301	3,445.9	11,305

Schoolcraft County, Mich.: NE. corner of sec. 27, T. 46 N., R. 19 W. (U. S. L. S.).	46 21 44.01						
	86 39 26.96						
Schoolcraft County, Mich.: SE. corner of sec. 4, T. 45 N., R. 20 W. (U. S. L. S.).	46 19 06.42						
	86 48 13.18						
Delta County: NW. corner of NE. quarter of sec. 16, T. 42 N., R. 19 W. (U. S. L. S.).	46 02 31.29						
	86 41 16.63						
Delta County: SE. corner of sec. 12, T. 38 N., R. 23 W. (U. S. L. S.).	45 41 12.84						
	87 06 02.66						
△⊙91. Gillman (U. S. L. S.), 1868	46 35 15.96						
	90 31 24.41						
Little Girls Point, stake 57, Gillman (U. S. L. S.)	46 36 31.17						
	90 20 01.91						
△1871. Presque Isle River (U. S. L. S.)	46 42 40.27						
	89 58 19.20						
⊙22. Gillman (U. S. L. S.), 1868	47 44 32.96						
	90 22 04.53						
△1. Lieutenant Rodgers, 1868, or Gillman (U. S. L. S.)	47 46 35.44						
	90 11 20.97						
⊙69. Lieutenant Rodgers (U. S. L. S.), 1868	47 50 45.04						
	89 56 13.30						
⊙53½. Lieutenant Rodgers (U. S. L. S.), 1868	47 51 54.18						
	89 53 19.70						
△X′ (U. S. L. S.)	48 06 11.97						
	88 35 15.97						
Isle Royal Lighthouse (U. S. L. S.)	48 05 23.66						
	88 34 45.08						
△Point (U. S. L. S.)	48 04 23.62						
	88 34 23.00						
Keweenaw Point, middle base (U. S. L. S.), 1871, l. 1929 (d. m.).	46 54 31.71	298 42 24	118 46 39	Quaquaming (U. S. L. S.)	3.926319	8,439.5	27,689
	88 28 10.80	18 31 46	198 30 58	Keweenaw Point south base (U. S. L. S.).	3.639534	4,360.5	14,306
Mount Houghton (U. S. L. S.), 1867, l. 1934	47 24 26.08	248 38 25	68 44 57	Vulcan (U. S. L. S.)	4.077537	11,954.7	39,221
	87 56 29.03	358 30 52	178 31 45	Huron Mountains (U. S. L. S.)	4.769445	58,809.2	192,943
East Bluff (U. S. L. S.), 1865	47 26 45.93	287 40 38	107 48 23	Manitou Island (U. S. L. S.)	4.143138	13,903.9	45,616
	87 47 37.94	68 50 50	248 44 19	Mount Houghton (U. S. L. S.)	4.076983	11,939.4	39,171

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Superior—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Manitou Island Lighthouse (U. S. L. S.), 1865	47 25 11.12	87 09 13	266 53 34	Mount Houghton (U. S. L. S.)	4.427886	26,784.7	87,876
	87 35 13.09	100 42 01	280 32 52	East Bluff (U. S. L. S.)	4.200888	15,881.4	52,104
West Bluff (U. S. L. S.), 1865, l. 1934	47 27 57.23	283 19 42	103 25 08	East Bluff (U. S. L. S.)	3.978602	9,519.2	31,231
	87 55 00.07	15 57 51	195 56 46	Mount Houghton (U. S. L. S.)	3.831360	6,782.0	22,251
Montreal (U. S. L. S.), 1865	47 26 23.11	46 24 52	226 22 39	Mount Houghton (U. S. L. S.)	3.719358	5,240.3	17,193
	87 53 27.99	146 26 30	326 25 22	West Bluff (U. S. L. S.)	3.542630	3,488.4	11,445
Silver Creek (U. S. L. S.), 1865	47 27 07.64	75 10 12	255 07 10	Montreal (U. S. L. S.)	3.729524	5,364.4	17,600
	87 49 20.50	102 11 07	282 06 57	West Bluff (U. S. L. S.)	3.861859	7,275.4	23,869
C (U. S. L. S.), 1865	47 28 27.89	311 00 57	131 02 37	Silver Creek (U. S. L. S.)	3.576943	3,775.2	12,386
	87 51 36.48	31 13 59	211 12 37	Montreal (U. S. L. S.)	3.653812	4,506.2	14,784
D (U. S. L. S.), 1865	47 27 37.16	186 28 41	6 28 47	C (U. S. L. S.)	3.197734	1,576.6	5,173
	87 51 44.97	286 45 02	106 46 48	Silver Creek (U. S. L. S.)	3.499766	3,160.6	10,369
⊙16 Gillman (U. S. L. S.)	47 28 29.37	271 49 49	91 50 39	C (U. S. L. S.)	3.155624	1,430.9	4,695
	87 52 44.78	322 09 18	142 10 02	D (U. S. L. S.)	3.310004	2,041.8	6,699
A (U. S. L. S.), 1865	47 28 06.34	137 29 42	317 29 19	⊙16 Gillman (U. S. L. S.)	2.984500	964.9	3,166
	87 52 13.64	229 27 54	49 28 21	C (U. S. L. S.)	3.010299	1,024.0	3,360
Copper Harbor astronomic station (U. S. L. S.), 1865	47 28 03.74	128 21 01	308 20 26	⊙16 Gillman (U. S. L. S.)	3.105901	1,276.1	4,187
	87 51 56.98	209 55 49	29 56 04	C (U. S. L. S.)	2.934823	860.6	2,823
Copper Harbor latitude mark (U. S. L. S.), 1865	47 28 08.85	122 20 47	302 20 12	⊙16 Gillman (U. S. L. S.)	3.073566	1,184.6	3,886
	87 51 56.98	216 08 57	36 09 12	C (U. S. L. S.)	2.862132	728.0	2,388
B (U. S. L. S.), 1865	47 28 00.19	104 18 44	284 18 18	A (U. S. L. S.)	2.885337	768.0	2,520
	87 51 38.11	182 17 26	2 17 27	C (U. S. L. S.)	2.932442	855.9	2,808
Copper Harbor Lighthouse (U. S. L. S.), 1865	47 28 28.06	1 08 29	181 08 28	B (U. S. L. S.)	2.934825	860.6	2,823
	87 51 37.29	48 37 19	228 36 52	A (U. S. L. S.)	3.006264	1,014.5	3,328
Mount Bohemia (U. S. L. S.), 1865, l. 1934	47 23 30.60	221 34 05	41 38 22	West Bluff (U. S. L. S.)	4.041869	11,012.1	36,129
	88 00 48.95	252 31 13	72 34 25	Mount Houghton (U. S. L. S.)	3.756883	5,713.2	18,744
Mount Lookout (U. S. L. S.), 1865 (Bald Pate, 1855), l. 1934.	47 26 53.15	261 53 02	82 01 14	West Bluff (U. S. L. S.)	4.150276	14,134.4	46,373
	88 06 08.20	313 02 12	133 06 07	Mount Bohemia (U. S. L. S.)	3.961918	9,160.5	30,054
⊙CXXI (U. S. L. S.)	47 28 05.57	270 54 46	91 03 32	West Bluff (U. S. L. S.)	4.175261	14,971.4	49,119
	88 06 54.84	336 24 02	156 24 36	Mount Lookout (U. S. L. S.)	3.387458	2,440.4	8,007
Eagle Harbor Lighthouse (U. S. L. S.)	47 27 40.03	256 30 06	76 32 02	⊙CXXI (U. S. L. S.)	3.529301	3,383.0	11,099
	88 09 31.92	288 43 06	108 45 36	Mount Lookout (U. S. L. S.)	3.653803	4,506.1	14,784

Keweenaw Bay

Huron Island Lighthouse (U. S. L. S.)	46 57 47.74	327 56 42	148 00 05	Huron Mountains (U. S. L. S.)	4.046230	11,123.2	36,493
	87 59 55.83	103 45 15	283 16 07	Wheal Kate (U. S. L. S.)	4.715075	51,889.0	170,239
Point Abbeye (U. S. L. S.), 1867	46 58 02.28	95 17 14	275 05 49	Crebassa (U. S. L. S.)	4.298871	19,900.8	65,291
	88 08 39.99	161 11 55	341 08 01	Traverse Point (U. S. L. S.)	4.319672	20,877.2	68,495
Huron Island (U. S. L. S.), 1867	46 57 47.44	94 19 53	274 02 05	Crebassa (U. S. L. S.)	4.490956	30,971.1	101,611
	87 59 56.35	138 44 14	318 33 57	Traverse Point (U. S. L. S.)	4.430260	26,931.5	88,358
Tobacco River (U. S. L. S.), 1867	47 15 42.57	342 37 22	162 45 03	Huron Mountains (U. S. L. S.)	4.649772	44,644.9	146,472
	88 05 46.72	38 39 31	218 33 30	Traverse Point (U. S. L. S.)	4.220512	16,615.4	54,512
Bete Gris (U. S. L. S.), 1867	47 20 05.41	357 52 51	177 53 56	Huron Mountains (U. S. L. S.)	4.705639	50,773.7	166,580
	87 56 45.70	45 57 35	225 44 56	Traverse Point (U. S. L. S.)	4.481389	30,296.3	99,397
Keweenaw (U. S. L. S.), 1867	47 24 05.07	15 14 55	195 05 46	Huron Mountains (U. S. L. S.)	4.779888	60,240.4	197,639
	87 42 48.83	67 13 46	247 03 30	Bete Gris (U. S. L. S.)	4.280015	19,055.3	62,517
Manitou Island (U. S. L. S.), 1867	47 24 28.74	21 26 24	201 13 04	Huron Mountains (U. S. L. S.)	4.800718	63,200.1	207,349
	87 37 06.09	89 55 34	269 41 18	Mount Houghton (U. S. L. S.)	4.387079	24,382.5	79,995
Stannard Rock day beacon (U. S. L. S.), 1867	47 10 37.77	58 13 57	237 43 17	Huron Mountains (U. S. L. S.)	4.796764	62,627.3	205,470
	87 13 22.51	124 56 26	304 31 15	Vulcan (U. S. L. S.)	4.720352	52,523.3	172,320
Schultz (1865) (U. S. L. S.)	46 51 37.27	202 26 49	22 30 04	Crebassa (U. S. L. S.)	4.170701	14,815.0	48,606
	88 28 45.31	246 21 41	66 32 11	Middle (U. S. L. S.)	4.299513	19,930.3	65,388
Au Village (U. S. L. S.), 1865	46 51 05.43	99 41 20	279 38 01	Schultz (U. S. L. S.)	3.767870	5,859.6	19,224
	88 24 12.62	179 35 09	359 35 05	Crebassa (U. S. L. S.)	4.166536	14,673.6	48,142
Bendery (1865) (U. S. L. S.)	46 45 30.32	170 56 56	350 55 54	Schultz (U. S. L. S.)	4.059735	11,474.5	37,646
	88 27 20.09	200 59 40	21 01 57	Au Village (U. S. L. S.)	4.044744	11,085.2	36,369
Portage Entry Lighthouse (U. S. L. S.)	46 58 41.06	344 59 55	165 01 44	Quaquaming (U. S. L. S.)	4.085375	12,172.4	39,936
	88 24 50.04	38 00 09	217 58 35	Keweenaw Point north base (U. S. L. S.).	3.646137	4,427.3	14,525
Crebassa latitude post (U. S. L. S.)	46 58 40.94	290 55 51	111 03 32	Middle (U. S. L. S.)	4.154985	14,288.4	46,878
	88 24 53.09	344 42 03	164 43 54	Quaquaming (U. S. L. S.)	4.085839	12,185.4	39,978

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Superior

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
St. Ignace (U. S. L. S.) (Canada), 1867, r. 1872 (d. m.)	48 47 18.927	358 19 05.9	178 21 41.6	Vulcan (U. S. L. S.)	5.174100	149,313.8	489,874
	87 51 06.752	35 48 05.0	215 16 15.9	Isle Royale East (U. S. L. S.)	4.955023	90,161.9	295,806
Tip Top (U. S. L. S.) (Canada), 1867, r. 1871 (d. m.)	48 16 24.484	56 11 52.3	234 52 12.9	Vulcan (U. S. L. S.)	5.210845	162,496.9	533,125
	86 00 12.193	113 27 06.9	292 04 00.5	St. Ignace (U. S. L. S.)	5.170413	148,051.6	485,733
Michipicoten (U. S. L. S.) (Canada), 1869, r. 1873, p. l. 1894 (d. m.).	47 45 21.369	77 14 07.2	255 49 27.0	Vulcan (U. S. L. S.)	5.169573	147,765.5	484,794
	85 52 58.274	171 09 46.6	351 04 24.0	Tip Top (U. S. L. S.)	4.765243	58,242.9	191,085
		309 38 11.0	130 34 29.4	Mamainse (U. S. L. S.)	5.099895	125,862.1	412,933
Paugon (U. S. L. S.) (Canada), 1869 (d. m.)	47 57 24.745	45 54 49.5	225 41 10.0	Michipicoten (U. S. L. S.)	4.505779	32,046.4	105,139
	85 34 33.067	138 02 06.2	317 43 00.3	Tip Top (U. S. L. S.)	4.676350	47,462.4	155,716
Gargantua (U. S. L. S.) (Canada), 1869, r. 1895 (d. m.)	47 34 42.225	335 06 32.1	155 23 01.6	Mamainse (U. S. L. S.)	4.829635	67,551.5	221,625
	84 58 54.537	12 24 02.1	192 12 05.0	Crisp (U. S. L. S.)	4.985228	96,655.8	317,112
		106 35 38.3	285 55 40.4	Michipicoten (U. S. L. S.)	4.848148	70,493.3	231,277
		133 35 59.9	313 09 36.5	Paugon (U. S. L. S.)	4.787232	61,267.8	201,009
Batchewana middle base (U. S. L. S.) (Canada), 1895 (d. m.).	46 53 15.84	357 08 47	177 09 06	Havilland (U. S. L. S.)	4.045167	11,096.0	36,404
	84 28 13.61	145 56 32	325 50 31	Mamainse (U. S. L. S.)	4.270612	18,647.1	61,178
Whitefish Point latitude post (U. S. L. S.), 1867	46 46 06.10						
	84 57 26.46						
Robbins (U. S. L. S.), 1895 (d. m.)	46 38 04.98	200 49 21	20 52 38	Whitefish Point (U. S. L. S.)	4.207348	16,119.4	52,885
	85 02 03.24	281 01 38	81 14 58	Parisian Island (U. S. L. S.)	4.374181	23,669.1	77,654
Salt Point (U. S. L. S.), 1896 (d. m.)	46 28 12.29	167 23 30	347 19 14	Whitefish Point (U. S. L. S.)	4.533953	34,194.2	112,185
	84 51 41.39	204 49 57	24 55 44	Parisian Island (U. S. L. S.)	4.383687	24,192.8	79,373

St. Marys River

Lake George Lighthouse (U. S. L. S.), 1893	46 24 38.57	160 23 39	340 20 01	Rankin Mountain (U. S. L. S.)	4.280678	19,084.4	62,613
	84 08 54.77	273 41 02	93 45 49	Laird (U. S. L. S.)	3.930296	8,517.2	27,944
Phillips (U. S. L. S.) (Canada), 1893 (d. m.)	46 28 33.53	87 28 37	267 06 43	Larke (U. S. L. S.)	4.587577	38,688.1	126,929
	83 53 08.72	112 05 39	291 50 34	Rankin Mountain (U. S. L. S.)	4.457189	28,654.2	94,010
Sault Ste. Marie Observatory, west pier (U. S. L. S.), 1893 (d. m.).	46 30 05.04	158 59 52	338 58 12	Korah (U. S. L. S.)	3.913877	8,201.2	26,907
	84 20 56.39	178 06 38	358 06 29	Azimuth (U. S. L. S.)	3.907144	8,075.0	26,493

Green Bay

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Round Island (U. S. L. S.), 1864	45 44 53.29	Flat Rock (U. S. L. S.), 1863	45 47 29.86
	86 45 52.44		87 03 24.45
Garden Bluff (U. S. L. S.), 1864	45 46 55.16	E (south) (U. S. L. S.), 1863	45 49 52.65
	86 37 49.63		87 00 14.99
Chippewa Point (U. S. L. S.), 1864	45 43 12.73	Bluff (U. S. L. S.), 1863	45 50 00.20
	86 50 33.60		87 02 35.86
St. Vidal Point (U. S. L. S.), 1864	45 47 41.27	A east base (U. S. L. S.), 1863	45 50 52.35
	86 47 01.61		87 00 02.71
Middle Bluff (U. S. L. S.), 1864	45 43 29.07	D (U. S. L. S.), 1863	45 50 53.78
	86 39 58.82		86 58 52.15
Indian Point (U. S. L. S.), 1864	45 50 31.48	C (U. S. L. S.), 1863	45 52 16.51
	86 43 08.62		87 00 18.23
Stony Point (U. S. L. S.), 1864	45 50 09.73	B west base (U. S. L. S.), 1863	45 51 21.23
	86 38 53.37		87 01 22.33
Valentine Point (U. S. L. S.), 1864	45 50 46.25	E (north) (U. S. L. S.), 1863	45 51 52.28
	86 32 24.27		86 57 50.84
Porcupine Point (U. S. L. S.), 1864	45 52 37.56	F (north) (U. S. L. S.), 1863	45 53 35.70
	86 35 56.26		86 59 02.68
Fishdam (old) (U. S. L. S.), 1864	45 53 27.96	G (north) (U. S. L. S.), 1863	45 53 00.52
	86 32 29.85		86 56 50.54
St. Vidal Island (U. S. L. S.), 1864	45 48 00.83	H (U. S. L. S.), 1863	45 53 57.06
	86 45 37.40		86 56 55.78
Sand Point (U. S. L. S.), 1863	45 44 41.18	I (mouth of Whitefish River) (U. S. L. S.), 1863	45 54 28.20
	87 02 40.06		86 57 44.94
G (south) (U. S. L. S.), 1863	45 42 23.17		
	86 59 04.08		

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Michigan, north end

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Boyers Bluff (old) (U. S. L. S.) (Wis.), 1864	45 25 12.72 86 56 10.79						
Peninsula Point (U. S. L. S.), 1864	45 40 04.49 86 58 01.75						
Ford River (old) (U. S. L. S.), 1864	45 41 14.02 87 06 01.92						
Burnt Bluff (old) (U. S. L. S.), 1864	45 41 09.60 86 42 39.15	15 20 07 73 34 48	195 15 35 253 12 05	Rock Island (U. S. L. S.) Bark River (U. S. L. S.)	4.494949 4.634322	31,257.1 43,084.6	102,549 141,353
South Fox (1860) (U. S. L. S.), 1860	45 24 57.97 85 51 37.00	90 13 24 114 36 26	269 32 33 294 00 00	Rock Island (U. S. L. S.) Burnt Bluff (old) (U. S. L. S.)	4.874183 4.862618	74,848.5 72,881.6	245,565 239,112
Northwest Manitou (1864) (U. S. L. S.), 1864	45 09 22.98 86 02 45.98	115 40 58 206 43 55	295 08 07 26 51 51	Rock Island (U. S. L. S.) South Fox (1860) (U. S. L. S.)	4.825512 4.509705	66,913.2 32,337.4	219,531 106,094
Cat Head (1860) (U. S. L. S.), 1860	45 10 58.07 85 37 05.18	85 09 56 143 51 35	264 51 43 323 41 15	Northwest Manitou (1864) (U.S.L.S.) South Fox (1860) (U. S. L. S.)	4.528602 4.507076	33,775.5 32,142.2	110,812 105,453
Middle Village (U. S. L. S.), 1860	45 34 42.32 85 06 13.40	22 21 36 96 03 44	202 15 28 275 46 53	Pine River (U. S. L. S.) Beaver Island (1860) (U. S. L. S.)	4.471059 4.489243	29,584.1 30,849.1	97,061 101,211
Pine River (U. S. L. S.), 1860	45 19 55.77 85 14 50.24	101 12 47 147 30 32	280 46 36 327 19 51	South Fox (1860) (U. S. L. S.) Beaver Island (1860) (U. S. L. S.)	4.689450 4.559406	48,915.9 36,258.2	160,485 118,957
Hat Island (U. S. L. S.), 1853	45 49 01.63 85 17 57.11	330 04 46 33 28 38	150 13 10 213 20 09	Middle Village (U. S. L. S.) Beaver Island (1860) (U. S. L. S.)	4.485553 4.446658	30,588.1 27,967.8	100,354 91,758
Pt. aux Chenes (1853) (U. S. L. S.), 1853	45 55 39.58 84 54 48.71	20 56 14 67 49 48	200 48 04 247 33 12	Middle Village (U. S. L. S.) Hat Island (U. S. L. S.)	4.618482 4.510102	41,541.5 32,367.0	136,291 106,191
d (U. S. L. S.), 1853	45 45 33.91 84 56 15.94	102 59 00 185 44 20	282 43 28 5 45 23	Hat Island (U. S. L. S.) Point aux Chenes (1853) (U. S. L. S.)	4.459814 4.274020	28,828.0 18,794.0	94,580 61,660
Grand Traverse Lighthouse (U. S. L. S.), 1860	45 12 36.85 85 32 59.84						
North Fox (1860) (U. S. L. S.), 1860	45 28 09.85 85 46 25.82	290 06 56 48 48 55	110 29 26 228 45 13	Pine River (U. S. L. S.) South Fox (1860) (U. S. L. S.)	4.643045 3.953780	43,958.7 8,990.4	144,221 29,496
Beaver Island Lighthouse (U. S. L. S.), 1860	45 34 32.30 85 34 24.49	316 34 01 51 45 42	136 47 58 231 33 26	Pine River (U. S. L. S.) South Fox (1860) (U. S. L. S.)	4.570457 4.456106	37,192.6 28,582.9	122,023 93,776
Waugoshance Lighthouse (1853) (U. S. L. S.), 1853	45 47 14.21 85 05 29.94	101 41 24 221 29 47	281 32 28 41 37 27	Hat Island (U. S. L. S.) Point aux Chenes (1853) (U. S. L. S.)	4.216751 4.319153	16,472.2 20,852.3	54,043 68,413
Biddle Point (U. S. L. S.), 1854	46 04 31.72 85 22 41.21	282 36 18 347 56 31	102 48 51 167 59 55	Manitou Payment (U. S. L. S.) Hat Island (U. S. L. S.)	4.362516 4.467770	23,041.8 29,360.9	75,596 96,328
Point Paterson (U. S. L. S.), 1854	45 58 03.97 85 39 15.10	240 39 07 260 51 29	60 51 02 81 15 56	Biddle Point (U. S. L. S.) Manitou Payment (U. S. L. S.)	4.389207 4.647634	24,502.3 44,425.7	80,388 145,753
Garden Island (U. S. L. S.), 1854	45 49 19.19 85 31 13.72	147 24 24 201 20 37	327 18 38 21 26 46	Point Paterson (U. S. L. S.) Biddle Point (U. S. L. S.)	4.284228 4.480858	19,241.0 32,259.2	63,127 99,275
Scott Point (U. S. L. S.)	45 57 34.30 85 41 44.38	254 04 52 318 17 01	74 06 40 138 24 34	Point Paterson (U. S. L. S.) Garden Island (U. S. L. S.)	3.524023 4.310879	3,342.1 20,458.7	10,965 67,122
High Island (U. S. L. S.), 1854	45 43 54.07 85 41 01.34	184 58 55 231 36 32	5 00 11 51 43 33	Point Paterson (U. S. L. S.) Garden Island (U. S. L. S.)	4.420617 4.209095	26,340.1 16,184.3	86,417 53,098
Seul Choix (U. S. L. S.)	45 55 14.34 85 54 40.27	289 43 54 319 49 58	110 00 43 139 59 45	Garden Island (U. S. L. S.) High Island (U. S. L. S.)	4.508629 4.438568	32,257.4 27,451.6	105,831 90,064
Gull Island (U. S. L. S.), 1855	45 42 08.93 85 50 00.12	166 01 17 241 15 57	345 57 56 61 29 24	Seul Choix (U. S. L. S.) Garden Island (U. S. L. S.)	4.397795 4.442958	24,991.7 27,730.5	81,994 90,979

Straits of Mackinac

Point St. Martin (new) (U. S. L. S.), 1851, r. 1896 (m.)	45 58 10.14 84 31 55.52	302 02 58 27 47 06	122 07 14 207 43 29	Goose Island (U. S. L. S.) C. Mackinac Island (U. S. L. S.)	3.956924 4.146334	9,055.7 14,006.6	29,710 45,953
Point Fuyard (new) (U. S. L. S.), 1896	45 57 01.36 84 24 04.32	42 40 56 58 27 11	222 39 34 238 17 55	Goose Island (U. S. L. S.) C. Mackinac Island (U. S. L. S.)	3.562806 4.292030	3,654.3 19,589.8	11,989 64,271
McGulpin Point Lighthouse (1896) (U. S. L. S.), 1896	45 47 13.62 84 46 22.67	213 54 10 221 20 19	33 56 52 41 35 39	D. St. Ignace (U. S. L. S.) Robinson (U. S. L. S.)	3.942492 4.619691	8,759.8 41,657.3	28,739 136,671
St. Ignace, smokestack (U. S. L. S.), 1896	45 51 18.37 84 42 15.22	57 32 48 169 26 54	237 32 33 349 26 08	D. St. Ignace (U. S. L. S.) Rabbit Back (U. S. L. S.)	2.729616 3.876081	536.6 7,517.6	1,760 24,664
Magnetic station (Mackinac), west base (U. S. L. S.), 1896.	45 47 21.17 84 46 21.49	214 37 56 237 47 55	34 40 37 57 54 39	St. Ignace (U. S. L. S.) C. Mackinac Island (U. S. L. S.)	3.932104 4.157200	8,552.7 14,361.5	28,060 47,118
B. Mackinac, east base (old) (U. S. L. S.)	45 44 32.40 84 40 07.87	165 21 16 197 39 38	345 19 30 17 41 54	D. St. Ignace (U. S. L. S.) C. Mackinac Island (U. S. L. S.)	4.102365 4.129976	12,658.0 13,488.9	41,529 44,255

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Straits of Mackinac—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
H. near Pine River (U. S. L. S.), 1851	46 02 25.49	356 06 20	176 07 06	C. Mackinac Island (U. S. L. S.)	4.308055	20,326.1	66,687
	84 38 02.17	27 21 03	207 17 15	Rabbit Back (U. S. L. S.)	4.172163	14,864.9	48,769
I. Point St. Martin (U. S. L. S.), 1851, r. 1896 (m.)	45 58 10.13	27 47 10	207 43 32	C. Mackinac Island (U. S. L. S.)	4.146336	14,006.7	45,954
	84 31 55.51	70 11 37	250 03 26	Rabbit Back (U. S. L. S.)	4.194702	15,656.8	51,367
K. Goose Island (north end) (U. S. L. S.)	45 55 34.34	61 57 58	241 50 04	C. Mackinac Island (U. S. L. S.)	4.206930	16,103.9	52,834
	84 25 59.29	122 07 13	302 02 57	I. Point St. Martin (U. S. L. S.)	3.956914	9,055.5	29,710
L. Point Fuyard (U. S. L. S.), 1849	45 55 58.04	65 39 11	245 29 01	C. Mackinac Island (U. S. L. S.)	4.303356	20,107.4	65,969
	84 22 49.02	109 10 00	289 03 27	I. Point St. Martin (U. S. L. S.)	4.095397	12,456.5	40,868
Bois Blanc Lighthouse (U. S. L. S.), 1849	45 48 37.64	109 15 08	289 06 44	C. Mackinac Island (U. S. L. S.)	4.206031	16,070.6	52,725
	84 25 14.91	193 00 55	13 02 40	L. Point Fuyard (U. S. L. S.)	4.144772	13,956.4	45,789
O. Bois Blanc Island (U. S. L. S.), 1851	45 46 19.14	115 23 27	295 12 15	C. Mackinac Island (U. S. L. S.)	4.349544	22,363.7	73,372
	84 21 21.67	173 59 23	353 58 20	L. Point Fuyard (U. S. L. S.)	4.254600	17,972.1	58,963
N. Beaver Tail Point (U. S. L. S.), 1851	45 57 56.72	33 46 22	213 38 24	O. Bois Blanc Island (U. S. L. S.)	4.413123	25,889.5	84,939
	84 10 15.57	77 21 04	257 12 02	L. Point Fuyard (U. S. L. S.)	4.221052	16,636.1	54,580
Spectacle Reef water station (U. S. L. S.), 1851	45 46 05.08	91 32 02	271 22 36	O. Bois Blanc Island (U. S. L. S.)	4.232735	17,089.7	56,068
	84 08 11.00	173 02 23	353 00 54	N. Beaver Tail Point (U. S. L. S.)	4.345080	22,135.0	72,621
M. water station (1851) (U. S. L. S.)	45 54 46.81	97 03 06	276 53 06	L. Point Fuyard (U. S. L. S.)	4.258297	18,125.8	59,468
	84 08 54.05	163 20 04	343 19 06	N. Beaver Tail Point (U. S. L. S.)	3.786797	6,120.6	20,081
E′ of E. P. S. (U. S. L. S.), 1851	45 58 03.64	31 09 19	211 07 16	M. water station (1851) (U. S. L. S.)	3.851266	7,100.1	23,294
	84 06 03.61	87 46 04	267 43 03	N. Beaver Tail Point (U. S. L. S.)	3.734739	5,429.2	17,812
Point St. Vital (U. S. L. S.), 1851	45 56 50.98	28 29 15	208 23 16	Spectacle Reef, water station (U. S. L. S.).	4.355607	22,678.1	74,403
	83 59 50.41	98 38 08	278 30 39	N. Beaver Tail Point (U. S. L. S.)	4.134022	13,615.1	44,669
Mast (U. S. L. S.)	45 34 28.60	142 39 07	322 29 53	O. Bois Blanc Island (U. S. L. S.)	4.441272	27,623.1	90,627
	84 08 26.09	180 52 07	0 52 18	Spectacle Reef, water station (U. S. L. S.).	4.332547	21,505.4	70,556
Round Island astronomical station (U. S. L. S.), 1853	45 50 06.76	104 15 43	284 11 31	D. St. Ignace (U. S. L. S.)	3.893446	7,824.3	25,670
	84 36 44.73	173 27 22	353 27 12	C. Mackinac Island (U. S. L. S.)	3.405759	2,545.4	8,351
P (U. S. L. S.), 1851	45 48 21.21	81 53 11	261 45 10	A. Mackinac, west base (U. S. L. S.)	4.165563	14,640.7	48,034
	84 35 11.45	118 24 14	298 18 55	St. Ignace (U. S. L. S.)	4.037783	10,909.0	35,791
Q (U. S. L. S.), 1849	45 44 30.54	158 22 02	338 19 20	D. St. Ignace (U. S. L. S.)	4.121819	13,237.9	43,431
	84 38 50.01	213 31 29	33 34 06	P (U. S. L. S.)	3.931715	8,545.1	28,035
R (U. S. L. S.), 1853	45 45 41.22	77 16 28	257 11 09	Q (U. S. L. S.)	3.994472	9,873.5	32,393
	84 31 24.51	135 14 14	315 11 32	P (U. S. L. S.)	3.842567	6,959.3	22,832
S (U. S. L. S.), 1851	45 42 33.34	168 19 13	348 18 00	P (U. S. L. S.)	4.040106	10,967.5	35,983
	84 33 28.63	204 48 56	24 50 25	R (U. S. L. S.)	3.805592	6,391.3	20,969
T (U. S. L. S.)	45 44 03.98	60 22 30	240 19 47	S (U. S. L. S.)	3.752587	5,657.0	18,560
	84 29 41.29	143 23 37	323 22 23	R (U. S. L. S.)	3,572928	3,740.5	12,272
U (U. S. L. S.), 1851	45 40 22.23	131 06 52	311 04 18	S (U. S. L. S.)	3.789478	6,158.5	20,205
	84 29 54.13	182 19 18	2 19 27	T (U. S. L. S.)	3.835809	6,851.9	22,480
V (U. S. L. S.), 1849	45 43 50.07	10 43 45	190 43 05	U (U. S. L. S.)	3.814979	6,531.0	21,427
	84 28 57.96	67 59 38	247 56 24	S (U. S. L. S.)	3.800373	6,315.0	20,718
X (U. S. L. S.), 1851	45 43 13.12	83 33 35	263 27 38	S (U. S. L. S.)	4.036047	10,865.4	35,648
	84 25 09.49	103 01 34	282 58 51	V (U. S. L. S.)	3.705058	5,070.6	16,636
W (U. S. L. S.), 1851	45 40 10.40	143 58 42	323 55 59	V (U. S. L. S.)	3.923661	8,388.0	27,520
	84 25 09.82	180 04 22	0 04 22	X (U. S. L. S.)	3.751382	5,641.3	18,508
Y (U. S. L. S.), 1851	45 39 50.56	95 00 00	274 56 07	W (U. S. L. S.)	3.849515	7,071.6	23,201
	84 19 44.37	131 40 08	311 36 15	X (U. S. L. S.)	3.973703	9,412.5	30,881
Cheboygan Lighthouse (1851) (U. S. L. S.), 1851	45 40 10.29	180 10 55	0 10 55	X (U. S. L. S.)	3.751624	5,644.5	18,519
	84 25 10.31	274 54 09	94 58 02	Y (U. S. L. S.)	3.850156	7,082.0	23,235
Z (U. S. L. S.)	45 38 05.22						
	84 12 55.64						
2 of E. P. S., 1849, northwest point of Isle Brule, or Great St. Martin Island (U. S. L. S.).	45 58 50.25						
	84 38 07.44						
G or 8 (on main shore) (U. S. L. S.)	45 58 21.94						
	84 41 05.33						
V of E. P. S. (U. S. L. S.)	45 58 59.73						
	84 16 17.84						

777209°—31——9

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Straits of Mackinac—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
P of E. P. S., 1851, Les Cheneaux (U. S. L. S.)	45 58 37.13 84 14 01.18						
Y of E. P. S. (U. S. L. S.)	45 59 03.25 84 12 48.21						
3 on Isle Brule (U. S. L. S.)	45 57 28.27 84 38 18.43						
W 1849 (Goose Island Reef) (U. S. L. S.)	45 54 37.69 84 25 25.94						
P of E. P. S. (U. S. L. S.), 1849	45 58 19.33 84 25 13.56						
I of E. P. S. (U. S. L. S.)	45 59 35.29 84 25 48.66						
Detour Lighthouse (1849) (U. S. L. S.)	45 57 20.91 83 54 55.64						

St. Marys River

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Logarithm (meters)	Meters	Feet
South Gros Cap (U. S. L. S.) (Canada), 1893, r. 1894 (d. m.).	46 32 00.54 84 35 19.70	37 59 25 144 18 43	217 56 24 324 12 37	Iroquois (U. S. L. S.) Parisian Island (U. S. L. S.)	3.936673 4.263786	8,643.2 18,356.3	28,357 60,224
A (U. S. L. S.) (Canada)	46 30 09.01 84 33 33.77	66 03 30 146 45 34	245 59 12 326 44 17	Iroquois (U. S. L. S.) South Gros Cap (U. S. L. S.)	3.918741 3.614695	8,293.6 4,118.1	27,210 13,511
I (U. S. L. S.)	46 26 38.38 84 35 24.48	121 00 04 199 56 54	300 57 07 19 58 15	Iroquois (U. S. L. S.) A (U. S. L. S.)	3.784447 3.840051	6,087.6 6,919.1	19,972 22,700
B (U. S. L. S.) (Canada)	46 28 57.62 84 31 55.31	46 05 42 136 23 56	226 03 10 316 22 45	I (U. S. L. S.) A (U. S. L. S.)	3.792194 3.483517	6,197.2 3,044.5	20,332 9,988
M (U. S. L. S.)	46 26 01.23 84 31 24.91	102 40 02 173 12 38	282 37 08 353 12 16	I (U. S. L. S.) B (U. S. L. S.)	3.719453 3.739168	5,241.5 5,484.9	17,196 17,995
10 (U. S. L. S.) (Canada)	46 28 08.92 84 30 47.90	11 19 49 64 41 06	191 19 22 244 37 45	M (U. S. L. S.) I (U. S. L. S.)	3.604333 3.814971	4,021.0 6,530.9	13,192 21,427
15, Ripley (U. S. L. S.)	46 26 48.75 84 29 49.32	54 17 21 153 12 30	234 16 12 333 11 48	M (U. S. L. S.) 10 (U. S. L. S.)	3.400252 3.442970	2,513.3 2,773.1	8,246 9,098
12 (U. S. L. S.) (Canada)	46 27 50.56 84 28 26.93	42 39 56 100 41 20	222 38 56 280 39 38	15, Ripley (U. S. L. S.) 10 (U. S. L. S.)	3.414114 3.485857	2,594.9 3,061.0	8,513 10,043
17 (U. S. L. S.)	46 26 22.31 84 27 52.24	108 06 13 164 48 16	288 04 48 344 47 51	15, Ripley (U. S. L. S.) 12 (U. S. L. S.)	3.419797 3.450788	2,629.0 2,823.5	8,625 9,263
N (U. S. L. S.)	46 28 13.77 84 27 19.84	11 21 58 63 24 12	191 21 34 243 23 24	17 (U. S. L. S.) 12 (U. S. L. S.)	3.545369 3.204395	3,510.5 1,601.0	11,517 5,253
C (U. S. L. S.) (Canada)	46 28 36.24 84 27 41.74	326 02 23 34 21 10	146 02 39 214 20 37	N (U. S. L. S.) 12 (U. S. L. S.)	2.922482 3.232686	836.5 1,708.8	2,744 5,606
O (U. S. L. S.)	46 28 36.13 84 26 31.03	56 27 57 90 08 44	236 27 22 270 07 52	N (U. S. L. S.) C (U. S. L. S.)	3.096648 3.178532	1,249.2 1,508.5	4,098 4,949
E (U. S. L. S.) (Canada)	46 30 00.97 84 26 27.12	1 49 15 31 19 09	181 49 12 211 18 15	O (U. S. L. S.) C (U. S. L. S.)	3.418493 3.486032	2,621.2 3,062.2	8,600 10,047
D (U. S. L. S.) (Canada)	46 29 48.74 84 28 03.97	260 07 31 315 27 04	80 08 45 165 27 23	E (U. S. L. S.) C (U. S. L. S.)	3.343294 3.364114	2,204.4 2,312.7	7,232 7,588
P (U. S. L. S.)	46 29 08.92 84 25 22.45	55 18 58 139 22 31	235 18 08 319 21 44	O (U. S. L. S.) E (U. S. L. S.)	3.250174 3.325910	1,779.0 2,117.9	5,837 6,948
□2 (U. S. L. S.) (Canada)	46 30 19.34 84 24 03.42	37 47 16 79 31 47	217 46 19 259 30 03	P (U. S. L. S.) E (U. S. L. S.)	3.439503 3.493614	2,751.1 3,116.1	9,026 10,223
R (U. S. L. S.)	46 29 22.30 84 24 47.05	119 14 04 207 50 26	299 12 51 27 50 58	E (U. S. L. S.) □2 (U. S. L. S.)	3.388371 3.299208	2,445.5 1,991.6	8,023 6,534
3 (U. S. L. S.)	46 29 33.44 84 22 54.15	81 53 00 133 49 02	261 51 38 313 48 11	R (U. S. L. S.) □2 (U. S. L. S.)	3.386010 3.311135	2,432.3 2,047.1	7,980 6,716
△2 (U. S. L. S.) (Canada)	46 30 32.84 84 23 30.09	337 19 08 59 36 27	157 19 34 239 36 03	3 (U. S. L. S.) □2 (U. S. L. S.)	3.298359 2.915927	1,987.7 824.0	6,521 2,703
7 (U. S. L. S.)	46 30 04.13 84 22 23.40	34 40 58 121 56 46	214 40 35 301 55 57	3 (U. S. L. S.) △2 (U. S. L. S.)	3.061597 3.224159	1,152.4 1,675.6	3,781 5,497
6 (U. S. L. S.) (Canada)	46 30 35.75 84 21 35.77	46 07 47 87 53 44	226 07 13 267 52 21	7 (U. S. L. S.) △2 (U. S. L. S.)	3.148863 3.387200	1,408.8 2,438.9	4,622 8,002
9 (U. S. L. S.)	46 29 40.38 84 21 20.23	120 20 31 169 02 14	300 18 57 349 02 03	△2 (U. S. L. S.) 6 (U. S. L. S.)	3.506224 3.240979	3,207.9 1,741.7	10,525 5,714

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
8 (U. S. L. S.) (Canada)	46 30 21.40	58 23 29	238 22 19	9 (U. S. L. S.)	3.383127	2,416.2	7,927
	84 19 43.74	100 31 28	280 30 06	6 (U. S. L. S.)	3.385470	2,429.2	7,970
21 (U. S. L. S.)	46 29 20.16	100 35 16	280 33 22	9 (U. S. L. S.)	3.531818	3,402.7	11,164
	84 18 43.39	145 46 06	325 45 22	8 (U. S. L. S.)	3.359333	2,287.4	7,505
14, Ripley, Topsail Island (U. S. L. S.) (Canada)	46 29 43.30	57 30 31	237 29 53	21 (U S. L. S.)	3.123743	1,329.7	4,363
	84 17 50.81	116 03 05	296 01 43	8 (U. S. L. S.)	3.428172	2,680.2	8,793
L (U. S. L. S.)	46 25 05.15	134 47 05	314 45 26	I (U. S. L. S.)	3.611498	4,087.9	13,412
	84 33 08.56	231 56 52	51 58 07	M (U. S. L. S.)	3.448739	2,810.2	9,220
K (U. S. L. S.)	46 25 24.41	199 21 12	19 21 39	I (U. S. L. S.)	3.383979	2,420.9	7,943
	84 36 02.07	279 06 15	99 08 21	L (U S. L. S.)	3.574345	3,752.7	12,312
11 (U. S. L. S.)	46 25 59.75	156 34 14	336 33 58	Round Island Lighthouse (upper St. Marys River) (U. S. L. S.).	3.073042	1,183.2	3,882
	84 30 34.30	212 23 33	32 24 06	15, Ripley (U. S. L. S.)	3.253375	1,792.2	5,880
13 (U. S. L. S.)	46 26 24.44	36 50 46	216 50 27	11 (U. S. L. S.)	2.978997	952.8	3,126
	84 30 07.54	107 14 10	287 13 35	Round Island Lighthouse (upper St. Marys River) (U. S. L. S.).	3.037699	1,090.7	3,578
5 (U. S. L. S.)	46 29 38.48	76 41 21	256 40 58	3 (U. S. L. S.)	2.830185	676.4	2,219
	84 22 23.28	179 49 20	359 49 20	7 (U. S. L. S.)	2.898672	791.9	2,598
□9 (U. S. L. S.)	46 30 14.28	120 56 02	300 55 24	6 (U. S. L. S.)	3.110669	1,290.2	4,233
	84 20 43.86	260 15 32	80 16 16	8 (U. S. L. S.)	3.114111	1,300.5	4,267
□11 (U. S. L. S.)	46 30 02.12	58 40 41	238 40 03	9 (U. S. L. S.)	3.111042	1,291.3	4,237
	84 20 28.50	125 54 58	305 54 09	6 (U. S. L. S.)	3.248147	1,770.7	5,809
□4 (U. S. L. S.) (Canada)	46 30 13.12	311 57 41	131 58 16	14, Ripley, Topsail Island (U. S. L. S.).	3.139010	1,377.2	4,518
	84 18 38.83	3 24 19	183 24 16	21 (U. S. L. S.)	3.214369	1,638.2	5,375
□15 (U. S. L. S.)	46 29 37.89	159 22 14	339 21 57	8 (U. S. L. S.)	3.156989	1,435.5	4,710
	84 19 20.02	264 58 53	84 59 58	14, Ripley, Topsail Island (U. S. L. S.).	3.281004	1,909.9	6,266
Magnetic station, No. 1 (U. S. L. S.), 1894	46 29 54.50						
	84 20 33.91						
Magnetic station, No. 2 (U. S. L. S.), 1894	46 29 08.65						
	84 21 32.02						

Lake Superior, Whitefish Bay

Gargantua Lighthouse (U. S. L. S.) (Canada), 1895	47 33 28.87						
	84 57 48.31						
Middle Pancake (U. S. L. S.) (Canada), 1895 (d. m.)	46 57 27.64	225 31 41	45 36 12	Mamainse (U. S. L. S.)	4.039287	10,946.8	35,915
	84 42 38.06	344 19 26	164 21 30	Steamboat Island (U. S. L. S.)	4.122918	13,271.4	43,541
South Pancake (U. S. L. S.) (Canada), 1895 (d. m.)	46 55 03.56	227 36 37	147 40 40	Rudder Head (1868) (U. S. L. S.)	4.120769	13,205.9	43,326
	84 39 13.65	1 10 45	181 10 38	North Sandy (1895) (U. S. L. S.)	4.014824	10,347.2	33,947
East Bay (U. S. L. S.) (Canada), 1895 (d. m.)	46 51 35.52	79 34 49	259 22 42	North Sandy (1895) (U. S. L. S.)	4.331898	21,473.3	70,450
	84 22 47.33	136 57 43	316 47 44	Mamainse (U. S. L. S.)	4.404776	25,395.6	83,322
Rock (U. S. L. S.) (Canada), 1895 (d. m.)	46 49 32.06	147 40 55	327 32 46	Mamainse (U. S. L. S.)	4.422693	26,466.3	86,832
	84 25 18.08	219 56 37	39 58 27	East Bay (U. S. L. S.)	3.696685	4,973.8	16,318
Sand Point (U. S. L. S.) (Canada), 1895 (d. m.)	46 55 15.48	44 44 40	224 38 35	North Sandy (1895) (U. S. L. S.)	4.178126	15,070.4	49,443
	84 31 03.19	149 42 49	329 38 51	Mamainse (U. S. L. S.)	4.133726	13,605.9	44,639
Corbay Lighthouse (U. S. L. S.) (Canada), 1895	46 53 21.04	19 14 57	199 10 02	Parisian Island (U. S. L. S.)	4.416536	26,093.7	85,609
	84 36 58.77	70 06 42	249 38 50	Crisp (U. S. L. S.)	4.714182	51,782.4	169,889
Steamboat Island (U. S. L. S.) (Canada), 1895 (d. m.)	46 50 33.82	191 42 40	11 45 07	Mamainse (U. S. L. S.)	4.319705	20,878.8	68,500
	84 39 48.83	291 36 30	111 45 16	Havilland (U. S. L. S.)	4.216296	16,454.9	53,986
North Sandy (1868) (U. S. L. S.) (Canada), 1868, r. 1895 (d. m.).	46 49 39.30	15 33 42	195 30 52	Parisian Island (U. S. L. S.)	4.266438	18,468.8	60,593
	84 39 50.57	74 18 41	254 05 46	Whitefish Point (U. S. L. S.)	4.369640	23,422.9	76,847
South Sandy (U. S. L. S.) (Canada), 1895 (d. m.)	46 48 10.29	187 17 36	7 19 26	Mamainse (U. S. L. S.)	4.399300	25,078.4	82,278
	84 38 58.90	276 31 53	96 40 02	Havilland (U. S. L. S.)	4.156325	14,332.6	47,023
South Shore (U. S. L. S.) (Canada), 1895 (d. m.)	46 50 41.35	80 20 29	260 12 58	North Sandy (1895) (U. S. L. S.)	4.124281	13,313.2	43,678
	84 29 04.51	155 08 20	335 02 56	Mamainse (U. S. L. S.)	4.347963	22,282.5	73,105
Rudder Head (1895) (U. S. L. S.) (Canada), 1895 (d. m.).	46 49 42.15	87 01 43	266 57 08	North Sandy (1895) (U. S. L. S.)	3.902898	7,996.5	26,235
	84 33 06.94	169 05 21	349 02 54	Mamainse (U. S. L. S.)	4.351130	22,445.5	73,640
Rudder Head (1868) (U. S. L. S.) (Canada), 1868, r. 1895 (d. m.).	46 49 02.30	37 38 07	217 30 47	Parisian Island (U. S. L. S.)	4.322415	21,009.5	68,929
	84 33 39.95	96 22 55	276 18 45	North Sandy (1895) (U. S. L. S.)	3.865193	7,331.5	24,053

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Superior, Whitefish Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Maple Island (U.S. L. S.) (Canada), 1895 (d. m.)	46 46 12.01 84 34 49.34	136 14 14 175 49 03	316 10 54 355 47 51	North Sandy (1895) (U. S. L. S.) Mamainse (U. S. L. S.)	3.924664 4.456423	8,407.4 28,603.8	27,583 93,844
Goulais Point (1868) (U. S. L. S.) (Canada), 1868, r. 1895 (d. m.).	46 42 53.17 84 34 30.59	13 17 16 65 57 50	193 13 40 245 51 08	Iroquois (U. S. L. S.) Parisian Island (U. S. L. S.)	4.442559 4.109525	27,705.1 12,868.4	90,896 42,219
Goulais Point (1895) (U. S. L. S.) (Canada), (d. m.)	46 41 01.85 84 33 17.46	18 37 29 82 17 38	198 32 59 262 10 02	Iroquois (U. S. L. S.) Parisian Island (U. S. L. S.)	4.394871 4.128023	24,824.0 13,428.4	81,443 44,056
Crawford (U. S. L. S.) (Canada), 1895 (d. m.)	46 54 12.84 84 35 52.46	321 17 26 27 01 35	141 23 21 206 59 01	Havilland (U. S. L. S.) North Sandy (1895) (U. S. L. S.)	4.216073 3.993575	16,446.5 9,853.1	53,958 32,326
North Parisian (U. S. L. S.) (Canada), 1895 (d. m.)	46 42 59.50 84 44 02.98	206 13 36 248 53 40	26 16 59 69 05 30	North Sandy (1895) (U. S. L. S.) Havilland (U. S. L. S.)	4.126967 4.345902	13,395.8 22,177.0	43,949 72,759
South Parisian (U. S. L. S.) (Canada), 1895 (d. m.)	46 38 43.02 84 43 25.59	87 17 01 127 44 00	267 03 31 307 33 43	Robbins (U. S. L. S.) Whitefish Point (U. S. L. S.)	4.376576 4.356778	23,799.9 22,739.3	78,084 74,604
North Gros Cap (U. S. L. S.) (Canada), 1895 (d. m.)	46 34 50.15 84 35 05.82	24 59 29 131 18 55	204 56 18 311 12 39	Iroquois (U. S. L. S.) Parisian Island (U. S. L. S.)	4.123645 4.165850	13,293.7 14,650.4	43,614 48,066
Iroquois Lighthouse (U. S. L. S.), 1893	46 29 03.33 84 37 56.23	55 52 42 160 05 15	235 51 35 340 01 03	Iroquois (U. S. L. S.) Parisian Island (U. S. L. S.)	3.378834 4.335892	2,392.4 21,671.6	7,849 71,101
Iroquois Point observatory post (U. S. L. S.), 1867	46 29 03.14 84 37 55.05						
Iroquois Lighthouse (old) (U. S. L. S.)	46 29 02.91 84 37 54.41						
Iroquois (old station) (U. S. L. S.)	46 28 19.67 84 40 13.43	168 23 07 269 39 04	348 20 34 89 39 36	Parisian Island (U. S. L. S.) Iroquois (U. S. L. S.)	4.345868 2.976070	22,175.2 946.4	72,753 3,105
Taquamenon Island (U. S. L.S.), 1868, r. 1895 (d. m.)	46 31 54.53 84 56 55.54	228 05 56 286 26 22	48 15 32 106 39 02	Parisian Island (U. S. L. S.) Iroquois (U. S. L. S.)	4.354550 4.366935	22,623.0 23,277.4	74,222 76,369
Emerson (U. S. L. S.), 1895 (d. m.)	46 33 14.76 85 01 37.70	176 31 52 306 14 36	356 31 34 126 21 49	Robbins (U. S. L. S.) Salt Point (U. S. L. S.)	3.953186 4.197959	8,978.1 15,774.6	29,456 51,754
Whitefish Point Lighthouse (U. S. L. S.), 1895	46 46 16.04 84 57 26.61	303 17 37 325 17 23	123 27 36 145 30 26	Parisian Island (U. S. L. S.) Iroquois (U. S. L. S.)	4.320873 4.606079	20,935.0 40,371.9	68,684 132,453
Emerson smokestack (U. S. L. S.), 1895	46 32 27.28 85 01 44.26	191 48 12 301 25 43	11 51 14 121 33 00	Whitefish Point (U. S. L. S.) Salt Point (U. S. L. S.)	4.415715 4.178224	26,044.4 15,073.8	85,447 49,455
Shelldrake smokestack (U. S. L. S.), 1895	46 40 34.62 85 01 47.68	207 20 15 330 32 53	27 23 20 150 40 13	Whitefish Point (U. S. L. S.) Salt Point (U. S. L. S.)	4.070368 4.420085	11,758.9 26,307.8	38,579 86,312
Dollar Settlement (U. S. L. S.), 1896	46 27 51.38 84 44 01.84	93 48 53 180 59 31	273 43 20 0 59 44	Salt Point (U. S. L. S.) Parisian Island (U. S. L. S.)	3.992391 4.354044	9,826.3 22,596.6	32,238 74,136
Iroquois Island (U. S. L. S.), 1896	46 29 34.75 84 40 51.83	79 39 08 169 21 05	259 31 17 349 19 00	Salt Point (U. S. L. S.) Parisian Island (U. S. L. S.)	4.148837 4.295397	14,087.6 19,742.3	46,219 64,771
Luce County, Mich.: Section corner 11, 12, 13, 14, T. 50 N., R. 8 W. (U. S. L. S.).	46 44 15.91 85 15 36.17						
Chippewa County, Mich.: Section corner 5, 6, 31, 32, T. 51 N., R. 5 W. (U. S. L. S.).	46 46 03.03 84 57 57.65						
Foremast of wreck *Josephine* (U. S. L. S.) (Canada)	46 50 11.75 84 40 25.19						
Pancake Shoal water station (of 1868 survey) (U. S. L. S.) (Canada).	46 55 01.1 84 48 13.8						

St. Marys River

Waiska smokestack (U. S. L. S.), 1893	46 25 58.24 84 34 52.77	126 35 12 224 11 51	306 31 52 44 20 18	Iroquois (U. S. L. S.) Korah (U. S. L. S.)	3.865773 4.329060	7,341.3 21,333.4	24,085 69,991
Round Island Lighthouse (Upper St. Marys River) (U. S. L. S.), 1893.	46 26 34.90 84 30 56.34	106 32 59 259 16 32	286 26 47 79 22 03	Iroquois (U. S. L. S.) Larke (U. S. L. S.)	4.057343 3.996154	11,411.5 9,911.8	37,439 32,519
Point aux Pins Lighthouse (U. S. L. S.) (Canada), 1893.	46 27 51.06 84 28 22.30	93 38 35 209 04 01	273 30 32 29 07 45	Iroquois (U. S. L. S.) Korah (U. S. L. S.)	4.153934 4.130207	14,253.9 13,496.1	46,765 44,278
Sault Ste. Marie, Fort Brady flagstaff (U. S. L. S.), 1893.	46 29 35.31 84 21 34.02	239 43 55 341 10 42	59 46 36 161 10 52	Ste. Marie (U. S. L. S.) Soo (U. S. L. S.)	3.738142 2.939955	5,471.9 870.9	17,952 2,857
Canal Park flagstaff (U. S. L. S.), 1893	46 30 06.68 84 21 01.01	229 05 55 13 16 40	49 11 04 193 16 25	Rankin Mountain (U. S. L. S.) Soo (U. S. L. S.)	4.078779 3.265361	11,988.9 1,842.3	39,334 6,044
Sault Ste. Marie, courthouse flagstaff (U. S. L. S.), 1893.	46 29 53.27 84 20 42.67	220 24 49 30 34 00	40 24 53 210 33 32	Soo west base (U. S. L. S.) Soo (U. S. L. S.)	2.291700 3.204494	197.1 1,601.4	647 5,254
Sault Ste. Marie, St. Marys Catholic Church spire (U. S. L. S.), 1893.	46 29 51.00 84 20 28.25	38 40 39 125 23 25	218 40 01 305 23 19	Soo (U. S. L. S.) Soo west base (U. S. L. S.)	3.254069 2.342885	1,795.0 220.2	5,889 722

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Sault Ste. Marie, Ontario, International Hotel (U. S. L. S.), 1893.	46 30 47.61	321 48 43	141 50 01	Soo east base (U. S. L. S.)	3.570882	3,722.9	12,214
	84 20 09.60	20 41 59	200 41 40	Soo west base (U. S. L. S.)	3.213095	1,633.4	5,359
Sault Ste. Marie, Ontario, Catholic Church spire (U. S. L. S.), 1893.	46 30 26.52	326 11 56	146 12 48	Soo east base (U. S. L. S.)	3.437376	2,737.6	8,982
	84 19 33.09	57 07 26	237 06 40	Soo west base (U. S. L. S.)	3.208019	1,614.4	5,297
Sault Ste. Marie, Ontario, Indian Home flagstaff (U. S. L. S.), 1893.	46 30 01.57	43 14 55	223 14 07	Soo east base (U. S. L. S.)	3.315051	2,065.6	6,777
	84 17 15.33	157 56 21	337 55 54	Sault Ste. Marie (U. S. L. S.)	3.322056	2,099.2	6,887
Crib light post (Ross) (U. S. L. S.) (Canada), 1894	46 14 58.03	10 52 36	190 51 45	Rocky Point (U. S. L. S.)	3.902052	7,980.9	26,184
	84 06 08.27	45 33 58	225 31 50	Winter Point (U. S. L. S.)	3.727300	5,337.0	17,510
Smokestack (tallest of three at Sailors' Encampment) (U. S. L. S.), 1894.	46 14 56.08	286 20 04	106 20 36	Ross (U. S. L. S.)	2.987308	971.2	3,186
	84 06 32.65	7 12 13	187 11 40	Rocky Point (U. S. L. S.)	3.894272	7,839.2	25,719
Iron tower (Winter Point, back range) (U. S. L. S.), 1894.	46 13 03.96	232 44 55	52 47 16	Ross (U. S. L. S.)	3.721836	5,270.3	17,291
	84 09 04.97	6 12 56	186 12 55	Winter Pt. (U. S. L. S.)	2.335539	216.5	710
Lightkeeper's house, chimney, Winter Point (U. S. L. S.), 1894.	46 13 03.20	232 21 47	52 24 08	Ross (U. S. L. S.)	3.721191	5,262.5	17,265
	84 09 03.67	332 16 01	152 17 17	Rocky Pt. (U. S. L. S.)	3.685616	4,848.6	15,907
Pilot Island, front range light (U. S. L. S.), 1894	46 10 33.85	162 21 32	342 20 45	Winter Pt. (U. S. L. S.)	3.666308	4,637.8	15,216
	84 08 00.49	250 28 57	70 29 27	Rocky Pt. (U. S. L. S.)	2.980479	956.0	3,136
Round Island Lighthouse (lower St. Marys River) (U. S. L. S.), 1894.	46 06 32.31	164 50 52	344 50 29	Pointe aux Frenes (U. S. L. S.)	3.419869	2,629.5	8,627
	84 01 11.60	195 26 19	15 27 47	Salters Hill (U. S. L. S.)	3.995250	9,891.2	32,451
Sweets Point light (post) (U. S. L. S.), 1894	46 02 10.62	114 01 49	293 57 41	Raber (U. S. L. S.)	3.908725	8,104.5	26,590
	83 56 08.37	145 52 51	325 48 50	Pointe aux Frenes (U. S. L. S.)	4.108244	12,830.5	42,095
Pipe Island Lighthouse (U. S. L. S.), 1894	46 00 58.42	302 10 37	122 12 05	Drummond (U. S. L. S.)	3.494685	3,123.8	10,249
	83 53 58.39	28 13 36	208 12 57	Detour (U. S. L. S.)	3.388395	2,445.7	8,024
Frying Pan Lighthouse (U. S. L. S.), 1894	45 59 12.26	163 18 14	343 14 20	Salters Hill (U. S. L. S.)	4.382775	24,142.1	79,206
	83 53 45.34	214 12 12	34 15 12	Bacon Island (U. S. L. S.)	3.980872	9,569.1	31,395
200 (U. S. L. S.), 1894 (m.)	46 12 22.84	101 59 56	281 57 09	Winter Point (U. S. L. S.)	3.705904	5,080.5	16,668
	84 05 14.22	170 28 24	350 27 59	Ross (U. S. L. S.)	3.655196	4,520.6	14,831
201. Twin Island (U. S. L. S.), 1894 (m.)	46 09 26.38	142 02 07	321 59 16	Winter Point (U. S. L. S.)	3.916478	8,250.5	27,069
	84 05 09.27	175 04 20	355 03 51	Ross (U S. L. S.)	3.997531	9,943.3	32,622
202 (U. S. L. S.) (Canada), 1894 (m.)	46 11 27.83	70 49 15	250 47 05	Rocky Point (U. S. L. S.)	3.612572	4,098.0	13,445
	84 04 18.02	114 03 13	293 59 46	Winter Point (U. S. L. S.)	3.830015	6,761.1	22,182
202A (U. S. L. S.) (Canada), 1894 (m.)	46 10 45.61	89 32 15	269 29 21	Rocky Point (U. S. L. S.)	3.713907	5,175.0	16,978
	84 03 17.22	118 30 19	298 26 08	Winter Point (U. S. L. S.)	3.929870	8,508.8	27,916
203 (U. S. L. S.), 1894 (m.)	46 08 46.28	137 42 54	317 38 57	Winter Point (U. S. L. S.)	4.019884	10,468.5	34,345
	84 03 37.46	226 51 06	46 54 20	Salters Hill (U. S. L. S.)	3.897402	7,895.9	25,905
204 (U. S. L. S.) (Canada), 1894 (m.)	46 09 41.02	20 33 48	200 33 07	Pointe aux Frenes (U. S. L. S.)	3.545564	3,512.1	11,523
	84 00 46.15	103 05 16	283 00 33	Rocky Point (U. S. L. S.)	3.936482	8,639.4	28,344
208 (U. S. L. S.) (Canada), 1894 (m.)	46 06 31.02	122 02 19	302 00 01	Pointe aux Frenes (U. S. L. S.)	3.686818	4,862.0	15,951
	83 58 31.62	175 14 24	355 13 57	Salters Hill (U. S. L. S.)	3.982579	9,606.8	31,518
205 (U. S. L. S.), 1894 (m.)	46 06 49.27	210 16 44	30 19 41	Salters Hill (U S. L. S.)	4.018536	10,436.0	34,239
	84 03 14.20	275 16 37	95 20 01	208 (U. S. L. S.)	3.784934	6,094.4	19,995
206 (U. S. L. S.) (Canada), 1894 (m.)	46 07 30.84	108 41 31	288 40 19	Pointe aux Frenes (U. S. L. S.)	3.358225	2,281.5	7,485
	81 00 02.94	188 32 40	8 33 19	Salters Hill (U. S. L. S.)	3.892839	7,813.4	25,634
207 (U. S. L. S.), 1894 (m.)	46 05 25.29	163 21 01	343 20 15	Pointe aux Frenes (U. S. L. S.)	3.682072	4,809.2	15,778
	84 00 39.43	189 30 26	9 31 31	Salters Hill (U. S. L. S.)	4.070594	11,765.1	38,599
209 (U. S. L. S.), 1894 (m.)	46 05 40.30	147 47 11	327 45 43	Pointe aux Frenes (U. S. L. S.)	3.690054	4,898.4	16,071
	83 59 41.98	223 58 20	43 59 10	208 (U. S. L. S.)	3.337683	2,176.1	7,139
211 (U. S. L. S.), 1894 (m.)	46 04 29.91	147 16 47	327 14 31	Pointe aux Frenes (U. S. L. S.)	3.875658	7,510.3	24,640
	83 58 34.51	180 56 55	0 56 57	208 (U. S. L. S.)	3.572856	3,739.9	12,270
210 (U. S. L. S.) (Canada), 1894 (m.)	46 05 34.57	128 52 36	308 49 36	Pointe aux Frenes (U. S. L. S.)	3.838097	6,888.1	22,599
	83 57 33.82	144 32 38	324 31 56	208 (U. S. L. S.)	3.330415	2,140.0	7,021
212 (U. S. L. S.) (Canada), 1894 (m.)	46 04 23.76	96 16 21	276 15 23	211 (U. S. L. S.)	3.240237	1,738.7	5,704
	83 57 14.08	157 01 52	337 00 56	208 (U. S. L. S.)	3.630189	4,267.7	14,002
213 (U. S. L. S.), 1894 (m.)	46 03 56.01	276 52 42	96 53 55	Fort St. Joe (U. S. L. S)	3.341449	2,195.1	7,202
	83 58 29.23	310 07 34	130 12 18	Drummond (U. S. L. S.)	4.044590	11,081.3	36,356
214 (U. S. L. S.) (Canada), 1894 (m.)	46 03 57.96	325 24 05	145 26 51	Drummond (U. S. L. S.)	3.942192	8,753.7	28,719
	83 55 46.51	351 21 29	171 22 08	Detour (U. S. L. S.)	3.891356	7,786.7	25,547
215 (U. S. L. S.), 1894 (m.)	46 02 40.86	135 54 52	315 53 35	Raber (U. S. L. S.)	3.517116	3,289.4	10,792
	81 00 06.29	184 13 35	4 14 16	Salters Hill (U. S. L. S.)	4.223383	16,725.6	54,874
216 (U. S. L. S.) (Canada), 1894 (m.)	46 04 19.12	341 43 59	161 45 26	Drummond (U. S. L. S.)	3.917905	8,277.6	27,157
	83 53 56.09	8 13 04	188 12 24	Detour (U. S. L. S.)	3.926259	8,438.4	27,685
217 (U. S. L. S.), 1894 (m.)	46 01 49.61	135 34 26	315 32 16	Raber (U. S. L. S.)	3.742343	5,525.1	18,127
	83 58 52.82	216 24 56	36 26 26	Fort St. Joe (U. S. L. S.)	3.655440	4,523.2	14,840

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
218 (U. S. L. S.) (Canada) 1894 (m.)	46 05 02.57	218 55 54	38 56 30	Burnt Point (No. 220) (U. S. L. S.)	3.225352	1,680.2	5,512
	83 53 28.96	289 40 37	109 46 04	Harbor Island (No. 281) (U. S. L. S.)	4.015451	10,362.2	33,997
219 (U. S. L. S.), 1894 (m.)	46 01 46.57	125 18 41	305 15 30	Raber (U. S. L. S.)	3.844543	6,991.1	22,937
	83 57 27.33	192 47 37	12 48 06	Fort St. Joe (U. S. L. S.)	3.583003	3,828.3	12,560
221 (U. S. L. S.), 1894 (m.)	46 01 54.17	116 48 21	296 44 08	Raber (U. S. L. S.)	3.926598	8,445.0	27,707
	83 56 02.07	164 16 37	344 16 04	Fort St. Joe (U. S. L. S.)	3.560469	3,634.7	11,925
222 (U. S. L. S.) (Canada), 1894 (m.)	46 07 55.34	315 09 23	135 14 17	Harbor Island (No. 281) (U. S. L. S.)	4.095041	12,446.3	40,834
	83 52 43.36	358 54 53	178 54 56	Burnt Point (No. 220) (U. S. L. S.)	3.605099	4,028.1	13,216
223 (U. S. L. S.) 1894 (m.)	46 02 20.17	107 00 20	286 54 50	Raber (U. S. L. S.)	4.012316	10,287.6	33,752
	83 54 15.04	129 22 42	309 20 52	Fort St. Joe (U. S. L. S.)	3.628430	4,250.4	13,945
225 (U. S. L. S.) 1894 (m.)	46 01 32.83	323 20 50	143 21 58	Drummond (U. S. L. S.)	3.531270	3,398.4	11,150
	83 53 29.79	28 50 44	208 49 45	Detour (U. S. L. S.)	3.565027	3,673.1	12,051
231 (U. S. L. S.), 1894 (m.)	46 00 32.86	116 21 24	296 14 16	Raber (U. S. L. S.)	4.153886	14,252.3	46,759
	83 51 58.57	134 02 00	313 58 32	Fort St. Joe (U. S. L. S.)	3.936998	8,649.6	28,378
227 (U. S. L. S.), 1894 (m.)	46 00 42.27	153 15 27	333 13 51	Fort St. Joe (U. S. L. S.)	3.806477	6,404.4	21,012
	83 54 33.81	274 57 10	94 59 02	231 (U. S. L. S.)	3.525364	3,352.5	10,999
229 (U. S. L. S.), 1894 (m.)	46 01 33.72	41 37 48	221 36 52	231 (U. S. L. S.)	3.400287	2,513.5	8,246
	83 50 40.96	117 40 07	297 35 43	Fort St. Joe (U. S. L. S.)	3.949634	8,905.0	29,216
232 (U. S. L. S.) (Canada), 1894 (m.)	46 07 32.54	343 09 04	163 10 26	Harbor Island (No. 281) (U. S. L. S.)	3.928968	8,491.2	27,858
	83 47 49.58	61 57 43	241 54 14	Burnt Point (No. 220) (U. S. L. S.)	3.849016	7,063.4	23,174
235 (U. S. L. S.), 1894 (m.)	45 59 16.89	109 14 52	289 13 18	Detour (U. S. L. S.)	3.473330	2,973.9	9,757
	83 52 41.67	147 39 18	327 36 21	Fort St. Joe (U. S. L. S.)	3.995275	9,891.8	32,453
245 (U. S. L. S.), 1894 (m.)	46 03 36.28	340 42 07	160 43 24	Drummond (U. S. L. S.)	3.840541	6,926.9	22,726
	83 53 41.90	12 08 11	192 07 21	Detour (U. S. L. S.)	3.856698	7,189.5	23,588
247 (U. S. L. S.), 1894 (m.)	46 04 17.46	290 10 13	110 12 31	Bacon Island (U. S. L. S.)	3.641407	4,379.3	14,368
	83 52 46.33	79 54 52	259 51 58	Fort St. Joe (U. S. L. S.)	3.722100	5,273.5	17,301
253 (U. S. L. S.), 1894 (m.)	46 04 46.15	294 27 39	114 31 19	Harbor Island (No. 281) (U. S. L. S.)	3.858065	7,212.2	23,662
	83 51 00.47	322 33 40	142 34 42	Bacon Island (U. S. L. S.)	3.479830	3,018.8	9,904
228 (U. S. L. S.) (Canada), 1894 (m.)	46 08 10.25	354 38 58	174 39 26	Bacon Island (U. S. L. S.)	3.941359	8,736.9	28,664
	83 50 13.00	9 11 41	189 11 07	253 (U. S. L. S.)	3.805071	6,383.7	20,944
261 (U. S. L. S.), 1894 (m.)	46 03 33.70	187 26 30	7 26 39	253 (U. S. L. S.)	3.353342	2,256.0	7,402
	83 51 14.07	274 17 46	94 18 57	Bacon Island (U. S. L. S.)	3.329082	2,133.4	6,999
263 (U. S. L. S.), 1894 (m.)	46 03 09.85	250 02 12	70 03 05	Bacon Island (U. S. L. S.)	3.227471	1,688.4	5,539
	83 50 48.92	270 07 11	90 10 42	Harbor Island (No. 281) (U. S. L. S.)	3.800483	6,316.6	20,724
267 (U. S. L. S.), 1894 (m.)	46 02 21.01	55 01 13	234 57 28	Detour (U. S. L. S.)	3.913844	8,200.6	26,905
	83 49 39.90	106 13 30	286 08 22	Fort St. Joe (U. S. L. S.)	3.981396	9,580.7	31,433
277 (U. S. L. S.), 1894 (m.)	46 00 46.67	113 27 35	293 20 23	Fort St. Joe (U. S. L. S.)	4.147904	14,057.4	46,120
	83 46 47.93	144 17 10	324 15 10	Bacon Island (U. S. L. S.)	3.789281	6,155.8	20,196
273 (U. S. L. S.), 1894 (m.)	46 00 09.81	173 11 16	353 10 52	Bacon Island (U. S. L. S.)	3.790900	6,178.7	20,271
	83 49 01.00	215 47 18	35 49 32	Harbor Island (No. 281) (U. S. L. S.)	3.834682	6,834.1	22,422
283 (U. S. L. S.), 1894 (m.)	46 02 17.88	128 40 34	308 39 03	Bacon Island (U. S. L. S.)	3.542939	3,490.9	11,453
	83 47 28.31	231 35 41	51 36 48	Harbor Island (No. 281) (U. S. L.S.)	3.407765	2,557.2	8,390
285 (U. S. L. S.), 1894 (m.)	46 03 48.79	300 11 32	120 12 42	Harbor Island (No. 281) (U. S. L. S.)	3.384298	2,422.7	7,948
	83 47 32.50	76 38 50	256 37 22	Bacon Island (U. S. L. S.)	3.432717	2,708.4	8,886
287 (U. S. L. S.), 1894 (m.)	46 04 27.66	303 46 34	123 48 35	Harbor Island (No. 281) (U. S. L. S.)	3.638398	4,349.1	14,269
	83 48 43.26	31 23 32	211 22 55	Bacon Island (U. S. L. S.)	3.330275	2,139.3	7,019
291 (U. S. L. S.), 1894 (m.)	46 06 08.00	0 16 37	180 16 36	Bacon Island (U. S. L. S.)	3.692335	4,924.2	16,155
	83 49 33.99	36 19 57	216 18 54	253 (U. S. L. S.)	3.496432	3,136.4	10,290
Detour smokestack (U. S. L. S.), 1894	45 59 38.02	105 45 00	285 44 21	Detour (U. S. L. S.)	3.081306	1,205.9	3,956
	83 53 58.21	252 46 23	72 47 51	Drummond (U. S. L. S.)	3.441555	2,764.1	9,069
Detour church (U. S. L. S.), 1894	45 59 57.38	222 37 17	42 40 38	Bacon Island (U. S. L. S.)	3.947579	8,863.0	29,078
	83 54 14.29	265 45 54	85 47 34	Drummond (U. S. L. S.)	3.476314	2,994.4	9,824

St. Marys River, Hay Lake

23 (U. S. L. S.)	46 29 02.50	112 59 23	292 58 39	21 (U. S. L. S.)	3.145080	1,396.6	4,582
	84 17 43.11	172 34 34	352 34 28	14. Ripley, Topsail Island (U. S. L. S.).	3.103924	1,270.4	4,160
25 (U. S. L. S.)	46 29 27.50	56 41 49	236 41 09	23 (U. S. L. S.)	3.147991	1,406.0	4,613
	84 16 48.02	110 00 51	290 00 05	14. Ripley, Topsail Island (U. S. L. S.).	3.153839	1,425.1	4,676

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Hay Lake—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
16 (Canada) (U. S. L. S)	46 29 44.88	18 14 28	198 14 22	25 (U. S. L. S.)	2.751950	564.9	1,853
	84 16 39.73	88 09 34	268 08 42	14. Ripley, Topsail Island (U. S. L. S.).	3.180871	1,516.6	4,976
4U (U. S. L. S.)	46 29 15.64	131 46 03	311 45 30	14. Ripley, Topsail Island (U. S. L. S.).	3.107918	1,282.1	4,206
	84 17 05.96	211 47 21	31 47 40	16 (U. S. L. S.)	3.026206	1,062.2	3,485
1 (U. S. L. S.)	46 28 57.69	195 05 19	15 05 32	14. Ripley, Topsail Island (U. S. L. S.).	3.163917	1,458.5	4,785
	84 18 08.61	247 27 46	67 28 32	4U (U. S. L. S.)	3.160346	1,446.6	4,746
6 (U. S. L. S.)	46 28 29.69	127 15 45	307 15 06	1 (U. S. L. S.)	3.154688	1,427.9	4,685
	84 17 15.33	188 01 02	8 01 09	4U (U. S. L. S.)	3.156165	1,432.7	4,700
3 (U. S. L. S.)	46 28 07.86	167 02 45	347 02 33	1 (U. S. L. S.)	3.198324	1,578.8	5,189
	84 17 52.02	229 15 14	49 15 41	6 (U. S. L. S.)	3.014089	1,033.0	3,389
8 (U. S. L. S.)	46 27 59.17	100 02 01	280 01 09	3 (U. S. L. S.)	3.187940	1,541.5	5,057
	84 16 40.87	142 02 55	322 02 30	6 (U. S. L. S.)	3.077508	1,195.4	3,922
5 (U. S. L. S.)	46 27 42.05	183 45 03	3 45 06	6 (U. S. L. S.)	3.168580	1,474.3	4,837
	84 17 19.86	237 33 40	57 34 08	8 (U. S. L. S.)	2.993656	985.5	3,233
7 (U. S. L. S.)	46 27 19.09	137 22 40	317 22 18	5 (U. S. L. S.)	2.983872	963.5	3,161
	84 16 49.28	188 14 39	8 14 45	8 (U. S. L. S.)	3.097071	1,250.5	4,103
10 (U. S. L. S.)	46 27 26.30	77 33 44	257 33 10	7 (U. S. L. S.)	3.014558	1,034.1	3,393
	84 16 01.96	106 18 39	286 17 43	5 (U. S. L. S.)	3.238518	1,731.9	5,682
9 (U. S. L. S.)	46 26 42.14	156 54 29	336 54 13	7 (U. S. L. S.)	3.093470	1,240.1	4,069
	84 16 26.49	200 59 57	21 00 15	10 (U. S. L. S.)	3.164527	1,460.6	4,792
12 (U. S. L. S.)	46 26 34.45	96 03 21	276 02 05	9 (U. S. L. S.)	3.353552	2.257.1	7,405
	84 14 41.33	132 56 49	312 55 51	10 (U. S. L. S.)	3.371178	2,350.6	7,712
11 (U. S. L. S.)	46 26 19.75	178 53 27	358 53 26	10 (U. S. L. S.)	3.312898	2,055.4	6,743
	84 16 00.10	254 53 20	74 54 17	12 (U. S. L. S.)	3.240917	1,741.5	5,714
14 (U. S. L. S.)	46 26 01.29	106 37 07	286 36 02	11 (U. S. L. S.)	3.299861	1,994.6	6,544
	84 14 30.56	167 20 41	347 20 33	12 (U. S. L. S.)	3.020947	1,049.4	3,443
13 (U. S. L. S.)	46 25 06.77	164 53 02	344 52 41	11 (U. S. L. S.)	3.368176	2,334.4	7,659
	84 15 31.58	217 43 52	37 44 36	14 (U. S. L. S.)	3.328116	2,128.7	6,984
16 (U. S. L. S.)	46 24 40.61	112 09 39	292 08 32	13 (U. S. L. S.)	3.330834	2,142.1	7,028
	84 13 58.68	139 45 07	319 43 39	11 (U. S. L. S.)	3.603312	4,011.5	13,161
15 (U. S. L. S.)	46 24 19.38	174 39 53	354 39 48	13 (U. S. L. S.)	3.167216	1,469.7	4,822
	84 15 25.18	250 27 14	70 28 16	16 (U. S. L. S.)	3.292343	1,960.4	6,432
18 (U. S. L. S.)	46 23 37.96	137 56 46	317 55 22	13 (U. S. L. S.)	3.567439	3,693.5	12,118
	84 13 35.73	165 46 40	345 46 23	16 (U. S. L. S.)	3.300047	1,995.5	6,547
17 (U. S. L. S.)	46 23 27.35	334 23 54	154 24 37	19. Haylake (U. S. L. S.)	3.467483	2,934.2	9,627
	84 15 06.08						
20 (U. S. L. S.)	46 22 46.56	59 51 49	239 50 27	19. Hay Lake (U. S. L. S.)	3.441127	2,761.4	9,060
	84 12 15.05	109 01 48	288 59 44	17 (U. S. L. S.)	3.587228	3,865.7	12,683
75 (U. S. L. S.)	46 21 48.78	96 07 11	276 05 05	19. Hay Lake (U. S. L. S.)	3.572531	3,737.1	12,261
	84 11 12.94	143 21 14	323 20 30	20 (U. S. L. S.)	3.347102	2,223.8	7,296
21 (U. S. L. S.)	46 21 02.11	152 21 18	332 20 45	19. Hay Lake (U. S. L. S.)	3.317103	2,075.4	6,809
	84 13 21.72	242 21 31	62 23 04	75 (U. S. L. S.)	3.492434	3,107.7	10,196
73 (U. S. L. S.)	46 20 26.24	122 52 24	302 49 50	19. Hay Lake (U. S. L. S.)	3.734830	5,430.4	17,816
	84 10 33.40	161 39 17	341 38 49	75 (U. S. L. S.)	3.428958	2,685.1	8,809
76 (U. S. L. S.)	46 20 23.68	228 19 46	48 21 26	75 (U. S. L. S.)	3.596931	3,953.0	12,969
	84 13 31.07	268 47 34	88 49 42	73 (U. S. L. S.)	3.579827	3,800.4	12,468
69 (U. S. L. S.)	46 19 30.33	117 21 21	297 19 34	76 (U. S. L. S.)	3.554727	3,587.0	11,768
	84 11 02.10	199 34 15	19 34 36	73 (U. S. L. S.)	3.262976	1,832.2	6,011
67 (U. S. L. S.)	46 19 22.28	100 03 16	280 02 29	69 (U. S. L. S.)	3.153603	1,424.3	4,673
	84 09 56.54	158 14 21	338 13 58	73 (U. S. L. S.)	3.327645	2,126.4	6,976
71 (U. S. L. S.)	46 19 54.81	353 59 37	173 59 40	67 (U. S. L. S.)	3.004334	1,010.0	3,314
	84 10 01.48	59 45 47	239 45 03	69 (U. S. L. S.)	3.176366	1,500.9	4,924
□55 (U. S. L. S.)	46 19 39.93	48 31 56	228 31 35	67 (U. S. L. S.)	2.915330	822.9	2,700
	84 09 27.72	122 28 23	302 27 59	71 (U. S. L. S.)	2.932480	856.0	2,808
57 (U. S. L. S.)	46 19 13.21	100 36 19	280 35 28	67 (U. S. L. S.)	3.182548	1,522.5	4,995
	84 08 46.59	133 09 35	313 09 05	□55 (U. S. L. S.)	3.081381	1,206.1	3,957
□53 (U. S. L. S.)	46 19 24.61	70 43 13	250 42 39	57 (U. S. L. S.)	3.027646	1,065.7	3,496
	84 07 59.57	104 05 23	284 04 19	□55 (U. S. L. S.)	3.288717	1,944.1	6,378

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, West Neebish

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
77 (U. S. L. S.)	46 19 19.77	127 27 41	307 26 14	76 (U. S. L. S.)	3.511277	3,245.5	10,648
	84 11 30.61	210 47 55	30 48 36	73 (U. S. L. S)	3.378293	2,389.4	7,839
78 (U. S. L. S.)	46 19 05.22	174 08 13	354 08 05	76 (U. S. L. S.)	3.386601	2,435.6	7,991
	84 13 19.44	259 03 50	79 05 09	77 (U. S. L. S.)	3.374959	2,371.1	7,779
79 (U. S. L. S.)	46 18 39.38	127 50 24	307 49 49	78 (U. S. L. S.)	3.114202	1,300.8	4,268
	84 12 31.42	226 12 09	46 12 53	77 (U. S. L. S.)	3.255836	1,802.3	5,913
80 (U. S. L. S.)	46 17 41.49	180 21 49	0 21 49	78 (U. S. L. S.)	3.412506	2,585.3	8,482
	84 13 20.20	210 17 01	30 17 36	79 (U. S. L. S.)	3.315944	2,069.9	6,791
81 (U. S. L. S.)	46 17 33.62	106 44 36	286 44 09	80 (U. S. L. S.)	2.926154	843.6	2,768
	84 12 42.46	186 38 05	6 38 13	79 (U. S. L. S.)	3.310483	2,044.0	6,706
82 (U. S. L. S.)	46 17 06.52	155 10 00	335 09 43	80 (U. S. L. S.)	3.075511	1,189.9	3,904
	84 12 56.85	200 12 51	20 13 01	81 (U. S. L. S.)	2.950269	891.8	2,926
83 (U. S. L. S.)	46 17 18.95	46 19 46	226 19 32	82 (U. S. L. S.)	2.745092	556.0	1,824
	84 12 38.07	127 39 29	307 38 58	80 (U. S. L. S.)	3.056587	1,139.2	3,738
85 (U. S. L. S.)	46 17 00.89	103 55 59	283 55 35	82 (U. S. L. S.)	2.858594	722.1	2,369
	84 12 24.11	151 50 06	331 49 56	83 (U. S. L. S.)	2.801204	632.7	2,076
84 (U. S. L. S.)	46 16 58.21	181 46 44	1 46 45	83 (U. S. L. S.)	2.806650	640.7	2,102
	84 12 39.00	255 27 45	75 27 56	85 (U. S. L. S.)	2.517330	329.1	1,080
86 (U. S. L. S.)	46 16 42.40	143 36 40	323 36 28	84 (U. S. L. S.)	2.782945	606.7	1,990
	84 12 22.18	175 51 32	355 51 31	85 (U. S. L. S.)	2.757738	572.5	1,878
87 (U. S. L. S.)	46 16 46.25	75 15 58	255 15 43	86 (U. S. L. S.)	2.670308	468.1	1,536
	84 12 01.04	132 27 15	312 26 59	85 (U. S. L. S.)	2.825754	669.5	2,197
88 (U. S. L. S.)	46 16 11.02	148 28 58	328 28 38	86 (U. S. L. S.)	3.055558	1,136.5	3,729
	84 11 54.44	172 35 36	352 35 31	87 (U. S. L. S.)	3.040209	1,097.0	3,599
89R (U. S. L. S.)	46 16 20.74	62 19 43	242 19 24	88 (U. S. L. S.)	2.810421	646.3	2,120
	84 11 27.71	119 49 41	299 49 02	86 (U. S. L. S.)	3.128555	1,344.5	4,411
114 (U. S. L. S.)	46 15 42.16	145 41 25	325 41 05	88 (U. S. L. S.)	3.032975	1,078.9	3,540
	84 11 26.04	178 16 49	358 16 48	89R (U. S. L. S.)	3.076214	1,191.8	3,910
107 (U. S. L. S.)	46 15 45.80	80 36 59	260 36 36	114 (U. S. L. S.)	2.837892	688.5	2,259
	84 10 54.32	121 10 45	301 10 02	88 (U. S. L. S.)	3.177433	1,504.6	4,936
112 (U. S. L. S.)	46 15 16.36	159 07 45	339 07 35	114 (U. S. L. S.)	2.930793	852.7	2,798
	84 11 11.85	202 26 35	22 26 48	107 (U. S. L. S.)	2.992789	983.5	3,227
105 (U. S. L. S.)	46 15 15.22	92 34 33	272 34 06	112 (U. S. L. S.)	2.895089	785.4	2,577
	84 10 35.22	156 34 51	336 34 37	107 (U. S. L. S.)	3.012441	1,029.1	3,376
110 (U. S. L. S.)	46 14 54.10	158 43 22	338 43 13	112 (U. S. L. S.)	2.867713	737.4	2,419
	84 10 59.36	218 24 59	38 25 17	105 (U. S. L. S.)	2.920149	832.0	2,730
103 (U. S. L. S.)	46 14 49.12	104 14 27	284 14 06	110 (U. S. L. S.)	2.796341	625.7	2,053
	84 10 31.05	173 40 19	353 40 16	105 (U. S. L. S.)	2.908872	810.7	2,660
108 (U. S. L. S.)	46 14 26.08	170 23 09	350 23 04	110 (U. S. L. S.)	2.943306	877.6	2,879
	84 10 52.52	212 52 45	32 53 01	103 (U. S. L. S.)	2.927946	847.1	2,779
101 (U. S. L. S.)	46 14 18.70	103 12 51	283 12 18	108 (U. S. L. S.)	2.998725	997.1	3,271
	84 10 07.21	134 22 53	314 22 15	110 (U. S. L. S.)	3.193970	1,563.0	5,128
106 (U. S. L. S.)	46 14 07.78	206 31 32	26 31 41	108 (U. S. L. S.)	2.800377	631.5	2,072
	84 11 05.68	254 55 49	74 56 31	101 (U. S. L. S.)	3.113060	1,297.4	4,257
99 (U. S. L. S.)	46 13 47.68	105 41 33	285 40 19	106 (U. S. L. S.)	3.361038	2,296.3	7,534
	84 09 22.50	135 00 07	314 59 35	101 (U. S. L. S.)	3.131818	1,354.7	4,445
102 (U. S. L. S.)	46 11 08.50						
	84 10 45.37						

St. Marys River, Little Mud Lake

62 (U. S. L. S.) (Canada)	46 16 23.72	3 19 22	183 19 20	63 (U. S. L. S.)	3.068125	1,169.8	3,838
	84 06 37.01	77 23 49	257 23 22	61 (U. S. L. S.)	2.921904	835.4	2,741
60 (U. S. L. S.) (Canada)	46 17 31.08	359 20 02	179 20 02	62 (U. S. L. S.)	3.318105	2,080.2	6,825
	84 06 38.14	19 16 26	199 15 59	61 (U. S. L. S.)	3.379609	2,396.7	7,863
59 (U. S. L. S.)	46 17 30.68	269 24 47	89 25 28	60 (U. S. L. S.)	3.082125	1,208.2	3,964
	84 07 34.58	349 29 24	169 29 38	61 (U. S. L. S.)	3.359555	2,288.5	7,508
98 (U. S. L. S.) (Canada)	46 13 44.17	72 16 08	252 13 35	Winter Point (U. S. L. S.)	3.679288	4,778.5	15,677
	84 05 33.72						
97 (U. S. L. S.)	46 14 13.06	286 44 07	106 45 47	98 (U. S. L. S.)	3.490778	3,095.8	10,157
	84 07 52.07	34 01 41	214 00 48	Winter Point (U. S. L. S.)	3.452440	2,834.3	9,299

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Little Mud Lake—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
95 (U. S. L. S.)	46 15 17.16	327 45 51	147 46 52	98 (U. S. L. S.)	3.530718	3,394.0	11,135
	84 06 58.20	30 15 07	210 14 28	97 (U. S. L. S.)	3.359998	2,290.9	7,516
72 (U. S. L. S.) (Canada)	46 14 30.34	76 56 55	256 55 37	97 (U. S. L. S.)	3.372933	2,360.1	7,743
	84 06 04.76	141 37 46	321 37 07	95 (U. S. L. S.)	3.265753	1,844.0	6,050
66 (U. S. L. S.) (Canada)	46 15 48.37	3 54 48	183 54 43	72 (U. S. L. S.)	3.382875	2,414.8	7,923
	84 05 57.07	53 39 20	233 38 36	95 (U. S. L. S.)	3.211023	1,625.6	5,333
70 (U. S. L. S.) (Canada)	46 15 14.66	41 01 45	221 01 05	72 (U. S. L. S.)	3.258557	1,813.7	5,950
	84 05 09.19	135 25 54	315 25 19	66 (U. S. L. S.)	3.164687	1,461.1	4,794
65 (U. S. L. S.)	46 15 17.62	193 01 40	13 01 47	66 (U. S. L. S.)	2.988779	974.5	3,197
	84 06 07.33	274 11 37	94 12 19	70 (U. S. L. S.)	3.096418	1,248.6	4,096
63½ (U. S. L. S.)	46 15 30.87	225 12 32	45 12 50	66 (U. S. L. S.)	2.884693	766.8	2,516
	84 06 22.48	321 34 39	141 34 50	65 (U. S. L. S.)	2.717903	522.3	1,714
63 (U. S. L. S.)	46 15 45.89	265 15 53	85 16 24	66 (U. S. L. S.)	2.966809	926.4	3,039
	84 06 40.18	320 44 18	140 44 31	63½ (U. S. L. S.)	2.777441	599.0	1,965
64 (U. S. L. S.) (Canada)	46 16 09.89	317 42 48	137 43 08	66 (U. S. L. S.)	2.953431	898.3	2,947
	84 06 25.29	23 16 53	203 16 42	63 (U. S. L. S.)	2.906701	806.7	2,647
61 (U. S. L. S.)	46 16 17.81	282 54 40	102 55 16	64 (U. S. L. S.)	3.039009	1,094.0	3,589
	84 07 15.09	322 48 55	142 49 20	63 (U. S. L. S.)	3.092362	1,237.0	4,058
104 (U. S. L. S.)	46 13 06.39						
	84 14 08.07						

St. Marys River, Lake George

18 (U. S. L. S.) (Canada)	46 29 49.84	52 18 53	232 18 23	25 (U. S. L. S.)	3.052247	1,127.8	3,700
	84 16 06.17	77 55 55	257 55 31	16 (U. S. L. S.)	2.864421	731.8	2,401
27 (U. S. L. S.)	46 29 32.48	83 44 48	263 44 01	25 (U. S. L. S.)	3.149095	1,409.6	4,625
	84 15 42.32	136 29 42	316 29 25	18 (U. S. L. S.)	2.868526	738.8	2,424
20 (U. S. L. S.) (Canada)	46 30 12.19	9 57 05	189 56 58	27 (U. S. L. S)	3.095110	1,244.8	4,084
	84 15 32.23	46 21 24	226 21 00	18 (U. S. L. S.)	3.000034	1,000.1	3,281
29 (U. S. L. S.)	46 30 05.03	72 11 04	252 10 15	18 (U. S. L. S.)	3.185582	1,533.1	5,030
	84 14 57.72	106 43 18	286 42 53	20 (U. S. L. S.)	2.885542	768.3	2,521
22 (U. S. L. S.) (Canada)	46 30 40.94	350 12 24	170 12 31	29 (U. S. L. S.)	3.051161	1,125.0	3,691
	84 15 06.69	31 31 35	211 31 17	20 (U. S. L. S.)	3.017569	1,041.3	3,416
31 (U. S. L. S.)	46 30 20.44	25 25 49	205 25 41	29 (U. S. L. S.)	2.721764	526.9	1,729
	84 14 47.11	75 10 00	255 09 27	20 (U. S. L. S.)	2.997939	995.3	3,265
33 (U. S. L. S.)	46 30 48.26	24 06 29	204 06 09	29 (U. S. L. S.)	3.165027	1,462.3	4,798
	84 14 29.71	74 00 06	253 59 39	22 (U. S. L. S.)	2.913951	820.3	2,691
24 (U. S. L. S.) (Canada)	46 31 20.13	8 33 00	188 32 55	33 (U. S. L. S.)	2.997915	995.2	3,265
	84 14 22.77	37 43 58	217 43 26	22 (U. S. L. S.)	3.184751	1,530.2	5,020
35 (U. S. L. S.)	46 31 05.89	43 34 02	223 33 44	33 (U. S. L. S.)	2.875804	751.3	2,465
	84 14 05.42	139 56 36	319 56 23	24 (U. S. L. S.)	2.759348	574.6	1,885
37 (U. S. L. S.)	46 31 44.22	35 33 07	215 32 38	35 (U. S. L. S.)	3.162834	1,454.9	4,773
	84 13 25.73	58 32 15	238 31 33	24 (U. S. L. S.)	3.153866	1,425.2	4,676
26 (U. S. L. S.) (Canada)	46 31 54.81	291 37 36	111 38 04	37 (U. S. L. S.)	2.947570	886.3	2,908
	84 14 04.39	20 05 34	200 05 20	24 (U. S. L. S.)	3.056923	1,140.0	3,740
28 (U. S. L. S.) (Canada)	46 32 25.58	3 38 19	183 38 16	37 (U. S. L. S.)	3.107001	1,279.4	4,197
	84 13 21.92	43 36 37	223 36 03	24 (U. S. L. S.)	3.117973	1,312.1	4,305
39 (U. S. L. S.)	46 31 59.26	45 24 08	225 23 52	37 (U. S. L. S.)	2.820210	661.0	2,169
	84 13 03.65	154 23 54	334 23 41	28 (U. S. L. S.)	2.954803	901.2	2,957
30 (U. S. L. S.) (Canada)	46 32 48.19	34 07 58	214 07 23	39 (U. S. L. S.)	3.261299	1,825.2	5,988
	84 12 15.59	63 43 03	243 42 15	28 (U. S. L. S.)	3.197650	1,576.3	5,172
41 (U. S. L. S.)	46 32 09.18	109 47 59	289 47 11	28 (U. S. L. S.)	3.174726	1,495.3	4,906
	84 12 15.90	180 18 31	0 18 31	30 (U. S. L. S.)	3.080815	1,204.5	3,952
32 (U. S. L. S.) (Canada)	46 32 58.52	38 12 30	218 11 49	41 (U. S. L. S.)	3.287520	1,938.7	6,361
	84 11 19.62	75 01 39	255 00 58	30 (U. S. L. S.)	3.091433	1,234.3	4,050
34 (U. S. L. S.) (Canada)	46 31 56.83	100 11 01	280 09 49	41 (U. S. L. S.)	3.334102	2,158.3	7,081
	84 10 36.21	154 06 05	334 05 34	32 (U. S. L. S.)	3.325816	2,117.5	6,947
43 (U. S. L. S.)	46 31 10.52	143 19 21	323 18 35	41 (U. S. L. S.)	3.353847	2,258.6	7,410
	84 11 12.59	208 27 34	28 28 00	34 (U. S. L. S.)	3.211312	1,626.7	5,337
45 (U. S. L. S.)	46 31 26.06	79 55 55	259 54 23	43 (U. S. L. S.)	3.438133	2,742.4	8,997
	84 09 05.91	116 16 59	296 15 53	34 (U. S. L. S.)	3.331678	2,146.2	7,041

77720°—30——10

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Lake George—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
40 (U. S. L. S.) (Canada)	46 32 48.22	36 47 42	216 46 38	45 (U. S. L. S.)	3.500724	3,167.6	10,392
	84 07 36.90	67 27 54	247 25 44	34 (U. S. L. S.)	3.616703	4,137.2	13,573
42 (U. S. L. S.) (Canada)	46 31 44.99	82 17 36	262 15 10	45 (U. S. L. S.)	3.638235	4,347.5	14,263
	84 05 43.78	129 01 03	308 59 41	40 (U. S. L. S.)	3.491615	3,101.8	10,176
47 (U. S. L. S.)	46 30 39.22	199 00 37	19 01 24	40 (U. S. L. S.)	3.624620	4,213.3	13,823
	84 08 41.32	241 45 33	61 47 42	42 (U. S. L. S.)	3.632947	4,294.8	14,091
44 (U. S. L. S.) (Canada)	46 29 47.38	107 29 53	287 27 00	47 (U. S. L. S.)	3.726792	5,330.8	17,489
	84 04 42.84	160 19 20	310 18 36	42 (U. S. L. S.)	3.586265	3,857.1	12,655
46 (U. S. L. S.) (Canada)	46 27 39.13	146 19 30	326 17 24	47 (U. S. L. S.)	3.824991	6,683.3	21,927
	84 05 47.50	199 11 44	19 12 31	44 (U. S. L. S.)	3.622555	4,193.3	13,758
49 (U. S. L. S.)	46 28 04.35	240 48 08	60 51 22	44 (U. S. L. S.)	3.814720	6,527.1	21,414
	84 09 10.03	280 11 33	100 14 00	46 (U. S. L. S.)	3.642579	4,391.2	14,407
48 (U. S. L. S.) (Canada)	46 23 50.06	167 48 40	347 47 42	49 (U. S. L. S.)	3.904881	8,033.1	26,355
	84 07 50.54	200 12 49	20 23 18	46 (U. S. L. S.)	3.877675	7,545.3	24,755
51 (U. S. L. S.)	46 25 16.70	208 21 22	28 22 57	49 (U. S. L. S.)	3.769615	5,883.2	19,302
	84 11 20.99	300 44 09	120 46 42	48 (U. S. L. S.)	3.718576	5,230.9	17,162
53 (U. S. L. S.)	46 22 40.41	149 04 39	329 03 01	51 (U. S. L. S.)	3.750209	5,626.1	18,458
	84 09 05.60	216 42 30	36 43 25	48 (U. S. L. S.)	3.428614	2,683.0	8,802
50 (U. S. L. S.) (Canada)	46 22 31.53	96 19 40	276 18 16	53 (U. S. L. S.)	3.396358	2,490.9	8,172
	84 07 09.76	160 14 18	340 13 49	48 (U. S. L. S.)	3.411034	2,576.5	8,453
54 (U. S. L. S.) (Canada)	46 20 56.04	143 31 31	323 30 10	53 (U. S. L. S.)	3.602962	4,008.3	13,151
	84 07 14.11	181 48 18	1 48 21	50 (U. S. L. S.)	3.469840	2,950.1	9,679
52 (U. S. L. S. (Canada)	46 21 39.15	44 03 20	224 02 36	54 (U. S. L. S.)	3.267685	1,852.2	6,077
	84 06 13.88	143 33 29	323 32 48	50 (U. S. L. S.)	3.303349	2,010.7	6,597
56 (U. S. L. S.) (Canada)	46 19 57.44	129 23 15	309 22 00	54 (U. S. L. S.)	3.455120	2,851.8	9,356
	84 05 31.03	163 44 26	343 43 55	52 (U. S. L. S.)	3.514734	3,271.4	10,733
55 (U. S. L. S.)	46 19 19.78	171 41 25	351 41 10	54 (U. S. L. S.)	3.477626	3,003.5	9,854
	84 06 53.81	236 42 06	56 43 06	56 (U. S. L. S.)	3.325989	2,118.3	6,950
58 (U. S. L. S.) (Canada)	46 18 30.68	153 34 24	333 33 58	55 (U. S. L. S.)	3.228712	1,693.2	5,555
	84 06 18.58	200 47 23	20 47 57	56 (U. S. L. S.)	3.457213	2,865.6	9,402
□51 (U. S. L. S.)	46 19 12.67						
	84 07 35.91						
□6 (U. S. L. S.) (Canada)	46 33 21.96	26 21 49	206 21 04	34 (U. S. L. S.)	3.467377	2,933.4	9,624
	84 09 35.09	72 00 24	251 59 08	32 (U. S. L. S.)	3.369515	2,341.6	7,682
□19 (U. S. L. S.)	46 31 33.33	140 39 54	320 39 23	41 (U. S. L. S.)	3.155660	1,431.1	4,695
	84 11 33.33	239 11 50	59 12 31	34 (U. S. L. S.)	3.151416	1,417.2	4,650
□21 (U. S. L. S.)	46 31 22.60	106 56 28	286 55 51	□19 (U. S. L. S.)	3.055353	1,137.2	3,731
	84 10 42.29	186 59 05	6 59 09	34 (U. S. L. S.)	3.027253	1,064.8	3,493
34R (U. S. L. S.) (Canada)	46 32 00.05	27 02 55	207 02 28	43 (U. S. L. S.)	3.234809	1,717.2	5,634
	84 10 35.95	97 33 02	277 31 49	41 (U. S. L. S.)	3.332109	2,148.4	7,049
□23 (U. S. L. S.)	46 31 22.41	90 18 09	270 17 30	□21 (U. S. L. S.)	3.065356	1,162.4	3,814
	84 09 47.75	135 49 39	315 49 04	34 (U. S. L. S.)	3.170855	1,482.0	4,862
□8 (U. S. L. S.) (Canada)	46 31 48.07	321 58 21	141 58 39	45 (U. S. L. S.)	2.935862	862.7	2,830
	84 09 30.85	61 52 27	241 51 13	43 (U. S. L. S.)	3.390769	2,459.1	8,068
□25 (U. S. L. S.)	46 31 44.30	16 05 45	196 05 39	45 (U. S. L. S.)	2.767906	586.0	1,923
	84 08 58.29	99 32 18	279 31 54	□8 (U. S. L. S.)	2.847312	703.6	2,308
□10 (U. S. L. S.) (Canada)	46 31 53.61	273 45 02	93 47 19	42 (U. S. L. S.)	3.607326	4,048.8	13,283
	84 08 53.35	17 27 58	197 27 49	45 (U. S. L. S.)	2.950278	891.8	2,926
10R (U. S. L. S.) (Canada)	46 31 54.51	274 10 31	94 12 47	42 (U. S. L. S.)	3.604113	4,019.0	13,186
	84 08 51.86	18 49 37	198 49 27	45 (U. S. L. S.)	2.967599	928.1	3,045
□12 (U. S. L. S.) (Canada)	46 32 00.50	278 06 10	98 08 04	42 (U. S. L. S.)	3.530181	3,389.9	11,122
	84 08 21.25	41 50 16	221 49 44	45 (U. S. L. S.)	3.154429	1,427.0	4,682
12R (U. S. L. S.) (Canada)	46 32 01.37	278 55 33	98 57 22	42 (U. S. L. S.)	3.512287	3,253.0	10,673
	84 08 14.57	45 06 41	225 06 04	45 (U. S. L. S.)	3.188788	1,544.5	5,067
□14 (U. S. L. S.) (Canada)	46 31 56.42	190 22 18	10 22 28	40 (U. S. L. S.)	3.211114	1,626.0	5,335
	84 07 50.64	277 25 26	97 26 58	42 (U. S. L. S.)	3.435592	2,726.4	8,945
38 (U. S. L. S.) (Canada)	46 31 46.97	76 00 47	255 59 19	45 (U. S. L. S.)	3.426226	2,668.2	8,754
	84 07 04.44	159 54 51	339 54 27	40 (U. S. L. S.)	3.304032	2,013.9	6,607
36 (U. S. L. S.) (Canada)	46 32 16.20	288 56 32	108 58 01	38 (U. S. L. S.)	3.443882	2,779.0	9,117
	84 09 07.77	358 32 03	178 32 04	45 (U. S. L. S.)	3.189948	1,548.6	5,081
Manchester shoal crib (U. S. L. S.)	46 31 41.68	129 19 12	309 18 47	12R (U. S. L. S.)	2.982059	959.5	3,148
	84 07 39.74	267 36 57	87 38 21	42 (U. S. L. S.)	3.393294	2,473.4	8,115

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Lake George—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	″	″				
□27 (U. S. L. S.)	46 31 32.35	183 10 06	3 10 10	40 (U. S. L. S.)	3.370374	2,346.2	7,697
	84 07 42.99	261 15 09	81 16 35	42 (U. S. L. S.)	3.409992	2,570.3	8,433
□16 (U. S. L. S.) (Canada)	46 31 31.94	171 02 58	351 02 45	40 (U. S. L. S.)	3.377373	2,384.4	7,823
	84 07 19.49	258 48 48	78 49 57	42 (U. S. L. S.)	3.317887	2,079.2	6,822
□18 (U. S. L. S.) (Canada)	46 31 16.72	172 28 57	352 28 44	40 (U. S. L. S.)	3.454840	2,850.0	9,350
	84 07 19.40	246 47 49	66 48 58	42 (U. S. L. S.)	3.345783	2,217.1	7,274
□20 (U. S. L. S.) (Canada)	46 31 08.63	166 23 05	346 22 40	40 (U. S. L. S.)	3.500252	3,164.1	10,381
	84 07 01.94	236 00 35	56 01 32	42 (U. S. L. S.)	3.302964	2,008.9	6,591
□29 (U. S. L. S.)	46 30 59.48	169 41 01	349 40 40	40 (U. S. L. S.)	3.533114	3,412.8	11,197
	84 07 08.21	232 00 15	52 01 16	42 (U. S. L. S.)	3.358561	2,283.3	7,491
□22 (U. S. L. S.) (Canada)	46 30 50.64	162 56 19	342 55 41	40 (U. S. L. S.)	3.579541	3,797.9	12,460
	84 06 44.60	217 40 29	37 41 13	42 (U. S. L. S.)	3.326469	2,120.6	6,957
□31 (U. S. L. S.)	46 30 22.88	326 32 07	146 34 01	46 (U. S. L. S.)	3.782453	6,059.7	19,881
	84 08 24.09	12 54 27	192 53 54	49 (U. S. L. S.)	3.642300	4,388.3	14,397
Church Point crib light (U. S. L. S.)	46 30 14.77	205 27 53	25 28 38	42 (U. S. L. S.)	3.489400	3,086.0	10,125
	84 06 46.04	287 49 53	107 51 22	44 (U. S. L. S.)	3.440879	2,759.8	9,054
42½ (U. S. L. S.) (Canada)	46 30 10.14	73 26 59	253 25 39	44 (U. S. L. S.)	3.391879	2,465.4	8,089
	84 02 52.02	128 40 31	308 38 27	42 (U. S. L. S.)	3.671070	4,688.9	15,383
46R (U. S. L. S.) (Canada)	46 27 39.22	146 13 12	326 11 06	47 (U. S. L. S.)	3.825297	6,688.0	21,942
	84 05 46.90	199 02 35	19 03 22	44 (U. S. L. S.)	3.621837	4,186.4	13,735
49R (U. S. L. S.)	46 28 04.45	240 50 54	60 54 08	44 (U. S. L. S.)	3.814921	6,530.1	21,424
	84 09 10.27	280 09 14	100 11 41	46R (U. S. L. S.)	3.644332	4,408.9	14,465
Crib light (head of flats) (U. S. L. S.)	46 26 04.04	184 06 03	4 06 12	49R (U. S. L. S.)	3,571407	3,727.4	12,229
	84 09 22.77	237 26 44	57 29 20	46R (U. S. L. S.)	3.737601	5,465.1	17,930
□33 (U. S. L. S.)	46 25 56.93	318 05 45	138 07 44	48 (U. S. L. S.)	3.721159	5,262.1	17,264
	84 10 35.05	38 18 15	218 17 41	51 (U. S. L. S.)	3.199482	1,583.0	5,194
□31½ (U. S. L. S.)	46 26 21.53	318 40 24	138 40 47	□33 (U. S. L. S.)	3.004934	1,011.4	3,318
	84 11 06.33	8 53 28	188 53 17	51 (U. S. L. S.)	3.306688	2,026.2	6,648
Crib W (1879) (U. S. L. S.)	46 24 46.02	307 58 02	127 59 17	48 (U. S. L. S.)	3.448402	2,808.0	9,213
	84 09 34.16	351 03 31	171 03 51	53 (U. S. L. S.)	3.593983	3,926.3	12,882
Crib E (1879) (U. S. L. S.) (Canada)	46 24 51.19	346 18 35	166 18 51	48 (U. S. L. S.)	3.288378	1,942.6	6,373
	84 08 12.06	84 48 42	264 47 43	Crib W (1879) (U. S. L. S.)	3.245688	1,760.7	5,777
Crib W (1881) (U. S. L. S.)	46 24 46.04	307 57 23	127 58 38	48 (U. S. L. S.)	3.448659	2,809.7	9,218
	84 09 34.24	351 02 11	171 02 31	53 (U. S. L. S.)	3.594077	3,927.1	12,884
Crib E (1881) (U. S. L. S.) (Canada)	46 24 51.11	346 15 40	166 15 56	48 (U. S. L. S.)	3.287952	1,940.7	6.367
	84 08 12.11	84 54 19	264 53 20	Crib W (1881) (U. S. L. S.)	3.245745	1,760.9	5,777
Crib W (1882) (U. S. L. S.)	46 24 45.92	307 53 13	127 54 28	48 (U. S. L. S.)	3.448441	2,808.3	9,214
	84 09 34.28	351 00 51	171 01 11	53 (U. S. L. S.)	3.593706	3,923.8	12,873
□35 (U. S. L. S.)	46 24 23.85	163 34 15	343 33 59	51 (U. S. L. S.)	3.230752	1,701.2	5,581
	84 10 58.46	284 33 00	104 35 17	48 (U. S. L. S.)	3.617817	4,147.8	13,608
Crib light (foot of flats) (U. S. L. S.)	46 23 59.58	103 44 42	283 42 58	□35 (U. S. L. S.)	3.499406	3,158.0	10,361
	84 08 34.85	123 52 50	303 50 50	51 (U. S. L. S.)	3.630781	4,273.5	14,021
□37 (U. S. L. S.)	46 23 10.96	223 10 27	43 11 06	48 (U. S. L. S.)	3.218944	1,655.6	5,432
	84 08 43.56	301 15 49	121 16 57	50 (U. S. L. S.)	3.370192	2,345.3	7,695
□24 (U. S. L. S.) (Canada)	46 23 25.71	70 23 49	250 23 05	□37 (U. S. L. S.)	3.132554	1,356.9	4,452
	84 07 43.74	169 03 57	349 03 52	48 (U. S. L. S.)	2.884099	765.8	2,512
□17 (U. S. L. S.)	46 29 41.37	96 50 01	276 49 31	16 (U. S. L. S.)	2.959275	910.5	2,987
	84 15 57.33	144 13 08	324 13 02	18 (U. S. L. S.)	2.508023	322.1	1,057
□39 (U. S. L. S.)	46 22 41.19	172 25 49	352 25 45	□37 (U. S. L. S.)	2.967247	927.4	3,043
	84 08 37.84	278 59 32	99 00 36	50 (U. S. L. S.)	3.280110	1,905.9	6,253
□26 (U. S. L. S.) (Canada)	46 22 07.20	125 54 59	305 54 10	53 (U. S. L. S.)	3.242544	1,748.0	5,735
	84 07 59.36	183 23 52	3 23 58	48 (U. S. L. S.)	3.502632	3,181.5	10,438
□43 (U. S. L. S.)	46 21 05.18	242 21 48	62 22 56	52 (U S. L. S.)	3.354452	2,261.8	7,421
	84 07 47.60	291 30 58	111 31 22	54 (U. S. L. S.)	2.836431	769.9	2,526
□28 (U. S. L. S.) (Canada)	46 21 24.92	343 39 09	163 39 18	54 (U. S. L. S.)	2.968144	929.3	3,049
	84 07 26.34	36 43 53	216 43 38	□43 (U. S. L. S.)	2.880946	760.2	2,494
□41 (U. S. L. S.)	46 21 30.45	280 39 44	100 40 15	□28 (U. S. L. S.)	2.965195	923.0	3,028
	84 08 08.77	329 53 10	149 53 26	□43 (U. S. L. S.)	2.955133	901.8	2,959
□45 (U. S. L. S.)	46 20 40.21	168 33 34	348 33 29	□43 (U. S. L. S.)	2.895773	786.6	2,581
	84 07 40.31	228 54 17	48 54 36	54 (U. S. L. S.)	2.871198	743.4	2,439

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Lake George—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
□B (1881) (U. S. L. S.) (Canada)	46 20 46.76 84 07 19.06	66 01 18 132 59 06	246 01 02 312 58 45	□45 (U. S. L. S.) □43 (U. S. L. S.)	2.696656 2.921375	497.3 834.4	1,632 2,738
□A (1881) (U. S. L. S.) (Canada)	46 20 59.28 84 07 23.06	32 03 36 109 08 55	212 03 23 289 08 37	□45 (U. S. L. S.) □43 (U. S. L. S.)	2.841832 2.744682	694.8 555.5	2,280 1,823
□47 (U. S. L. S.)	46 20 14.13 84 07 16.32	147 30 39 182 05 40	327 30 22 2 05 42	□45 (U. S. L. S.) 54 (U. S. L. S.)	2.979965 3.112237	954.9 1,294.9	3,133 4,248
□34 (U. S. L. S.) (Canada)	46 19 01.07 84 06 12.51	123 11 31 207 00 30	303 11 01 27 01 00	55 (U. S. L. S.) 56 (U. S. L. S.)	3.023553 3.290861	1,055.7 1,953.7	3,464 6,410
□32 (U. S. L. S.) (Canada)	46 19 58.47 84 06 50.03	335 38 00 3 52 06	155 38 27 183 52 03	□34 (U. S. L. S.) 55 (U. S. L. S.)	3.289092 3.078218	1,945.8 1,197.3	6,384 3,928
C (1883) (U. S. L. S.)	46 19 38.51 84 08 44.16						
Shoal Island Lighthouse (U. S. L. S.) (Canada)	46 18 47.91 84 04 32.52	108 02 49 126 32 15	288 01 07 306 30 36	55 (U. S. L. S.) □32 (U. S. L. S.)	3.502299 3.563572	3,179.1 3,660.8	10,430 12,010
□36 (U. S. L. S.) (Canada)	46 18 45.42 84 06 47.23						
68 (U. S. L. S.) (Canada)	46 15 04.82 84 05 51.43	139 14 56 174 52 13	319 14 45 354 52 09	65 (U. S. L. S.) 66 (U. S. L. S.)	2.717248 3.130290	521.5 1,349.9	1,711 4,429
91 (U. S. L. S.)	46 14 59.87 84 06 26.52	254 35 01 332 55 28	74 35 56 152 55 43	70 (U. S. L. S.) 72 (U. S. L. S.)	3.235051 3.010298	1,718.1 1,024.0	5,637 3,360
93 (U. S. L. S.)	46 14 22.44 84 07 04.03	214 48 47 259 07 33	34 49 14 79 08 15	91 (U. S. L. S.) 72 (U. S. L. S.)	3.148470 3.111600	1,407.6 1,293.0	4,618 4,242
74 (U. S. L. S.) (Canada)	46 14 16.98 84 06 12.85	98 45 18 167 31 55	278 44 41 347 31 45	93 (U. S. L. S.) 91 (U. S. L. S.)	3.045148 3.132378	1,109.6 1,356.4	3,640 4,450

Green Bay

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
W. Whaleback water station (U. S. L. S.), 1864	45 21 37.98 87 11 24.89	North Sturgeon (old) (U. S. L. S.), 1865	44 54 18.23 87 24 16.37
Washington Island (U. S. L. S.), 1864	45 20 32.21 86 57 20.57	Sturgeon (old) (U. S. L. S.) (Wis.), 1865	44 52 33.23 87 25 48.58
Sable (U. S. L. S.), 1864	45 17 56.83 87 00 56.60	North Egg (U. S. L. S.), 1865	45 04 30.22 87 16 49.39
North Chambers (U. S. L. S.), 1864	45 12 40.33 87 20 07.90	Chambers Island, south base (U. S. L. S.), 1864	45 09 32.54 87 19 47.76
Sister Bluff (U. S. L. S.), 1864	45 14 28.07 87 06 59.04	Chambers Island north base (U. S. L. S.) (Wis.), 1864	45 12 07.95 87 21 53.03
Horseshoe Island (U. S. L. S.), 1864	45 10 48.18 87 12 39.90	⊙3 Penny (U. S. L. S.), 1862	45 10 00.30 87 14 17.68
Sister Island (U. S. L. S.), 1864	45 13 28.10 87 08 56.90	Abbott (U. S. L. S.)	45 13 14.36 87 30 43.53
North Strawberry (U. S. L. S.), 1864	45 10 24.16 87 15 57.75	Eagle (old) (U. S. L. S.)	45 10 15.42 87 13 53.40
Rochereau (old) (U. S. L. S.), 1864	45 17 41.10 87 26 11.86	Fish Creek (U. S. L. S.)	45 07 53.86 87 14 58.30
Green Island (U. S. L. S.), 1865	45 03 38.14 87 30 06.20	Hat Island (U. S. L. S.), 1864	45 06 04.92 87 19 00.28
South Egg (old) (U. S. L. S.) (Wis.), 1865	44 59 13.39 87 21 37.30	Middle Strawberry (U. S. L. S.), 1864	45 10 01.38 87 15 58.40
Peshtigo (old) (U. S. L. S.) (Wis.), 1865	44 59 06.54 87 37 42.58	South Strawberry Island (U. S. L. S.), 1864	45 09 26.63 87 15 49.21

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Menominee (old) (1865) (U. S. L. S.) (Wis.)	45 05 19.35 87 35 37.55	2 17 40 13 23 44	182 17 04 193 22 15	Debroux (U. S. L S.) Peshtigo (U. S. L. S.)	4.444125 4.072870	27,805.1 11,826.9	91,224 38,802

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Potagannissing Bay

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Burnt Island (U. S. L. S.), 1896 (m.)	46 05 47.51	321 51 35	141 53 43	Harbor Island (No. 281), (U. S. L. S.)	3.792990	6,208.5	20,369
	83 48 53.46	11 46 53	191 46 23	Bacon Island (U. S. L. S.)	3.641854	4,383.8	14,383
Kocruish (U. S. L. S.) (Canada), 1896 (m.)	46 08 27.04	351 11 59	171 12 50	Harbor Island (No. 281) (U. S. L. S.)	3.996800	9,926.6	32,568
	83 47 05.74	25 09 49	205 08 32	Burnt Island (U. S. L. S.)	3.735734	5,441.7	17,853
Chippewa Point (U. S. L. S.), 1896 (m.)	46 06 02.48	86 26 14	266 22 08	Burnt Island (U. S. L. S.)	3.867445	7,369.6	24,178
	83 43 11.04	131 33 17	311 30 28	Kocruish (U. S. L. S.)	3.828127	6,731.7	22,086
Serpent (U. S. L. S.) (Canada), 1896 (m.)	46 10 26.81	17 19 33	197 18 07	Chippewa Point (U. S. L. S.)	3.931909	8,548.9	28,048
	83 41 12.51	64 01 34	243 57 19	Kocruish (U. S. L. S.)	3.926001	8,433.4	27,669
Sulphur Island Lighthouse (U. S. L. S.) (Canada), 1896.	46 08 40.72	88 17 38	268 09 59	Kocruish (U. S. L. S.)	4.136083	13,679.9	44,881
	83 36 28.67	118 18 08	298 14 44	Serpent (U. S. L. S.)	3.839811	6,915.3	22,688
252 (U. S. L. S.) (Canada), 1896 (m.)	46 11 04.03	278 21 02	98 25 24	Serpent (U. S. L. S.)	3.896430	7,878.3	25,847
	83 47 15.89	357 25 35	177 25 42	Kocruish (U. S. L. S.)	3.685935	4,852.2	15,919
Grande Point (U. S. L. S.) (Canada), 1896 (m.)	46 12 35.75	3 52 14	183 51 56	Kocruish (U. S. L. S.)	3.886309	7,696.8	25,252
	83 46 41.53	14 35 04	194 34 39	252 (U. S. L. S.)	3.466306	2,926.2	9,600
345 (U. S. L. S.) (Canada), 1896 (m.)	46 06 14.14	157 38 36	337 36 48	Serpent (U. S. L. S.)	3.926157	8,436.4	27,678
	83 38 42.91	212 28 41	32 30 18	Sulphur Island Lighthouse (U. S. L. S.).	3.729618	5,365.6	17,604
343 (U. S. L. S.), 1896 (m.)	46 06 12.23	236 18 14	56 22 05	Sulphur Island Lighthouse (U. S. L. S.).	3.917549	8,270.8	27,135
	83 41 49.29	269 08 14	89 10 28	345 (U. S. L. S.)	3.602435	4,003.5	13,135
262. Gull Island (U. S. L. S.) (Canada), 1896 (m.)	46 09 44.65	334 21 58	154 22 30	Sulphur Island Lighthouse (U. S. L. S.).	3.340324	2,189.4	7,183
	83 37 12.80	104 13 44	284 10 51	Serpent (U. S. L. S.)	3.724660	5,304.7	17,404
299. Cedar Island (U. S. L. S.), 1896 (m.)	46 05 10.57	358 49 16	178 49 18	Harbor Island (No. 281) (U. S. L. S.)	3.573399	3,744.5	12,285
	83 45 58.68	55 54 10	235 51 34	Bacon Island (U. S. L. S.)	3.749564	5,617.8	18,431
341. Drummond Island (U. S. L. S.), 1896 (m.)	46 04 49.94	47 47 12	227 45 17	Harbor Island (No. 281) (U. S. L. S.)	3.664882	4,622.6	15,166
	83 43 15.84	72 53 43	252 49 10	Bacon Island (U. S. L. S.)	3.930932	8,529.7	27,985
337. Peck Island (U. S. L. S.), 1896 (m.)	46 03 41.31	78 27 10	258 24 28	Harbor Island (No. 281) (U. S. L. S.)	3.692393	4,924.8	16,157
	83 42 10.65	146 32 10	326 31 23	341. Drummond Island (U. S. L. S.)	3.404894	2,540.4	8,335
311. Drummond Island (U. S. L. S.), 1896 (m.)	46 01 24.39	147 16 36	327 15 26	Harbor Island (No. 281) (U. S. L. S.)	3.585589	3,851.1	12,635
	83 44 18.26	212 58 25	32 59 57	337. Peck Island (U. S. L. S.)	3.702405	5,039.7	16,534
267 (U. S. L. S.), 1896 (m.)	46 02 21.03	182 50 23	2 50 27	Bacon Island (U. S. L. S.)	3.319344	2,086.1	6,844
	83 49 39.90	252 50 05	72 52 47	Harbor Island (No. 281) (U. S. L. S.)	3.703993	5,058.2	16,595
327. Drummond Island (U. S. L. S.), 1896 (m.)	46 02 23.02	108 53 38	288 51 18	Harbor Island (No. 281) (U. S. L. S.)	3.645347	4,419.2	14,499
	83 42 40.61	170 31 32	350 31 07	341. Drummond Island (U. S. L. S.)	3.662683	4,599.2	15,089
339. Drummond Island (U. S. L. S.), 1896 (m.)	46 03 50.36	79 31 11	259 27 22	Harbor Island (No. 281) (U. S. L. S.)	3.841697	6,945.4	22,787
	83 40 37.41	118 24 01	298 22 07	341. Drummond Island (U. S. L. S.)	3.587697	3,869.9	12,696
238½. Perrique Island (U. S. L. S.) (Canada), 1896 (m.)	46 08 29.02	87 55 59	267 55 02	Kocruish (U. S. L. S.)	3.228349	1,691.8	5,551
	83 45 46.97	158 16 32	338 15 28	252 (U. S. L. S.)	3.711997	5,152.3	16,904
254. Fox Island (U. S. L. S.) (Canada), 1896 (m.)	46 10 37.94	351 20 09	171 20 29	238½. Perrique Island (U. S. L. S.)	3.604909	4,026.3	13,210
	83 46 15.23	121 46 16	301 45 32	252 (U. S. L. S.)	3.184777	1,530.3	5,021
232 (U. S. L. S.) (Canada), 1896 (m.)	46 07 32.54	209 12 55	29 13 26	Kocruish (U. S. L. S.)	3.285137	1,928.1	6,326
	83 47 49.59	236 27 35	56 29 03	238½. Perrique Island (U. S. L. S.)	3.499345	3,157.5	10,359
238. North Seine Island (U. S. L. S.) (Canada), 1896 (m.).	46 07 37.38	84 39 50	264 38 57	232 (U. S. L. S.)	3.205631	1,605.6	5,268
	83 46 35.13	156 48 11	336 47 49	Kocruish (U. S. L. S.)	3.222238	1,668.2	5,473
236. Maple Island (U. S. L. S.) (Canada), 1896 (m.)	46 06 56.98	110 55 33	290 53 57	232 (U. S. L. S.)	3.487900	3,075.4	10,090
	83 45 35.79	134 23 51	314 23 08	238. North Seine Island (U. S. L. S.)	3.251131	1,782.9	5,849
295. Burnt Island (U. S. L. S.), 1896 (m.)	46 06 26.22	170 06 45	350 06 33	232 (U. S. L. S.)	3.317763	2,078.6	6,820
	83 47 32.96	249 18 21	69 19 45	236. Maple Island (U. S. L. S.)	3.429690	2,689.6	8,824
301. Choke Cherry Island (U. S. L. S.), 1896 (m.)	46 05 28.00	122 32 36	302 31 02	295. Burnt Island (U. S. L. S.)	3.524090	3,342.6	10,967
	83 45 21.76	173 44 31	353 44 21	236 (U. S. L. S.)	3.441524	2,763.9	9,068
303. Propeller Island (U. S. L. S.), 1896 (m.)	46 04 40.27	158 34 31	338 34 12	301. Choke Cherry Island (U. S. L. S.).	3.199543	1,583.2	5,194
	83 44 54.84						
305. Standerson Island (U. S. L. S.), 1896 (m.)	46 04 08.66	240 10 13	60 11 10	303. Propeller Island (U. S. L. S.)	3.292781	1,962.4	6,438
	83 46 14.06						
250. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.)	46 10 10.54	319 45 13	139 46 42	238½. Perrique Island (U. S. L. S.)	3.613389	4,105.7	13,470
	83 47 50.56	343 14 49	163 15 21	Kocruish (U. S. L. S.)	3.523379	3,337.2	10,949
240. Colville Island (U. S. L. S.) (Canada), 1896 (m.)	46 08 51.84	171 44 08	351 43 48	252 (U. S. L. S.)	3.615351	4,124.3	13,531
	83 46 48.25	192 11 59	12 12 23	254. Fox Island (U. S. L. S.)	3.525249	3,351.6	10,996
246. Hog Island (U. S. L. S.) (Canada), 1896 (m.)	46 08 58.95	182 19 25	2 19 30	252 (U. S. L. S.)	3.587172	3,865.2	12,681
	83 47 23.20	286 18 13	106 18 38	240. Colville Island (U. S. L. S.)	2.892910	781.5	2,564

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Potagannissing Bay—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
293. Burnt Island (U. S. L. S.), 1896 (m.)	46 06 32.04	215 56 42	35 57 27	232 (U. S. L. S.)	3.363105	2,307.3	7,570
	83 48 52.67	275 59 26	96 00 23	295. Burnt Island (U. S. L. S.)	3.235854	1,721.3	5,647
230 (U. S. L. S.) (Canada), 1894 (m.)	46 07 45.15	286 41 40	106 42 23	232 (U. S. L. S.)	3.131974	1,355.1	4,446
	83 48 50.04	1 25 56	181 25 54	293. Burnt Island (U. S. L. S.)	3.353709	2,257.9	7,408
307. Saltonstall Island (U. S. L. S.), 1896 (m.)	46 03 39.28						
	83 47 50.83						
248. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.)	46 09 29.99	132 24 11	312 23 00	Kocruish (U. S. L. S.)	3.459838	2,883.0	9,459
	83 48 44.95	341 51 04	161 51 44	232 (U. S. L. S.)	3.581638	3,816.3	12,521
244. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.)	46 08 22.15	265 40 30	85 41 37	Kocruish (U. S. L. S.)	3.302146	2,005.1	6,578
	83 48 38.89	325 21 07	145 21 43	232 (U. S. L. S.)	3.269984	1,862.0	6,109
242. Beef Island (U. S. L. S.) (Canada), 1896 (m.)	46 08 28.55	273 02 19	93 02 48	Kocruish (U. S. L. S.)	2.945195	881.4	2,892
	83 47 46.75	2 01 02	182 01 00	232 (U. S. L. S.)	3.238208	1,730.6	5,678
297. Wilson Island (U. S. L. S.), 1896 (m.)	46 05 23.96	346 22 28	166 23 02	Harbor Island (No. 281) (U. S. L. S.)	3.631197	4,277.6	14,034
	83 46 41.97	46 14 32	226 12 28	Bacon Island (U. S. L. S.)	3.712012	5,152.4	16,904
291½. Burnt Island Reef (U. S. L. S.), 1896 (m.)	46 06 26.79	206 36 13	26 36 54	230 (U. S. L. S.)	3.432317	2,705.9	8,878
	83 49 46.49	231 01 39	51 03 03	232 (U. S. L. S.)	3.508972	3,228.3	10,592
260. Thessalon Island (U. S. L. S.), 1896 (m.)	46 11 49.47	62 20 40	242 17 56	Serpent (U. S. L. S.)	3.739924	5,494.4	18,026
	83 37 25.63	96 53 33	276 46 52	Grande Point (U. S. L. S.)	4.079307	12,003.5	39,381
313. Boulanger Island (U. S. L. S.), 1896 (m.)	46 02 18.94	164 43 52	344 43 38	Harbor Island (No. 281) (U. S. L. S.)	3.207448	1,612.3	5,290
	83 45 35.35	315 26 34	135 27 30	311. Drummond Island (U. S. L. S.)	3.373518	2,363.3	7,754
309. Harbor Island Reef (U. S. L. S.), 1896 (m.)	46 02 40.43	116 11 04	296 09 23	Bacon Island (U. S. L. S.)	3.527150	3,366.3	11,044
	83 47 14.56	242 25 24	62 26 21	Harbor Island (No. 281) (U. S. L. S.)	3.284959	1,927.3	6,323
269. Surveyors Island (U. S. L. S.), 1896 (m.)	46 01 50.25	174 51 20	354 51 11	Bacon Island (U. S. L. S.)	3.483750	3,046.1	9,994
	83 49 22.39	241 16 12	61 18 41	Harbor Island (No. 281) (U. S. L. S.)	3.706030	5,081.9	16,673
279. Sam Island (U. S. L. S.), 1896 (m.)	46 01 33.97	127 01 25	306 58 48	Bacon Island (U. S. L. S.)	3.769090	5,876.1	19,279
	83 45 56.85	180 43 57	0 43 58	Harbor Island (No. 281) (U. S. L. S.)	3.468944	2,944.0	9,659
281. Wreck Island (U. S. L. S.), 1896 (m.)	46 01 54.21	179 46 12	359 46 12	Harbor Island (No. 281) (U. S. L. S.)	3.365289	2,318.9	7,608
	83 45 54.66	293 55 55	113 57 05	311. Drummond Island (U. S. L. S.)	3.355776	2,268.7	7,443
315. Rogg Island (U. S. L. S.), 1896 (m.)	46 02 20.09	232 12 18	52 14 06	337. Peck Island (U. S. L. S.)	3.612042	4,093.0	13,428
	83 44 41.12	344 02 31	164 02 47	311. Drummond Island (U. S. L. S.)	3.252541	1,788.7	5,868
317. Fire Island (U. S. L. S.), 1896 (m.)	46 02 25.14	0 51 08	180 51 07	311. Drummond Island (U. S. L. S.)	3.273165	1,875.7	6,154
	83 44 16.96	73 19 10	253 18 53	315. Rogg Island (U. S. L. S.)	2.734285	542.4	1,780
319. La Pointe Island (U. S. L. S.), 1896 (m.)	46 02 26.72	21 55 07	201 54 41	311. Drummond Island (U. S. L. S.)	3.316897	2,074.4	6,806
	83 43 42.26	80 49 07	260 48 25	315. Rogg Island (U. S. L. S.)	3.107961	1,282.2	4,207
321. Grape Island (U. S. L. S.), 1896 (m.)	46 03 02.44	179 49 04	359 49 04	341. Drummond Island (U. S. L. S.)	3.521045	3,319.3	10,890
	83 43 15.35	229 12 07	49 12 54	337. Peck Island (U. S. L. S.)	3.264129	1,837.1	6,027
323. Bald Island (U. S. L. S.), 1896 (m.)	46 03 13.52	201 36 17	21 36 56	341. Drummond Island (U. S. L. S.)	3.505423	3,202.0	10,505
	83 44 10.71	251 36 05	71 37 31	337. Peck Island (U. S. L. S.)	3.434516	2,719.7	8,923
331. James Island (U. S. L. S.), 1896 (m.)	46 02 43.68						
	83 41 32.46						
329. Bay Island (U. S. L. S.), 1896 (m.)	46 02 39.01						
	83 42 20.55						
333. Ashman Island (U. S. L. S.), 1896 (m.)	46 03 10.30	89 37 01	269 34 37	Harbor Island (No. 281) (U. S. L. S.)	3.634145	4.306.7	14,130
	83 42 34.77	163 59 42	343 59 13	341. Drummond Island (U. S. L. S.)	3.505238	3,200.6	10,501
335. Rutland Island (U. S. L. S.), 1896 (m.)	46 03 26.54	84 19 33	264 16 34	Harbor Island (No. 281) (U. S. L. S.)	3.728733	5,354.7	17,568
	83 41 47.24	120 45 12	300 42 11	299. Cedar Island (U. S. L. S.)	3.798387	6,286.2	20,624
271. Fairbanks Island (U. S. L. S.), 1896 (m.)	46 00 21.64	163 28 26	343 27 29	Bacon Island (U. S. L. S.)	3.779493	6,018.6	19,746
	83 48 15.45	210 13 53	30 15 34	Harbor Island (No. 281) (U. S. L. S.)	3.777630	5,992.8	19,661
275. Picnic Island (U. S. L. S.), 1896 (m.)	46 00 32.48	152 53 59	332 52 26	Bacon Island (U. S. L. S.)	3.785763	6,106.1	20,033
	83 47 25.69	201 54 31	21 55 36	Harbor Island (No. 281) (U. S. L. S.)	3.717644	5,219.7	17,125
265 (U. S. L. S.), 1896 (m.)	46 01 50.57	186 38 31	6 38 35	267 (U. S. L. S.)	2.976206	946.7	3,106
	83 49 45.00	243 47 16	63 50 02	Harbor Island (No. 281) (U. S. L. S.)	3.741060	5,508.8	18,073

St. Marys River, Detour Passage

237. Drummond Island (U. S. L. S.), 1896 (m.)	45 58 22.94	137 43 19	317 41 58	Detour (U. S. L. S.)	3.553402	3,576.0	11,732
	83 53 00.35	193 34 31	13 34 44	235 (U. S. L. S.)	3.233946	1,713.7	5,622
264. Upper Peninsula (U. S. L. S.), 1896 (m.)	45 58 00.81	222 15 19	42 16 30	235 (U. S. L. S.)	3.501628	3,174.2	10,414
	83 54 20.83	248 28 28	68 29 26	237. Drummond Island (U. S. L. S.)	3.270104	1,862.5	6,111
266. Upper Peninsula (U. S. L. S.), 1896 (m.)	45 57 28.12	200 26 20	20 26 32	264. Upper Peninsula (U. S. L. S.)	3.032294	1,077.2	3,534
	83 54 38.30	231 14 35	51 15 45	237. Drummond Island (U. S. L. S.)	3.432038	2,704.2	8,872

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Detour Passage—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
239 (U. S. L. S.), 1896 (m.)	45 57 51.38	72 35 49	252 34 33	266. Upper Peninsula (U. S. L. S.)	3.380182	2,399.8	7,873
	83 52 51.96	98 39 40	278 38 36	264. Upper Peninsula (U. S. L. S.)	3.286797	1,935.5	6,350
241 (U. S. L. S.), 1896 (m.)	45 57 33.34	87 24 02	267 22 04	266. Upper Peninsula (U. S. L. S.)	3.548054	3,532.3	11,589
	83 51 54.44	114 13 09	294 12 27	239. (U. S. L. S.)	3.132912	1,358.0	4,455
268. Island (U. S. L. S.), 1896 (m.)	45 57 58.63	198 10 09	18 10 46	Detour (U. S. L. S.)	3.553179	3,574.2	11,726
	83 55 43.93	318 35 37	138 36 11	Detour Lighthouse (U. S. L. S.)	3.190732	1,551.4	5,090

St. Marys River, shore-line points (old)

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Scammons, M, Drummond Island (U. S. L. S.)	45 58 16.35 83 52 20.26	V. Mainland (west of Lime Island) (U. S. L. S.)	46 04 17.80 84 02 43.88
1. Southeast end Scammons, 1853 (south coast Drummond Island) (U. S. L. S.)	45 56 15.84 83 44 32.61	R″. South point St. Joseph Island (U. S. L. S.) (Canada)	46 03 40.75 83 56 46.30
19. Drummond Island (U. S. L. S.)	46 00 01.68 83 52 16.35	1. N (end of small island 2 miles south of R″ Scammons, 1854) (U. S. L. S.).	46 01 54.15 83 56 35.65
W. West side St. Marys River (opposite 19) (U. S. L. S.)	46 00 00.04 83 54 04.73	a′ (U. S. L. S.)	46 03 10.38 83 50 51.68
d. Southwest point of Harbor Island (U. S. L. S.)	46 02 38.74 83 46 17.22	2b (U. S. L. S.)	45 59 15.31 83 48 03.45

Lake Michigan, north end

Cross Village (old) (U. S. L. S.)	45 37 59 85 04 00	West Cape Garden Island (U. S. L. S.)	45 48 01 85 32 00
Simmons Reef (U. S. L. S.)	45 55 01 85 12 19	Mount Pisgah (U. S. L. S.)	45 44 18 85 33 23
Grays Reef (U. S. L. S.)	45 47 31 85 13 30	Northwest corner Big Beaver Island (U. S. L. S.)	45 45 37 85 33 58
White Shoal (U. S. L. S.)	45 50 12 85 09 33	Squaw Island (U. S. L. S.)	45 50 01 85 35 21
Hog Island Reef (U. S. L. S.)	45 43 33 85 20 47	L (U. S. L. S.)	45 45 37 85 33 58
Southwest side Garden Island (U. S. L. S.)	45 47 24 85 27 15	R. 1854 (west coast of Beaver Island) (U. S. L. S.)	45 43 38 85 34 20
Triangle Island (U. S. L. S.)	45 46 06 85 26 41	Whiskey Island (U. S. L. S.)	45 48 42 85 36 22
Mille Coquins (old) (U. S. L. S.)	46 05 07 85 26 54	Trout Island (U. S. L. S.)	45 46 21 85 41 12
Northwest point Hog Island (U. S. L. S.)	45 48 48 85 22 42	Hughes (old) (U. S. L. S.)	45 57 51 85 50 28
South Cape Garden Island (U. S. L. S.)	45 46 32 85 29 49	⊙ 80 Hearding (U. S. L. S.)	45 57 31 86 08 09
Northeast corner Big Beaver Island (U. S. L. S.)	45 45 14 85 30 11		

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Toledo to Chicago

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
St. Mary's Church, Toledo (U. S. L. S.) (Ohio), 1879	41 39 32.98	158 37 50	338 34 29	Bedford (U. S. L. S.)	4.282323	19,156.8	62,850
	83 32 03.06	250 57 57	71 05 54	Cedar Point (U. S. L. S.)	4.243935	17,536.2	57,533
Monroe Lighthouse (U. S. L. S.), 1877	41 53 27.66	231 00 24	51 03 06	Stony Point (U. S. L. S.)	3.855559	7,170.7	23,526
	83 19 52.57	0 53 15	180 53 06	Cedar Point (U. S. L. S.)	4.302198	20,053.9	65,794
Monroe Courthouse (U. S. L. S.), 1877	41 54 52.59	260 13 47	80 19 07	Stony Point (U. S. L. S.)	4.048619	11,184.6	36,695
	83 23 49.09	295 38 58	115 41 36	Monroe Lighthouse (U. S. L. S.)	3.781661	6,048.7	19,845
Monroe Presbyterian Church (U. S. L. S.)	41 54 53.38						
	83 23 50.75						
Monroe German Lutheran Church (U. S. L. S.)	41 54 43.36	96 04 04	276 01 05	Monroe (U. S. L. S.)	3.791590	6,188.6	20,304
	83 23 48.49	258 47 10	78 52 29	Stony Point (U. S. L. S.)	4.050098	11,222.7	36,820
Monroe M. E. Church (U. S. L. S.)	41 54 52.41	93 35 07	273 32 13	Monroe (U. S. L. S.)	3.777657	5,993.2	19,663
	83 23 55.97	260 20 17	80 25 41	Stony Point (U. S. L. S.)	4.054680	11,341.7	37,210
Tecumseh Presbyterian Church (U. S. L. S.)	42 00 14.96	290 55 17	111 06 26	Dundee (U. S. L. S.)	4.392444	24,685.6	80,989
	83 56 54.01	341 02 00	161 02 57	Raisin (U. S. L. S.)	3.777193	5,986.8	19,642
Adrian engine house No. 2 (U. S. L. S.)	41 53 45.33	117 39 13	297 29 52	Woodstock (U. S. L. S.)	4.338540	21,804.2	71,536
	84 01 36.16	284 50 09	104 58 55	Blissfield (U. S. L. S.)	4.274767	18,826.4	61,766
Hudson Congregational Church (U. S. L. S.)	41 51 12.55	73 45 03	253 40 00	Pittsford (U. S. L. S.)	4.038631	10,930.3	35,860
	84 21 25.20	131 30 54	311 26 58	Wheatland (U. S. L. S.)	4.036826	10,884.9	35,712
Prattville Church (U. S. L. S.)	41 46 50.01	125 59 55	305 56 35	Pittsford (U. S. L. S.)	3.932977	8,569.9	28,116
	84 23 59.48	163 17 40	343 15 27	Wheatland (U. S. L. S.)	4.203744	15,986.2	52,448
Jackson, Michigan, State prison (U. S. L. S.)	42 14 34.60	336 21 29	156 27 32	Woodstock (U. S. L. S.)	4.491997	31,045.4	101,855
	84 24 36.01	11 31 02	191 28 57	Bunday (U. S. L. S.)	4.329754	21,367.5	70,103
Jackson, chimney (U. S. L. S.)	42 15 45.40	338 20 43	158 26 37	Woodstock (U. S. L. S.)	4.517859	32,950.3	108,104
	84 24 23.37	11 08 56	191 06 43	Bunday (U. S. L. S.)	4.372292	23,566.3	77,317
Jackson First M. E. Church (U. S. L. S.)	42 14 49.91	336 35 10	156 41 15	Woodstock (U. S. L. S.)	4.498398	31,506.3	103,367
	84 24 39.04	11 05 23	191 03 21	Bunday (U. S. L. S.)	4.338800	21,817.3	71,579
Hillsdale Courthouse (U. S. L. S.)	41 55 15.28						
	84 37 54.04						
Hillsdale College clock tower (U. S. L. S.)	41 55 56.94						
	84 38 01.34						
Reading, southeast corner of Colby Wringer Factory (U. S. L. S.).	41 50 06.98						
	84 44 32.67						
Reading, cupola of schoolhouse east side of Chestnut St. (U. S. L. S.).	41 50 16.06						
	84 44 44.86						
Reading First Baptist Church (U. S. L. S.)	41 50 18.44						
	84 44 46.23						
Sturgis Presbyterian Church (U. S. L. S.)	41 48 03.37	57 30 54	237 23 09	Van Buren (U. S. L. S.)	4.281845	19,135.7	62,781
	85 25 07.95	150 42 01	330 40 38	Sherman (U. S. L. S.)	3.766496	5,841.1	19,164
Sturgis M. E. Church (U. S. L. S.)	41 48 01.04	57 41 12	237 33 28	Van Buren (U. S. L. S.)	4.280856	19,092.2	62,638
	85 25 08.21	151 05 31	331 04 09	Sherman (U. S. L. S.)	3.770917	5,900.9	19,360
Sturgis schoolhouse (U. S. L. S.)	41 48 05.48	57 15 03	237 07 21	Van Buren (U. S. L. S.)	4.281467	19,119.1	62,727
	85 25 10.61	150 54 58	330 53 37	Sherman (U. S. L. S.)	3.759997	5,754.4	18,879
Lima School (U. S. L. S.) (Ind.)	41 43 30.55	168 31 49	348 30 30	Sherman (U. S. L. S.)	4.139442	13,786.1	45,230
	85 25 13.02	285 49 17	105 55 20	Mongo (U. S. L. S.)	4.117195	13,097.7	42,971
Three Rivers, tall steeple (U. S. L. S.)	41 56 54.08	306 49 45	126 56 59	Sherman (U. S. L. S.)	4.273980	18,792.3	61,654
	85 38 03.87	356 08 40	176 09 32	Van Buren (U. S. L. S.)	4.426994	26,729.7	87,696
Three Rivers, church (U. S. L. S.)	41 56 58.84	307 06 28	127 13 45	Sherman (U. S. L. S.)	4.276788	18,914.2	62,054
	85 38 05.70	356 04 32	176 05 25	Van Buren (U. S. L. S.)	4.429412	26,878.9	88,185
White Pigeon Woolen Mill (U. S. L. S.)	41 47 41.75	249 41 03	69 48 33	Sherman (U. S. L. S.)	4.221141	16,639.5	54,591
	85 38 28.25	346 13 18	166 14 26	Van Buren (U. S. L. S.)	3.996234	9,913.7	32,525
White Pigeon Baptist Church (U. S. L. S.)	41 47 47.30	250 24 48	70 32 23	Sherman (U. S. L. S.)	4.223337	16,723.9	54,868
	85 38 34.83	345 36 58	165 38 10	Van Buren (U. S. L. S.)	4.005036	10,116.6	33,191
Constantine schoolhouse (U. S. L. S.)	41 50 06.92	265 47 43	85 56 16	Sherman (U. S. L. S.)	4.249922	17,779.6	58,332
	85 40 00.47	342 19 56	162 22 06	Van Buren (U. S. L. S.)	4.170388	14,804.3	48,570
South Bend, standpipe (U. S. L. S.) (Ind.)	41 40 31.24	87 49 16	267 39 27	Carlisle (U. S. L. S.)	4.312113	20,517.0	67,313
	86 14 51.94	136 52 26	316 47 15	Bertrand (U. S. L. S.)	4.198727	15,802.5	51,845
New Carlisle, Ind., M. E. Church steeple (U. S. L. S.)	41 42 25.50	284 25 23	104 37 30	Penn (U. S. L. S.)	4.417357	26,143.1	85,771
	86 30 40.21	341 40 52	161 41 33	Carlisle (U. S. L. S.)	3.659510	4,565.7	14,979
New Carlisle Ind., spire of Christian Church (U. S. L. S.).	41 42 22.17	233 53 30	53 58 51	Bertrand (U. S. L. S.)	4.138763	13,764.6	45,159
	86 30 41.24	284 11 30	104 23 38	Penn (U. S. L. S.)	4.417316	26,140.6	85,763
St. Joseph, Mich., Congregational Church (U. S. L. S.).	42 06 18.85	23 31 45	203 27 04	Bald Tom (U. S. L. S.)	4.383999	24,210.2	79,430
	86 28 59.50	38 17 33	218 01 56	Michigan City (U. S. L. S.)	4.717974	52,236.5	171,379

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Toledo to Chicago—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Michigan City High School (U. S. L. S.) (Ind.)	41 42 51.64 86 53 46.96	220 32 25 293 09 07	40 33 23 113 15 18	Michigan City (U. S. L. S) Springville (U. S. L. S.)	3.489348 4.146572	3,085.7 14,014.3	10,124 45,979
Michigan City Deutsche Evangelical Church (U. S. L. S.) (Ind.).	41 42 45.22 86 53 58.93	221 54 20 291 58 33	41 55 26 112 04 52	Michigan City (U. S. L. S.) Springville (U. S. L. S.)	3.533630 4.152099	3,416.9 14,193.8	11,210 46,567

Lake Michigan, south end

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Michigan City Lighthouse (U. S. L. S.) (Ind.)	41 43 21.0 86 54 21.2	△ Azimuth V (U. S. L. S.)	42 00 01.2 86 33 20.5
△Azimuth VII, New Buffalo (U. S. L. S.)	41 48 00.3 86 44 57.9	△ Azimuth IV, or St. Joseph Station (U. S. L. S.)	42 06 47.2 86 29 14.2
△16 (U. S. L. S.)	41 51 08.2 86 40 22.3	△ Azimuth III (U. S. L. S.)	42 13 56.3 86 22 16.7
△ Azimuth VI (U. S. L. S.)	41 54 16.7 86 36 29.6		

Section corners, southern Michigan

Monroe County, Mich.: SW. corner of private claim No. 432 (U. S. L. S.).	41 54 42.62 83 28 29.26	Branch County: SW. corner of SE. quarter of sec. 16, T. 7 S., R. 8 W. (U. S. L. S.).	41 51 15.94 85 14 35.43
Monroe County, Mich.: NE. corner of sec. 5, T. 8 S., R. 7 E. (U. S. L. S.).	41 49 19.82 83 36 31.80	St. Joseph County: SW. corner of SE. quarter of sec. 22, T. 7 S., R. 10 W. (U. S. L. S.).	41 50 21.23 85 27 28.22
Monroe County, Mich.: Corner of secs. 25, 26, 35, 36, T. 6 S., R. 6 E. (U. S. L. S.).	41 55 28.22 83 40 18.08	Cass County: SW. corner of NW. quarter of sec. 36, T. 7 S., R. 13 W. (U. S. L. S.).	41 48 59.27 85 46 46.83
Lenawee County: Corner of secs. 22, 23, 26, 27, T. 7 S., R. 5 E. (U. S. L. S.).	41 50 56.96 83 48 26.30	Cass County: SW. corner of NW. quarter of sec. 27, T. 7 S., R. 14 W. (U. S. L. S.).	41 49 57.58 85 56 06.68
Lenawee County: Corner of secs. 14, 15, 22, 23, T. 6 S., R. 4 E. (U. S. L. S.).	41 56 57.04 83 55 33.65	Cass County: Corner of secs. 4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.)	41 47 49.68 86 11 09.69
Lenawee County: NE. corner of sec. 3, T. 8 S., R. 3 E. (U. S. L. S.)	41 49 00.15 84 02 29.49	Van Buren County: SW. corner of sec. 36, T. 1 N., R. 17 W. (U. S. L. S.).	42 25 04.57 86 15 57.44
Lenawee County: NE. corner of sec. 1, T. 6 S., R. 1 E. (U. S. L. S.)	41 59 11.84 84 14 45.94	Berrien County: Corner of secs. 14, 15, 22, 23, T. 8 S., R. 18 W. (U. S. L. S.).	41 46 34.78 86 22 39.05
Hillsdale County, Mich.: Corner of secs. 22, 23, 26, 27, T. 7 S., R. 4 W. (U. S. L. S.).	41 50 22.60 84 44 52.60	Berrien County: SE. corner of sec. 35, T. 6 S., R. 20 W. (U. S. L. S.)	41 53 58.43 86 35 23.35
Hillsdale County, Mich.: NE. corner of sec. 26, T. 7 S., R. 4 W. (U. S. L. S.).	41 50 22.30 84 43 42.08	Steuben County, Ind.: NW. corner of sec. 31, T. 38 N., R. 14 E. (U. S. L. S.).	41 42 55.83 84 58 15.42
Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.).	41 55 11.78 84 39 04.56	La Grange County: Corner of secs. 4, 5, 8, 9, T. 37 N., R. 11 E. (U. S. L. S.) (Ind.)	41 41 08.32 85 16 22.69
Hillsdale County, Mich.: NW. corner of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.).	41 55 38.05 84 39 04.43	La Grange County: SW. corner of NW. quarter of sec. 33, T. 38 N., R. 8 E. (U. S. L. S.) (Ind.)	41 42 15.94 85 37 13.02
Hillsdale County, Mich.: SE. corner of sec. 8, T. 5 S., R. 1 W. (U. S. L. S.).	42 03 54.93 84 28 59.86	Elkhart County: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 6 E. (U. S. L. S.) (Ind.)	41 40 54.71 85 48 42.93
Hillsdale County, Mich.: SE. corner of sec. 36, T. 7 S., R. 2 W. (U. S. L. S.).	41 48 40.87 84 28 34.19	St. Joseph County, Ind.: Corner of secs. 17, 18, 19, 20, T. 37 N., R. 3 E. (U. S. L. S.).	41 39 04.24 86 12 56.67
Hillsdale County, Mich.: Corner of secs. 19, 20, 29, 30, T. 6 S., R. 1 W. (U. S. L. S.).	41 55 38.55 84 27 33.67	St. Joseph County, Ind.: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.).	41 40 46.26 86 30 22.98
Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 29, T. 6 S., R. 1 W. (U. S. L. S.).	41 55 12.62 84 27 33.61	La Porte County: SW. corner of SE. quarter of SW. quarter of sec. 32, T. 38 N., R. 2 W. (U. S. L. S.) (Ind.)	41 41 38.86 86 40 32.82
Branch County: SW. corner of SE. quarter of sec. 7, T. 6 S., R. 5 W. (U. S. L. S.).	41 57 22.54 84 55 55.12	La Porte County: SE. corner of sec. 10, T. 37 N., R. 3 W. (U. S. L. S.)(Ind).	41 39 52.09 86 44 19.11
		La Porte County: NW. corner of sec. 10. T. 36 N., R. 4 W. (U. S. L. S.) (Ind.).	41 35 32.64 86 52 38.36

77720°—30——11

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Erie

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
Kingsville (U. S. L. S.) (Canada), 1877 (m.)	42 01 36.08	348 59 54	169 02 07	Point Pelée (U. S. L. S.)	4.381207	24,055.1	78,921
	82 44 20.75	47 47 03	227 36 31	Middle Sister (U. S. L. S.)	4.469506	29,478.5	96,714
Kingsville M. E. Church (U. S. L. S.) (Canada), 1877	42 02 16.74	349 34 05	169 36 18	Point Pelée (U. S. L. S.)	4.402872	25,285.5	82,958
	82 44 20.22	0 33 31	180 33 31	Kingsville (U. S. L. S.)	3.098510	1,254.6	4,116
Kingsville schoolhouse (U. S. L. S.) (Canada), 1877	42 02 21.38	349 08 06	169 10 25	Point Pelée (U. S. L. S.)	4.405982	25,467.2	83,554
	82 44 29.84	351 29 24	171 29 30	Kingsville (U. S. L. S.)	3.150265	1,413.4	4,637
Old Hen Island (U. S. L. S.), 1877 (m.)	41 47 20.13	253 22 31	73 27 02	Point Pelée (U. S. L. S.)	3.990646	9,786.9	32,109
	82 47 48.16	355 39 07	175 39 30	Middle Bass Island (U. S. L. S.)	4.012059	10,281.6	33,732
Azimuth △, Chicken Island (U. S. L. S.), 1877	41 46 13.38	246 28 01	66 33 23	Point Pelée (U. S. L. S.)	4.085534	12,176.8	39,950
	82 49 05.55	342 35 21	162 36 35	Middle Bass Island (U. S. L. S.)	3.933769	8,585.6	28,168
East Sister Island (U. S. L. S.), 1877 (m.)	41 48 50.94	269 58 36	90 05 16	Point Pelée (U. S. L. S.)	4.142205	13,874.1	45,519
	82 51 02.96	337 57 35	158 00 07	Middle Bass Island (U. S. L. S.)	4.148627	14,080.8	46,197
Little Point (U. S. L. S.), 1877	41 59 03.07	313 45 38	133 55 08	Point Pelée (U. S. L. S.)	4.435806	27,277.6	89,493
	82 55 15.40	23 59 56	203 56 41	Middle Sister (U. S. L. S.)	4.218729	16,547.4	54,289
Turtle Island Lighthouse (U. S. L. S.), 1877	41 45 08.69	207 53 36	27 58 41	Stony Point (U. S. L. S.)	4.352745	22,529.2	73,915
	83 23 28.14	314 53 39	134 55 53	Cedar Point (U. S. L. S.)	3.819316	6,596.5	21,642
Toledo stone longitude post (U. S. L. S.) (Ohio), 1877.	41 39 04.50						
	83 32 31.18						

Detroit River

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
Bar Point (1878) (U. S. L. S.), 1877 (m.)	42 02 57.95	337 45 10	157 49 35	Middle Sister (U. S. L. S.)	4.383087	24,159.4	79,263
	83 06 43.62	43 57 00	223 50 54	Stony Point (U. S. L. S.)	4.259121	18,160.2	59,581
Point Mouillée (1873) (U. S. L. S.), 1873 (m.)	42 00 49.62	235 22 04	55 24 51	Bar Point (1878) (U. S. L. S.)	3.843312	6,971.3	22,872
	83 10 53.05	320 59 08	141 06 20	Middle Sister (U. S. L. S.)	4.374209	23,670.6	77,659
Sugar Island (U. S. L. S.), 1873 (m.)	42 05 25.36	330 40 09	150 41 23	Bar Point (1878) (U. S. L. S.)	3.717354	5,216.2	17,113
	83 08 34.73	20 30 46	200 29 13	Point Mouillée (1873) (U. S. L. S.)	3.958212	9,082.6	29,798
Bar Point (1874) (U. S. L. S.), 1873 (m.)	42 03 24.54	48 27 32	228 24 55	Point Mouillée (1873) (U. S. L. S.)	3.857610	7,204.6	23,637
	83 06 58.70	149 22 20	329 21 16	Sugar Island (U. S. L. S.)	3.636724	4,332.4	14,214
Hackett (U. S. L. S.), 1873 (m.)	42 05 15.43	352 54 20	172 54 32	Bar Point (1874) (U. S. L. S.)	3.537541	3,447.8	11,312
	83 07 17.22	99 45 36	279 44 44	Sugar Island (U. S. L. S.)	3.257130	1,807.7	5,931
Bois Blanc (U. S. L. S.), 1873 (m.)	42 06 09.68	351 49 05	171 49 12	Hackett (U. S. L. S.)	3.228115	1,690.9	5,548
	83 07 27.68	48 25 00	228 24 15	Sugar Island (U. S. L. S.)	3.313883	2,060.1	6,759
Barker (U. S. L. S.), 1873 (m.)	42 07 39.46	334 20 10	154 20 49	Bois Blanc (U. S. L. S.)	3.487609	3,073.3	10,083
	83 08 25.61	2 54 01	182 53 55	Sugar Island (U. S. L. S.)	3.617318	4,143.0	13,592
Clark (U. S. L. S.), 1873 (m.)	42 08 18.98	10 05 30	190 05 09	Bois Blanc (U. S. L. S.)	3.607703	4,052.3	13,295
	83 06 56.78	59 08 29	239 07 29	Barker (U. S. L. S.)	3.375983	2,376.7	7,798
Biddle (U. S. L. S.), 1873 (m.)	42 08 02.83	254 52 51	74 53 45	Clark (U. S. L. S.)	3.281325	1,911.3	6,271
	83 08 17.13	241 58 28	161 59 01	Bois Blanc (U. S. L. S.)	3.564842	3,671.5	12,046
Brodhead (U. S. L. S.), 1873 (m.)	42 09 30.48	320 44 08	140 45 01	Clark (U. S. L. S.)	3.454676	2,848.9	9,347
	83 08 15.30	0 53 28	180 53 27	Biddle (U. S. L. S.)	3.432094	2,704.5	8,873
Turkey Island (U. S. L. S.), 1873 (m.)	42 11 09.32	1 40 37	181 40 33	Clark (U. S. L. S.)	3.720797	5,257.7	17,250
	83 06 50.08	32 40 59	212 40 02	Brodhead (U. S. L. S.)	3.559053	3,622.9	11,886
North Wyandotte (U. S. L. S.), 1873 (m.)	42 12 49.14	318 43 57	138 45 16	Turkey Island (U. S. L. S.)	3.612447	4,096.8	13,441
	83 08 47.84	353 03 05	173 03 27	Brodhead (U. S. L. S.)	3.790615	6,174.7	20,258
Grosse Isle (U. S. L. S.)	42 10 42.65	176 57 12	356 57 06	North Wyandotte (U. S. L. S.)	3.591960	3,908.0	12,821
	83 08 38.78	251 44 15	71 45 28	Turkey Island (U. S. L. S.)	3.419405	2,626.7	8,618
Wyandotte (U. S. L. S.)	42 11 43.36	289 04 15	109 05 44	Turkey Island (U. S. L. S.)	3.506902	3,212.9	10,541
	83 09 02.41	343 51 12	163 51 28	Grosse Isle (U. S. L. S.)	3.290039	1,950.0	6,398
Wyandotte south base (U. S. L. S.)	42 10 53.03	223 13 25	43 14 08	Wyandotte (U. S. L. S.)	3.328626	2,131.2	6,992
	83 10 06.02	279 04 49	99 05 48	Grosse Isle (U. S. L. S.)	3.306993	2,027.6	6,652
Wyandotte north base (U. S. L. S.)	42 11 50.46	322 49 18	142 50 05	Grosse Isle (U. S. L. S.)	3.419242	2,625.7	8,614
	83 09 47.92	13 11 52	193 11 40	Wyandotte south base (U. S. L. S.)	3.260069	1,820.0	5,971
Fighting Island (U. S. L. S.), 1873 (m.)	42 14 38.38	358 24 26	178 24 31	Turkey Island (U. S. L. S.)	3.809759	6,453.0	21,171
	83 06 57.90	36 48 19	216 47 05	North Wyandotte (U. S. L. S.)	3.624195	4,209.2	13,810
Ecorse (U. S. L. S.), 1873 (m.)	42 15 21.38	309 10 31	129 11 19	Fighting Island (U. S. L. S.)	3.322292	2,100.4	6,891
	83 08 08.92	10 45 35	190 45 09	North Wyandotte (U. S. L. S.)	3.679574	4,781.6	15,688
River Rouge (U. S. L. S.)	42 16 15.33	344 24 16	164 24 41	Fighting Island (U. S. L. S.)	3.492176	3,105.8	10,190
	83 07 34.32	25 28 36	205 28 13	Ecorse (U. S. L. S.)	3.265713	1,843.8	6,049
Petite Cote (U. S. L. S.)	42 16 33.36	22 10 49	202 10 07	Fighting Island (U. S. L. S.)	3.583337	3,831.2	12,570
	83 05 54.81	76 17 54	256 16 47	River Rouge (U. S. L. S.)	3.370546	2,347.2	7,701

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Detroit River—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
Field (U. S. L. S.), 1873 (m.)	42 17 34.14 83 06 22.51	341 18 07 34 05 36	161 18 26 214 04 48	Petite Cote (U. S. L. S.) River Rouge (U. S. L. S.)	3.296580 3.467744	1,979.6 2,935.9	6,495 9,632
Sandwich (U. S. L. S.), 1873 (m.)	42 17 25.62 83 05 27.21	21 25 08 101 43 42	201 24 50 281 43 05	Petite Cote (U. S. L. S.) Field (U. S. L. S.)	3.238516 3.111851	1,731.9 1,293.8	5,682 4,245
Swayne (U. S. L. S.), 1873	42 18 48.00 83 05 09.47	9 05 10 36 17 22	189 04 58 216 16 33	Sandwich (U. S. L. S.) Field (U. S. L. S.)	3.410616 3.451330	2,574.0 2,827.0	8,445 9,275
Sandwich Courthouse (U. S. L. S.) 1873	42 18 00.95 83 04 35.59	47 19 51 151 52 32	227 19 16 331 52 09	Sandwich (U. S. L. S.) Swayne (U. S. L. S.)	3.206399 3.216407	1,608.4 1,645.9	5,277 5,400
Michigan Central Elevator (U. S. L. S.), 1873	42 19 23.39 83 03 36.29	28 06 15 62 54 16	208 05 35 242 53 13	Sandwich Courthouse (U. S. L. S.) Swayne (U. S. L. S.)	3.459917 3.379668	2,883.5 2,397.0	9,460 7,864
Windsor (U. S. L. S.), 1873	42 19 09.89 83 02 21.86	55 14 01 103 44 24	235 12 31 283 43 34	Sandwich Courthouse (U. S. L. S.) Michigan Central Elevator (U. S. L. S.).	3.571598 3.244179	3,729.0 1,754.6	12,234 5,757
Engine house center (U. S. L. S.), 1873	42 20 40.88 83 02 20.93	0 25 54 35 49 17	180 25 54 215 48 27	Windsor (U. S. L. S.) Michigan Central Elevator (U. S. L. S.).	3.448315 3.469577	2,807.5 2,948.3	9,211 9,673
Azimuth post, Belle Isle (U. S. L. S.), 1873	42 20 06.78 82 59 53.86	62 37 45 107 22 01	242 36 06 287 20 22	Windsor (U. S. L. S.) Engine House Center (U. S. L. S.)	3.581636 3.547445	3,816.2 3,527.3	12,520 11,572
St. Paul's Church (U. S. L. S.), 1873	42 19 45.78 83 02 53.04	261 00 22	81 02 23	Azimuth post, Belle Isle (U. S. L. S.)	3.618375	4,153.1	13,626
△Engine House (U. S. L. S.), 1873	42 20 40.80 83 02 20.92	287 18 14 23 25 17 0 26 18	107 19 53 203 24 56 180 26 18	Azimuth post, Belle Isle (U. S. L. S.) St. Paul's Church (U. S. L. S.) Windsor (U. S. L. S.)	3.547321 3.267202 3.447946	3,526.3 1,850.1 2,805.1	11,569 6,070 9,203
Office, southeast corner building, Grand River and Park Place (U. S. L. S.), 1873.	42 20 00.53 83 03 07.04	220 20 42 324 51 11	40 21 13 144 51 20	△Engine House (U. S. L. S.) St. Paul's Church (U. S. L. S.)	3.212320 2.745521	1,630.5 556.6	5,349 1,826
Detroit City Hall flagstaff (U. S. L. S.), 1873	42 19 52.32 83 02 50.91	124 25 21	304 25 10	Office, southeast corner building, Grand River and Park Place (U. S. L. S.).	2.65095	447.7	1,469
		204 38 58	24 39 18	△Engine House (U. S. L. S.)	3.216342	1,645.7	5,399
Observatory post, east pier (U. S. L. S.), 1871	42 20 00.70 83 03 06.87						
Westminster or St. Aloysius Church, southwest corner (U. S. L. S.), 1873.	42 19 57.79 83 03 02.56						
Fort and Griswold Sts., intersection (U. S. L. S.), 1873.	42 19 49.78 83 02 50.94						
Detroit, old observatory (U. S. L. S.), 1857, r. 1870	42 19 59.55 83 03 04.96						

Lake St. Clair

Happy (U. S. L. S.), 1873	42 19 19.84 82 58 47.35	86 26 32 117 06 06	266 24 08 297 03 42	Windsor (U. S. L. S.) Engine House Center (U. S. L. S.)	3.692099 3.739726	4,921.5 5,491.9	16,147 18,018
Windmill Point Lighthouse (U. S. L. S.), 1873	42 21 30.09 82 55 49.08	45 27 19 80 25 34	225 25 19 260 21 10	Happy (U. S. L. S.) Engine House Center (U. S. L. S.)	3.757970 3.958861	5,727.6 9,096.2	18,791 29,843
Lake St. Clair west base (U. S. L. S.), 1871	42 18 57.33 82 55 20.78	98 22 25 172 10 36	278 20 06 352 10 17	Happy (U. S. L. S.) Windmill Point Lighthouse (U. S. L. S.).	3.679521 3.677410	4,781.0 4,757.8	15,686 15,610
Grosse Point Church (U. S. L. S.), 1871	42 23 39.38 82 53 29.57	16 18 45 38 40 36	196 17 30 218 39 02	Lake St. Clair west base (U.S. L. S.) Windmill Point Lighthouse (U. S. L. S.).	3.957477 3.708330	9,067.3 5,108.9	29,748 16,761
La Puce (1869) (U. S. L. S.)	42 18 12.14 82 46 39.92	96 42 58 115 57 42	276 37 07 295 51 32	Lake St. Clair west base (U. S. L. S.) Windmill Point Lighthouse (U. S. L. S.).	4.079562 4.145455	12,010.5 13,978.3	39,404 45,860
Grosse Point (U. S. L. S.), 1871	42 23 41.14 82 53 26.75	317 25 56 16 36 20	137 30 30 196 35 03	La Puce (1869) (U. S. L. S.) Lake St. Clair west base (U. S. L. S.).	4.139107 3.960834	13,775.5 9,137.6	45,195 29,979
Lake St. Clair east base, (U. S. L. S.), 1871	42 18 30.06 82 50 41.44	97 31 08 158 30 05	277 28 00 338 28 14	Lake St. Clair west base (U. S. L. S.) Grosse Point (U. S. L. S.)	3.809737 4.013566	6,452.6 10,317.3	21,170 33,849
Milk River (U. S. L. S.), 1871	42 27 16.35 82 52 06.26	335 59 55	156 03 35	La Puce (1869) (U. S. L. S.)	4.264270	18,376.8	60,291
Post on base line, Michigan Land Survey (U. S. L. S.), 1871	42 27 06.98 82 52 12.07						

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake St. Clair—Continued

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance: Logarithm (meters)	Distance: Meters	Distance: Feet
	° ′ ″	° ′ ″	° ′ ″				
A (U. S. L. S.), 1871	42 21 01.93 82 54 30.76	16 35 38 115 52 23	196 35 04 295 51 30	Lake St. Clair west base (U. S. L. S.). Windmill Point Lighthouse (U. S. L. S.).	3.603296 3.299320	4,011.4 1,992.1	13.161 6,536
Bassett (U. S. L. S.), 1871	42 29 37.11 82 35 45.76	35 21 17 79 07 03	215 13 56 258 56 01	La Puce (1869) (U. S. L. S.) Milk River (U. S. L. S.)	4.413205 4.358217	25,894.4 22,814.8	84,955 74,852
La Puce (1871) (U. S. L. S.), 1871	42 18 04.24 82 46 45.09	156 41 53 215 08 07	336 38 17 35 15 32	Milk River (U. S. L. S.) Bassett (U. S. L. S.)	4.268402 4.417665	18,552.5 26,161.6	60,868 85,832
Stony Point (U. S. L. S.), 1871	42 18 54.12 82 33 58.54	85 49 22 172 57 51	265 40 50 352 56 39	La Puce (1869) (U. S. L. S.) Bassett (U. S. L. S.)	4.242689 4.300829	17,485.9 19,990.7	57,368 65,586
Mitchel (U. S. L. S.) (Canada), 1871	42 25 50.26 82 25 57.46	40 38 56 117 33 48	220 33 32 297 27 11	Stony Point (U. S. L. S.) Bassett (U. S. L. S.)	4.228203 4.180544	16,912.3 15,154.6	55,486 49,720
Thames River Lighthouse (U. S. L. S.), 1871	42 19 02.76 82 27 12.14	88 23 46 187 43 54	268 19 12 7 44 44	Stony Point (U. S. L. S.) Mitchel (U. S. L. S.)	3.968972 4.103430	9,310.5 12,689.1	30,546 41,631
Huron Point (U. S. L. S.), 1871	42 33 58.26 82 47 05.11	297 23 55 29 01 56	117 31 34 208 58 32	Bassett (U. S. L. S.) Milk River (U. S. L. S.)	4.242381 4.151671	17,473.5 14,179.8	57,328 46,522
North Channel (34 O. N. Chaffee, 1867) (U. S. L. S.), 1871.	42 37 41.09 82 37 23.46	351 30 12 62 38 52	171 31 18 242 32 18	Bassett (U. S. L. S.) Huron Point (U. S. L. S.)	4.178957 4.174269	15,099.3 14,937.2	49,538 49,006
St. Clair Flats Rear Range Lighthouse (U. S. L. S.), 1871.	42 32 21.82 82 41 24.12	209 05 49 303 18 49	29 08 32 123 22 38	North Channel (34 O. N. Chaffee, 1867) (U. S. L. S.). Bassett (U. S. L. S.)	4.052191 3.965950	11,276.9 9,245.9	36,998 30,334
Beacon (U. S. L. S.), 1871	42 32 16.27 82 41 35.74	301 32 52 57 19 41	121 36 48 237 12 35	Bassett (U. S. L. S.) Milk River (U. S. L. S.)	3.972108 4.233397	9,378.0 17,115.8	30,768 56,154
Congregational Church at New Baltimore (U. S. L. S.), 1871.	42 40 45.18 82 44 16.81	330 28 24 17 00 06	150 34 10 196 58 12	Bassett (U. S. L. S.) Huron Point (U. S. L. S.)	4.374382 4.118229	23,680.0 13,128.9	77,690 43,074
Lutheran Church at New Baltimore (U. S. L. S.), 1871.	42 40 48.73 82 44 16.64	330 36 41 16 52 45	150 42 27 196 50 51	Bassett (U. S. L. S.) Huron Point (U. S. L. S.)	4.376090 4.121715	23,773.3 13,234.7	77,996 43,421
Camp Post (U. S. L. S.) (Canada)	42 19 42.22 82 26 35.24						
1, O. N. Chaffee (U. S. L. S.), 1867	42 37 12.63 82 30 36.41						
9, Macomb (O. N. C. 1867) (U. S. L. S.)	42 33 27.18 82 41 05.75						
⊙43, O. N. C. (1867) (U. S. L. S.)	42 37 56.69 82 39 20.38						

Lake Michigan, east shore

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Frankfort (astronomic latitude) (U. S. L. S.), 1871	44 38 52.49 86 15 04.24	⊙99 (U. S. L. S.)	44 03 14.02 86 31 02.26
⊙28 (U. S. L. S.)	44 31 53.67 86 13 51.14	⊙123 (U. S. L. S.)	43 55 01.18 86 26 55.15
⊙53 (U. S. L. S.)	44 21 57.49 86 15 41.91	⊙150 (U. S. L. S.)	43 44 15.15 86 28 16.04
Manistee (astronomic latitude) (U. S. L. S.), 1871	44 16 44.96 86 19 05.01	⊙160 (U. S. L. S.)	43 40 44.21 86 31 49.68
Rush Lake (U. S. L. S.), 1866	44 16 30.15 86 18 59.10	Observatory post, O. B. Wheeler, Little Pt. Sable (1866) (U. S. L. S.)	43 40 22.24 86 31 57.19
⊙76 (U. S. L. S)	44 12 17.66 86 21 56.15	Little Point Sable (astronomic latitude) (U. S. L. S.)	43 38 39.00 86 30 07.78
⊙95 (U. S. L. S.)	44 04 48.05 86 29 44.42	⊙7 (marked N1) (U. S. L. S.)	43 37 50.36 86 32 28.08
Observatory post, O. B. Wheeler, Big Pt. Sable (1866) (U. S. L. S.)	44 03 29.53 86 30 56.69	Claybanks (astronomic latitude) (U. S. L. S.), 1871 (m.)	43 30 22.44 86 28 20.00
Big Point Sable (astronomic latitude) (U. S. L. S.), 1866 (m.)	44 03 26.41 86 30 57.03	△Z (U. S. L. S.)	43 29 49.68 86 28 13.04
Big Point Sable (O. N. C.) (U. S. L. S.)	44 03 24.83 86 29 25.99	△35. reference stone (U. S. L. S.)	43 29 29.42 86 28 04.17

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Lake Michigan, east shore—Continued

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Duck Lake (astronomic latitude) (U. S. L. S.), 1871 (m.)	43 20 02.50 86 24 15.38	Observatory post 4 (U. S. L. S.)	42 46 21.02 86 12 34.13
△53 (U. S. L. S.)	43 16 13.39 86 21 57.09	△39 (U. S. L. S.)	42 40 55.15 86 12 38.00
△84 (U. S. L. S.)	43 07 47.99 86 16 39.53	△22 (U. S. L. S.)	42 39 52.82 86 12 59.91
⊙85 (U. S. L. S.)	43 07 25.72 86 09 27.98	Douglas (astronomic latitude) (U. S. L. S.), 1873 (m.)	42 38 11.05 86 13 43.82
⊙77 (U. S. L. S.)	43 07 01.27 86 09 51.90	Az. I (U. S. L. S.)	42 32 05.40 86 14 29.02
Observatory post 3 (U. S. L. S.)	43 03 29.87 86 14 51.86	Az. II (U. S. L. S.)	42 24 16.39 86 16 50.52
South Twin Sister (astronomic latitude) (U. S. L. S.), 1871, (m.)	42 58 34.31 86 13 23.93	△68 (U. S. L. S.)	42 19 11.58 86 18 59.72
△127 (U. S. L. S.)	42 54 39.08 86 12 55.18	South Haven Lighthouse (geodetic) (U. S. L. S.), 1873 (m.)	42 24 00.65 86 17 09.19
△140 (U. S. L. S.)	42 50 21.53 86 12 40.34	South Haven (geodetic) (U. S. L. S.), 1873	42 16 08.80 86 20 43.19
△194 (U. S. L. S.)	42 47 50.23 86 06 40.75	Station 20 (geodetic) (U. S. L. S.)	42 08 55.11 86 27 02.06

Lake Michigan, northeast end

Station	Latitude and longitude	Azimuth	Back azimuth	To station	Distance		
					Logarithm (meters)	Meters	Feet
	° ′ ″	° ′ ″	° ′ ″				
North Manitou (U. S. L. S.), 1860	45 03 51.51 85 59 43.76	195 08 39 245 56 58	15 14 25 66 13 01	South Fox (U. S. L. S.) Cathead (U. S. L. S.)	4.607593 4.511634	40,512.9 32,481.3	132,916 106,566
Pyramid Point (U. S. L. S.), 1860	44 58 04.42 85 55 27.61	152 23 38 185 44 53	332 20 37 5 47 36	North Manitou (U. S. L. S.) South Fox (U. S. L. S.)	4.082567 4.699537	12,093.9 50,065.3	39,678 164,256
Carp River (U. S. L. S.), 1860	45 01 43.61 85 45 30.42	62 42 24 102 01 18	242 35 22 281 51 14	Pyramid Point (U. S. L. S.) North Manitou (U. S. L. S.)	4.168106 4.280762	14,726.7 19,088.1	48,316 62,625
South Manitou Lighthouse (U. S. L. S.), 1860	45 00 27.61 86 05 38.10	230 54 15 288 13 44	50 58 26 108 20 56	North Manitou (U. S. L. S.) Pyramid Point (U. S. L. S.)	3.999511 4.148780	9,988.7 14,085.8	32,771 46,213
South Manitou (U. S. L. S.), 1860	45 00 35.23 86 09 01.14	243 32 04 273 00 35	63 38 39 93 02 59	North Manitou (U. S. L. S.) South Manitou Lighthouse (U.S. L. L. S.).	4.134236 3.648620	13,621.8 4,452.7	44,691 14,609
Sleeping Bear (U. S. L. S.), 1860	44 52 22.71 86 04 07.46	157 04 32 172 26 46	337 01 05 352 25 42	South Manitou (U. S. L. S.) South Manitou Lighthouse (U. S. L. S.).	4.217774 4.178970	16,511.0 15,099.8	54,170 49,540
Point aux Becs Scies (U. S. L. S.), 1860	44 41 48.64 86 14 58.70	192 41 14 206 05 46	12 45 26 26 16 32	South Manitou (U. S. L. S.) North Manitou (U. S. L. S.)	4.552081 4.658067	35,651.8 45,505.8	116,968 149,297
Point Betsie Lighthouse (U. S. L. S.), 1858, r. 1872	44 41 28.53 86 15 18.67						
⊙ Penny, No. 1 (U. S. L. S.)	44 41 49.85 86 15 01.77						

GEOGRAPHIC POSITIONS, UNITED STATES LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED—Continued

Grand Traverse Bay

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
Traverse Point (Lake Michigan) (U. S. L. S.)	45 14 06.90 85 23 16.65	3 (U. S. L. S.), 1860	44 47 12.55 85 33 34.87
15 (U. S. L. S.), 1861	45 11 23.90 85 23 11.68	2 (U. S. L. S.), 1860	44 44 49.39 85 32 53.50
16 (U. S. L. S.), 1861	45 10 37.53 85 31 54.52	1 (U. S. L. S.), 1860	44 45 17.95 85 34 35.31
12 (New Mission Point) (U. S. L. S.) 1861	45 02 51.92 85 33 57.89	Suttons Point (U. S. L. S.), 1860	44 59 22.21 85 35 57.82
14 (U. S. L. S.), 1861	45 08 34.08 85 22 34.62	P (Merrels Point) (U. S. L. S.), 1860	44 58 26.76 85 31 11.12
C (U. S. L. S.), 1861	45 08 02.30 85 33 30.50	R (U. S. L. S.), 1860	44 53 39.95 85 33 53.38
10 (U. S. L. S.), 1861	45 01 49.76 85 22 51.68	Lees Point (U. S. L. S), 1860	44 55 29.13 85 36 03.10
11 (Old Mission) (U. S. L. S.), 1860	44 59 29.62 85 28 44.43	U (U. S. L. S.), 1860	44 52 03.49 85 38 52.81
8 (U. S. L. S.), 1860	44 55 58.23 85 23 43.37	T (Blacks Point) (U. S. L. S.), 1860	44 49 07.19 85 34 41.26
9 (U. S. L. S.), 1860	44 57 35.17 85 27 57.17	V (Norris Point) (U. S. L. S.), 1860	44 48 02.92 85 38 00.60
7 (U. S. L. S.), 1860	44 54 08.46 85 29 20.76	W (U. S. L. S.), 1860	44 45 54.34 85 36 22.31
6 (U. S. L. S.), 1860	44 51 15.06 85 27 11.72	S (Hog Island) (U. S. L. S.), 1860	44 52 10.77 85 34 50.40
5 (U. S. L. S.), 1860	44 51 23.55 85 30 01.29	Little Hog Island (U. S. L. S.), 1860	44 51 37.26 85 34 53.70
4 (U. S. L. S.), 1860	44 48 15.34 85 29 57.69	Penny ⊙ 203 (U. S. L. S.), 1860	44 47 04.72 85 38 14.97

Green Bay Islands

Station	Latitude and longitude	Station	Latitude and longitude
	° ′ ″		° ′ ″
St. Martins Island (U. S. L. S.)	45 30 39.80 86 46 22.86	Gull Island (U. S. L. S.)	45 30 41.11 86 43 15.27
Poverty Island (U. S. L. S.)	45 31 53.94 86 40 05.11	Rock Island Lighthouse (old) (U. S. L. S.)	45 25 39.13 86 49 40.09
Rocky Island (△Heardings R 1863) (U. S. L. S.)	45 36 33.96 86 42 39.16	Transit Post (Boyers Bluff, old) (U. S. L. S.)	45 25 12.34 86 49 09.57
Summer Island (U. S. L. S,)	45 32 42.06 86 38 56.76	Transit Post (Burnt Bluff, old) (U. S. L. S.)	45 40 39.23 86 43 02.20
Little Summer Island (U. S. L. S.)	45 35 49.79 86 41 23.51	Pilot Island Lighthouse (U. S. L. S.)	45 17 02.93 86 55 10.08
Gravelly Island (U. S. L. S.)	45 31 18.42 86 43 34.11	Baileys Harbor Lighthouse (U. S. L. S.)	45 03 19.30 87 05 45.86

DESCRIPTIONS AND PLANE COORDINATES OF TRIANGULATION STATIONS

Until recently, the plane coordinates of the triangulation stations have been listed in separate tables apart from the descriptions in publications of this Bureau. In this publication, for the convenience of the engineer and others who use the information, the plane coordinates of a station are given with its description, where the data are readily available. Thus there appears in the description of each station all the information concerning the station except its geographic position, and this may be found in the list of geographic positions.

EXPLANATION OF DESCRIPTIONS

The following descriptions of stations may be conveniently consulted by reference to the illustrations at the end of this publication or to the index. Azimuths given in the descriptions are geodetic azimuths, unless noted otherwise, and are reckoned continuously from true south around by west to 360°, south being 0°, west 90°, north 180°, and east 270°. Do not confuse these azimuths with plane-coordinate or "grid" azimuths. (See p. 171.) Where magnetic azimuths are given they are indicated as such. Wheverer the name of a point is printed in *italics* in the body of the descriptions, its position may be found in the tables.

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

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

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

MARKING OF STATIONS

The standard station and reference marks referred to in the following descriptions and notes consist of a disk and shank of bronze cast in one piece. The disk of the station mark (see fig. 4) 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. In recent years the slits in the stems of both station and reference disks have been enlarged so that the two prongs may be spread far apart and set in concrete without the use of a wedge. The marks

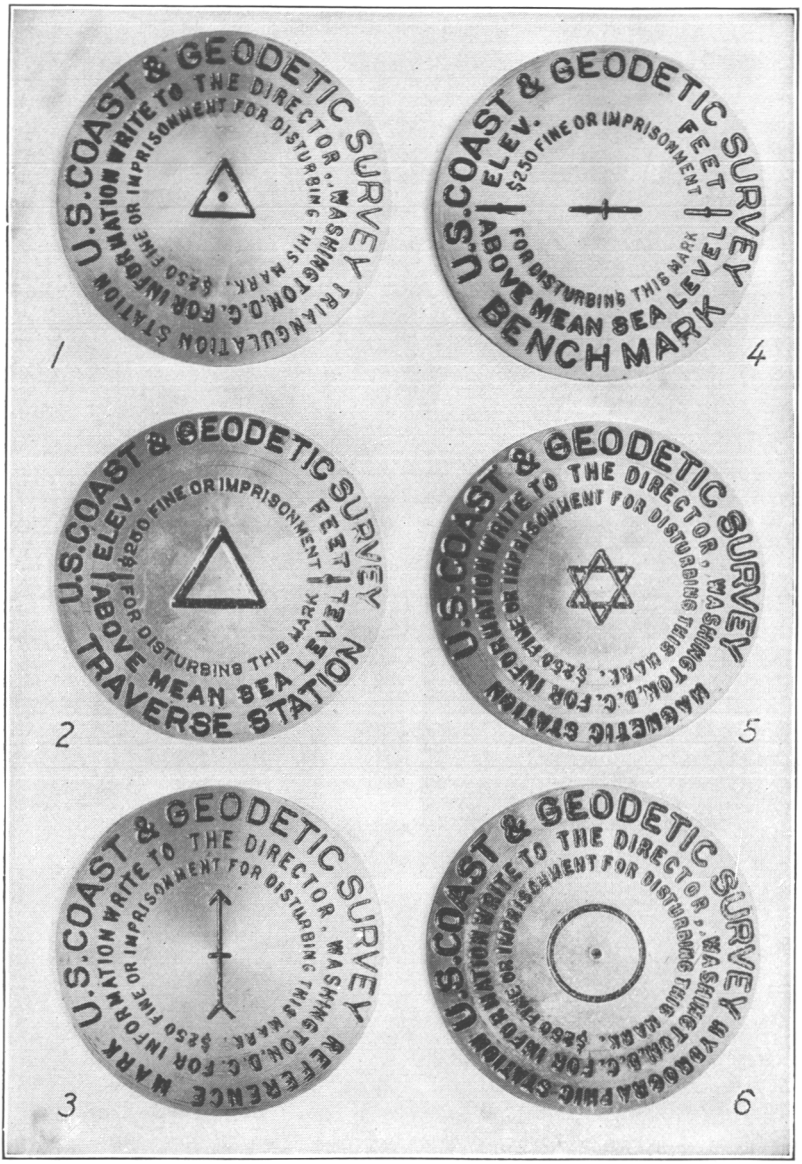

FIGURE 4.—STANDARD MARKS OF THE U. S. COAST AND GEODETIC SURVEY.

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

used between about 1915 and 1920 have grooves cut around the shank instead of the slit.

The standard disk reference mark shown in figure 4 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 disk azimuth mark, referred to on page 168, is not shown in figure 4. It is the same as the reference mark described above except that the words "azimuth mark" take the place of the words "reference mark" in the inscribed legend.

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.

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.

Reference marks [3]

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 glaze 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.

EXPLANATION OF PLANE-COORDINATE SYSTEM

In order to meet the various demands imposed upon it by engineering and surveying operations (see p. 10), a plane-coordinate system must satisfy conditions which naturally accompany requirements for accurate computations and exact results. The preservation of angles is one important factor to be considered; another factor of utmost importance is the elimination of variations of scale. Since variations of scale are inevitable, it becomes necessary to select a projection which will give definite scale values in certain directions, so that scale values may be tabulated, and through their use, when utmost accuracy is desired, one can eliminate the distortions of scale which result from the projection of spheroidal coordinates onto a plane.

These various requirements pointed very definitely to the adoption of one of the conformal projections. After due consideration it was decided to employ the Lambert conformal projection with two standard parallels in States with greatest extent in an east-west direction and the transverse Mercator projection where the greatest extent was in a north-south direction. Such a rule, however, could be applied only in those States which were of such limited extent in one of these directions that the entire State could be included in a single zone. It therefore became necessary to divide the larger States into a number of zones, using the projection in each which would satisfy the requirements of accuracy indicated by the limiting scale error, and at the same time keep to a minimum the number of zones required.

For these reasons the transverse Mercator projection with three zones was adopted for Michigan (see fig. 5). It will be noticed that the junction lines between zones follow the county boundary lines; so that all stations in any county will be included in the same zone.

[3] These notes also apply to methods of setting azimuth marks, for which standard reference disks suitably stamped were first used, but for which on later arcs disks were used on which an appropriate legend was cast. (See p. 167.)

Since, however, some surveys will extend across these artificial boundaries, the coordinates of stations which lie within what may be termed the borderland of two contiguous zones are given on both zones. With these data the engineer will not have to go from one zone of coordinates to the other in extending a survey a short distance beyond a boundary. Care must always be taken, however, to use in direct

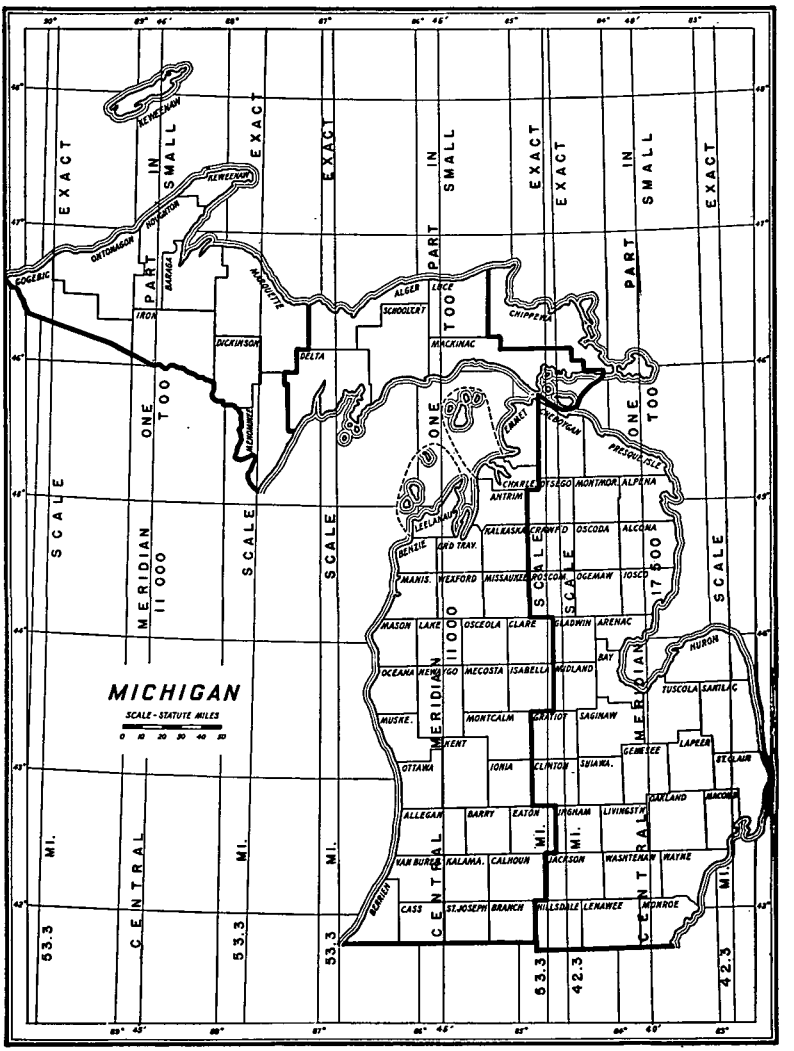

FIGURE 5.—Map of Michigan with grid system outline.

combination only coordinates which are given on the same zone. Where it is necessary to go from one zone or system to another, suitable directions for so doing will be found in Special Publication No. 193.

Each geodetic position in this publication has been reduced to plane coordinates which are given at the end of the description of each station, with the exception of those positions determined by the

United States Lake Survey for which no descriptions were available. The plane coordinates for these are listed in tabular form. These coordinates are based upon the transverse Mercator projection of Michigan with three zones. The zone upon which a station has been computed is denoted in the description by the initial (E, C, or W) directly preceding the plane coordinates in the second paragraph of each description. Coordinate tables for the State have been prepared by this Bureau as a basis for computing the coordinates. The purpose in view in supplying these coordinates has been to provide for computations of surveys by the usual methods of plane surveying in which the convergence of the meridians is not considered. A State-wide application can now be made of principles ordinarily confined in common practice to very restricted areas.

The x and y coordinates of stations whose geographic positions are listed to three decimal places are given in feet to two decimal places. This is one place farther than geodetic positions justify, but it was thought desirable to accept the positions as if they were correct to three decimal places, and carry two decimal places in the coordinates for use in adjusting traverses between fixed points.

The plane coordinates are in all essential features merely the plane representation of the spheroidal coordinates given in the tables of geodetic positions. For definite instructions regarding the use of plane coordinates, reference should be made to the following manuals of this Bureau: Special Publication No. 193, Manual of plane-coordinate computation, cost 35 cents; Special Publication No. 194, Manual of traverse computation on the Lambert grid, cost 20 cents; and Special Publication No. 195, Manual of traverse computation on the tranverse Mercator grid, cost 25 cents. These manuals may be procured from the Superintendent of Documents, Washington, D. C. The State coordinate tables for the other States are available in lithographed form, but the tables for this State are contained in this publication. (See p. 352.)

A few stations, for which geodetic positions are given in this publication, lie so far outside the State that plane coordinates were not computed for them on the grid of this State. If it becomes necessary to use any of these as control for local surveys, their coordinates should be obtained from the Coast and Geodetic Survey on the grid of the State in which they lie. Computation of traverses tied to them would then have to be made by passing from one grid to the other. The method of accomplishing this is given in Special Publication No. 193. It is not thought that this necessity will arise very often, but when it does occur the method of handling it is not complicated and the necessary computations can easily be made.

Explanation of plane lengths

The length of line between any two stations can be computed from the differences of coordinates just as is done in ordinary plane surveying. The resulting length is affected by the distortion due to the reduction of the actual curved surface of the earth to a plane. It must be corrected for the scale of the grid at that point to reduce it to the sea-level length listed in the geographic-position tables. Should it be desired to obtain the actual ground-level length, a further correction must be applied, as described on page 16 for lines of triangulation.

Explanation of plane or grid azimuths

The plane or grid azimuths given in the descriptions of stations are based upon the central meridian of the proper zone, and they therefore differ from the geodetic azimuths which appear in the lists of geographic positions and in the descriptions. The back azimuth differs from the forward azimuth by exactly 180°, hence it is necessary to list the azimuth of each line in only one direction.

Many of the azimuths listed are to special azimuth marks located at comparatively short distances from the stations. These marks have been placed at such positions as to be visible from the ground at the stations, and thus are readily available as starting azimuths for local surveys such as traverses. Since 1927 it has been the custom to establish these azimuth marks at most of the first-order stations determined by this Bureau.

The plane azimuth from a triangulation station to an azimuth mark or other triangulation station may be computed in two ways: first, by means of the formula: [4]

$$\text{Geodetic azimuth}-\text{grid azimuth}=\Delta\alpha+\frac{(y_2-y_1)\ (2x_1'+x_2')}{(6\rho_0^2 \sin 1'')_g}$$

In this formula, the sub-one coordinates are the coordinates of the origin of the line, and the sub-two coordinates are those of the azimuth mark or other triangulation station. The x''s are the x coordinates minus 500,000. The value of $\Delta\alpha$ is the convergence of the meridian through the origin of the line with reference to the central meridian (Y axis) of the projection; it is constant for a given triangulation station, and is computed at the same time as the coordinates for a station, and on the same form.[5]

The value of $\log \frac{1}{(6\rho_0^2 \sin 1'')_g}$ is given among the constants of the projection, page 364, for the zone in which the station is located.

The second method of computing a plane azimuth is by means of the usual plane-surveying formula:

$$\text{Tangent grid azimuth}=\frac{\Delta x}{\Delta y}$$

in which Δx and Δy are the respective differences of the x and y coordinates of two stations.

Since the second term of the first formula is negligible for distances up to approximately one mile, the grid azimuth may be derived by applying the $\Delta\alpha$ term directly to the geodetic azimuth. For azimuths over short distances, more consistent results will be obtained in this way than can be had through using the second (or tangent) formula. This is due to the fact that there are not enough significant figures in the differences of the x and y coordinates to make the second formula sufficiently exact.

Inconsistencies between the plane azimuths as computed from the two formulas may also arise when the coordinates of the azimuth mark are derived from a "no check" (see p. 16) geodetic position.

[4] See Special Publication No. 193, Manual of plane-coordinate computation, p. 13.
[5] Idem, p. 28.

This results from discarding the third decimal place of the seconds of latitude and longitude, and thus using only hundredths of seconds for computing the plane-coordinate position.

Since these inconsistencies diminish as the distance between the station and azimuth mark increases, the second formula has been used to compute the plane azimuths of such lines as are of sufficient length to make the difference negligible. In other words, when the distance between the station and the azimuth mark is such that both formulas give practically the same result, and when the coordinates of both station and azimuth mark are known, the second (or tangent) formula is used.

The first formula (neglecting the second term) has been used in computing the plane azimuths to all azimuth marks whose coordinates were not known; this includes practically all special azimuth marks, the distances to such marks being nearly always less than one mile, and very rarely known with sufficient accuracy to permit the computation of the position of the mark. The first formula was also used for computing the plane azimuths to stations whose plane coordinates were derived from "no check" geodetic positions, and to other azimuth marks whose coordinates were known, but for which consistent results were not obtained through the use of the second formula. In the descriptions of stations, the plane azimuths computed by means of the first formula are marked by footnotes. The plane azimuths computed by the second formula are carried out to tenths of seconds, distinguishing them from the ones computed by the first formula which are carried to even seconds only.

A table of values of $\Delta\alpha$ may be found on page 364. The latitude of a station and its distance from the central meridian ($\Delta\lambda$) are the arguments for obtaining $\Delta\alpha$ from this table. Straight-line interpolation in the table will give $\Delta\alpha$ within a tenth of a second of the value computed by means of the rigid formula.[6]

All of the $\Delta\alpha$'s for plane azimuths listed in the following descriptions were computed by formula instead of by use of the table. For most practical purposes the value derived by interpolation in the table will be sufficiently exact, that is, within a tenth of a second and will furnish an excellent check on the value computed by formula. For ease in interpolation horizontally, the tabular differences for each latitude listed is given in the two right-hand columns of the table. The tabular differences in the vertical direction are small enough so that no special aids are necessary for interpolating in that direction.

The following computation should serve as an example in the use of the table for computing $\Delta\alpha$. The position of station Brandywine (p. 55) is: Latitude (ϕ) 42°19′32″.028; longitude (λ) 86°18′29″.643. The geodetic azimuth to the azimuth mark is 242°32′04″. The grid azimuth is to be computed on the central zone of the plane-coordinate system. In this zone the central meridian is 85°45′00″.000 (see p. 364). This value minus λ equals −33′29″.643, the value of $\Delta\lambda$ with which to enter the table as one argument. The other argument is the latitude ϕ. In the column headed 0°30′ opposite latitude 42°10′ is the value 20′08″.3. To this value add 3×40″.28 (minutes of $\Delta\lambda$ and value of $\Delta\alpha$ for 1′ of $\Delta\lambda$) and 29.643×0″.671 (seconds of $\Delta\lambda$ and value of $\Delta\alpha$ for 1″ of $\Delta\lambda$). The 40″.28 and 0″.671 appear in the last two

[6] See Special Publication No. 195, p. 10.

columns of the table opposite latitude 42°10′. The result of these multiplications and addition is 22′29″.03, the value of $\Delta\alpha$ for latitude 42°10′ and $\Delta\lambda$, 33′29″.643. In the column headed 0°30′ opposite latitude 42°20′ is the value 20′12″.2. To this quantity add $3\times40''.41$ and $29.643\times0''.674$ giving 22′33″.41, the value of $\Delta\alpha$ for latitude 42°20′ and $\Delta\lambda$, 33′29″.643. Latitude 42°19′32″.028 is 9′32″.028 or 9.′5338 from 42°10′, the lower limit. The 9.′5338 is 0.95338 of the whole tabular difference of 10′. The difference between 22′29″.03 and 22′33″.41 is 4″.38. This multiplied by 0.95338 gives 4″.18 which added to 22′29″.03 gives 22′33″.21 as the final interpolated value of $\Delta\alpha$. This value is negative to agree with the sign of $\Delta\lambda$. The grid azimuth equals the geodetic azimuth minus $\Delta\alpha$, so in this particular case the grid azimuth to the azimuth mark is equal to −22′33″.2 subtracted from 242°32′04″ which gives 242°54′37″.

EXPLANATION OF PLANE-COORDINATE PROJECTION TABLES

The State tables of plane coordinates (see p. 352) are intended primarily for use in the reduction of geodetic positions to grid coordinates, and they were computed with this end in view. However, they serve another purpose, as they are needed for use in the computation of surveys on the grid coordinate system. The zone projection constants are frequently needed in the solution of special problems, while the scale factors are necessary if computations are to produce exact results through the elimination of variations in scale.

There are several ways in which the table of scale variations can be used on the transverse Mercator grid. The scale varies with the distance from the central meridian and the factors are tabulated for every 5,000 feet from this meridian. The factor is the same at a given distance out from the central meridian, whether in an east or a west direction. This distance is given by the x' value, which is the x coordinate minus the added constant (500,000 in this State).

The first method would be to make a preliminary computation of these x' values for the various stations of the survey and then obtain the mean value of the x' for each line. An interpolation in the table of scale factors using the x' of each line as an argument would give a scale factor for each of the lines of the survey. This is probably the most accurate method of computing the scale factors.

A second method would be to make an approximate plotting of the traverse on a Geological Survey quadrangle map by means of angles and distances and from this map scale off approximate distances of the traverse stations from the central meridian. If the traverse runs from one control station to another, the x''s of these two stations being known, two lines could be drawn through them with known x' values. By scaling out from one or the other of these lines approximate x' values for all of the traverse stations could be determined. These could then be used just as the computed x' values were used in the first method.

A third method that is probably accurate enough for most traverses consists in computing a mean scale factor for the whole traverse. If a general mean x' for an entire traverse is determined, the scale factor corresponding to this value can be adopted and applied to all the lines of the traverse. The x''s of the control points will be known and from these an acceptable mean x' for the whole traverse can be determined and from it the mean scale factor.

The scale factors are given in two forms in the table on page 355: First, as a correction to the logarithm of the length; and second as a factor for multiplying the length. The signs of the logarithmic corrections are adopted for algebraic addition to the logarithms of the measured lengths reduced to sea level. They are expressed in units of the seventh place of logarithms with tenths for the eighth place. The ratio form is used as a factor for multiplying the measured lengths to obtain the grid lengths. If the grid length is given, the process must be reversed to get the geodetic or sea-level length; that is, the logarithmic correction must be subtracted algebraically and the length must be divided by the factor. This gives the geodetic or sea-level length. To get the ground-level length a correction for elevation must also be applied. (See p. 16.) Before applying the grid correction to the measured lengths, they should be reduced to sea level by applying a correction for elevation. Reference should be made to Special Publication No. 193, "Manual of plane coordinate computation" and to Special Publication No. 195, "Manual of traverse computation on the transverse Mercator grid." These publications give a full account of the use of the State tables and of the use of the coordinates in computations.

DESCRIPTIONS AND PLANE COORDINATES

LAKE SUPERIOR

Principal points

Farquhars Knob (U. S. L. S.) (Cook County, Minn., U. S. Lake Survey, 1869; 1934).—On northwest shore of Lake Superior, about 4 miles northwest Hovland. To reach from Hovland, follow McFarland Lake Road about 3⅓ miles to new road to left (Hovland Tower Road), turn left and continue about ½ mile to small garage on right. Trail leading to station is directly across road from garage; follow up trail about 400 yards to top of hill and station site. Station mark is cross cut in solid rock, 3 feet below surface, over which is centered stone post. *Farquhars Knob (U. S. L. S.) latitude station* is 7.801 meters (25.59 feet) distant in azimuth 283°20′29″.

East Sawteeth (U. S. L. S.) (Lake County, Minn., U. S. Lake Survey, 1870).—On one of Sawteeth Mountains, 1½ miles northeast of station *West Sawteeth (U. S. L. S.)* (see description thereof) and about 2 miles from lake shore. Station mark is stone post. *East Sawteeth (U. S. L. S.) latitude station* is distant 15.28 meters (50.1 feet) from station in azimuth 156°35′23″.

Porcupine Mountains (U. S. L. S.) (Ontonagon County, U. S. Lake Survey, 1869; 1870).—On one of highest ridges of Porcupine Mountains, about 2 miles south of Carp Lake, and about 4 miles south of the "Carp Lake Mining Co." landing. Station mark is stone post. *Porcupine Mountains (U. S. L. S.) latitude station* is distant 14.4 meters (47.2 feet) from station in azimuth 197°52′52″. In 1935 it was reported that station mark was found lying in the center of a hole about 18 inches in diameter.

Plane coordinates: (W), x=254,336.16 feet; y=1,927,491.42 feet.

Wheal Kate (U. S. L. S.) (Houghton County, U. S. Lake Survey, 1869; 1934).—About 1 mile west of South Range, on highest point of bluff, directly (not centered) under fire tower erected by State. Station can best be reached from southwest, starting from west of South Range School and following path to summit. Originally marked by stone post. In 1934 only a remnant of old mark was found. Dirt was tamped around and above this mark and new mark, disk in 1½-inch iron pipe in concrete, was centered over old mark. Mark is 6 inches below ground. Reference marks are four concrete abutments of tower at following approximate bearings and distances from station: Northwest, 13.45 feet; northeast, 7.55 feet; southeast, 17.80 feet; southwest, 20.5 feet. *Wheal Kate (U. S. L. S.), latitude station* is distant 30.012 meters (98.46 feet) from station in azimuth 250°50′29″.

Plane coordinates: (W), x=521,825.74 feet; y=2,031,246.93 feet.

For notes in regard to marking of stations see p. 167.

Isle Royale East (U. S. L. S.) (Keweenaw County, U. S. Lake Survey, 1869; 1906).—Near east end of Isle Royale, and about 1½ miles north of old mining company's landing at Rock Harbor. Station originally marked by stone post. In 1906 it was reported that station was marked by copper bolt in bedrock. *Isle Royale East* (*U. S. L. S.*) *latitude station* is distant 26.82 meters (88.0 feet) from station in azimuth 267°16′49″. Cross in 4-inch circle cut in large boulder bears N. 18°44′ E. from station and is distant 7.33 feet. From cross, station is S. 18°44′ W. when Thunder Cape Lighthouse is N. 55°23′ W. Lake Survey records also call this station "Isle Royale."

Plane coordinates: (W), $x=546,307.16$ feet; $y=2,416,624.34$ feet.

Vulcan (U. S. L. S.) (Keweenaw County, U. S. Lake Survey, 1869; W. Bowie, 1908; 1935).—About 6 miles southeast of village of Copper Harbor, on Keweenaw Point, about 3 miles due east-southeast from eastern end of Lake Fanny Hooe, at eastern extremity of prominent ridge running east and west, on round flat-topped and wooded knoll several feet higher than remainder of ridge. To reach, follow old mining road leading southeast from eastern end of Lake Fanny Hooe. Marked by copper bolt in dressed stone set flush with ground. In 1935 three reference marks, standard U. S. Lake Survey disks in concrete, were set. Reference mark No. 1 (azimuth mark) is 333.95 feet, N. 62°03′ W. (true) from station; No. 2 is 20.15 feet, N. 41°31′ E. (true) from station; and No. 3 is 23.25 feet, S. 15°51′ W. (true) from station. *Vulcan Post No. 1* (*U. S. L. S.*) *latitude station* is distant 14.79 meters (48.5 feet) from station in azimuth 83°17′00″. *Vulcan Post No. 2* (*U. S. L. S.*) *latitude station* is 47.598 meters (156.16 feet) directly south of other latitude station.

Plane coordinates: (W), $x=736,592.75$ feet; $y=2,169,092.23$ feet.

Huron Mountains (U. S. L. S.) (Marquette County, U. S. Lake Survey, 1871; 1872).—About 3 miles southwest of mouth of Pine River, on one of Huron Mountains, near north end of Mountain Lake. Marked by stone post. *Huron Mountains* (*U. S. L. S.*) *latitude station* is distant 29.73 meters (97.5 feet) from station in azimuth 36°29′32″.

Plane coordinates: (W), $x=707,213.76$ feet; $y=1,961,620.82$ feet.

Traverse Point (U. S. L. S.) (Houghton County, U. S. Lake Survey, 1871).—On the extreme end of Traverse Point. Marked by stone post.

Plane coordinates: (W), $x=628,611.56$ feet; $y=2,058,182.05$ feet.

Traverse Island (U. S. L. S.) (Houghton County, U. S. Lake Survey, 1867).—Plane coordinates: (W), $x=619,805.80$ feet; $y=2,030,560.52$ feet.

Crebassa (U. S. L. S.) (Houghton County, U. S. Lake Survey, 1871).—About ½ mile northeast of Portage Entry Lighthouse, on east side of Keweenaw Point, and in 1871 not more than 10 feet back from edge of bluff rising nearly vertically 44 feet above water. Marked by stone post. Witness mark, head of nail driven into blazed hemlock tree, bears N. 43°53′ W. from station and is distant 59.75 feet. In 1929 it was reported that bluff was soft, and eroding, and that station mark had probably caved into lake. In 1934 station was reported destroyed by erosion of bank.

Plane coordinates: (W), $x=586,132.87$ feet; $y=1,999,033.02$ feet.

Middle (U. S. L. S.) (Baraga County, U. S. Lake Survey, 1871).—About midway between Pequaming Point and Point Abbaye, on east shore of Keweenaw Bay. Marked by stone post.

Plane coordinates: (W), $x=627,536.51$ feet; $y=1,980,472.87$ feet.

Quaquaming (U. S. L. S.) (Baraga County, U. S. Lake Survey, 1871).—On northeast extremity of Pequaming Point, on east side of Keweenaw Bay. Marked by stone post. In 1934 it was reported that station was probably lost.

Plane coordinates: (W), $x=594,396.45$ feet; $y=1,958,518.06$ feet.

Keweenaw Point North Base (U. S. L. S.) (Houghton County, U. S. Lake Survey, 1871; 1934).—About 1½ miles south of Portage Entry, on Keweenaw Point, in road connecting Houghton and L'Anse. Mark is intersection of two lines cut on end of copper bolt, ¾ inch in diameter and 10 inches long, leaded into sandstone rock, and about 4 feet below surface of ground. End of bolt, projecting slightly above rock, is covered by telegraph-wire insulator. Stone post, slightly below surface of ground, covered by flat stone about 1 foot square, is directly over bolt. Witness mark is stone post, about flush with ground, directly in line to *Keweenaw Point South Base* (*U. S. L. S.*), and is distant 28.37 inches. In 1929 it was reported that highway had been built over base line and station could not be located.

Plane coordinates: (W), $x=575,001.91$ feet; $y=1,985,561.90$ feet.

For notes in regard to marking of stations see p. 167.

Keweenaw Point South Base (U. S. L. S.) (Baraga County, U. S. Lake Survey, 1871; R. L. Pfau, 1929; 1934).—About 6½ miles south of Portage Entry, about ½ mile back from lake shore, on Keweenaw Point, 0.75 mile north of post office at village of Keweenaw Bay, 0.30 mile north of the Minneapolis, St. Paul & Sault Ste. Marie Railway crossing, 20 feet west of center of main highway from L'Anse to Houghton (U. S. Route 41), on first curve north of the Mineral Range Railroad grade, and almost directly in front of farmhouse owned by the McCauley Estate. Mark was intersection of two lines cut on surface of brass frustum leaded into top of stone post, top flush with surface of ground. A second stone post, 2½ feet long, with brass rod in center of top, was set 1 yard south of station mark, and exactly in prolongation of base line, its top being 6 feet below surface of ground. In 1929 station mark was reported destroyed by highway construction. Underground stone post was recovered and reported to be at bottom of small drainage ditch at foot of west shoulder of road, 5.3 meters (17 feet) west of center of road, 45.50 meters (149.3 feet) south of center of west end of culvert, 10.10 meters (33.1 feet) from center of gate leading into McCauley farm, and 10 inches below surface of ground. In 1934 it was reported that surface mark (concrete monument, set with top 3 feet below bottom of road ditch, and 4¼ feet below road level) was on west side of U. S. Route 41, 17 feet east of fence on west side of road and 39 feet west of fence on east side of road. Reference marks, stone posts, 6 feet long and projecting 1 foot above ground, were set, one east and one west of station and at right angles to base line, each about 65 feet distant. In 1934 it was reported that reference mark to east was in west ditch of road about 1 foot below surface, and reference mark to west (reported in 1873 to be broken off at top) could not be located. *Keweenaw Point South Base (U. S. L. S.) latitude station* is distant 7.714 meters (25.31 feet) from station in azimuth 271°52′40″.

Plane coordinates: (W), $x=565,568.10$ feet; $y=1,958,150.41$ feet.

Ives Hill (U. S. L. S.) (Marquette County, U. S. Lake Survey, 1872).—About 4 miles southeast of mouth of Pine River, about ½ mile east of Ives Lake, on one of Huron Mountains. Marked by nail leaded into solid surface rock. Witness marks are three small triangles cut in rock, each 11 feet 2 inches from station, one south, one west, and one east.

Plane coordinates: (W), $x=729,113.59$ feet; $y=1,941,994.68$ feet.

Granite Island (U. S. L. S.) (Marquette County, U. S. Lake Survey, 1872; 1873).—On north side of Granite Island, Lake Superior. Marked by cross cut in solid surface rock. Granite Island Lighthouse, center, bears S. 73°33′46″ W. from station and is 171.32 feet distant.

Plane coordinates: (W), $x=835,754.57$ feet; $y=1,905,960.25$ feet. (C), $x=83,335.80$ feet; $y=1,907,503.08$ feet.

Triloba (U. S. L. S.) (Marquette County, U. S. Lake Survey, 1873).—About 3 miles southwest of Granite Point, on bald granite knob, highest hill in vicinity. Marked by brass frustum leaded into solid rock.

Plane coordinates: (W), $x=816,886.19$ feet; $y=1,863,341.03$ feet. (C), $x=62,856.48$ feet; $y=1,865,629.79$ feet.

Mount Mesnard (U. S. L. S.) (Marquette County, U. S. Lake Survey, 1873).—About 2 miles south of Marquette, on granite knob known as Mount Mesnard. Mark is cross cut in solid surface rock, which is about 3 feet below surface soil. Around and above mark is pile of small rocks. Witness marks are crosses cut in solid rock; one 45 feet north; one 27 feet east; and one 17.3 feet west of station. Lake Survey records also call this station "Mesnard."

Plane coordinates: (W), $x=839,982.12$ feet; $y=1,830,324.41$ feet. (C), $x=84,682.48$ feet; $y=1,831,756.03$ feet.

Shelter Bay (U. S. L. S.) (Alger County, U. S. Lake Survey, 1873).—About 2 miles southwest of Shelter Bay, and about ¼ mile south of west end of Deer Lake. Marked by stone post. In 1919 it was reported that station was not recovered, but old cleared line toward station *Mud Lake* could be traced in woods on north end of hill by following second growth timber.

Plane coordinates: (C), $x=188,112.00$ feet; $y=1,814,623.20$ feet. (W), $x=943,990.13$ feet; $y=1,817,131.85$ feet.

Grand Island (U. S. L. S.) (Alger County, U. S. Lake Survey, 1872; 1929).—On highest part of Grand Island, about 2 miles south of lighthouse. Marked by stone post about 4 inches below surface of ground. Three witness stones were set north, east, and south of station, each 10 feet away. In 1919 it was reported that station mark was leaning slightly and was set plumb. Witness stones could not be located.

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Plane coordinates: (C), $x=262,655.47$ feet; $y=1,834,405.79$ feet. (W), $x=1,017,741.64$ feet; $y=1,839,735.91$ feet.

Supplementary points

Farquhars Knob (U. S. L. S.) latitude station (Cook County, Minn., U. S. Lake Survey, 1869).—On northwest shore of Lake Superior, about 4 miles northwest of Hovland. Marked by wooden post, 1.80 meters (5.9 feet) or 0″.06 of latitude south and 7.59 meters (24.9 feet) east of station *Farquahars Knob* (*U. S. L. S.*).

East Sawteeth (U. S. L. S.) latitude station (Lake County, Minn., U. S. Lake Survey, 1870).—On one of Sawteeth Mountains, 1½ miles northwest of station *West Sawteeth* (*U. S. L. S.*) (see description thereof), and about 2 miles from lake shore. Marked by wooden post, 14.92 meters (46.0 feet) or 0″.06 of latitude north and 6.07 meters (19.9 feet) west of station *East Sawteeth* (*U. S. L. S.*).

Porcupine Mountains (U. S. L. S.) latitude station (Ontonagon County, U. S. Lake Survey, 1870).—On one of highest ridges of Porcupine Mountains, about 2 miles south of Carp Lake, and about 4 miles south of Carp Lake Mining Company landing. Marked by wooden post, 13.7 meters (45 feet) or 0″.44 of latitude north and 4.42 meters (14.5 feet) east of station *Porcupine Mountains* (*U. S. L. S.*). In 1934 the station was reported lost.

Plane coordinates:[1] (W), $x=254,351$ feet; $y=1,927,536$ feet.

Wheal Kate (U. S. L. S.) latitude station (Houghton County, U. S. Lake Survey, 1866; 1870).—About 1 mile west of South Range. Marked by wooden post, 9.85 meters (32.3 feet) or 0″.32 of latitude north and 28.35 meters (93.0 feet) east of station *Wheal Kate* (*U. S. L. S.*).

Plane coordinates:[1] (W), $x=521,919$ feet; $y=2,031,279$ feet.

Isle Royale East (U. S. L. S.) latitude station (Keweenaw County, 1866; 1906).—Near east end of Isle Royale, and about 1½ miles north of old mining company's landing at Rock Harbor. Marked by wooden post, 0.9 meter (3 feet) or 0″.03 of latitude north and 26.8 meters (88 feet) east of station *Isle Royale East* (*U. S. L. S.*).

Plane coordinates:[1] (W), $x=546,395$ feet; $y=2,416,629$ feet.

Vulcan Post No. 1 (U. S. L. S.) latitude station (Keweenaw County, U. S. Lake Survey, 1867; W. Bowie, 1908).—About 6 miles southeast of village of Copper Harbor, on Keweenaw Point, about 3 miles due east-southeast from eastern end of Lake Fanny Hooe. Marked by wooden post, 1.73 meters (5.3 feet) or 0″.06 of latitude north and 14.69 meters (48.2 feet) west of station *Vulcan* (*U. S. L. S.*). *Vulcan Post No. 2* (*U. S. L. S.*) *latitude station* is distant 47.598 meters (156.16 feet) from station in azimuth 0°00′00″.

Plane coordinates:[1] (W), $x=736,545$ feet; $y=2,169,086$ feet.

Vulcan Post No. 2 (U. S. L. S.) latitude station (Keweenaw County, U. S. Lake Survey, 1867; W. Bowie, 1908).—About 6 miles southeast of village of Copper Harbor, on Keweenaw Point, about 3 miles due east-southeast from eastern end of Lake Fanny Hooe. Marked by wooden post 47.598 meters (156.16 feet) or 1.54″ of latitude due south of station *Vulcan Post No. 1* (*U. S. L. S.*) *latitude station.*

Plane coordinates:[1] (W), $x=736,595$ feet; $y=2,168,931$ feet.

Huron Mountains (U. S. L. S.) latitude station (Marquette County, U. S. Lake Survey, 1866; 1872).—About 3 miles southwest of mouth of Pine River, on one of Huron Mountains, near north end of Mountain Lake. Marked by stone post, 23.90 meters (78.4 feet) or 0″.77 of latitude south and 17.68 meters (58.0 feet) west of station *Huron Mountains* (*U. S. L. S.*).

Plane coordinates:[1] (W), $x=707,157$ feet; $y=1,961,542$ feet.

Keweenaw Point South Base (U. S. L. S.) latitude station (Baraga County, U. S. Lake Survey, 1873).—Station is marked by post 0.08 meter (0.3 foot) north and 7.71 meters (25.3 feet) east of station *Keweenaw Point South Base* (*U. S. L. S.*).

Plane coordinates:[1] (W), $x=565,593$ feet; $y=1,958,150$ feet.

LAKE SUPERIOR TO MENOMINEE

Principal points

Mud Lake (U. S. L. S.) (Alger County, U. S. Lake Survey, 1874; 1929).—In Northern Peninsula of Michigan, in sec. 4, T. 45 N., R. 20 W. Marked by spike

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

driven into root of tree. Reference mark, stone 3 feet below surface of ground, and at surface, stone marked by cross, bears S. 29°19′ E. from station, and is 31.02 feet distant. Two additional reference stones were set: One approximately 5.75 feet north of station; the other approximately 2.83 feet south of station. Station recovered in 1919 and new station marks set. Surface mark is 9-inch ship spike in center of letters "U. S. L. S. 1874, 1919" inscribed in top of concrete monument, surrounded by chimney of cobbles, and projecting about 8 inches above ground. Underground mark is ship spike cemented into drill hole in top of block of hard sandstone, 3½ feet below surface of ground. Large boulders were rolled beside station mark and old reference mark to south, which had not been disturbed. *Schoolcraft County, Mich.: SE. corner of sec. 4, T. 45 N., R. 20 W.* (*U. S. L. S.*) is 1,061.8 feet from station on bearing S. 44°06′ E. This section corner was listed in U. S. Lake Survey reports as being in Schoolcraft County.

Plane coordinates: (C), $x=233,046.46$ feet; $y=1,758,860.03$ feet.

Divide (U. S. L. S.) (Alger County, U. S. Lake Survey, 1873; 1929).—About 6½ miles south of Munising, about 1,000 feet east of old Bay de Noquette and Lake Superior road, on divide between Lake Superior and Green Bay. Mark is stone post 3½ feet below surface of ground. Over mark is stone post flush with surface of ground. In 1919 station recovered, center stone being 8 inches below surface of ground. Two concrete reference monuments, 10 inches square and 3½ feet long, were set, each projecting about 6 inches above ground. No. 1 is on small knoll, about 20 feet from bank, about 20 feet east of old road leading up hill from point on railroad 1 mile west of Wetmore, and 742.40 feet from station in azimuth 166°07′53″. No. 2 is 27.37 feet from station in azimuth 216°25′. *Schoolcraft County, Mich.: NE. corner of sec. 27, T. 46 N., R. 19 W.* (*U. S. L. S*) is 760 feet from station on bearing N. 67° E. This section corner was listed in the U. S. Lake Survey reports as being in Schoolcraft County.

Plane coordinates: (C), $x=270,187.45$ feet; $y=1,773,302.91$ feet; grid azimuth to reference mark No. 1=166°47′25″.*

Manistique (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874).—On Northern Peninsula of Michigan, 975 feet southwest of northeast corner of sec. 7, T. 43 N., R. 18 W. Station mark is middle point of line joining two stones set 5 feet apart in east-and-west line. In 1919 station site was visited, stump of center-post reported found, but search failed to reveal stones. In 1929 this station was reported lost. Lake Survey records also call this station "Monistique."

Plane coordinates: (C), $x=284,946.71$ feet; $y=1,693,150.14$ feet.

Sturgeon (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874).—In Northern Peninsula of Michigan, in sec. 16, T. 42 N., R. 19 W. Marked by stone about 2½ feet below surface of ground. Over station mark is stone projecting from 4 to 6 inches above ground. *Delta County: NW. corner of NE. quarter of sec. 16, T. 42 N., R. 19 W.* (*U. S. L. S.*) is 705 feet from station on bearing N. 40° W. Lake Survey records also call this station "Sturgeon River."

Plane coordinates: (C), $x=262,267.41$ feet; $y=1,656,377.98$ feet.

Fishdam (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874).—In Northern Peninsula of Michigan, about 5 miles northeast of mouth of Fishdam River, or head of Big Bay de Noc. Marked by stone about 2 feet below surface of ground. Witness marks (trees) are: 8 feet 1 inch north, 6 feet 6 inches east, and 12 feet 6 inches northwest of station. Lake Survey records also call this station "Fishdam River."

Plane coordinates: (C), $x=311,145.00$ feet; $y=1,626,612.81$ feet.

Pine Hill (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874).—On Peninsula Point, about 5½ miles from Squaw Point in bearing N. 65° E. Marked by nail leaded into solid rock about 2 feet below surface of ground. Stone post is directly over nail. Witness points are: Head of wrought spike in center-post tree, 1 foot 4 inches southwest; head of wrought spike in pine tree, 14 feet 4 inches north; and head of wrought spike in pine stump, 34 feet southeast.

Plane coordinates: (C), $x=207,388.62$ feet; $y=1,591,339.22$ feet.

Burnt Bluff (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874; R. L. Pfau, 1929).—About 3 miles southwest of Fayette, on highest part of and about 20 meters (66 feet) back from face of Burnt Bluff, on farm owned by estate of Clevis Raymond, almost directly opposite signboard on face of bluff giving elevation, 165 paces north of east-and-west fence along northern rim of broad valley which makes up from beach on which pleasure resort and wharf are located, 6.3 meters

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

(21 feet) east of north-and-south fence along bluff, 26 paces south of center line of small ravine which goes eastward for distance of 25 paces from north-and-south fence, and 5.87 meters (19.3 feet) north of flat stone marked with drill hole and letters "U. S." Marked by stone post 8 inches square, with brass triangle leaded into top, and marked "U. S." Top of mark is 6 inches below surface of ground. Distances and directions from station to witness stones (1874) are: 10 feet east; 10 feet south; and 20 feet south.

Plane coordinates: (C), $x=254,439.46$ feet; $y=1,527,176.88$ feet.

Boyer's Bluff (U. S. L. S.) (Door County, Wis., U. S. Lake Survey, 1874; R. L. Pfau, 1929).—On northwest point of Washington Island, on most northerly point of Boyer's Bluff, and 6.8 meters (22 feet) back from face of second bluff line. Small point of bluff projects to north at station. Marked by stone post 8 inches square, with drill hole in top and letters "U. S." Mark is 4 inches below surface of ground. Reference mark, square limestone post with drill hole in center of top, projecting about 4 inches above ground, bears S. 43° E. (true) from station, 7.202 meters (23.63 feet) distant. Another reference mark is stone bearing N. 33° W. from station, 15½ feet distant. In 1903 it was reported that this mark could not be found. Bearings from station to witness marks are: Birch tree, spike in center of triangular blaze, N. 25° E. (true); spruce tree, spike in center of triangular blaze, N. 47° E. (true); spruce tree, spike in center of triangular blaze, S. 7° W. (true). In 1934 it was reported that the Lighthouse Department had centered a lighthouse over station.

Plane coordinates: (W), $x=965,694.74$ feet; $y=1,434,034.49$ feet. (C), $x=195,386.14$ feet; $y=1,431,029.34$ feet.

Rock Island (U. S. L. S.) (Door County, Wis., U. S. Lake Survey, 1864; 1906).—On highest point of Rock Island, about 300 meters (984 feet) southeast of center of island, 810 meters (2,657 feet) due west of shore of island, 760 meters (2,493 feet) north of shore, and 450 meters (1,476 feet) north of edge of steep bluff. Mark is brass plug with letters "U. S." leaded into stone, and is about 3 feet below surface of ground.

Plane coordinates: (C), $x=226,134.32$ feet; $y=1,428,611.96$ feet.

Ford River (U. S. L. S.) (Delta County, U. S. Lake Survey, 1874; R. L. Pfau, 1929).—About 5 miles southwest of Escanaba Lighthouse, 2 miles northeast of mouth of Ford River, about 175 feet back from bay shore, 60 paces west of west rim of old water-filled quarry pit, on top of small ridge which makes off to westward from pit, about 4 feet higher than general ground level, and on land owned by Coleman Nee of Escanaba (in 1929 generally used as picnic grounds). Marked by cross cut in solid rock about 3 feet below surface of ground. Over mark is stone post, originally square with drill hole in center and set with top flush with ground. Edges of post have worn away so that top now resembles surface stone and may be mistaken for one. Two reference stones were set, one approximately 55.1 feet north, and one approximately 64.5 feet west of station. Reference marks were not reported when station was recovered in 1929. Large boulder, about 5 feet in diameter, marked with drill hole and letters "U. S." is 6.157 meters (20.20 feet) south of station. Witness marks (1929) are: 24-inch walnut tree, with spike in center of triangular blaze, 14.68 meters (48.2 feet) north; 12-inch cedar tree, with spike in center of triangular blaze, on same ridge as station, in clump of cedar trees, 13.15 meters (43.1 feet) east of station. Delta County, SE. corner of sec. 12, T. 42 N., R. 19 W. is 435.5 feet from station on bearing N. 79°29′ E.

Plane coordinates: (C), $x=154,378.77$ feet; $y=1,528,872.31$ feet. (W), $x=921,054.47$ feet; $y=1,530,286.01$ feet.

Bark River (U. S. L. S.) (Delta County, U. S. Lake Survey, 1864; 1905).—About 400 meters (1,312 feet) northwest of mouth of Bark River, on second bank, 14 meters (46 feet) back from bay shore, in thick woods of white birch, spruce, cedar, and balsam. Marked by nail leaded into limestone block about 18 inches below surface of ground, and covered with flat stone 24 by 18 by 4 inches. Reference marks are boulders, about 6 feet in diameter on beach. One bears N. 77° E., from station and is distant 57 meters (187 feet); another bears S. 19° E. from station and is 67 meters (220 feet) distant.

Plane coordinates: (C), $x=118,375.98$ feet; $y=1,488,847.15$ feet. (W), $x=886,573.58$ feet; $y=1,488,939.73$ feet.

Cedar River (U. S. L. S.) (Menominee County, U. S. Lake Survey, 1864; 1905).—About 3 miles north of mouth of Cedar River, on northeast extremity of Deadmans Point, about 25 meters (82 feet) from shore, and (in 1905) under and near center of fisherman's shack (northerly of two buildings, other being ware-

For notes in regard to marking of stations see p. 167.

house). Marked by stone post about 2 feet below surface of ground. Over mark is another stone post flush with surface of ground. Three witness stones were set: One 13 meters (43 feet) north; one 12.5 meters (41 feet) south; and one 14 meters (46 feet) west of station. In 1905 it was reported that subsurface mark was not recovered, but surface stone was in place. Witness stone to west was not located, witness stone to north had been disturbed, and witness stone to south was in place, but top broken.

Plane coordinates: (W), $x=865,519.68$ feet; $y=1,435,653.76$ feet. (C), $x=95,346.51$ feet; $y=1,436,383.94$ feet.

Door Bluff (U. S. L. S.) (Door County, Wis., U. S. Lake Survey, 1864; 1874).—On east shore of Green Bay, on highest part and 34 feet back from edge of west side of Deathdoor Bluff. Marked by cross cut in solid rock. Over mark is stone post. Cedar witness stakes, surrounded by rock piles are north, east, and south of station, each 10 feet distant. *Door Bluff (U. S. L. S.) latitude station* is distant 27.43 meters (90.0 feet) from station in azimuth 34°47′06″. In 1904 it was reported that station could not be located, although center post was located.

Plane coordinates: (W), $x=933,606.17$ feet; $y=1,388,170.15$ feet. (C), $x=161,615.15$ feet; $y=1,386,397.51$ feet.

Rochereau (U. S. L. S.) (Menominee County, U. S. Lake Survey, 1874; C. A. Schanck, 1934).—About 15 miles northeast of Menominee, 10 miles east of Carbondale, on Rochereau Point, about 250 feet west of present shore line of Green Bay, 90 feet west of apparent high-water line, on land owned by C. L. Bailey, just east of his orchard, about 250 feet east of State Route 35, 21 feet south of southwest corner and 28 feet southwest of southeast corner of old log house, 18 feet southeast of 7-inch apple tree, and 16 feet west of barbed-wire fence enclosing orchard on east side. To reach from junction of U. S. Route 41 and State Route 35 in Menominee, go northeast 14.4 miles on Route 35 to gas pump and candy stand on east side of road, and proceed east and southeast about 300 feet on trail to old log house and station site. Originally marked by stone in wooden box sunk in quicksand, about 2½ feet below surface of ground. Over mark was set another stone with drill hole in center, projecting about 6 inches above ground. In 1934, top of stone was reported to be 15 inches below surface of ground. Reference mark (1874) is stone post with triangular hole in center and letters "U. S." cut in top, projecting 4 inches above ground, 6 feet southeast of large fence post, 8 feet northeast of 6-inch cherry tree, 11 feet west of center line of trail leading to point, and 64.91 feet from station in azimuth 280°08′. In 1934, reference and azimuth marks were established, standard disks in concrete, note 11b, projecting 6 inches above ground. Reference mark No. 2 is at south edge of clearing, 18 feet north of 10-inch twin ash tree, 24 feet northwest of 15-inch scraggly maple tree, and 134.00 feet from station in azimuth 17°04′. Azimuth mark is at northwest corner of Mr. Bailey's pasture, about 500 feet west of Route 35, 3 feet west of corner fence post, and approximately 0.25 mile from station in azimuth 145°30′17″. Another reference stone (1874) was set 74.65 feet from station bearing N. 19°58′ E. In 1905 this mark was found dug up, and was reset with top 6 inches above ground, 2½ feet east of east road fence in orchard, 11½ feet north of center of 12-inch beech tree, and 234.0 feet from station bearing N. 58°12′ W.

Plane coordinates: (W), $x=837,980.19$ feet; $y=1,385,811.27$ feet; grid azimuth to azimuth mark=144°34′16″.* (C), $x=65,967.59$ feet; $y=1,387,599.33$ feet; grid azimuth to azimuth mark=146°42′13.″*

Eagle Bluff (U. S. L. S.) (Door County, Wis., U. S. Lake Survey, 1874; C. A. Schanck, 1934).—On east shore of Green Bay, about 2½ miles north of Fish Creek, in yard of and 105 feet southwest of southwest corner of Eagle Bluff Lighthouse, 12 feet west of west corner of small oil house in yard, 15 feet southeast of face of stone fence, 19 feet east of west corner of yard, and about 10 meters (33 feet) back from edge of limestone bluff rising perpendicularly from bay. To reach from Fish Creek, go east 0.45 mile on Route 42 to junction with boulevard leading north into Peninsular State Park, follow this road 2.5 miles to road leading north, turn and go north 0.9 mile to lighthouse and station. Marked by ¼-inch hole in stone post marked with letters "U. S. L. S." in top which is 3 inches below surface of ground. Reference mark (1874) is drill hole in solid rock, 6.7 meters (22 feet) from station in bearing S. 72°10′W. In 1934, reference and azimuth marks were established, standard disks in concrete, note 11b. Reference mark No. 2 projects 5 inches above ground, is near southeast corner of old stable, 34 feet northeast of fence line, 34 feet northwest of fence line, about 1½ feet from southeast corner of

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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stable, and 155.40 feet from station in azimuth 300°19′. Azimuth mark projects 7 inches above ground, is on shore of Ternison's Bay, 25 feet east of center line of road, 70 feet east of high-water mark, and approximately 0.4 mile from station in azimuth 342°53′27″. Azimuth from station to Eagle Bluff Lighthouse, 135.45 feet distant, is 228°29′.

Plane coordinates: (W), x=890,228.80 feet; y=1,340,671.38 feet; grid azimuth to azimuth mark=341°49′14″.* (C), x=116,504.30 feet; y=1,340,546.32 feet; grid azimuth to azimuth mark=343°56′54″.*

Menominee (U. S. L. S.) (Marinette County, Wis., U. S. Lake Survey, 1874; C. A. Schanck, 1934).—In village of Menekaunee, suburb of Marinette, at southwest corner of Alimeda and Bird Streets, 30 feet south and 9.7 feet west of northeast corner of lot, and 3.2 feet north and 8 feet east of northeast corner of house. Marked by ½ inch drill hole in stone post, with letters "U. S." cut in top, 3 feet below surface of ground. Over mark is stone post flush with surface of ground. Reference stone was 20.5 meters (67 feet) from station on bearing N. 39°48′ E. Second reference stone was 20.7 meters (68 feet) from station on bearing S. 59°22′ E. In 1905 reference stones were reset. One reference stone is 19.92 meters (65.9 feet) from station on bearing N. 39°52′ E.; other reference stone is 19.10 meters (63.4 feet) from station on bearing S. 8°20′E. Lake Survey records also call this station "Menomonee." In 1934 station mark recovered 4 inches below surface of ground. Described as being in southwest corner of intersection of Alimeda and Bird Streets, 8.6 feet east-northeast of northeast corner of house, 13.0 feet north-northwest of northeast corner of east wing of house, and 6.3 feet west of soft maple. Reference and azimuth marks established in 1934 are standard disks in concrete, set as in note 11b. No. 1 projects 2 inches, is in northwest angle of intersection, directly in front of front door of house, 1 foot west of sidewalk, 114.82 feet northwest of No. 2, and 115.38 feet north of station. *Reference mark No. 2* (see description and position thereof) was occupied in 1934 as main-scheme station, and other reference mark and azimuth mark observed on therefrom. Azimuth mark projects 3 inches, is in west edge of road leading down on point, 0.35 mile south of last buildings, midway between Green Bay and lagoon inside of point, and about 0.5 mile southeast of station.

Plane coordinates: (W), x=798,885.36 feet; y=1,309,395.38 feet. (C), x=24,056.40 feet; y=1,312,679.62 feet.

South Egg (U. S. L. S.) (Door County, Wis., U. S. Lake Survey, 1874; 1905).—About 5 miles southwest of Egg Harbor, on brow of prominent bluff known as Monument Point, 1,700 meters (5,577 feet) south of prominent break in bluff, directly opposite Monument Shoals, 540 meters (1,772 feet) from water edge, and in thick birch timber. Old clearing with road through it is 350 meters (1,148 feet) from station on bearing N. 30° E. Marked by stone post projecting 3 or 4 inches above ground. Three reference stones were set: One N. 29° E., 53.1 feet distant; one S. 56° E., 35.2 feet distant; and one S. 25° W., 50.3 feet distant from station.

Plane coordinates: (W), x=861,832.79 feet; y=1,274,731.53 feet. (C), x=85,682.76 feet; y=1,275,703.39 feet.

Supplementary points

Peninsula Point Lighthouse (U. S. L. S.) (Delta County, U. S. Lake Survey).—Plane coordinates: (C), x=188,921.13 feet; y=1,521,535.05 feet.

Rock Island Lighthouse (U. S. L. S.) (Delta County, U. S. Lake Survey).—Plane coordinates: (C), x=223,229.62 feet; y=1,433,350.65 feet.

Poverty Island Lighthouse (U. S. L. S.) (Delta County, U. S. Lake Survey).—Plane coordinates: (C), x=265,103.97 feet; y=1,467,431.61 feet.

Little Gull (U. S. L. S.) (Delta County, U. S. Lake Survey, 1864; 1903).—On northwest point of Little Gull Island, at entrance to Green Bay, 50 feet south of top of bank on north side of island, 27 feet north of top of bank on south side of island, 35 feet southeast of top of bank at northwest point of island, 24.0 feet S. 67°14′ E. from triangle-blazed 4-inch balsam tree, 20.5 feet S. 32°37′ W. from triangle-blazed 12-inch cedar tree, and 35.0 feet N. 9°41′ W. from triangle-blazed 6-inch birch tree. Marked by copper bolt in concrete block, 5 by 5 by 18 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), x=252,169.75 feet; y=1,459,532.47 feet.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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St. Martins (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On most northerly point of St. Martin Island at entrance to Green Bay, 7 feet back from edge of second cliff, 10 feet west of small gulch in cliff, 100 feet from water's edge, 2,500 feet northwest of old village, 24.0 feet N. 17°19′ W. from triangle-blazed 6-inch balsam tree, 8.7 feet N. 45°10′ E. from triangle-blazed 8-inch birch tree, and 21.0 feet S. 36°35′ E. from triangle-blazed 8-inch birch tree. Marked by copper bolt in concrete block, 5 by 6 by 18 inches, projecting about 2 inches above surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=237,937.93$ feet; $y=1,463,499.00$ feet.

Sand Point (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On Sand Point at Escanaba. Marked by large spike projecting from top of 4 by 4 inch hub, driven 2½ feet into ground and projecting about 1 foot above surface of ground.

Plane coordinates: (C), $x=169,911.38$ feet; $y=1,549,829.33$ feet.

Stonington (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903). On east shore of Little Bay de Noc, 3.88 miles (shore line measurement) north of Peninsula Point Lighthouse, 2,300 feet south of outer end of dock at Stonington, S. 56°43′30″ E. from Escanaba Lighthouse, and 60 feet from water's edge. Marked by copper bolt in concrete block, 6 by 6 by 20 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=185,090.98$ feet; $y=1,539,240.24$ feet.

F. South (U. S. L. S.) (1863) (Delta County, U. S. Lake Survey, 1903).—On east shore of Little Bay de Noc, on center one of three projecting points of land, 55 feet from water's edge, and N. 60°21′ E. of Escanaba Lighthouse, 15.9 feet N. 5°11′ W. from 8-inch tamarack tree, and 24.0 feet S. 37°19′ W. from 12-inch poplar tree; both trees blazed with small triangles. Marked by copper bolt in concrete block 6 by 6 by 20 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=185,231.89$ feet; $y=1,558,358.55$ feet.

Escanaba River (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—About 1 mile northeast of Wells, on small point, on west shore of Little Bay de Noc, about 1 mile north of mouth of Escanaba River, 120 feet from water's edge on north side of point, 250 feet from water's edge on south side of point, 335 feet from extreme end of point, 240 feet from northeast corner of building on top of bank, 29.2 feet N. 22°48′ E. from triangle-blazed 10-inch white pine tree, and 41.0 feet S. 57°37′ E. from triangle-blazed 12-inch white pine tree. Marked by copper bolt in concrete block 6 by 6 by 20 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=166,593.04$ feet; $y=1,566,924.77$ feet.

Escanaba Lighthouse (U. S. L. S.) (Delta County, U. S. Lake Survey).—Plane coordinates: (C), $x=169,579.79$ feet; $y=1,549,782.52$ feet.

Squaw Point Lighthouse (U. S. L. S.) (Delta County, U. S. Lake Survey).—Plane coordinates: (C), $x=180,154.37$ feet; $y=1,581,256.02$ feet.

Sand Bank (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—About 6 miles north of Escanaba, 2¼ miles southwest of Gladstone, on west shore of Little Bay de Noc, on top of and 25 feet from edge of sand bank, and 16 feet from triangle-blazed lone 12-inch oak tree. Marked by 30-penny wire nail in concrete block, 6 by 6 by 20 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=170,193.08$ feet; $y=1,581,732.78$ feet.

Elevator (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—Center of pole, used for night display of weather signals, on center of Minneapolis, St. Paul & Sault Ste. Marie Railway Co.'s grain elevator at Gladstone.

Plane coordinates: (C), $x=179,161.44$ feet; $y=1,588,429.41$ feet.

Maywood (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On Hunters' Point, on east shore of Little Bay de Noc, on top of sand bank, directly east of Gladstone, 3,675 feet N. 25° E. from shore end of Maywood Park dock, 365 feet from water's edge of bay, 55 feet from edge of first sand bank, 100 feet north of wagon road, and 75.1 feet S. 24°58′ E. from triangle-blazed, tall, lone, 12-inch Norway pine tree standing on slope on bank. Marked by copper bolt in concrete block, 6 by 6 by 18 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=186,488.46$ feet; $y=1,587,102.90$ feet.

Cleveland Cliffs (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On west shore of Little Bay de Noc, 2 miles from Gladstone, on narrow gravel point extending northerly from Cleveland Cliffs Iron Co.'s blast furnace, 200 feet from

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northerly end of point, 850 feet from main shore of bay, 900 feet northeast of canal, and about 2,000 feet northeast of blast furnace. Marked by copper bolt in concrete block 6 by 6 by 18 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=181,425.71$ feet; $y=1,597,363.18$ feet.

Little Lake (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On east shore of Little Bay de Noc, on top of first sand terrace, 270 feet north of Little Lake Creek, 200 feet east of water's edge of bay, 30 feet east of edge of sand terrace, 325 feet from mouth of creek, 52.7 feet S. 6°41′ E. of blazed 10-inch Norway pine, and 63.7 feet S. 68°41′ W. of blazed 6-inch Norway pine. Marked by copper bolt in concrete block 6 by 6 by 18 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=195,135.46$ feet; $y=1,600,264.56$ feet.

Day River (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On west shore of Little Bay de Noc, immediately north of mouth of Day River, on flat sand bar at junction of river and bay, about 30 feet from each, 30 feet northwest of old rock-filled crib, and 3,000 feet S. 20° W. from dock at Masonville. Marked by copper bolt in concrete block 6 by 6 by 18 inches, top flush with surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=186,517.93$ feet; $y=1,604,141.37$ feet.

Garth (U. S. L. S.) (Delta County, U. S. Lake Survey, 1903).—On west end of prominent peninsula, at extreme northerly end of Little Bay de Noc, opposite Masonville, 100 feet northeast of south shore of peninsula, 600 feet from north shore, 825 feet from extreme end of point, 2,250 feet from sawdust burner at Garth sawmill, 2,375 feet from sawmill, and 250 feet from west edge of brush. Abandoned village of Garth is on east end of peninsula. Marked by bolt in concrete block 6 by 6 by 18 inches, projecting about 1 inch above surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=191,109.80$ feet; $y=1,608,524.72$ feet.

Door Bluff (U. S. L. S.) latitude station (Door County, Wis., U. S. Lake Survey, 1865, 1874).—On east shore of Green Bay, on west side and highest part of Deathdoor Bluff. Marked by stone post, 22.53 meters (73.9 feet) or 0.″73 of latitude south and 15.65 meters (51.3 feet) west of station *Door Bluff* (*U. S. L. S.*). (See description thereof.)

Plane coordinates:[1] (W), $x=933,556$ feet; $y=1,388,095$ feet. (C), $x=161,563$ feet; $y=1,386,324$ feet.

Menominee (U. S. L. S.) astronomical station (Marinette County, Wis., U. S. Lake Survey, 1865).—Plane coordinates:[1] (W), $x=790,711$ feet; $y=1,313,671$ feet. (C), $x=16,045$ feet; $y=1,317,256$ feet.

NORTHERN MICHIGAN

Principal points

South Fox (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1906, 1925).—On South Fox Island in northern Lake Michigan, on west side of island, about midway between north and south ends, and on edge of sand bluff. Marked by nail in concrete-filled iron pipe about 1 foot below surface of ground. Reference marks are at following distances and bearings from station: 5-inch cedar post, 5.3 feet, S. 32°50′ W.; 4-inch cedar post, 20.3 feet, N. 45°52′ W.; 5-inch cedar post, 65.4 feet, N. 58°39′ W.; 5-inch cedar post, 59.5 feet, S. 44°09′ W.; and 8-inch balsam with 6-inch triangular blaze 6 feet above ground, 83.7 feet, N. 13°57′ E. Station *South Fox* (*1860*), marked by 5-inch cedar post, is 22.8 feet from station on bearing N. 86°56′ W.

Plane coordinates: (C), $x=471,702.54$ feet; $y=1,427,309.59$ feet.

N. W. Manitou (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1906, 1918).—On northwest corner of North Manitou Island, on sharp ridge on east side of deep depression, and about 12 feet from edge of bank. To reach station follow road from settlement on east shore or follow path up ridge from shore. Marked by concrete monument. Station *N. W. Manitou* (*1868*) is 9.42 feet from station in azimuth 134°08′.

Plane coordinates: (C), $x=423,620.96$ feet; $y=1,332,736.78$ feet.

[1] No check on this position.

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Cathead (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1868; H. W. Hemple, 1931; 1932).—On Cathead Point, about 4 miles north of Northport, in sec. 15, T. 32 N., R. 11 W., on land owned by L. G. Gardner, who owns a cottage ¼ mile east of station. To reach from Northport, go north on Leelanau County Route 633 (macadam road) 1.6 miles to gravel road leading straight north from where macadam curves to east; go north and west on gravel road 1.2 miles to beech tree with mail boxes on right at road fork, turn right (north) on sandy dirt road 1.0 mile to second gate with large stone posts. Station is on ridge of highest wooded sand dune, ¼ mile distant in magnetic azimuth 216° from this gate. Mark is copper pin in concrete block, 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is at northwest corner of old barn, 1 meter (3 feet) north of north end of barn, and approximately ¼ mile from station in azimuth 327°53′32″. Barn is 23 meters (75 feet) west of road, between above-mentioned gates, and 60 meters (197 feet) south of north gate. No. 2 is in woods, and 7.41 meters (24.3 feet) from station in azimuth 55°14′.

Plane coordinates: (C), $x=534{,}004.28$ feet; $y=1{,}342{,}263.49$ feet; grid azimuth to reference mark no. 1=327°47′55″.*

Charlevoix (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1906; 1918).—About 1 mile northeast of town of Charlevoix, on high sand dune known as Mount McSauba, near site of station *Charlevoix 2*. Marked by square concrete monument projecting about 8 inches above ground. Reference mark, nail in top of concrete monument inscribed "U. S. 1913," is 46.2 feet from station on bearing S. 16°14′ W. Following distances and bearings are from station: 7-inch ash tree, 41.2 feet, S. 78°10′ E.; 18-inch oak, 88.7 feet, S. 13°20′ E.; 12-inch oak, 80.6 feet, S. 64°36′ W.; and 12-inch white pine, 155.8 feet, S. 82°34′ W. In 1931 it was reported that station mark was found thrown over side of dune, and station *Charlevoix 2*, marked by standard station disk in concrete below surface of ground, note 7a, was established at approximate position of destroyed station.

Plane coordinates: (C), $x=629{,}580.86$ feet; $y=1{,}398{,}014.87$ feet.

Beaver Island (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; H. W. Hemple, 1931).—On Beaver Island, about 10 miles west of south of settlement of St. James. Reached by boat from Charlevoix to St. James. From St. James follow main gravel road south 0.45 mile; take right fork 1.8 miles and turn left at fire tower sign; keep straight ahead at 1.0 mile and turn left at tower sign at 4.4 miles; follow this road 0.5 mile and take right-hand fork 0.9 mile; thence turn sharply to left at 0.1 mile and to right 0.7 mile to station. Due to maze of trails it is easy to be misled, but anyone on island can direct one to the tower. Station mark, brass pin set in concrete about 30 inches below surface of ground, was found in good condition in 1931. Reference mark (concrete monument) found in good condition in 1931, and is 7.332 meters (24.06 feet) from station in azimuth 305°11′. Angle at station between reference mark and Charlevoix water tower is 20°45′. Station also called "Beaver" by U. S. Lake Survey.

Plane coordinates: (C), $x=548{,}294.77$ feet; $y=1{,}508{,}824.52$ feet.

Goodhart (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1903; H. W. Hemple, 1931).—About 17 miles north of Harbor Springs and 4 miles south of west of Cross Village, in SW¼NW¼ sec. 20, T. 37 N., R. 6 W., on land said to belong to James Henderson of Harbor Springs. To reach from Cross Village, follow Harbor Springs road (not the shore road) 3.9 miles to corner where main road turns east, turn west 1.6 miles to corner, thence straight west on dirt road 0.6 mile to vacant farm. Turn north at house and follow wagon track across field northwest ¼ mile to station, in cleared field, 2½ feet west of old burnt stump, in center of small rock pile. Mark is copper pin in a concrete block, 1 foot below surface of ground. Reference monument bears S. 40°32′ E., and is distant 1,413.8 feet from station. Witness points are: east-west-south fence corner, S. 11°47′ E., about 600 feet distant; west-south fence corner, S. 27°32′ W., about 300 feet distant; north-south-east fence corner, S. 69°45′ E., about 700 feet distant from station. Station recovered in 1931 and two reference marks were established, standard reference disks in concrete, note 11a. No. 1 is in southwest corner of wood lot, in fence line between wood lot and old orchard, 8 meters (26 feet) north of center line of road, ½ mile west of intersection with gravel road, 0.1 mile east of entrance into old deserted farmyard, and approximately ¼ mile from station in azimuth 319°28′44″. No. 2 is 1 foot east of broken-off corner post at

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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intersection of east-and-west and north-and-south wire fences, in open field, and 59.19 meters (194.2 feet) from station in azimuth 37°04′.

Plane coordinates: (C), $x=672,355.41$ feet; $y=1,491,497.72$ feet; grid azimuth to reference mark no. 1=318°59′53″.*

Point aux Chenes (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1908; R. L. Pfau, 1929).—On north shore of Lake Michigan, on west side of Point aux Chenes, 3½ miles south of extreme southern tip of Brevoort Lake, in sec. 22, T. 41 N., R. 5 W., Moran Township, on peak of highest sand hill in vicinity. Marked by nail in concrete-filled ¾-inch gas pipe, centered in concrete-filled 6-inch sheet iron pipe, projecting 1 foot above ground. Mark is 10 paces north of triangle-blazed 10-inch balsam tree, with nails at center and vertices of triangle. Old 4-foot pole stand is still standing. Following bearings are from station: Waugoshance Lighthouse, S. 40°24′ W.; large dead 24-inch pine with old blaze, distant 11 meters (36 feet), N. 70°10′ E.

Plane coordinates: (C), $x=712,961.87$ feet; $y=1,615,538.44$ feet.

A. Mackinac west base U. S. L. S.) (Emmet County, U. S. Lake Survey, 1852, R. L. Pfau, 1929).—In front of old McGulpin Point Lighthouse, Straits of Mackinac, 23.6 feet from northeast corner of lighthouse dwelling, and 13.1 feet from front angle of lighthouse tower (angle formed by the northeast face of tower and north buttress of tower). To reach from Mackinaw City, follow main street through town away from water front to point where road turns abruptly left, turn right and follow road to lighthouse. Surface mark is intersection of two lines on end of ⅜-inch brass bolt cemented into limestone post, about 20 inches below surface of ground. Underground mark is ⅛-inch hole in 1½-inch brass plug, in center of concrete-filled sugar barrel, 4 feet below surface of ground.

Plane coordinates: (C), $x=749,257.70$ feet; $y=1,564,107.39$ feet. (E), $x=217,787.71$ feet; $y=1,564,589.63$ feet.

Crane (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1902; 1918).—On Waugoshance or Crane Island, about 500 feet from north side and 1,200 feet from west end, Cross Village Township. Mark is ½-inch brass tube in concrete block, inscribed "U. S. 1902," 2 feet below surface of ground. One concrete reference monument is on line to Waugoshance Lighthouse, just inside timber line on north shore, and 460 feet from station; another is just off ridge, and 25¼ feet west of station.

Plane coordinates: (C), $x=673,446.55$ feet; $y=1,555,173.57$ feet.

Hog Island (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On Hog Island, about ⅜ mile west from east shore of island, and ⅜ mile north of shore opposite Tim's Island. Mark is ¼-inch brass bolt in concrete monument, 12 inches square, 1 foot below surface of ground. Reference mark is concrete monument 12.1 feet from station in azimuth 227°30′. Station also called "Hog" by U. S. Lake Survey.

Plane coordinates: (C), $x=600,197.48$ feet; $y=1,567,864.56$ feet.

Manitou Payment (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1854; 1917).—On Manitou Payment Point, on north shore of Lake Michigan, just west of the "High Rollways," in southwest part of sec. 18, T. 42 N., R. 6 W., Moran Township, on peak of highest sand hill near shore, 5.3 meters (17 feet) N. 52°07′ E. of 5-inch oak tree, 6.7 meters (22 feet) N. 70°25′ W. from 4-inch oak tree, 9.1 meters (30 feet) S. 69°49′ W. from 10-inch oak tree, and 4.8 meters (16 feet) S. 24°26′ E. from 5-inch birch tree. Marked by cross on flat stone 4 feet below surface of ground. Over mark is concrete monument, 10 inches square, projecting 4 inches above ground.

Plane coordinates: (C), $x=668,223.40$ feet; $y=1,651,786.33$ feet.

Maple Hill (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1896; 1917).—In NE ¼ sec. 3, T. 43 N., R. 4 W., Brevoort Township, near north edge of lime stone ridge. Marked by lead plug in solid rock. Reference marks are crosses, near inscribed letters "U. S.," cut in rock on edges of ledge. One is 27.5 feet from station on bearing N. 10° W.; other is 26.5 feet distant on bearing N. 75°30′ E.

Plane coordinates: (C), $x=744,689.61$ feet; $y=1,699,223.26$ feet. (E), $x=216,753.33$ feet; $y=1,699,786.23$ feet.

Rabbit Back (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1851; 1896).—About 4 miles north of St. Ignace, on summit of Rabbit Rock Peak, improperly called in original description Rabbits Back Peak. Surface mark is ⅜-inch brass rod in center of stone, 6 inches square, 2 inches below surface of ground. Under-

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

ground mark is cluster of nails driven into solid rock 20 inches below surface of ground.

Plane coordinates: (C), x=761,619.24 feet; y=1,613,292.35 feet. (E), x=231,428.89 feet; y=1,613,437.53 feet.

C. Mackinac Island (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1851; 1917).—On summit of Mackinac Island, at Fort Holmes. Mark is intersection of two diameters of circle, cut in small granite boulder. In 1917 concrete monument, 20 inches square and 4 feet long projecting 8 inches above ground, was centered over original mark.

Plane coordinates: (C), x=788,876.94 feet; y=1,590,456.35 feet. (E), x=258,081.75 feet; y=1,589,897.15 feet.

B. Mackinac east base (U. S. L. S.) (Cheboygan County, U. S. Lake Survey, 1851; 1917).—About 2¼ miles southeast of Mackinaw City, in center of sec. 20, T. 39 N., R. 3 W., 196.9 feet southwest of southwest side of U. S. Route 23, 32.0 feet southwest of southwest right-of-way fence of the Michigan Central Railroad, and in southwest rut of old Cheboygan-Mackinaw gravel road. Marked by brass plug in top of cut stone monument 5 inches below surface of gravel road. Reference mark, cut stone monument inscribed "U. S." projecting 2 inches above surface of ground, is on line to Round Island Lighthouse, and in southwest fence line of railroad.

Plane coordinates: (E), x=236,022.88 feet; y=1,553,035.30 feet. (C), x=767,786.92 feet; y=1,553,032.61 feet.

D. St. Ignace (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1851 1896).—In south end of St. Ignace, at southeast end of rocky ridge. Marked by ⅜-inch brass rod in drill hole in solid rock 18 inches below surface of ground.

Plane coordinates: (C), x=764,980.20 feet; y=1,588,142.81 feet. (E), x=234,132.31 feet; y=1,588,207.91 feet.

Robinson (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1895; 1903).—In north central part of T. 42 N., R. 1 W., on hill 200 feet high, about ½ mile from road, and back of Captain Stevenson's farm (1903). Mark is ½-inch hole in center of cut stone, 6 inches square and 2 feet 4 inches long, projecting 2 inches above ground. Reference stones are at following distances and azimuths from station: 139.14 feet, 168°09′; 215.39 feet, 222°50′; 103.38 feet, 329°12′. Cross with letters "U. S." inscribed on large boulder is 71.1 feet from station in azimuth 88°.

Plane coordinates: (C), x=838,251.46 feet; y=1,667,810.29 feet. (E), x=309,460.01 feet; y=1,665,932.04 feet.

Goose Island (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1895; 1920).—About 96 feet from west end of Goose Island, Cedar Township. Mark is cross on field stone, imbedded in block of concrete, about 2½ feet below surface of ground. Over mark is another block of concrete with nail as center.

Plane coordinates: (C), x=835,096.37 feet; y=1,616,054.85 feet. (E), x=304,952.63 feet; y=1,614,279.57 feet.

Duke (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894; 1921).—In NE¼NW¼ sec. 33, T. 44 N., R. 1 W. Marked by ⅜-inch hole between letters "U. S." in top of stone, 6 inches square and 2 feet long, 4 feet below surface of ground. Reference marks are crosses on tops of two field stones with letters "U. S." on sides toward station, and are 344 feet apart, and each 33 feet north of north line of section 33. One is 203.7 feet from station on bearing N. 46°30′ W.; other is 236.75 feet distant on bearing N. 55° E. Witness marks are at following distances and bearings from station: 36-inch pine stump 59.5 feet, S. 48° W.; 15-inch pine tree, near road, 173 feet, N. 21° E. Azimuth from station to north quarter corner, sec. 33, T. 44 N., R. 1. W., is 259°04′26″, and azimuth to north peak of school is 269°46′06″.

Plane coordinates: (E), x=304,871.97 feet; y=1,735,653.53 feet; grid azimuth to T. 44 N., R. 1 W., sec. 33, north quarter corner=259°37′52″.* (C), x=831,836.13 feet; y=1,737,391.08 feet; grid azimuth to T. 44 N., R. 1 W., sec. 33, north quarter corner=258°07′34″.*

Raco (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1921).—About 4 miles west of Raco railroad station, in north part of sec. 34, T. 46 N., R. 4 W. Surface and underground marks are concrete monuments. Upper mark projects 4 inches above ground and lower mark is 2½ feet below surface of ground. Azimuth from station to fire tower is 226°31′39″

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (E), $x=217,664.60$ feet; $y=1,772,905.73$ feet; grid azimuth to fire tower=227°20′12″.* (C), $x=743,679.93$ feet; $y=1,772,337.30$ feet; grid azimuth to fire tower=225°49′45″.*

Iroquois (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893; 1921).—In T. 47 N., R. 3 W., on east end of highest ridge of Iroquois Point. Mark is ⅜-inch hole in stone, 6 inches square and 2 feet long, 4 feet below surface of ground. Reference marks are two stones 4 inches square and 2 feet long. One is 50 feet from station in azimuth 166°32′; other is 50 feet from station in azimuth 274°18′.

Plane coordinates: (E), $x=250,198.69$ feet; $y=1,814,004.54$ feet. (C), $x=775,119.12$ feet; $y=1,814,277.19$ feet.

Larke (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893).—In NE¼NE¼ sec. 23, T. 47 N., R. 1 W., on summit of ridge. Mark is intersection of crosslines on ⅜-inch brass rod set in stone block with letters "U. S." on top, 3.3 feet below surface of ground. Reference marks are four field stones, with cross and letters "U. S." on top, each 50 feet from station. One is in line with St. Marys Catholic Church, Sault Ste. Marie; others are respectively 90°, 180°, and 270° from this line.

Plane coordinates: (E), $x=317,984.38$ feet; $y=1,808,662.87$ feet.

Pennefather (U. S. L. S.) (West Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On highest ridge in section 29, Pennyfather Township, about 500 feet west of Goulais Bay Road. Mark is ½-inch hole in cut stone, 6 inches square and 2 feet long, about 2 feet below surface of ground. Reference marks are crosses, near letters "U. S." cut on nearby boulders and are at following distances and bearings from station: 49.61 feet, N. 42¾° W.; 33.70 feet, S. 27¼° W.; and 26.52 feet, S. 52¾° E.

Plane coordinates: (E), $x=306,779.72$ feet; $y=1,871,767.80$ feet.

Rankin Mountain (U. S. L. S.) (West Algoma District, Ontario, Canada, U. S. Lake Survey, 1893).—On highest part of Rankin Mountain, north of road to Garden River, east of old mining road up mountain, and on bearing S. 83° E. from single 18-inch pine on same ridge, 44.5 feet distant. Mark is 4-inch nail at center of triangle cut in top of highest solid rock, near letters "U. S." Reference marks are two crosses cut in rock 90.25 feet apart. One is 57.75 feet from station on bearing N. 53°15′ W.; other is 60.9 feet distant on bearing S. 25°30′ W. from station.

Plane coordinates: (E), $x=357,796.60$ feet; $y=1,849,498.86$ feet.

Laird (U. S. L. S.) (West Algoma District, Ontario, Canada, U. S. Lake Survey, 1894).—About 3 miles east of Lake George, about in center of section 16, Laird Township, about ½ mile east of road to Ecoba, ½ mile south of house owned by Mr. Rilley, and on solid rock hill. Marked by cross cut in solid rock.

Plane coordinates: (E), $x=406,318.23$ feet; $y=1,788,426.32$ feet.

Salters Hill (U. S. L. S.) (West Algoma District, Ontario, Canada, U. S. Lake Survey, 1894).—On St. Joseph Island, about ½ mile south of Hilton road, and not far from lines between Lots 5 and 6, and Concessions "N" and "O". Mark is ⅜-inch hole, within letters "U. S.", in top of stone, 6 inches square and 2 feet long, 3 feet below surface of ground. Reference marks are crosses with letters "U. S." cut in tops of four field stones (in natural positions). Distances and bearings from station to reference marks are: No. 1, 60.72 feet, N. 3° E.; No. 2 (74.2 feet from No. 1), 32.4 feet, S. 75°30′ E.; No. 3 (57.6 feet from No. 2), 60.9 feet, S. 7° E.; and No. 4 (76.3 feet from No. 3 and 80.5 feet from No. 1), 44.7 feet, S. 84° W.

Plane coordinates: (C), $x=946,761.09$ feet; $y=1,716,173.24$ feet. (E), $x=419,186.81$ feet; $y=1,711,427.90$ feet.

Detour (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894; 1903).—About 1 mile west of Picand, Mather & Co.'s dock at Detour, on top of hill, and about 800 feet south of east-and-west road. Marked by 6 by 6-inch cut stone 2 inches below surface of ground. Station site is well marked by 8 concrete foundation legs of tower.

Plane coordinates: (E), $x=437,016.95$ feet; $y=1,639,196.18$ feet. (C), $x=966,481.42$ feet; $y=1,644,419.32$ feet.

Phillips Hill (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1903; 1932).—Near northeast corner of series of hills north of Black Lake, near boundary of Presque Isle and Cheboygan Counties, in NE¼SW¼ sec. 7, T. 36 N., R. 2 E., Bearinger Township, and in 1903, 6 feet south of 16-inch Norway stub, and 52 feet north of blazed Norway stump, 14 inches in diameter and 2 feet high,

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

forming 8-foot triangle with 2 other Norway stumps of same size. Marked by spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1903," 12 inches below surface of ground.

Plane coordinates: (E), $x=352,603.92$ feet; $y=1,464,000.45$ feet. (C), $x=886,647.68$ feet; $y=1,467,055.15$ feet.

Reid (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—Near center of Cockburn Island, near highest point of hill in what is known as Scotch Settlement, and in road 10.5 feet from east fence and 45 feet from west. Marked by large spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1903," 6 inches below surface of ground. Concrete reference monument, 1 foot square, projecting 1 foot above ground, is 18 feet south-southeast of station. Following azimuths are from station: Tom Reid's barn, northwest corner, 175°20′; John Reid's barn, east peak, 261°54′; and stone heaps in fields, 303°51′, 333°51′, and 183°19′.

Plane coordinates: (E), $x=582,484.30$ feet; $y=1,612,010.24$ feet.

Bruder (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1904; 1932).—In NW¼ sec. 26, T. 35 N., R. 4 E., Moltke Township, on highest point on farm of Louis Bruder, 700 feet from southwest corner of Bruder's house, 604 feet from southeast corner of field, and 167 feet from triangular blaze on elm tree in stone pile. Marked by spike surrounded by 6 others in concrete monument inscribed "U. S. L. S. 1903," 12 inches below surface of ground.

Plane coordinates: (E), $x=434,473.89$ feet; $y=1,420,819.87$ feet.

Duck Island (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On edge of bluff on western side of Duck Island in Lake Huron, about ½ mile north of Duck Island Lighthouse, at place known as McCord's Camps. Marked by spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1903," 6 inches below surface of ground.

Plane coordinates: (E), $x=679,568.72$ feet; $y=1,514,950.82$ feet.

Presque Isle (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1904; 1932).—In NW¼NW¼ sec. 33, T. 34 N., R. 8 E., about 300 feet north of Presque Isle post office, in southwest corner of intersection of County Route 405 and road going to Grand Lake, 92.0 feet from southeast corner of Kaufman's cottage on bearing N. 65° E., and 87.7 feet from fence corner at southwest corner of road intersection on bearing S. 50° E. Originally marked by large spike surrounded by 6 others in concrete monument, inscribed "U. S. L. S. 1903," 12 inches below surface of ground. In 1932 station reported marked by 2-foot square block of concrete, inscribed "U. S. L. S. 1903," 1.8 feet below surface of ground. Four concrete leg foundations for tower are flush with ground surface.

Plane coordinates: (E), $x=548,684.75$ feet; $y=1,386,503.64$ feet.

Posen (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1904).—In barnyard of Roman Catholic Church at Posen, 295.7 feet from southeast corner foundation of church, 181.3 feet from southeast corner of brick house, and 257.6 feet from northwest corner foundation of schoolhouse. Marked by large spike surrounded by 6 others in concrete monument, inscribed "U. S. L. S. 1903," 12 inches below surface of ground. Eight concrete foundations for legs of tower were removed to 16 inches below surface of ground. In 1932 station reported destroyed.

Plane coordinates: (E), $x=492,257.34$ feet; $y=1,375,919.62$ feet.

Walker (U. S. L. S.) (Alpena County, U. S. Lake Survey, 1904; H. C. Warwick, 1932).—Eight miles north of Alpena, about 1 mile south of Long Lake, in SE¼ sec. 8, T. 32 N., R. 8 E., and on land owned by Ray Parker. To reach from traffic light on main street of Alpena (no left turn), follow Chisolm Street northwest 1.4 miles to end of macadam at school, follow right-hand gravel road fork north 6.0 miles to gravel crossroads at large yellow house on left, continue north 1.1 miles to Parker's gate (red pole gate which leads to small white bungalow with concrete barn to north) on left (west) side of road, follow drive west 50 yards to house, pass through red pole and wire gate on north, and follow old road northwest through brush 200 yards to station site. Large strip east and west from station has been cleared, and road follows south side of clearing passing 20 yards south of station. Marked by large spike surrounded by 6 others in top of 1-foot square concrete block, inscribed "U. S. L. S. 1904," and resting on natural rock. Mark is 10 inches below surface of ground. Eight concrete foundations of tower show above surface of ground.

Plane coordinates: (E), $x=548,636.76$ feet; $y=1,341,200.72$ feet.

Flanders (U. S. L. S.) (Alpena County, U. S. Lake Survey, 1904; H. C. Warwick, 1932).—About 8.5 miles east of Hillman, in SE¼ sec. 20, T. 31 N., R. 6 E.,

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and on land owned by John Eagling who lives at Lachine Corners. To reach from Hillman, go east 8.5 miles on Route M 32 to gate leading into pasture on right. Gate is in row of tall poplars and near old stone foundation of burned-down house. Station is on top of hill, about 300 meters (984 feet) south of gate, 105 feet southwest of pole fence corner, 83 feet west of north-and-south pole fence, and 178 feet east of another pole fence to west. Marked by large spike surrounded by 6 others in top of 1 by 1 by 4-foot concrete block, inscribed "U. S. L. S. 1904," 12 inches below surface of ground. Reference marks were concrete posts, inscribed "U. S. L. S. 1904," in fence lines, and projecting 1 foot above ground. No. 1 (not recovered in 1932) was in east fence line, and 71.5 feet from station in azimuth 254° 45′. No. 2 is 2 feet west of pole fence at point where fence crosses first ridge about 300 meters (984 feet) south of Route M 32, and 194.9 feet (slope distance to closest point of concrete block) from station in azimuth 111°53′. Reference mark and azimuth mark, standard disks in concrete, note 11a, were established in 1932. No. 1 (1932) is just west of pole fence, 27.5 feet south of rail fence corner, and 89.9 feet (slope distance) from station in azimuth 246°20′. Azimuth mark is at west edge of apple orchard, 49 feet south of center line of Route M 32, about 150 feet east of above-mentioned stone foundation, and approximately 0.15 mile from station in azimuth 186°59′00″. Azimuth from station to center of belfry on church, distant 1.1 miles, is 87°57′58″.

Plane coordinates: (E), $x=484,657.28$ feet; $y=1,297,805.92$ feet; grid azimuth to azimuth mark=187°01′30″.*

Mac (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905).—About 2 miles northeast of Spruce, near center of sec. 1, T. 28 N., R. 8 E. Marked by large spike surrounded by 6 others in concrete monument, inscribed "U. S. L. S. 1905," projecting about 1 foot above ground. In 1932 station was reported destroyed.

Plane coordinates: (E), $x=563,286.15$ feet; $y=1,221,543.95$ feet.

Stovel (U. S. L. S.) (Alpena County, U. S. Lake Survey, 1905; H. C. Warwick, 1932).—About 16 miles southwest of Alpena, 3 miles northwest of Hubbard Lake in NE¼ sec. 25, T. 29 N., R. 6 E., on prominent bushy hill known locally as "Tower Hill" and on land owned by Oscar Carr. Marked by 40-penny spike, surrounded by three inverted screws which form triangle, in top of concrete block 1 foot square and 3 feet long, inscribed "U. S. L. S.—1905," 10 inches below surface of ground. Reference mark was concrete post, projecting 1 foot, 70.0 feet from station in azimuth 90°34′. In 1932 reference mark was recovered in different position, with top broken off, and was re-marked by standard disk station mark in concrete built up around old post. This point is station *Stovel eccentric* and is 22.28 feet from station in azimuth 33°46′.

Plane coordinates: (E), $x=504,658.92$ feet; $y=1,234,036.49$ feet.

Stovel eccentric (Alpena County, H. C. Warwick, 1932).—About 16 miles southwest of Alpena, 3 miles northwest of Hubbard Lake, in NE¼ sec. 25, T. 29 N., R. 6 E., on prominent bushy hill known locally as "Tower Hill" and on land owned by Oscar Carr. To reach from Alpena, go south 13.5 miles on U. S. Route 23 to gravel road leading west at sign "Hubbard Lake, 8 miles" (4.0 miles south of Precore Hill fire lookout tower), follow road west 6.8 miles to crossroads at Witt School, proceed south 0.55 mile on dirt road to end of truck travel at gate leading to small shack owned by Loren Smith on right. Enter gate, follow wagon track west 0.25 mile across Smith's field, pass through wire gate, turn left (southeast) onto old road, follow 0.7 mile through woods to dim trace turning squarely to left, and, follow 0.1 mile to its end at station site on summit of hill. Marked by standard station disk in top of concrete post built up around old concrete post which probably was reference mark of Station *Stovel* (*U. S. L. S.*). Mark projects 10 inches above ground and is stamped "Stovel Ecc. 1905, 1932." Reference marks are standard reference disks in concrete, note 11a, slightly off summit of hill, and projecting 4 inches above ground. No. 1 is 43.47 feet from station in azimuth 300°04′. No. 2 is 50.35 feet from station in azimuth 24°53′. Station *Stovel* (*U. S. L. S.*) is 22.28 feet from station in azimuth 213°46′.

Plane coordinates: (E), $x=504,646.47$ feet; $y=1,234,017.95$ feet.

Supplementary points

Kentucky (U. S. L. S.) (Alger County, U. S. Lake Survey, 1919).—On highest point of highest hill of group known as Kentucky Hills, and thought to be in NE¼SE¼ sec. 35, T. 45 N., R. 19 W. Marked by spikes each surrounded by

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

three others in double concrete monument. Top of upper monument is flush with surface of ground and marked "U. S. L. S. 1919."

Plane coordinates: (C), $x=274,157.80$ feet; $y=1,735,328.43$ feet.

Shingleton (U. S. L. S.) (Schoolcraft County, U. S. Lake Survey, 1919.—About 3 miles south of the railroad station at Shingleton, and thought to be near center of SE¼ sec. 7, T. 45 N., R. 17 W. To reach from old Camp 69 on Michigan & Lake Shore Railroad, leave right-of-way and follow trail below south side of ridge about 2,100 feet to short 10-inch hemlock (blazed on north, east, and west sides) at south edge of trail, and proceed N. 78°40′ E. about 700 feet to clump of hemlocks near east end of ridge. Marked by double concrete monuments, tops of which have spikes at center and are marked "U. S. L. S. 1919." Point in center line of railroad, about 200 feet south of end of ridge, 19.96 feet south-southwest of blaze on large pine stump, and 24.45 feet east of similar blazed stump, is 2,743.1 feet from station in azimuth 280°21′.

Plane coordinates: (C), $x=318,880.08$ feet; $y=1,751,637.87$ feet.

Edmunds (U. S. L. S.) (Alger County, U. S. Lake Survey, 1919).—In northeast corner of sec. 10, T. 47 N., R. 17 W., on west extension of high hill. Marked by nails in centers of tops of double concrete monument. Upper monument projects 3 inches above ground. Azimuth from station to section corner, 537.25 feet distant, is 184°59′.

Plane coordinates: (C), $x=334,529.13$ feet; $y=1,819,674.33$ feet.

Driggs (U. S. L. S.) (Schoolcraft County, U. S. Lake Survey, 1920).—In SW¼NE¼ sec. 36, T. 46 N., R. 16 W., near highest part of short ridge. Marked by double concrete monument. Upper monument projects 6 inches above ground. Azimuth from station to southwest corner of railroad section house, about 3,900 feet distant, is 345°51′28″; and to southeast corner, sec. 36, T. 46 N., R. 16 W. 4,176.7 feet distant, is 328°25′06″.

Plane coordinates: (C), $x=405,706.80$ feet; $y=1,770,019.94$ feet; grid azimuth to T. 46 N., R. 16 W., sec. 36, southeast corner=328°41′19″.*

Elback (U. S. L. S.) (Alger County, U. S. Lake Survey, 1920).—About ¾ mile northwest of Beaver Junction, on east point of high ridge. To reach from Beaver Junction, go west about 1.1 miles along Munsing Road to intersection of new road to north at middle of first curve to south, turn north and continue 0.4 mile to station site. Marked by double concrete monument (each about size of nail keg). Upper monument projects 4 inches above ground.

Plane coordinates: (C), $x=426,699.35$ feet; $y=1,837,427.91$ feet.

Beech Hill (U. S. L. S.) (Luce County, U. S. Lake Survey, 1920; 1921).—About 1 mile northwest of Peanut Lake, and thought to be near center of NW¼NW¼ sec. 19, T. 47 N., R. 11 W. Marked by double concrete monument. Upper mark projects 4 inches above ground.

Plane coordinates: (C), $x=503,275.95$ feet; $y=1,806,436.54$ feet.

McMillan (U. S. L. S.) (Luce County, U. S. Lake Survey, 1920; 1921).—About 1 mile south of McMillan, and identical with center post of sec. 4, T. 45 N., R. 11 W. (according to Ryborg survey of that section for Charcoal Iron Co.). Marked by two concrete monuments.

Plane coordinates: (C), $x=515,807.47$ feet; $y=1,758,637.03$ feet.

Seney (U. S. L. S.) (Schoolcraft County, U. S. Lake Survey, 1920).—About ½ mile southeast of railroad station at Seney, on peak of hill, 120 feet northeast of iron fire tower. Marked by double concrete monument. Upper mark projects 4 inches above ground.

Plane coordinates: (C), $x=453,343.93$ feet; $y=1,764,196.77$ feet.

Corson (U. S. L. S.) (Luce County, U. S. Lake Survey, 1921).—Station is north-northwest of Newberry, in SW¼SW¼ sec. 20, T. 47 N., R. 10 W., and on knoll north of buildings on sheep ranch. Marked by double concrete monument marked "U. S. L. S. 1920." Upper mark projects 2 inches above ground. Following azimuths are from station: West peak of horse barn, 331°25′; east end of old store cellar, 3°05′; west peak of blacksmith shop, 6°51′; and pump, across north-and-south road, 64°19′.

Plane coordinates: (C), $x=539,824.56$ feet; $y=1,803,584.37$ feet.

Newberry (U. S. L. S.) (Luce County, U. S. Lake Survey, 1921).—In Newberry, on land owned by Geo. Zinker (N½NE¼SE¼SE¼ sec. 35, T. 46 N., R. 10 W.), 490 feet west of center of road, 169.4 feet north of south fence line, and 197.9 feet east of west fence line. Marked by double concrete monument. Upper monument is 1 foot below surface of ground.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (C), $x=560,219.99$ feet; $y=1,762,590.93$ feet.

Fordney (U. S. L. S.) (Luce County, U. S. Lake Survey, 1921).—In N½ sec. 35, T. 48 N., R. 9 W., slightly less than ½ mile N. 30° E. from Fordney's hunting camp on old railroad grade, and 205 feet east of road leading north from camp. Marked by double concrete monument marked "U. S. L. S. 1921." Upper monument projects 3 inches above ground.

Plane coordinates: (C), $x=590,836.30$ feet; $y=1,828,479.22$ feet. (E), $x=66,330.79$ feet; $y=1,833,064.69$ feet.

McLeod (U. S. L. S.) (Luce County, U. S. Lake Survey, 1921).—On extreme north and highest point of limestone ridge in NE¼ sec. 35, T. 45 N., R. 8 W. Underground mark is spike in concrete monument with top marked "U. S. L. S. 1921." Surface mark is ½-inch pipe in concrete monument with top marked "U. S. L. S. 1921," and projecting 1 foot above ground.

Plane coordinates: (C), $x=622,386.76$ feet; $y=1,733,392.43$ feet. (E), $x=95,373.60$ feet; $y=1,737,158.89$ feet.

Eckerman (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1921).—About 2 miles southeast of railroad station at Eckerman, 90 feet west-northwest of highest part of knoll, and northeast of center of sec. 35, T. 45 N., R. 6 W. Marked by double concrete monument marked "U. S. L. S. 1921." Upper monument is flush with surface of ground.

Plane coordinates: (E), $x=158,716.36$ feet; $y=1,767,433.47$ feet. (C), $x=684,901.47$ feet; $y=1,765,316.60$ feet.

Furlong (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1921).—About 4 miles east of Trout Lake, on the Furlong farm, in NE¼ sec. 29, T. 44 N., R. 5 W., on west end of limestone hill. Marked by brass plug cemented into solid rock. Cross on large limestone boulder is 61 feet 10½ inches southeast, and concrete monument marked with cross line on arrow is 4 feet northeast of station. Azimuth from station to section corner, distant 650.5 feet, is 242°27′.

Plane coordinates: (E), $x=175,185.33$ feet; $y=1,710,837.19$ feet. (C), $x=702,849.49$ feet; $y=1,709,179.14$ feet.

Bois Blanc Lighthouse (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1896).—Station is center of lantern house of abandoned lighthouse at end of long point on north side of Bois Blanc Island in Straits of Mackinac.

Plane coordinates: (C), $x=838,928.95$ feet; $y=1,573,928.20$ feet. (E), $x=307,684.43$ feet; $y=1,572,069.49$ feet.

Spectacle Reef Lighthouse (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—Plane coordinates: (E), $x=379,727.69$ feet; $y=1,557,841.75$ feet. (C), $x=911,325.71$ feet; $y=1,561,582.06$ feet.

La Fayette (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1908).—On La Fayette Point, on east end of Bois Blanc Island, in Straits of Mackinac, on low stony ridge, 95 feet east of shore road, 86 feet southeast of 9-inch pine tree, 48 feet northeast of two birch trees, and 13 feet southwest of white granite boulder. Marked by brass screw in top of concrete post 6 inches square, projecting 6 inches above surface of ground, and marked "U. S. 1908."

Plane coordinates: (C), $x=855,636.42$ feet; $y=1,559,991.40$ feet. (E), $x=324,021.90$ feet; $y=1,557,702.86$ feet.

Martin Reef Lighthouse (U. S. L. S.) (Mackinac County, U. S. Lake Survey).—Plane coordinates: (E), $x=377,331.37$ feet; $y=1,608,947.65$ feet. (C), $x=907,596.54$ feet; $y=1,612,615.24$ feet.

Beaver Harbor Lighthouse (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903).—Station is center of lantern house of lighthouse on north point of harbor at St. James, Beaver Island, in northern Lake Michigan.

Plane coordinates:[1] (C), $x=561,600$ feet; $y=1,546,472$ feet.

Grosse Point (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—About 8 miles north of St. Ignace, on end of Grosse Point, on bank of gravel in timber line, about 100 feet from water's edge, 25.3 feet S. 73°54′ E. from 6-inch cedar tree, and 175.4 feet S. 45°30′ E. from 12-inch spruce tree. Marked by spike in mass of concrete, flush with surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=771,404.53$ feet; $y=1,632,110.91$ feet. (E), $x=241,078.62$ feet; $y=1,632,002.50$ feet.

Burnt Island (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—In Straits of Mackinac, on extreme southerly point of Big St. Martin, or Burnt Island, on gravel bank which is small island at high water, 26 feet northeast from small pyramid of concrete on a flat boulder, and 50 feet N. 70° E. from a

[1] No check on this position.

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large white granite boulder. Marked by spike in mass of concrete, and marked "U. S. 18."

Plane coordinates: (C), $x=784,023.55$ feet; $y=1,626,090.49$ feet. (E), $x=254,160.50$ feet; $y=1,625,646.17$ feet.

Biddle (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1917).—About 3 miles east of Naubinway, on Biddle or Mattys Point, on north shore of Lake Michigan, 98 feet north of water's edge at end of point, 84 feet south of the southeast corner of frame house, 31 feet south of blazed 12-inch cedar tree, 40 feet northeast of blazed 8-inch cedar tree, and 66 feet northwest of blazed 10-inch double birch tree. Marked by brass screw in concrete, flush with surface of ground, and marked "U. S. 1917."

Plane coordinates: (C), $x=594,404.09$ feet; $y=1,667,875.35$ feet.

Patterson (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1917).—On Point Patterson, on north shore of Lake Michigan, on gravel bank in edge of timber, 117 feet S. 52°46′ W. from drill hole in boulder 6 by 6 by 4 feet, 52.7 feet N. 78°48′ E. from drill hole in boulder 3 by 4 by 2 feet at water's edge, and 19.7 feet S. 8°58′ E. from triangle-blazed 16-inch spruce tree. Marked by spike in center of triangle in top of concrete monument, 8 inches square, marked "U. S. 1917."

Plane coordinates: (C), $x=524,350.15$ feet; $y=1,628,328.07$ feet.

Squaw Island Lighthouse (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903).—Station is center of lantern house of Squaw Island Lighthouse, on Squaw Island of Beaver Island group in north end of Lake Michigan.

Plane coordinates: (C), $x=541,522.38$ feet; $y=1,581,905.30$ feet.

High (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On more northerly of two highest sand hills near west side of High Island of Beaver Island group in northern Lake Michigan, 39.6 feet S. 57° W. of blazed balsam tree, 66.1 feet N. 84° W. of blazed birch tree. Marked by wire nail in center of cement-filled 1½-inch iron pipe driven into sand with top 1 foot below surface of ground. Reference mark is iron stake about 1 inch square and 6 feet long, projecting 4 inches above surface of ground, midway between 3 stumps on ridge running west from station, and 39.6 feet distant, and bears N. 62°24′ E. from station.

Plane coordinates: (C), $x=516,903.89$ feet; $y=1,542,362.49$ feet.

Scott Point (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1917).—On Scott Point, on north shore of Lake Michigan, approximately at center of point, 67 feet south of old fish house at dock, 87 feet east of water's edge on line to Point Patterson, 76 feet west of water's edge on prolongation of same line, 108 feet from end of point, and 143.7 feet N. 37°10′ W. of ½-inch drill hole 2 inches deep in black boulder 4 feet square, at water's edge. Marked by brass bolt surrounded by 3 nails in concrete monument with top 4 inches above surface of ground, and marked "U. S. 1917."

Plane coordinates: (C), $x=514,912.99$ feet; $y=1,625,216.93$ feet.

Hughes (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1917).—Near the extremity of Hughes Point, about 5 miles east of Seul Choix Point, on north shore of Lake Michigan, 100 feet from water's edge to west, 105 feet from water's edge to south, and 108 feet from inner end of small dock on east side of point. Marked by brass screw in concrete post projecting 1 foot above surface of ground, and marked "U. S. 1917."

Plane coordinates: (C), $x=476,855.41$ feet; $y=1,627,138.26$ feet.

Seul Choix Lighthouse (U. S. L. S.) (Schoolcraft County, U. S. Lake Survey, 1916).—Station is center of lantern house of Seul Choix Lighthouse on north shore of Lake Michigan, about 16 miles east of Manistique.

Plane coordinates: (C), $x=458,752.97$ feet; $y=1,611,549.46$ feet.

South Gull (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1922).—On east side of south point of Gull Island of Beaver Island group in northern Lake Michigan, about 30 meters (98 feet) from water's edge, and 165 meters (541 feet) from southern tip of island. Marked by spike in concrete post. Reference mark is nail in concrete monument projecting 1 foot above surface of ground, mounted in wooden box filled with concrete, marked "U. S. 22," and circled with small boulders laid in concrete, 48.5 feet due west from blazed birch tree which is on top of bank and 32 feet from water's edge, and 59.4 feet south by west from station on line from station to east end of South Fox Island. Large flat rock laid in concrete at side of reference mark points to station.

Plane coordinates: (C), $x=476,728.32$ feet; $y=1,528,306.45$ feet.

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Fox (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1922).—On north end of South Fox Island in northern Lake Michigan, on highest point of second bare bank from northwest corner of island, about 8 feet from edge of bank. Marked by ¾-inch pipe driven into sand, projecting about 4 inches above surface of ground.

Plane coordinates: (C), $x=468,162.51$ feet; $y=1,436,520.32$ feet.

North Fox (1923) (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1923).—Near south end of North Fox Island in northern Lake Michigan, on top of small bare sand hill on highest point of island. An 8-inch blazed birch tree, with root exposed about 3 feet, stands on west edge of sand ridge, 47 feet from station. Marked by spike in concrete monument.

Plane coordinates: (C), $x=494,007.00$ feet; $y=1,446,756.54$ feet.

Pisgah (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1904).—In northern Lake Michigan, on northwest corner of Beaver Island, just west of Faunt Lake, on highest bald sand hill known as Mount Pisgah. Marked by nail in concrete-filled iron pipe driven into sand. In 1917 it was reported that station could not be located, and was probably destroyed by shifting sand.

Plane coordinates: (C), $x=549,469.33$ feet; $y=1,544,862.79$ feet.

Garden (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1919).—On Garden Island of Beaver Island group in northern Lake Michigan, on top of hill near northwest corner of island, in edge of old clearing which has grown up to brush and small trees, 29.5 feet S. 80° E. from small blazed poplar tree, 70 feet S. 10° W. from small blazed balsam tree, and 39.1 feet N. 65° W. from small blazed birch tree. Marked by nail cemented into rock 3 feet below surface of ground. Reference mark is concrete monument, 56.5 feet from station, 25 feet from edge of bluff, and on line to Squaw Island Lighthouse.

Plane coordinates: (C), $x=558,524.21$ feet; $y=1,575,378.46$ feet.

White Shoal Lighthouse (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1913).—Station is center of roof of lantern house of lighthouse built about 1908–09 on White Shoal in the westerly approach to Straits of Mackinac.

Plane coordinates: (C), $x=656,534.79$ feet; $y=1,583,042.94$ feet.

Epoufette (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—On north shore of Lake Michigan, near southeast corner of island off end of Point Epoufette, 41 feet southeast of water's edge, 79 feet northwest of water's edge, 131 feet east of end of rocky point, and 82.5 feet N. 28°55′ E. of drill hole in large boulder. Marked by brass bolt in mass of concrete, top flush with surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=639,366.37$ feet; $y=1,656,500.67$ feet.

Little Hog (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—On north shore of Lake Michigan, about 4 miles east of Biddle Point, on south shore of Little Hog Island, near west end of trees, about 15 feet from brush line, 105 feet N. 30°08′ W. of drill hole in large boulder, 74.5 feet N. 10°20′ W. of large triangular boulder, and 165 feet N. 71°45′ E. of drill hole in third large boulder. All boulders are at water's edge. Marked by nail surrounded by triangle in mass of concrete, top flush with surface of ground.

Plane coordinates: (C), $x=616,366.19$ feet; $y=1,666,064.04$ feet.

Whiskey (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On the east point of Whiskey Island, in Beaver Island group in northern Lake Michigan, 350 feet from end of point, 60 feet from water's edge on south side, and 100 feet from water's edge on north side of point. Marked by copper bolt in concrete monument, 12 inches square, marked "U. S. 1903," set with top about 1 foot below surface of ground. Reference mark is concrete monument, 12 inches square, marked "U. S. 1903," projecting about 1 foot above surface of ground, set on line to Squaw Island Lighthouse, 26.2 feet from station.

Plane coordinates: (C), $x=537,069.32$ feet; $y=1,571,595.28$ feet.

N. W. Garden (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1918).—On extreme northwestern corner of Garden Island, in Beaver Island group in northern Lake Michigan, 27 feet from water's edge, 8 feet from edge of bank, 117 feet S. 61° W. of large boulder 5 feet in diameter standing at edge of water, and 41 feet from 14-inch double birch tree. Marked by nail in concrete, flush with surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=556,789.58$ feet; $y=1,577,721.03$ feet.

Cranberry (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—About 7 miles northeast of Point Patterson, on Cranberry Point, on north shore of Lake Michigan, on top of sandy ridge near southerly side of long rounded point,

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250 meters (820 feet) south of mouth of creek, 105 feet from water's edge, 40 feet from high-water line, 74.4 feet northeast, 35.7 feet southeast, and 137 feet southwest of three blazed 8-inch jack pine trees. Marked by brass bolt in concrete, flush with surface of ground and marked "U. S. 1918."

Plane coordinates: (C), $x=543,786.55$ feet; $y=1,657,534.64$ feet.

M XII (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—About 4 miles west of Mille Coquins Point, on the north shore of Lake Michigan, ¾ mile north of old fishing station, on second sand ridge about 200 feet from water's edge, 339 feet northeast of blazed 8-inch birch tree, 135 feet east of blazed 16-inch jack pine tree, and 103 feet southeast of blazed 12-inch jack pine tree. Marked by brass bolt in concrete, flush with surface of ground, marked "U. S. 1918."

Plane coordinates: (C), $x=559,330.96$ feet; $y=1,674,699.38$ feet.

Naubinway Island (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1911; 1918).—On Naubinway Island, off north shore of Lake Michigan, on highest point of gravel ridge near center of north end, 90 meters (295 feet) from extreme northerly point of island, 28 meters (92 feet) from water's edge to west, and 39 meters (128 feet) from water's edge on line to Biddle Point, Original mark was nail in cedar post, which was replaced in 1918 by spike in mass of concrete.

Plane coordinates: (C), $x=577,382.68$ feet; $y=1,667,877.68$ feet.

Mille Coquins (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1911; 1918).—On north shore of Lake Michigan, on Mille Coquins Point, just west of Naubinway, 5 feet from water's edge, 31.68 feet S. 67°24′ W. of ½-inch drill hole 2 inches deep, in flat black boulder 3 feet in diameter at water's edge, and 38 feet S. 58°16′ E. of similar drill hole in large white boulder at brush line. Original mark was nail in cedar stake, which was replaced in 1918 by a ½-inch round iron rod 3 feet long, driven between three boulders, surrounded by concrete, and marked "U. S. 1918."

Plane coordinates: (C), $x=577,112.06$ feet; $y=1,671,449.25$ feet.

Trout (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On Trout Island of Beaver Island group in northern Lake Michigan, on east side of point at southeast end of island, 86 feet from edge of bank, and 105 feet from water's edge on line to Squaw Island. To reach from northeast corner of log cottage, go north 163 feet on line of east side, then west 44 feet to station site. Marked by copper bolt in concrete monument 12 inches square, with top about 1 foot below surface of ground, and marked "U. S. 1903."

Plane coordinates: (C), $x=516,354.57$ feet; $y=1,556,908.67$ feet.

Gull (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On east side of Gull Island of Beaver Island group in northern Lake Michigan, about 2,500 feet from north end and 1,100 feet north of point on east side of island, on highest ridge, 250 feet from water's edge, 56.5 feet north-northwest of 10-inch birch tree, 123 feet east of 16-inch balsam tree, and 74.5 feet south of 12-inch double birch tree. All witness trees are marked by spike in center of triangular blaze. Marked by spike in concrete monument 12 inches square, with top about 1 foot below surface of ground, and marked "U. S. 1903." Reference mark is concrete monument 12 inches square, marked "U. S. 1903," on east edge of first ridge from beach, on line to south end of High Island, and 85.7 feet from station.

Plane coordinates: (C), $x=478,211.65$ feet; $y=1,532,751.49$ feet.

Beaver Island (1860) (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1860; 1925).—On east side of Beaver Island in northern Lake Michigan, on highest hill on north side of Cole's Bay, 24.4 feet east of 8-inch white pine tree, and 53.1 feet south of a triangle-blazed 11-inch birch tree. Marked by spike in concrete monument, rounded on top, and marked "U. S."

Plane coordinates: (C), $x=564,760.73$ feet; $y=1,497,023.78$ feet.

Middle Village Church (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1925).—Plane coordinates: (C), $x=662,619.89$ feet; $y=1,477,342.83$ feet.

Northeast Beaver (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1917; 1924).—On Beaver Island in northern Lake Michigan, on east brow of hill on northeast corner of island, 18½ feet S. 79° E. of blazed white oak tree, and 24 feet S. 18° W. of blazed white pine tree. Marked by brass bolt in center of a ¾-inch iron pipe embedded in mass of concrete, top flush with surface of ground, and marked "U. S."

Plane coordinates: (C), $x=563,093.98$ feet; $y=1,550,497.56$ feet.

South Hog 1903 (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903, 1920).—On east side of small point on extreme south end of Hog Island of Beaver Island group in northern Lake Michigan. Original mark was nail in cedar post, which was replaced in 1920 by spike in mass of concrete, flush with surface of

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ground, marked "U. S. 1903." Station *South Hog 1917* (*U. S. L. S.*) is 72.71 feet from station in azimuth 59°08′.

Plane coordinates: (C), x=595,652.28 feet; y=1,556,237.66 feet.

South Hog 1917 (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1917; 1920).—On east side of small point on extreme south end of Hog Island of Beaver Island group in northern Lake Michigan, 49 feet from water's edge, 77.5 feet S. 17°50′ E. from spike in blaze on bowed birch tree, and 320 feet S. 82°25′ E. from very large boulder at brush line. Marked by brass screw in mass of concrete, top flush with surface of ground, marked "U. S. 1917." Station *South Hog 1903* (*U. S. L. S.*) is 72.71 feet from station in azimuth 239°08′.

Plane coordinates: (C), x=595,590.08 feet; y=1,556,200.09 feet.

Sandy (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1917).—On east side of Beaver Island in northern Lake Michigan, about 2.7 miles south of Beaver Harbor Lighthouse, 21.35 feet N. 76° E. of spike in concrete reference monument in fence line, and 33.22 feet S. 12° W. of drill hole in red granite boulder about 2 feet in diameter, with arrow pointing to station, cut in a patch of cement on its top, and 5 feet from water's edge. Marked by nail in cement-filled 1-inch iron pipe 4 feet long and embedded in mass of concrete with top flush with surface of ground.

Plane coordinates: (C), x=565,319.92 feet; y=1,532,734.32 feet.

SE. Garden (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1917).—On Garden Island of Beaver Island group in northern Lake Michigan, on point at extreme southeast corner of island, about at center of point which is about 40 feet wide at station site, 290 feet from end of point, and 22.5 feet south of black boulder 3 feet in diameter and 2 feet high (only black boulder on point). Marked by spike in concrete monument, top flush with surface of ground, and marked "U. S. 17."

Plane coordinates: (C), x=575,540.88 feet; y=1,559,150.50 feet.

SW. Hog (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1920).—On Hog Island of Beaver Island group in northern Lake Michigan, on long point extending westward from southwest end of island, about 450 meters (1,476 feet) west of bight of bay north of point, 95 meters (312 feet) from end of point, 12 meters (39 feet) from water's edge on south side of point and about 15 meters (49 feet) west of end of brush. Marked by spike in concrete monument, top flush with surface, and marked "U. S. 1920."

Plane coordinates: (C), x=589,704.25 feet; y=1,559,238.04 feet.

NW. Hog (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1920).—On Hog Island of Beaver Island group in northern Lake Michigan, near end of long point at northwest corner of island, 25 feet from water's edge to north, 25 feet from water's edge to south, and 75 feet from brush line. Marked by spike in mass of concrete, top flush with surface of ground, and marked "U. S. 20."

Plane coordinates: (C), x=594,720.60 feet; y=1,572,334.56 feet.

South Garden (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903; 1918).—On Garden Island of Beaver Island group in northern Lake Michigan, on gravel ridge, about 175 feet from southeast corner of square southerly end of island, 28 feet from water's edge, 32.2 feet east of 5-inch spruce tree, and 47 feet southwest of 7-inch poplar tree. Marked by 8-penny nail in top of 5-inch cedar post. In 1918 station was remarked by spike in concrete monument, with top flush with surface of ground, and marked "U. S. 1918."

Plane coordinates: (C), x=565,749.85 feet; y=1,557,869.28 feet.

South Beaver (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903).—On east side of Beaver Island in northern Lake Michigan, on point south of Little Sandy Bay, about 20 feet from brush line, and 20 feet from water's edge. Marked by cross in circle cut in large red boulder.

Plane coordinates: (C), x=564,708.35 feet; y=1,536,492.69 feet.

North Beaver (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903).—On Beaver Island in northern Lake Michigan, on flat gravel beach on point about ½ mile east of Beaver Harbor Lighthouse, about 45 feet from brush line, 50 feet from water's edge, and 25 feet S. 60°43′ W. from large white boulder. Marked by very faint cross, about 1 inch in size, on top of small point of rock in center of deep circle 2 inches in diameter, on top of white boulder.

Plane coordinates: (C), x=564,261.67 feet; y=1,547,398.18 feet.

Stony Point (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1903).—On Beaver Island in northern Lake Michigan, on flat stony shore of first point south of harbor at St. James, 60 feet S. 71°46′ W. of cross cut on east corner of large

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white boulder. Marked by 2-inch iron pipe driven flush with surface of ground.

Plane coordinates: (C), $x=564,151.68$ feet; $y=1,540,486.36$ feet.

Harbor Point (U. S. L. S.) (Charlevoix County, U. S. Lake Survey).—Plane coordinates:[1] (C), $x=560,454$ feet; $y=1,544,197$ feet.

Storm signal tower (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1917).—On Beaver Island in northern Lake Michigan, on Catholic Church property near Sandy Bay road, about 1 mile southeast of St. James. Mark is center of steel flagstaff of storm signal tower.

Plane coordinates:[1] (C), $x=558,256$ feet; $y=1,540,917$ feet.

Gros Cap (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1851; 1902).—On north shore of Straits of Mackinac, about 2 miles northeast of St. Helena Island, 1 mile northwest of Gros Cap, at top of steep wooded bluff about 325 feet east of 15-foot roadway running north-and-south at this point. Marked by 40-foot pole in hole in limestone 15 inches square and 2½ feet deep. Near center of this hole spike was driven into limestone crevice. In 1902, two reference marks, concrete monuments marked "U. S. 1902," were established, one 36.5 feet from station, on line to St. Helena Lighthouse, and bearing S. 35°32′ W., and another 332 feet from station, on west side of roadway at foot of bluff, and bearing S. 54°45′ W.

Plane coordinates: (C), $x=732,943.38$ feet; $y=1,598,758.22$ feet. (E), $x=202,381.72$ feet; $y=1,599,656.44$ feet.

Flagstaff, Grand Hotel (U. S. L. S.) (Mackinac County, U. S. Lake Survey).—Plane coordinates:[1] (E), $x=255,461$ feet; $y=1,587,312$ feet. (C), $x=786,325$ feet; $y=1,587,804$ feet.

Cross Village Catholic Church (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1925).—Center of spire on Catholic Church at extreme northern end of Cross Village.

Plane coordinates:[1] (C), $x=684,387$ feet; $y=1,512,057$ feet.

South Fox Lighthouse (U. S. L. S.) (Leelanau County, U. S. Lake Survey, 1901).—Plane coordinates:[1] (C), $x=477,626$ feet; $y=1,413,601$ feet.

Hat (U. S. L. S.) (Charlevoix County, U. S. Lake Survey, 1920).—Near center of Hat Island, in northern Lake Michigan. Marked by spike in center of triangle in top of mass of concrete, flush with surface of ground, marked "U. S. 1920." Reference mark is concrete monument, marked "U. S. 20 R," in edge of trees on west side of island, 84.03 feet from station, bearing N. 63°08′ W.

Plane coordinates: (C), $x=614,643.60$ feet; $y=1,573,799.54$ feet.

Goudreau (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1902).—At Gros Cap, on projecting point of bluff belonging to Abram Goudreau, and abut 1,215 feet N. 38°11′ E. from southwest corner of his frame residence. Marked by spike cemented in rock at bottom of hole 12 inches square and 8 inches deep. The rock was covered by 18 inches of loose stone and earth, and hole faced with mortar 2 inches thick which was inscribed "U. S. 1902." Reference marks are concrete monuments. One is 12 by 12 by 30 inches, projecting 15 inches above ground and marked "U. S. 1902," and is near edge of bluff, 20 feet from station, on line to St. Helena Lighthouse, and bears S. 64°47′ W. Another, 12 by 12 by 20 inches, not marked, and projecting 15 inches above surface of solid rock, is near edge of bluff, 20 feet from station, on line to McGulpin Point Lighthouse, and bears S. 18°42′ E. A third, 8 by 8 by 36 inches, with top projecting 1 foot above surface of ground, marked "U. S. 1902," is in line of rail fence along northerly side of highway, and 695 feet from station on line to McGulpin Point Lighthouse.

Plane coordinates: (C), $x=738,458.00$ feet; $y=1,594,696.81$ feet. (E), $x=207,788.81$ feet; $y=1,595,452.18$ feet.

Waugoshance Point (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1902; 1918).—On south shore of Straits of Mackinac, on second sandy ridge about 265 feet from shore, on point on west side of Big Stone Bay. Marked by spike in concrete monument 10 inches square and 2 feet long, with top 15 inches below surface of ground, and marked "U. S. 1902." Reference mark (identical with station *Waugoshance Reef* (*U. S. L. S.*) is monument of concrete cast around top of large forging driven 8½ feet into ground, and projecting 18 inches above surface of ground, marked "U. S. 1902," and is on first sand ridge, 93 feet from water's edge, 148 feet west of blazed 12-inch pine tree, 75 feet northwest of blazed 9-inch pine tree, 70 feet northeast of blazed 8-inch spruce tree, about 620 meters (2,034 feet) westerly along beach from 10-foot boulder on west side of Big Stone Bay, and 240 feet from station on line to St. Helena Lighthouse.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (C), $x=706,954.02$ feet; $y=1,553,395.80$ feet.

Old Mackinac Point Lighthouse (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1902).—Station is center of top of lantern house of lighthouse, Old Mackinac Point, in Mackinaw City.

Plane coordinates: (C), $x=760,316.68$ feet; $y=1,564,393.69$ feet (E), $x=228,850.91$ feet; $y=1,564,587,60$ feet.

Round Island Lighthouse (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1896).—Station is center of top of lantern house of lighthouse on extreme northwest tip of Round Island in Straits of Mackinac.

Plane coordinates: (C), $x=788,817.12$ feet; $y=1,582,895.97$ feet. (E), $x=257,824.71$ feet; $y=1,582,340.87$ feet.

St. Helena Lighthouse (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1902).—Center of top of lantern house of white masonry lighthouse at southeast corner of St. Helena Island, at west approach to Straits of Mackinac.

Plane coordinates: (C), $x=725,849.20$ feet; $y=1,588,576.61$ feet. (E), $x=195,023.66$ feet; $y=1,589,662.69$ feet.

Waugoshance Reef (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1918).—Station is identical with reference mark for station *Waugoshance Point* (*U. S. L. S.*).

Plane coordinates: (C), $x=707,067.46$ feet; $y=1,553,607.55$ feet.

Skilligallee Lighthouse (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1854).—Station is center of roof of lantern house of lighthouse on Ile Aux Galets, near east shore of Lake Michigan, 8 miles southeast of Waugoshance or Crane Island.

Plane coordinates: (C), $x=647,679.69$ feet; $y=1,522,696.86$ feet.

Waugoshance Lighthouse (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1902).—Center of roof of masonry tower of abandoned lighthouse, 2 miles northwest of Crane or Waugoshance Island, at west approach to Straits of Mackinac.

Plane coordinates: (C), $x=667,952.74$ feet; $y=1,563,330.16$ feet.

Cross Village (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1902; 1924).—Near east shore of Lake Michigan, about 2 miles southwest of Cross Village, and 6 miles southeast of Skilligallee Lighthouse, on summit of second sand hill on edge of main bluff between the "Beach Route" and lake shore. Marked by ½-inch brass tube set in concrete-filled 4-inch cast iron pipe, top 2 feet below surface of ground. Surrounding upper end of pipe is cement slab 2 inches thick, marked "U. S. 1902." Reference marks are cement-filled 2-inch wrought iron pipes 6 feet long, and driven to depth of 5.8 feet. One is 15.1 feet from station on line to Skilligallee Lighthouse, bearing N. 57°05′ W. Other is 14.8 feet from station on line to St. Helena Lighthouse.

Plane coordinates: (C), $x=674,488.98$ feet; $y=1,505,663.34$ feet.

Sturgeon (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1924).—On east shore of Lake Michigan, on first point south of old village of Sturgeon Bay, on sand knoll south of patch of thick timber, 205 meters (673 feet) from end of point and 32 meters (105 feet) from water's edge. Marked by spike in 4-inch cedar post 3 feet long, projecting 6 inches above surface of ground.

Plane coordinates: (C), $x=694,392.53$ feet; $y=1,524,848.11$ feet.

Point La Barbe (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1906; 1926).—On north shore of Lake Michigan, on Pt. La Barbe, 2 miles west of St. Ignace, ¼ mile northwest of Green Island, at inside corner of sharp westerly turn of highway from St. Ignace, about 5 meters (16 feet) west of center line of highway, 30 meters (98 feet) west and 60 meters (197 feet) north of water's edge. Original mark was 3-inch cedar post. In 1926 this post was replaced by concrete monument with spike in center of top, flush with surface of ground, and marked "U. S. 1926." Bearing from station to old Mackinac Point Lighthouse is S. 15°55′ E; and to Grand Hotel, Mackinac Island, is N. 82°54′ E.

Plane coordinates: (C), $x=754,613.05$ feet; $y=1,583,476.13$ feet. (E), $x=223,646.53$ feet; $y=1,583,813.11$ feet.

Green (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1926).—Near center of Green Island in Straits of Mackinac, on highest point of island, inside clump of cedars, about on line with Round Island Lighthouse and south end of St. Helena Island, 26 feet south of triangle-blazed 4-inch birch tree, 20 feet northeast of 4-foot brown boulder, and 140 feet south and 125 feet north of water's edge. Marked by spike in square concrete post, top flush with surface of ground, marked "U. S. 26."

Plane coordinates: (C), $x=755,055.09$ feet; $y=1,581,764.74$ feet. (E), $x=224,043.78$ feet; $y=1,582,090.68$ feet.

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McGulpin Point Lighthouse (U. S. L. S.) (Emmet County, U. S. Lake Survey).—Plane coordinates: (C), $x=749,241.27$ feet; $y=1,564,093.71$ feet. (E), $x=217,770.94$ feet; $y=1,564,576.38$ feet.

McGulpin (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1918).—On west side of McGulpin Point on south shore of Straits of Mackinac, on rocky ridge in edge of brush, 53 feet from water's edge, 8.7 feet northwest of blazed 12-inch cedar tree, and 82.3 feet south of blazed 10-inch cedar tree. Marked by brass bolt in mass of concrete, projecting 4 inches above surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=744,220.64$ feet; $y=1,561,397.81$ feet. (E), $x=212,681.45$ feet; $y=1,562,012.10$ feet.

Big Stone (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1918).—On south shore of Straits of Mackinac, on end of point east of Big Stone Bay, on flat stony beach, 55 feet from water's edge, 25 feet from brush line, 33.7 feet northwest of blazed 14-inch cedar tree, and 193.7 feet S. 89°46′ W. of drill hole in only large boulder on beach. Marked by brass bolt in mass of concrete, flush with surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=721,412.22$ feet; $y=1,552,640.14$ feet. (E), $x=189,650.93$ feet; $y=1,553,851.06$ feet.

Cecil (U. S. L. S.) (Emmet County, U. S. Lake Survey, 1918).—On south shore of Straits of Mackinac, on south end of small island off the point east of old dock at Cecil, about 2½ miles west of McGulpin Point. Marked by brass bolt in mass of concrete set in bank of gravel, and marked "U. S. 18."

Plane coordinates: (C), $x=735,412.07$ feet; $y=1,552,207.07$ feet. (E), $x=203,635.85$ feet; $y=1,553,053.38$ feet.

Fuyards (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1904; 1924).—On Marquette Island, on north side of Straits of Mackinac, on end of Point Fuyards, some distance from tip of point, entirely surrounded by small brush. Probably marked by drill hole in boulder.

Plane coordinates: (C), $x=849,165.02$ feet; $y=1,618,453.48$ feet. (E), $x=319,078.33$ feet; $y=1,616,309.68$ feet.

Penny (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1905).—At north end of Lake Huron, on south side of Penny Island, off southeast end of Government Island, on rock, at high-water mark. Reference mark is concrete monument, 29.1 feet from station on bearing N. 65°50′ W. Marked by intersection of lines cut in boulder.

Plane coordinates: (C), $x=870,233.66$ feet; $y=1,626,757.36$ feet. (E), $x=340,355.00$ feet; $y=1,624,059.51$ feet.

Buoy S (U. S. L. S.) (Mackinac County, U. S. Lake Survey).—Plane coordinates: (C), $x=861,116.50$ feet; $y=1,611,988.29$ feet. (E), $x=330,855.94$ feet; $y=1,609,534.99$ feet.

Marq (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1926).—On extreme easterly end of Marquette Island, on north side of the Straits of Mackinac, on a stony ridge at edge of timber. Marked by spike in concrete monument projecting above surface of ground.

Plane coordinates: (C), $x=857,261.79$ feet; $y=1,623,337.30$ feet. (E), $x=327,299.33$ feet; $y=1,620,979.93$ feet.

Nuns Creek (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—On north shore of St. Martin Bay, at brush line, about 300 feet from end of long point west of mouth of Nuns Creek, 27.5 feet N. 13°30′ W. of a drill hole within triangle cut on boulder, 20.8 feet N. 84°35′ W. of drill hole in boulder, and 65.3 feet S. 84°45′ W. of drill hole 1½ inches in diameter and 3 inches deep in boulder. Marked by spike in concrete monument, flush with surface of ground, and marked "U. S. 1919."

Plane coordinates: (C), $x=796,509.28$ feet; $y=1,650,572.49$ feet. (E), $x=267,282.19$ feet; $y=1,649,793.33$ feet.

Brabb (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1919).—In St. Martin Bay, on west side of point on northwest corner of Big St. Martin, or Burnt Island, 51 feet southwest of large white boulder, and 11 feet N. 16° E. of boulder with arrow pointing to station. Marked by spike in concrete monument marked "U. S. 19."

Plane coordinates: (C), $x=783,331.78$ feet; $y=1,635,114.34$ feet. (E), $x=253,704.83$ feet; $y=1,634,685.13$ feet.

Charles (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1919)—About 9 miles north of St. Ignace, and 1 mile south of Charles, on west shore of St. Martin Bay, on rounded point, in edge of brush, 43 feet east of old logging road, 51 feet

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northeast of 7-inch birch tree, and 32 feet southeast of flat black boulder. Marked by nail in concrete monument marked "U. S. 19."

Plane coordinates: (C), $x=770,809.32$ feet; $y=1,643,788.41$ feet. (E), $x=241,413.29$ feet; $y=1,643,683.91$ feet.

Jamieson (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1919).—On north shore of St. Martin Bay, 280 meters (919 feet) east of Jamieson's mill, and 15 meters (49 feet) from bank of lake, on top of second rocky knob east of mill. Marked by spike in mass of concrete in crevice in rock, and marked "U. S. 1919."

Plane coordinates: (C), $x=783,411.05$ feet; $y=1,656,992.50$ feet. (E), $x=254,356.41$ feet; $y=1,656,553.96$ feet.

St. Martin Point (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1904).—On southeast corner of St. Martin Point, on north shore of the Straits of Mackinac, in small clump of bushes about 130 meters (426 feet) from woods. Marked by center of ½-inch drill hole 1 inch deep, at intersection of two lines of cross on boulder 2 by 4 feet, projecting about 16 inches above surface of ground.

Plane coordinates: (C), $x=814,166.08$ feet; $y=1,632,145.06$ feet. (E), $x=284,450.75$ feet; $y=1,630,910.68$ feet.

Little St. Martin (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1918).—In Straits of Mackinac, north of Bois Blanc Island, on small island south of southwest corner of St. Martin Island, about 100 feet from east end, 60 feet from south side, and just south of small grove of poplar trees. Marked by brass bolt in mass of concrete, flush with surface of ground, and marked "U. S. 18."

Plane coordinates: (C), $x=801,595.12$ feet; $y=1,622,816.41$ feet. (E), $x=271,640.52$ feet; $y=1,621,913.96$ feet.

Detachee (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1926).—On Point Detachee, on north side of Bois Blanc Island, in Straits of Mackinac, in grassy meadow, about 5 meters (16 feet) south of road, 120 meters (394 feet) N. 52° E. and 90 meters (295 feet) N. 5° W. of two buildings. Marked by spike in concrete monument, top flush with surface of ground.

Plane coordinates: (C), $x=817,713.76$ feet; $y=1,573,563.75$ feet. (E), $x=286,467.82$ feet; $y=1,572,258.32$ feet.

Coats (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1904).—On Marquette Island, on north side of Straits of Mackinac, near middle of Coats Point, about 495 meters (1,624 feet) from extreme westerly end of point, and 60 meters (197 feet) from north side. Underground mark is cross on small boulder buried 6 inches below surface of ground, marked "U. S. L. S." Surface mark is stone 6 inches square. Reference mark is stone, marked with arrow in triangle, 30.3 feet southwest of station.

Plane coordinates: (C), $x=835,385.13$ feet; $y=1,628,433.67$ feet. (E), $x=305,564.74$ feet; $y=1,626,645.99$ feet.

Brulee (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1904).—On north shore of Straits of Mackinac, at west entrance to Les Cheneaux Islands, at extreme end of Point Brulee, at high-water mark, 38 feet from brush line, 90 feet southeast of 12-inch birch tree in group of four trees, and 70.3 feet from flat rock at surface of ground in edge of woods, marked with cross in triangle and arrow pointing towards station. Town of Hessel is visible to north, and small island south of St. Martin Island is just visible past edge of brush. Marked by drill hole ½ inch in diameter and 2 inches deep in flat limestone rock 3 feet in diameter and 1 foot high.

Plane coordinates: (C), $x=827,433.16$ feet; $y=1,631,654.50$ feet. (E), $x=297,700.02$ feet; $y=1,630,073.46$ feet.

Point St. Martin (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1919).—On southwest corner of St. Martin Point, on east shore of St. Martin Bay, in timber line, 14 feet southwest of blazed 8-inch spruce tree, 20 feet northwest of blazed 8-inch spruce tree, 20.8 feet south of ½-inch drill hole in large black boulder about 4 by 8 feet, rising 2 feet above beach. Marked by spike in concrete monument flush with surface of ground, marked "U. S. 1919."

Plane coordinates: (C), $x=809,516.95$ feet; $y=1,631,607.97$ feet. (E), $x=279,789.25$ feet; $y=1,630,495.33$ feet.

Isle St. Martin (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1919).—On north side of St. Martin Island, in St. Martin Bay, about 25 feet from edge of beach, on high land north of long narrow bay and swamp, 52 feet northeast of blazed 8-inch cedar tree, and 27 feet east of blazed 7-inch cedar tree. Marked by spike in concrete monument projecting 2 inches above surface of ground, and marked "U. S. 1919."

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Plane coordinates: (C), $x=798,912.37$ feet; $y=1,631,426.93$ feet. (E), $=x$ 269,183.76 feet; $y=1,630,591.60$ feet.

Nine (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1908).—On Nine Mile Point, on shore of Lake Huron, on beach, 98 feet east-southeast and 14 feet south-southwest from water's edge. Marked by brass screw in concrete post 6-inches square, projecting 10 inches above surface of ground, marked "U. S· 1908," and covered with pile of stones. Following distances and bearings are from station: Limestone block, marked "U. S.," 21.5 feet, S. 25°32′ E.; 4-inch birch tree, 35 feet, S. 33° W.; 15-inch balsam tree, 65 feet, S. 45° W.; and 5-inch birch tree, 56 feet, S. 27° E. All trees are blazed with triangles. In 1938 it was reported that the concrete post had been partially destroyed.

Plane coordinates: (E), $x=359,571.11$ feet; $y=1,507,619.13$ feet. (C), $x=$ 892,480.54 feet; $y=1,510,845.13$ feet.

74 (U. S. L. S.) (Cheboygan County, U. S. Lake Survey, 1907; 1927).—On Cordwood Point, on south shore of Straits of Mackinac, on beach, 22 feet from top of 7-foot bank. Original mark, probably spike in post, was found broken off in 1927 and replaced by spike in concrete monument, projecting 6 inches above surface of ground. Reference mark is concrete monument, on top of bank, north of road, and 32.85 feet S. 32°26′ W. from station.

Plane coordinates: (E), $x=330,704.61$ feet; $y=1,518,469.41$ feet. (C), $x=$ 863,338.72 feet; $y=1,520,942.11$ feet.

57 (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1907; 1927).—On Packard Point, on south side of Bois Blanc Island, in Straits of Mackinac, about 30 meters (98 feet) from end of point, 8 meters (26 feet) east and 20 meters (66 feet) west of shore, at edge of timber. Original mark, spike in stump of small tree, was replaced in 1927 by spike in concrete monument. Station Packard (U. S. L. S.), marked by iron bar 1¼ inches square, and projecting 4 inches above surface of ground, bears S. 47°04′ E., and is distant 15.4 feet.

Plane coordinates: (C), $x=839,856.13$ feet; $y=1,541,049.52$ feet. (E), $x=$ 307,754.75 feet; $y=1,539,179.63$ feet.

Cheboygan Point Lighthouse (U. S. L. S.) (Cheboygan County, U. S. Lake Survey, 1907).—Center of lantern house of Cheboygan Point Lighthouse on Cheboygan Point, on south side of Straits of Mackinac.

Plane coordinates: [1] (E), $x=307,461$ feet; $y=1,520,465$ feet. (C), $x=840,050$ feet; $y=1,522,332$ feet.

64 (U. S. L. S.) (Mackinac County, U. S. Lake Survey).—Plane coordinates: [1] (C), $x=819,904$ feet; $y=1,523,383$ feet. (E), $x=287,351$ feet; $y=1,522,039$ feet.

Poe Reef Lighthouse (U. S. L. S.) (Cheboygan County, U. S. Lake Survey).—Approximate center of foundation crib for new lighthouse on Poe Reef in the Straits of Mackinac.

Plane coordinates: [1] (E), $x=322,294$ feet; $y=1,529,729$ feet. (C), $x=854,637$ feet; $y=1,531,980$ feet.

78 (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1909).—On shore of Lake Huron, about 1½ miles southeasterly of Nine Mile Point, on beach, 25 feet from brush, and 20 feet from water's edge. Marked by brass plug in concrete monument, 6 inches square, projecting 4 inches above surface of ground. Bearings and distances from station are: Granite boulder, N. 64° W., 52 feet; granite boulder, S. 28° E., 69 feet; granite boulder, S. 27° E., 116 feet; triangle-blazed 6-inch pine tree, S. 20° W., 43.5 feet; triangle-blazed 8-inch pine tree, S. 48° W., 26 feet; and triangle-blazed 10-inch pine tree, S. 15°30′ E., 528 feet.

Plane coordinates: (E), $x=364,522.27$ feet; $y=1,502,599.81$ feet. (C), $x=$ 897,561.12 feet; $y=1,505,955.60$ feet.

Mast 1909 (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1909).—On Mast Point, on west side of Hammond Bay, on shore of Lake Huron, about 1.7 miles northwesterly from dock at Grace, just inside brush line, and 90 feet from end of point. Marked by brass screw in square concrete post, flush with surface of ground, and marked "U. S. 1909." Station Mast 1851 (U. S. L. S.) bears S. 5°48′ W., and is distant 23.0 feet; 4-inch blazed birch tree bears S. 77° W., and is distant 31 feet; and 7-inch blazed cedar tree bears S. 3° E., and is distant 47 feet.

Plane coordinates: (E), $x=378,644.07$ feet; $y=1,485,519.53$ feet.

Hammond (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1908).—Near north shore of Hammond Bay, on highest point of one of sand hills about ¼ mile south of Hammond Bay Coast Guard Station, about 300 feet southwest

[1] No check on this position.

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of bend in road which leaves beach just east of creek about 1,500 feet southwest of coast guard station. Marked by copper bolt in square concrete post, flush with surface of ground, and marked "U. S. 1908." Bearings and distances from station to following objects are: Spectacle Reef Lighthouse, N. 14°15′ W.; Coast Guard Station, flagpole, N. 5°35′.; blazed 8-inch jack pine tree, S. 84° W., 31 feet; 6-inch stump, N. 81° E., 24 feet; and blazed 10-inch pine, S. 36° E., 85 feet.

Plane coordinates: (E), $x=405,428.94$ feet; $y=1,454,613.88$ feet.

Forty Mile Point (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1903).—On Forty Mile Point, on east side of Hammond Bay, on west side of Lake Huron, near eastern end of highest sand hill, 738 meters (2,421 feet) southeast of lighthouse, about 300 meters (984 feet) from beach, and 92 meters (302 feet) northeast of road to lighthouse. Marked by spike in concrete monument at foot of 16-inch Norway pine stub blazed on both sides.

Plane coordinates: (E), $x=437,973.84$ feet; $y=1,450,957.80$ feet.

Adams Point (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1905).—On Adams Point, east of Rogers, in T. 35 N., R. 6 W. (Posen Township), about 70 feet from shore, and just inside tree line, 26½ feet west of 6-inch Norway pine tree, 30 feet northwest of two 8-inch birch trees, 30 feet north of 8-inch pine tree, 49 feet northeast of 10-inch birch tree, and 18 feet east of a blazed 8-inch stump. Marked by spike in concrete monument, marked "U. S. L. S. 1905," projecting 3 inches above surface of ground.

Plane coordinates: (E), $x=487,195.41$ feet; $y=1,426,705.12$ feet.

Rogers, courthouse (U. S. L. S.) (Presque Isle County, U. S. Lake Survey).—Plane coordinates: (E), $x=461,463.41$ feet; $y=1,429,264.65$ feet.

Twin Lakes (U. S. L. S.) (Presque Isle County, U. S. Lake Survey, 1904).—About 1½ miles west of Forty Mile Point Lighthouse, on peak of sandy hill, in T. 36 N., R. 4 E. (Rogers Township), in angle formed by road to lighthouse and trail to shore, 5½ feet south-southwest of 20-inch Norway pine tree, 15 feet northwest from 16-inch white pine tree, 4¼ feet north-northeast of 20-inch white pine, and 26 feet southeast of 14-inch white pine tree. Marked by rifle cartridge in concrete monument, top 6 inches below surface of ground, and marked "U. S. L. S. 1904."

Plane coordinates: (E), $x=431,005.38$ feet; $y=1,453,146.88$ feet. (C), $x=965,316.86$ feet; $y=1,458,237.59$ feet.

Bootjack (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1905).—At north end of Lake Huron, on Boot Island, in grassy meadow at southeast end of island, and approximately at high-water line. Marked by nail hole in piece of lead in boulder.

Plane coordinates: (C), $x=878,329.99$ feet; $y=1,627,705.90$ feet. (E), $x=348,472.56$ feet; $y=1,624,796.02$ feet.

Beaver Tail (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1903; 1919).—On north shore of Lake Huron, on end of Beaver Tail Point, and at edge of timber. Mark of station Beaver Tail 1851, described as drill hole in solid rock, could not be found in 1903. Mark of 1903 is drill hole in boulder buried beneath section of old post, and another boulder with drill hole set over post as surface mark.

Plane coordinates: (C), $x=901,517.88$ feet; $y=1,631,682.97$ feet. (E), $x=371,753.75$ feet; $y=1,628,165.15$ feet.

St. Vital (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1905).—On north shore of Lake Huron, on Point St. Vital, on center of point which is about 10 meters (33 feet) wide, and about 200 meters (656 feet) from extreme end. Marked by brass bolt in concrete monument 12 inches square and 3 feet long.

Plane coordinates: (E), $x=416,040.16$ feet; $y=1,621,077.48$ feet. (C), $x=945,981.45$ feet; $y=1,625,754.54$ feet.

Albany (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1905).—At north end of Lake Huron, on south end of Albany Island, 95.4 feet S. 45°45′ E. from southwest corner of cottage, 85.5 feet S. 23°05′ E. from southeast corner of cottage, 75.4 feet S. 25°47′ E. from spruce tree in front of cottage, 97.0 feet S. 16°17′ E. from cedar tree, and 51 feet N. 15°09′ W. from boulder. Marked by spike driven into hole at the intersection of lines of cross cut on rock at surface of ground.

Plane coordinates: (C), $x=919,333.08$ feet; $y=1,632,694.71$ feet. (E), $x=389,586.75$ feet; $y=1,628,710.65$ feet.

Saddlebag (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1905).—At north end of Lake Huron, on the south end of Saddlebag Island. Marked by small cross cut on large boulder, marked "U. S. L. S."

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Plane coordinates: (C), $x=936,412.68$ feet; $y=1,627,646.03$ feet. (E), $x=406,525.79$ feet; $y=1,623,218.07$ feet.

Huron Point (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1916).—On north shore of Lake Huron, about 3½ miles west of Point St. Vital, on end of Huron Point, at edge of brush. Marked by drill hole at intersection of two lines of cross cut in large boulder, marked "U. S."

Plane coordinates: (C), $x=927,351.66$ feet; $y=1,632,148.24$ feet. (E), $x=397,587.07$ feet; $y=1,627,954.83$ feet.

□ **59 Neebish (U. S. L. S.)** (Chippewa County, U. S. Lake Survey, 1894).—On east side of largest of islands in upper end of Little Mud Lake, about 4 feet east of front range target for course from East Neebish Channel into Little Mud Lake. Marked by ½-inch drill hole in stone, 15 inches below surface of ground. Station is buoy station 59.

Plane coordinates: (E), $x=383,458.81$ feet; $y=1,753,999.37$ feet.

19 Hay Lake (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—On west shore of Hay Lake (part of St. Marys River), in line with point of Sugar Island opposite upper end of dike in Middle Neebish Channel and point on Neebish Island opposite lower end of dike. Marked by 6- by 6- by 24-inch stone post.

Plane coordinates: (E), $x=356,469.66$ feet; $y=1,774,640.82$ feet.

Ross (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1894).—On St. Joseph Island, on hill back of Ross Hotel. Marked by ½-inch drill hole in large boulder on which are cut letters "U. S."

Plane coordinates: (E), $x=391,126.91$ feet; $y=1,730,416.17$ feet.

Winter Point (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—On south end of Neebish Island (the extreme point of land which forms northern limit between Mud Lake and Munuskong Bay). Marked by cut stone, top of which is 1 foot below surface of ground. Chimney of lightkeeper's house is 202.34 feet from station, bearing N. 18°35′ E.

Plane coordinates: (E), $x=377,219.13$ feet; $y=1,719,328.61$ feet.

Rocky Point (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—On Rocky Point (point which forms southern limit of Munuskong Bay), in St. Marys River, about 20 feet from shore. Marked by ½-inch drill hole between letters "U. S." cut in boulder.

Plane coordinates: (E), $x=384,707.17$ feet; $y=1,705,832.67$ feet.

Point aux Frenes (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—On Point aux Frenes, in St. Marys River, about 15 feet from shore, and 300 feet north of end of northeast point. Marked by cut stone, top of which is 1 foot below surface of ground.

Plane coordinates: (E), $x=408,191.71$ feet; $y=1,688,524.08$ feet.

Raber (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1894).—On extreme end of long narrow point, about 2 miles from Raber Sawmill. Marked by stone post, top of which is 6 inches below surface of ground.

Plane coordinates: (C), $x=936,243.60$ feet; $y=1,668,951.15$ feet. (E), $x=407,437.15$ feet; $y=1,664,506.29$ feet.

Fort St. Joe (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey 1894).—On southwest end of St. Joseph Island, on west end of one of walls of old Fort St. Joseph. Marked by stone post, top of which is 1 foot below surface of ground.

Plane coordinates: (C), $x=957,761.81$ feet; $y=1,668,426.12$ feet. (E), $x=428,930.22$ feet; $y=1,663,418.03$ feet.

Bacon Island (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1894).—On north end of Bacon Island (Island No. 10) in Potagannissing Bay. Marked by stone post, top of which is 6 inches below surface of ground. U. S. Lake Survey reports also call this station "Bacon."

Plane coordinates: (E), $x=459,444.22$ feet; $y=1,661,412.10$ feet.

Drummond (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1894).—On Drummond Island, on flat top of limestone ridge on west side of island, about 1 mile from shore, about 15 feet from edge of ledge, and nearly opposite Detour. Marked by ½-inch drill hole in rock with letters "U. S." cut in top surface.

Plane coordinates: (C), $x=978,912.25$ feet; $y=1,646,320.94$ feet. (E), $x=449,490.51$ feet; $y=1,640,771.54$ feet.

Burnt Point (No. 220) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1894).—On east side of hill on Whiskey Point, on south side of St. Joseph Island and west of Worlesley Bay, 300 or 400 feet from water's edge

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Marked by ½-inch drill hole in flat field stone, with letters "U. S." and "No. 220" cut in top surface, and set about 2 feet below surface of ground.

Plane coordinates: (E), $x=446,454.78$ feet; $y=1,675,257.55$ feet.

Harbor Island (No. 281) (U. S. L. S.) (Mackinac County, U. S. Lake Survey, 1894).—On west horn of Harbor Island, on hill about ½ mile north of Mr. Church's house. Marked by ½-inch drill hole in top of flat field stone, with letters "U. S." and "No. 281" cut in top surface, and set about 18 inches below surface of ground.

Plane coordinates: (E), $x=474,956.14$ feet; $y=1,659,442.52$ feet.

Detour Lighthouse (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1894).—Plane coordinates:[1] (E), $x=436,678$ feet; $y=1,624,239$ feet. (C), $x=966,534$ feet; $y=1,629,455$ feet.

Parisian Island (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On highest point of ridge extending along west side of Parisian Island. Marked by ⅜-inch drill hole between letters "U. S." in top of 6- by 6- by 24-inch cut stone, 2 feet below surface of ground. Reference marks are common field stones each with cross and letters "U. S." cut in top surface, and are at following distances and bearings from station: 24 feet, N. 18°30′ E.; and 50 feet, N. 72° W. Station also called Parisian by U. S. Lake Survey.

Plane coordinates: (C), $x=756,393.67$ feet; $y=1,885,271.40$ feet. (E), $x=233,353.81$ feet; $y=1,885,470.57$ feet.

Havilland (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—About ⅓-way toward Batchawana Bay from Goulais Bay, on highest hill, in southeast part of section 42, Havilland Township. Marked by ⅝-inch hole in surface rock, with letters "U. S." cut near it. Two large boulders marked by cross and letters "U. S." are at following distances and azimuths from station: 25.25 feet, 151°; and 29.60 feet, 228°.

Plane coordinates: (C), $x=822,335.03$ feet; $y=1,930,200.88$ feet. (E), $x=300,461.49$ feet; $y=1,928,638.44$ feet.

North Sandy (1895) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—In Whitefish Bay, at south end of North Sandy Island, on ridge near edge of timber. Marked by cut stone, top of which is 2 feet below surface of ground.

Plane coordinates: (E), $x=252,189.68$ feet; $y=1,942,520.33$ feet.

Batchewana west base (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—In Whitefish Bay, near west end of Batchawana Island. Marked by stone.

Plane coordinates: (E), $x=282,610.46$ feet; $y=1,961,587.62$ feet.

Batchewana east base (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—In Whitefish Bay, about ¼ mile from east end of Batchawana Island and on east end of hill. Marked by intersection of two lines (one in direction of base, one perpendicular to it) on ¼-inch brass cylinder leaded in top of cut stone, 2 feet long, 1 foot square, with top 4 feet below surface of ground.

Plane coordinates: (E), $x=304,059.47$ feet; $y=1,966,061.74$ feet.

Mamainse (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1869; 1895).—About 8 miles north of Batchawana Bay, about 8 miles east of Mamainse Point, on highest peak in vicinity, in west part of section 18, Palmer Township. Marked by ½-inch drill hole between letters "U. S." in field stone about 2 feet long, set on solid rock, with top 6 inches below surface of ground. Reference marks are at following distances and bearings from station: Stone post, 68.44 feet, S. 74°19′ E.; cross and "U. S." cut on rock, 22.68 feet just left of line to post; and cross and "U. S." cut on rock 43.84 feet, nearly south.

Plane coordinates: (C), $x=784,846.02$ feet; $y=2,016,645.77$ feet.

Crisp (U. S. L. S.) (Luce County, U. S. Lake Survey, 1895).—Five hundred and thirteen meters (1,683 feet) east and 981 meters (3,218 feet) south of northwest corner of sec. 13, T. 50 N., R. 8 W. Marked by copper triangle leaded into stone, top of which is 2½ feet below surface of ground. Reference marks are stones, one due north, one S. 60°E., one S. 60°W., and each 100 feet from station.

Plane coordinates: (E), $x=102,098.64$ feet; $y=1,910,085.02$ feet. (C) $x=624,548.79$ feet; $y=1,906,401.18$ feet.

Caribou Island Lighthouse (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—Plane coordinates: (C), $x=481,225.89$ feet; $y=2,128,660.25$ feet.

[1] No check on this position.

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Whitefish Point (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1895).—On Whitefish Point, about 800 feet from shore, in sec. 32, T. 51 N., R. 5 W. Marked by ⅜-inch drill hole between letters "U. S." in stone set in oil barrel, top of which is 2 feet below surface of ground, and surface mark consisting of post with nail as center. Reference marks are cut stone posts with letters "U. S." on sides facing station, and are at following distances and azimuths from station: 120 feet, 75°; and 120 feet, 191°. *Whitefish Point Lighthouse* is 560.8 feet from station in azimuth 234°21′. Square-cut sandstone post at southwest corner of sec. 32 is 600.64 meters (1,960.6 feet) from station in azimuth 59°48′52″. Astronomical post is 825.5 feet from station in azimuth 326°. Station also called "Whitefish" by U. S. Lake Survey. In 1910 it was reported that sand was found to have blown away and stone was gone.

Plane coordinates: (E), $x=176,104.14$ feet; $y=1,923,792.07$ feet. (C) $x=698,154.06$ feet; $y=1,922,061.43$ feet.

Korah (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey 1893; 1894).—On large stone ledge in southeast quarter of section 15, Korah Township. Marked by ½-inch drill hole about 5 inches deep in top of solid rock. Reference marks are crosses cut on projecting rocks and are at following distances and directions from station: 25.6 feet, north; 59.9 feet, east; 35.6 feet, southwest; and 26.15 feet, west. This station is also called "Bare Rock" by the U. S. Lake Survey.

Plane coordinates: (E), $x=318,741.77$ feet; $y=1,849,036.33$. feet.

Azimuth (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1893).—Near center of section 13, Korah Township, and in the Peoples Road. Surface mark is 10-foot truncated pyramid of stone, 2 feet square at base, 1 foot square at top, and projecting 7 feet above ground. Underground mark is ⅜-inch drill hole in top of stone post, set with top 4½ feet below surface of ground. Reference marks are stone posts, each marked with letters "U. S." on side and cross on top, at following distances and bearings from station: 69.4 feet, S. 35° W.; and 69.1 feet, S. 34°10′ E. Nail in foot of 10-inch balsam tree is 78 feet from second reference mark; and 82.4 feet from station, bearing N. 84°25′ E.

Plane coordinates: (E), $x=327,522.96$ feet; $y=1,850,319.54$ feet.

Mirron (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893).—On Sugar Island, on south side of main east-and-west road, 21.7 feet south of line between stakes at southeast and southwest corners of Mirron's 40-acre tract, 561.75 feet east of southwest stake, and 758.45 feet west of southeast stake. Marked by crosslines on top of ⅜-inch brass rod set in 18- by 18- by 4-inch stone, lettered "U. S." on top, and 3½ feet below surface of ground. Reference marks are stones marked "U. S." on sides nearest station; one is 50 feet distant bearing N. 1°15′E., and other is 50.4 feet distant bearing N. 86°15′ W. Distance between stones is 69.1 feet.

Plane coordinates: (E), $x=357,961.31$ feet; $y=1,817,370.34$ feet.

Soo east base (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893).—In Sault Ste. Marie, on south side of Portage Avenue, east of water-power embankment, on land owned by Methodist Mission Claim. Surface mark is nail in 4- by 4-inch post. Underground mark is ⅜-inch brass rod set in top of 18- by 18- by 6-inch stone which is set 3 feet below surface of ground, and has wall of cement 10 inches in diameter built up 1 foot above stone to keep out water. Wall is filled with packed earth and covered with flat stones. Reference marks are crosses on field stones having letters "U. S." cut on sides facing station, each 50 feet from station and bearing as follows: One, in line with spire on Catholic Church; one, 90°; one, 180°; and one 270°.

Plane coordinates: (E), $x=338,946.83$ feet; $y=1,818,455.96$ feet.

Ste. Marie (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1893).—In Sault Ste. Marie, in center of cultivated field nearly north of dwelling, on Park Lot No. 4, Third Concession, Ste. Marie Township. Surface mark is nail in center of 4- by 4-inch post set 6 inches below surface of ground. Underground mark is cross on ⅜-inch brass rod in top of 18- by 18- by 6-inch stone post which is set with top 3¼ feet below surface of ground. Reference marks are crosses on tops of stones 2 feet long with tops dressed to 4 inches, and letters "U. S." on sides facing station. One is in fence line on east side of field, and 736.5 feet from station. The other is in fence line on east side of field, and 567.8 feet from station. Nail in foot of triple oak tree bears S. 25°45′ E. from station at distance of 47.8 feet.

Plane coordinates: (E), $x=341,092.29$ feet; $y=1,829,758.30$ feet.

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Soo west base (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893).—In Sault Ste. Marie, at intersection of Portage Avenue and Bingham Street, 8.43 feet north of inner edge of north rail of street car track, 13 feet northeast of sewer manhole, and 2 feet west of fence line on east side of Bingham Street. Surface mark is nail in 4- by 4-inch post. Underground mark is cross on ⅜-inch brass rod in top of 18- by 18- by 6-inch stone, with letters "U. S. L. S." cut in top surface which is 3½ feet below surface of ground. Reference marks are stone posts with letters "U. S." on sides facing station, on south edge of Portgage Avenue. One is about 2 feet west of northeast corner of high-school fence, and 77.6 feet from station. Other is about 25 feet east of northwest corner of Fort Brady garden fence, and 50.4 feet from station.

Plane coordinates: (E), $x=329,540.66$ feet; $y=1,823,122.88$ feet.

Soo (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1893).—In Sault Ste. Marie, on high land southwest of Ryan's brickyard, about 550 feet west of center of Mackinac road, and about 200 feet south of center of Sixth Avenue. Surface mark is nail in 4- by 4-inch post. Underground mark is cross on ⅜-inch brass rod in top of 18- by 18- by 6-inch stone, with letters "U. S. L. S." cut in top surface which is 3½ feet below surface of ground. Reference marks are crosses on dressed-stone posts 2 feet long and 4 inches square, with letters "U. S." on sides facing station. One is on south side of Sixth Avenue, in line with spire of Catholic Church, and 203 feet from station. Other is on south side of Sixth Avenue, and 170.7 feet from station. Angle at station between stone posts is 60°.

Plane coordinates: (E), $x=326,406.76$ feet; $y=1,818,133.68$ feet.

Ant (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On Belanger Point, on southern side of Manitoulin Island. Marked by ⅝-inch drill hole, 2 inches deep in flat rock about 12 inches below surface of ground. Following bearings and distances are from station: North end of Inner Duck Island, S. 64°47′ E.; west side of Western Duck Island, S. 30°25′ E.; shore S. 75°36′ E., 460 feet; point, S. 15°10′ W., 460 feet; shore, N. 86°28′ W., 175 feet; 4-inch spruce tree, S. 70° E., 22.5 feet; 5-inch poplar tree, S. 82° E., 58.8 feet; two 5-inch birch trees (from one stump), N. 20° E., 69.2 feet.

Plane coordinates: (E), $x=656,507.34$ feet; $y=1,580,770.95$ feet.

Lynn (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On Lynn Point, known locally as Dark or Black Point, on southern side of Manitoulin Island. Marked by ⅝-inch drill hole in boulder placed at water level in hole among several unusually large boulders and covered in with small boulders. Reference mark is mass of limestone about 5 by 10 feet, rising about 3 feet above beach. On its nearly flat top are two ⅝-inch drill holes, 2.97 feet apart on line to station, which is 46.5 feet from nearest hole.

Plane coordinates: (E), $x=626,573.51$ feet; $y=1,590,022.46$ feet.

Boom Point (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On southeast corner of Cockburn Island, on bank of gravel near tree line, about 8 feet above water level, 18 feet from a 7-inch spruce tree, 24.6 feet from 8-inch balsam tree, near dead 14-inch pine tree, and 51.6 feet from a crooked 10-inch cedar tree. Marked by quart bottle, neck up, 18 inches below surface of ground.

Plane coordinates: (E), $x=579,266.18$ feet; $y=1,585,658.48$ feet.

Lime (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On Lime Point, on southern shore of Manitoulin Island, about 1½ miles south of Missisagi Strait Lighthouse. Marked by ⅝-inch drill hole in rock about 1 foot below surface of ground, 1½ feet farther from lake than a 10-inch tamarack stub, 49 feet from blazed 14-inch cedar tree, and 30.5 feet from another blazed 10-inch cedar tree, 11 feet beyond which, on same line, is blazed 16-inch birch tree.

Plane coordinates: (E), $x=613,954.53$ feet; $y=1,594,945.46$ feet.

Western Duck (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On long sandy point at northeast corner of Western Duck Island. Underground mark is pint beer bottle, neck up, about 2 feet below surface of ground. Surface mark is stake 16 inches long and 8 inches in diameter, in hollow where sand is blown out nearly to underlying gravel. About 50 feet towards Burnt Point is a large log partly buried in sand with one end projecting over bank.

Plane coordinates: (E), $x=676,060.81$ feet; $y=1,555,198.99$ feet.

Walkhouse (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On southern shore of Manitoulin Island, on Walkhouse Point (second point east of one which is connected by shoal water with Inner Duck Island (Green Point)), about 125 feet from water's edge and 50 feet from edge of trees. Marked by ⅝-inch drill hole near northeast corner of boulder with irregular surface and 3

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feet in diameter (with another, 4 by 3 feet, close by in direction of beach). Drill hole is approximately at center of group of eroded holes, and 29 inches from nearest point of second boulder. Reference mark is ⅝-inch drill hole in flat boulder, about 75 feet from edge of water, and 46.1 feet from station. To locate station from reference mark, turn angle of 71°25′ (to right) from north end of Western Duck Island.

Plane coordinates: (E), x=703,703.30 feet; y=1,562,563.15 feet.

Burnt Point (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On Burnt Island Point, on south shore of Manitoulin Island, on rocky beach about 40 feet from tree line. Center is unmarked, but is on line connecting two drill holes in mass of limestone 2 feet higher than surrounding beach, 17 inches from hole nearest lake and 10 inches from other. Bearings and distances from station to following objects are: Blazed 8-inch cedar tree, N. 45° E., 33 feet; blazed 4-inch spruce tree, N. 71°30′ E., 74 feet; and blazed 8-inch cedar tree, N. 27°10′ W., 67 feet.

Plane coordinates: (E), x=682,481.16 feet; y=1,570,019.17 feet.

Misery (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On southern shore of Manitoulin Island, on Misery Point, just west of Misery Bay, on bank of gravel, near line of trees, and about 140 feet from water line. Marked by ½-inch drill hole (1½ inches deep) in boulder which is embedded in gravel. Following directions (with Gatacre Point as initial at 116°16′), and distances are from station: 14-inch birch tree, 71°40′, 94 feet; 8-inch spruce tree, 52°15′, 41.5 feet; 6-inch birch tree, 50°25′, 34.0 feet; and 8-inch birch tree, 8°10′, 43.8 feet.

Plane coordinates: (E), x=732,519.95 feet; y=1,560,153.30 feet.

Gatacre (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1904).—On southern shore of Manitoulin Island, on Gatacre Point, about 40 feet from fringe of trees, 50 feet from nearest point of water, 71 feet from blazed 8-inch cedar tree, 74 feet from blazed 6-inch spruce tree, 55 feet from blazed 6-inch spruce tree, and 48 feet from blazed 8-inch cedar tree. Marked by ½-inch drill hole (1½ inches deep) in portion of rocks slightly lower than surrounding surface, and free from eroded holes with which most of surface is covered.

Plane coordinates: (E), x=763,640.54 feet; y=1,553,004.61 feet.

CHICAGO TO TOLEDO

Principal points

Michigan City (U. S. L. S.) (La Porte County, Ind., U. S. Lake Survey, 1874; 1877).—About 2 miles northeast of Michigan City, on last of range of high sand hills in that direction, about ½ mile northwest of track of the Michigan Central Railroad, and in sec. 22, T. 38 N., R. 4 W., Michigan Township. Marked by stone post, about 4 feet below surface, with wooden post set directly above as surface mark. Reference marks are stone posts at following distances and bearings from station: 3.36 meters (11.0 feet), S. 81°43′ E.; 13.19 meters (43.3 feet), S. 13°51′ W.; and 13.78 meters (45.2 feet), N. 53°43′ W. Milepost on Michigan-Indiana boundary line, marked by oak post 4½ inches square and about 3 feet high, standing in marsh, is 6,935.6 meters (22,755 feet) from station on bearing N. 66°46′17″ E. Azimuth from station to lighthouse at Michigan City, distant 3,145 meters (10,318 feet), is S. 62°46′ W. In 1935 this station was reported lost.

Plane coordinates: (C), x=193,701.60 feet; y=87,784.75 feet.

Springville (U. S. L. S.) (La Porte County, Ind., U. S. Lake Survey, 1874; R. P. Hoover, 1935).—About 1¼ miles south of Springville, on right-of-way of U. S. Route 20, in SE¼ sec. 10, T. 37 N., R. 3 W., Center Township, 252.46 meters (828.3 feet) from southeast corner of section 10 on bearing N. 86°00′ W., 245 meters (804 feet) west of road leading south to La Porte, 13 meters (43 feet) north of private road, 36 feet north of triangle-blazed oak tree, 51 feet south-southeast of triangle-blazed oak tree, 18 feet northwest of triangle-blazed hickory tree, and in 1908 near south edge of grove of high timber. Marked by ½-inch hole in cut stone, about 2½ feet below surface of ground. Reference mark stones are at following distances and bearings from station: (in road) 273.81 meters (898.3 feet) N. 63°43′ E.; (in road) 245.25 meters (804.6 feet), S. 86°14′ E.; and 13 meters (43 feet), S. 6°15′ E. (mag.). *La Porte County: SE. corner of sec. 10, T. 37 N., R. 3 W.* (*U. S. L. S.*) is 252.46 meters (828.3 feet) from station on bearing S. 86°00′ E.

Plane coordinates: (C), x=229,051.13 feet; y=61,540.87 feet.

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Bald Tom (U. S. L. S.) (Berrien County, U. S. Lake Survey, 1874; 1877).—About 3.5 miles southwest of Bridgman, 3.5 miles northwest of New Troy, in SW¼ sec. 35, T. 6 S., R. 20 W., Lake Township, on highest sand dune in vicinity known as Bald Tom and Tower Hill, and near site of station *Bald Tom 2*. (See description thereof.) Surface and underground marks are stone posts, the underground mark being 3 feet below surface of ground. Reference marks are stone posts at following distances and bearings from station: 19.37 meters (63.5 feet), S. 43°34′ W.; 7.56 meters (24.8 feet), N. 46°34′ W.; and 22.25 meters (73.0 feet), N. 74°12′ E. In 1932 it was reported that station could not be recovered, and that reference post described as being 22.25 meters (73.0 feet) from station on bearing N. 74°12′ E. was found leaning slightly and would soon be destroyed entirely due to erosion of the hill. *Berrien County: SE. corner of sec. 35, T. 6 S., R. 20 W. (U. S. L. S.)* is 1,038.9 meters (3,408 feet) from station on bearing S. 52°01½′ E.

Plane coordinates: (C), $x=268,713.69$ feet; $y=148,829.96$ feet.

Galena (U. S. L. S.) (La Porte County, Ind., U. S. Lake Survey, 1877; H. C. Warwick, 1932; 1935).—About 4 miles northwest of Rolling Prairie, station on New York Central Railroad, in SW¼ sec. 32, T. 32 N., R. 2 W., Galena Township, ¼ mile northeast of schoolhouse and cemetery at corner of sections 31 and 32, ¼ mile east and ⅛ mile north of western and southern section lines, respectively, and on land owned by Wm. Blank & Son, Tenth Street, Michigan City. To reach from Rolling Prairie, go west 3.3 miles on U. S. Route 20 to gravel crossroad, turn north onto gravel road, go 1.05 miles to Lambs Chapel and cemetery, turn east onto sand road, go 0.25 mile to sign on tree north of road "Keep out, if caught fine," cross wire fence just east of tree and go along fence line on old woods road about 600 feet to top of hill and station, about 87 feet east of road, 32.2 feet northwest of larger of two blazed oak trees, and 34.0 feet west of smaller. Marked by stone post 2½ feet below surface of ground. In 1932, station re-marked with standard station disk in concrete, note 1a, stamped "Galena U. S. L. S. 1877." Original reference marks were stone posts at following distances and bearings from station: 60.0 meters (197 feet), S. 32°24′ W., (recovered in 1932); 62.1 meters (204 feet), S. 84°19′ W.; and 36.6 meters (120 feet), S. 83°48′ E. In 1932 two reference marks and azimuth mark, standard reference disks in concrete, note 11a, projecting 5 inches above ground, were established. No. 1 is on north-and-south fence line, 5 feet west of old woods road, 29 feet northwest of blazed oak tree, and 92.85 feet from station in azimuth 79°23′. No. 2 is in same fence line, about 6 feet west of center line of road, and 92.39 feet from station in azimuth 111°15′. Azimuth mark (not visible from ground) is about 0.9 mile north of U. S. Route 20, 0.12 mile south of Lambs Chapel, 30 feet east of center line of gravel road, 5 feet east of fence line, on high bank about 15 feet above road, and approximately 0.3 mile from station in azimuth 45°04′36″.

Plane coordinates: (C), $x=247,273.89$ feet; $y=72,783.27$ feet; grid azimuth to azimuth mark=45°41′32″.*

Carlisle (U. S. L. S.) (St. Joseph County, Ind., U. S. Lake Survey, 1877; H. C. Warwick, 1932; 1935).—About 14 miles west of South Bend, about 2 miles south of New Carlisle (station on the New York Central Railroad), in SE¼ sec. 11, T. 37 N., R. 1 W., Olive Township, on proving grounds of the Studebaker Co., and on hill known as Studebaker Hill. To reach from South Bend go west about 10 miles on Indiana Route 2 to the Studebaker proving grounds, enter gate and follow gravel road 300 yards southeast to garage, turn south, go 200 yards to dirt and cinder road leading to right, follow this road up hill past old barn 0.65 mile to crossroad, turn left, go 20 yards to fork, follow left fork about 300 yards to summit of grade and highest point of hill. Station is on lower peak about 100 yards north of this summit. Surface and underground marks are stone posts, lower mark being 2½ feet below surface of ground. In 1932 station was re-marked with standard station disk stamped "Carlisle U. S. L. S. 1877–1932." Original reference marks were stone posts at following distances and bearings from station: 16.1 meters (53 feet), N. 32°16′ W.; and 8.7 meters (29 feet), S. 18°24′ W. In 1932 tops of these two posts were reported broken off. A third reference post was recovered in 1932 and re-marked with standard reference disk stamped "Carlisle U. S. L. S. 1877–1932." It is 47.46 feet from station in azimuth 273°27′. In 1932 another reference mark and azimuth mark, standard reference disks, were established. Reference mark is 59.16 feet

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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from station in azimuth 152°26′. Azimuth mark (not visible from ground without clearing trees) is 2 feet east of large fence-corner post, 23.5 feet north of center line of Indiana Route 2, 70 feet northeast of brick post in heavy woven wire guard fence around proving ground, 70 feet west of large slippery elm tree, about 200 feet northeast of large Studebaker car (used for advertising purposes), and approximately 0.4 mile from station in azimuth 203°24′07″. Azimuth from station to *New Carlisle, municipal tank, finial light* is 159°28′37″. *Carlisle (U. S. L. S.) latitude station* is distant 26.12 meters (85.7 feet) from station in azimuth 298°55′. *St. Joseph County, Ind.: corner of secs. 2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.)* is 1,640.9 meters (5,384 feet) from station on bearing N. 39°10′ W.

Plane coordinates: (C), x=296,747.73 feet; y=62,108.51 feet; grid azimuth to azimuth mark=203°53′48″.*

Bertrand (U. S. L. S.) (Berrien County, U. S. Lake Survey, 1877; H. C. Warwick, 1932).—About 10 miles northwest of South Bend, Ind., about 4 miles south of Buchanan (station on the Michigan Central Railroad), in northeast corner of sec. 15, T. 8 S., R. 18 W., on easterly summit of wooded sandy ridge, 30 yards west of west edge of field at east foot of knoll, on land owned by the Kern estate, administrator of estate being Tom Kern of Barron Lake. To reach from Buchanan, go south 1.7 miles on Michigan Route 174 to Michigan Route 60, keep straight ahead on macadam road 2.0 miles to sandy dirt road leading west just beyond white house with two fir trees in front yard, follow dirt road west 1.0 mile to triangle-blazed 2-foot maple tree north of road and just over summit of hill, turn north and go about 200 yards on wheel tracks to stumpy clearing where dim trace of old road leads north about 200 yards almost to station site. Originally marked by surface and underground stone posts, underground post being 3 feet below surface of ground. In 1932 station was recovered and remarked with standard station disk stamped "Bertrand U. S. L. S. 1877–1932." Original reference marks are stone posts at following distances and azimuths from station: One 31.8 feet, 178°21′; one, on section line between sections 14 and 15, 33.9 feet, 279°10′; and one (not recovered in 1932) originally reported as being at *Berrien County: corner of secs. 14, 15, 22, 23, T. 8 S., R. 18 W. (U. S. L. S.)*, 309.7 meters (1,016 feet) from station on bearing S. 2°47′ E. Two reference marks, standard reference disks, were established in 1932. No. 1 is 85.68 feet from station in azimuth 34°45′. No. 2 is 66.67 feet from station in azimuth 134°04′. Following azimuths are from station: *New Carlisle, municipal tank, finial light*, 54°48′59″; *South Bend, Bendix Corporation, center of neon sign*, 327°37′34″.

Plane coordinates: (C), x=328,801.32 feet; y=102,320.51 feet; grid azimuth to *New Carlisle, municipal tank, finial light*=55°14′03.″3.

Penn (U. S. L. S.) (St. Joseph County, Ind., U. S. Lake Survey, 1877; J. S. Bilby, 1920; 1935).—About 2.4 miles east of south of South Michigan Avenue, South Bend, about 150 yards south of Ewing Avenue, on top of barren hill in NW¼ sec. 20, T. 37 N., R. 3 E., about 200 yards west of the caretaker's home on the Oliver Estate, 29 yards north-northeast of prominent large granite boulder and 16 feet southwest of steel anchorage of observation tower which projects about 8 inches above ground. Marked by stone post, which projects about 2 inches above surface of ground. Reference marks are stone posts at following distances and bearings from station: 99.7 meters (327 feet), N. 86°30′ E.; 41.9 meters (137 feet), S. 7°37′ E.; and 69.6 meters (228 feet), S. 51°56′ W. which in 1935 was the only reference mark reported recovered. *Saint Joseph County, Ind.: corner of secs. 17, 18, 19, 20, T. 37 N., R. 3 E. (U. S. L. S.)* is 788.4 meters (2,587 feet) from station on bearing N. 63°51′ W.

Plane coordinates: (C), x=375,036.62 feet; y=54,273.81 feet.

Milton (U. S. L. S.) (Cass County, U. S. Lake Survey, 1877; J. S. Bilby, 1920).—About 4 miles east of Niles, in SE¼ sec. 4, T. 8 S., R. 16 W., Milton Township, and on highest ground in vicinity. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: on east side of road just west of station, 131.8 meters (432 feet), S. 62°30′ W.; on east side of road, 130.9 meters (429 feet), N. 62°03′ W.; and at center of section 4, 230.4 meters (756 feet), N. 32°06′ W. *Cass County: corner of secs. 4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.)* is 1,113.7 meters (3,654 feet) from station on bearing S. 57°13′ W.

Plane coordinates: (C), x=384,194.00 feet; y=110,524.07 feet.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Jefferson (U. S. L. S.) (Elkhart County, Ind., U. S. Lake Survey, 1878; R. P. Hoover, 1935).—About 3 miles south of Bristol (station on the New York Central Railroad), in SW¼ sec. 2, T. 37 N., R. 7 E., Jefferson Township, on what is known locally as the John Newell or Claude Everingham Farm, in plum orchard, 16 feet east of fence, and about 3 feet east of plum tree. To reach from Elkhart, go 9 miles east on U. S. Route 20, thence 1 mile north on Route 15, thence about 0.3 mile east on gravel road to top of hill, then north along fence about 174 yards to station site. Marked by stone posts. Upper post flush with surface of ground. Reference marks are stone posts at following distances and bearings from station: 13.5 meters (44 feet), S. 27°28′ W.; 23.6 meters (77 feet), N. 15°01′ W.; and 95.0 meters (312 feet), N. 25°44′ E. *Elkhart County: corner of secs. 2, 3, 10, 11, T. 37 N., R. 6 E.* (*U. S. L. S.*) is 350 meters (1,148 feet) from station on bearing S. 62°43′ W.

Plane coordinates: (C), $x=484,107.09$ feet; $y=66,793.48$ feet.

Calvin (U. S. L. S.) (Cass County, U. S. Lake Survey, 1878; J. S. Bilby, 1935).—About 7 miles south of Vandalia, about 7 miles southeast of Cassopolis, stations on the Michigan Central Railroad, in NE¼ sec. 27, T. 7 S., R. 14 W., Calvin Township. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: 44.6 meters (146 feet), N. 59°28′ E.; 87.5 meters (287 feet), S. 21°36′ E.; and 82.1 meters (269 feet), S. 9°47′ W. *Cass County: SW. corner of NW. quarter of sec. 27, T. 7 S., R. 14 W.* (*U. S. L. S.*) is 1,004.5 meters (3,296 feet) from station on bearing S. 67°08′ W. In 1935 station and three reference marks recovered, and further described as being about 12.6 miles by road north by east of Elkhart, 0.75 mile east of county route 665, 0.5 mile north of gravel section-line road, at highest point of woodland owned by Amos Smith and farmed by Mr. Wallace. Station mark is 6 by 6-inch stone post with short crosslines on it, in woods, 85 paces north of property line between Smith on north and Brown on south. It projects 3 inches. Triangles were blazed on 8-inch elm tree 7 feet southeast, on 8-inch elm tree 6 feet southwest, and on 4-inch oak tree 2 feet southeast. In 1935 stone post northeast of station was found lying on surface of ground, not much out of original position. Stone post southeast of station recovered, in property line, projecting 6 inches, and 20-inch oak tree about 3 feet southwest of this post was marked with triangular blaze. Stone post southwest of station recovered, in same property line as southeast post. All reference posts have letters "U. S." cut in their tops. Station most easily recovered from southeast reference mark. To reach station from post office in Elkhart, follow U. S. Highway 112–S north 5.9 miles to point 0.6 mile north of State line, where highway turns east; continue north on county route 677 (gravel) 2.0 miles to gravel crossroad; turn east and go 2.0 miles to crossroads at junction with county route 665; follow route 665 north 2.0 miles to gravel crossroad; turn east and go 0.75 mile to small red shack on north side of road (Mr. Brown's home). From Mr. Brown's house go north across idle ground about 0.5 mile to property-line fence which is marked only by thick growth of bushy trees. Reference stones are in this fence. Mr. Guy Byrd, who lives 0.25 mile east of Mr. Brown's house, on north side of gravel road, knows location of all marks.

Plane coordinates: (C), $x=452,572.49$ feet; $y=122,535.15$ feet.

Porter (U. S. L. S.) (Cass County, U. S. Lake Survey, 1878; R. L. Pfau, 1931; 1935).—One and one-half miles north by west of Mottville, in sec. 36, T. 7 S., R. 13 W., Porter Township, and on ridge on cultivated land belonging to Q. D. Winegar estate. To reach from Mottville, cross St. Joseph River on U. S. Route 112, continue to first road leading north just beyond bridge, turn north onto this road, go 0.3 mile, turn west (left), continue on road 1 mile to farmhouse on Winegar estate, go through barnyard, turn north up farm lane to woods, turn east into woods and follow woods road 0.25 mile to clearing. Station is in clearing, 21.0 meters (69 feet) south-southeast of blazed 10-inch hickory tree, 32.5 meters (107 feet) east of lone 24-inch hickory tree with stones piled around base, 14.8 meters (49 feet) south of east-and-west fence line, and 140 paces west of north-and-south fence line. Originally marked by stone posts with crosses in tops. In 1931 underground mark only was recovered, 10 inches below surface of ground. Reference marks are stone posts with letters "U. S." on tops at following distances and bearings from station: One (not recovered in 1931), 156.5 meters (513 feet), S. 48°02′ E.; one (not recovered in 1931), 108.3 meters (355 feet), N. 73°24′ W.; and one (recovered in 1931), 3 paces west of fence line east of station and 40 paces north of fence line north of station, 120.6 meters (396 feet), N. 73°29′ E. *Cass County, SW. corner of NW. quarter of sec. 36, T. 7 S., R. 13 W.* (*U. S. L. S.*) is 1,304.0 meters (4,278 feet) from station on bearing S. 56°55′ W. In 1935 station and one reference mark recovered. Underground mark reported in 1931 is original surface

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mark with top broken off. Original underground mark recovered 2.3 feet below surface of ground; it is stone post 6 inches square with drill hole in center. Witness marks are as follows: 10-inch elm with triangular blaze, 69 feet, N. 15° W.; 24-inch hickory tree in field with stones piled around base, 106.1 feet, N. 85° W. (mag.); iron anchor shoe of wood tower erected in 1878, projecting 10 inches, 24 feet, N. 53° E. (mag.). Fence line between cultivated ground and woods to north is 17.6 feet due north of station, which is 136 paces west of east property line of Winegar estate, and 117 paces east of north-south fence along west side of cultivated ground and east side of woods. Stake 18 inches long was left standing over station.

Plane coordinates: (C), $x=495,496.03$ feet; $y=117,640.50$ feet.

Sherman (U. S. L. S.) (St. Joseph County, U. S. Lake Survey, 1878; R. L. Pfau, 1931; 1935).—Three and three-quarters miles north-northwest of Sturgis, in NE¼ sec. 22, T. 7 S., R. 10 W., Sherman Township, on highest ground in vicinity, and on land owned by Mrs. George Mahle. To reach from Sturgis, go north out of town on Centerville Street, to intersection with New York Central Railroad, at 1.6 miles beyond railroad turn left; at 2.0 miles keep right-hand road; at 2.6 miles turn right (north); at 3.1 miles turn left (west) at T-intersection; at 3.6 miles turn right (north) and continue 4.1 miles to point where station is in woods to north of road, just beyond point where road turns west, 35 meters (115 feet) north of center line of east-and-west portion of road, and 10.8 meters (35 feet) west of prolongation of transmission line along west side of north-and-south portion of road at turn. Marked by double stone posts. Upper post with cross cut in top projects 10 inches above ground. Reference marks are posts, with letters "U. S." on tops at following distances and bearings from station: One in outer angle of road turn, about 5 meters (16 feet) east of prolongation of center line of north-and-south portion of road, and 5 meters (16 feet) south of prolongation of center line of east-and-west road, 45.9 meters (151 feet) S. 28°58′ E.; one 26.8 meters (88 feet), N. 70°12′ W.; and another (not recovered in 1931), 41.7 meters (137 feet), S. 21°16′ W. *Sherman (U. S. L. S.) latitude station* is distant 35.351 meters (115.98 feet) from station in azimuth 329°51′. *Saint Joseph County: SW. corner of SE. quarter of sec. 22, T. 7 S., R. 10 W. (U. S. L. S.)* is 921.0 meters (3,022 feet) from station on bearing S. 24°12′ W.

Plane coordinates: (C), $x=580,838.90$ feet; $y=126,495.09$ feet.

Van Buren (U. S. L. S.) (Lagrange County, Ind., U. S. Lake Survey, 1878; R. L. Pfau, 1931; 1935).—About 11.5 miles southwest of Sturgis, Mich., 9.5 miles southeast of Mottville, Mich., 6.5 miles south-southeast of White Pigeon, Mich., 3 miles north and 2 miles west of Shipshewana, in NW¼ sec. 33, T. 38 N., R. 8 E., Van Buren Township, near highest point in field about ¼ mile east of farmhouse, on land owned and occupied by Edward Meshler, about 175 yards west of southwest corner of tract of timber, about 200 yards south of tract of timber, about 105 yards N. 5° W. of blazed 14-inch hickory tree in fence line. To reach from White Pigeon, go south on main road (Shipshewana Road), at 2.0 miles turn left at T-intersection and go around east end of lake; at 3.0 miles turn left (east) with road; at 3.6 miles turn right (south) with road and continue to 7.2 miles to Mr. Meshler's house (on east side of road), drive through barnyard and east along lane and cow pass to gate leading into field in which station is located. Station is 15 meters (49 feet) east of highest point of ground, 52.3 meters (172 feet) east of hog wire fence along west side of lane, and 97.2 meters (319 feet) northwest of blazed 20-inch hickory tree in fence line south of station. Marked by double stone posts, upper post projecting 12 inches above ground. Reference marks are stone posts inscribed "U. S." at following distances and bearings from station: 130.0 meters (427 feet), S. 3°20′ W. (not recovered in 1931); 175.9 meters (577 feet), S. 89°11′ E. (not recovered in 1931); and 27.5 meters (90 feet), N. 22°59′ W. (recovered). *Lagrange County: SW. corner of NW. quarter of sec. 33, T. 38 N., R. 8 E. (U. S. L. S.)* is 752.4 meters (2,468 feet) from station on bearing S. 55°44′ W.

Plane coordinates: (C), $x=537,457.57$ feet; $y=75,901.32$ feet.

Mongo (U. S. L. S.) (Lagrange County, Ind., U. S. Lake Survey, 1878; R. P. Hoover, 1935).—About ¾ mile northeast of Mongo Mills, in sec. 4, T. 37 N., R. 11 E., Springfield Township, on what is known locally as the Barridge Farm, and 185 yards west of southwest corner of tract of timber, 1,462 feet west of 14-inch oak tree forming corner of east-and-west fence and fence running south, in cultivated field, 46.6 feet north of east-and-west fence and about 21.5 feet from each of four steel bars (foundation of observation tower) projecting 2 or 3 inches above surface of ground and located 45° diagonally from the cardinal points of

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the compass. To reach from end of concrete pavement at Mongo Mills, go east past schoolhouse 0.35 mile to end of road, thence north 0.25 mile to fence running east, thence along fence 425 yards east. Marked by stone posts. Upper post is 11 inches below surface of ground. Reference marks are stone posts at following distances and bearings from station: 28.6 meters (94 feet), S. 59°13′ E.; 16.7 meters (55 feet), S. 14°19′ E.; and 30.1 meters (99 feet), S. 57°03′ W. In 1935 it was reported that all reference marks were probably lost. *Lagrange County: corner of secs. 4, 5, 8, 9, T. 37 N., R. 11 E.* (*U. S. L. S.*) is 873.5 meters (2,866 feet) from station on bearing S. 22°44′ W.

Plane coordinates: (C), $x=631,386.84$ feet; $y=70,650.38$ feet.

Bronson (**U. S. L. S.**) (Branch County, U. S. Lake Survey, 1878).—About 3 miles west of Bronson (station on the New York Central Railroad), in SE¼SW¼ sec. 16, T. 7 S., R. 8 W., Bronson Township. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: 106.5 meters (349 feet), N. 40°13′ E.; 68.6 meters (225 feet), N. 85°08′ E.; and 116.4 meters (382 feet), S. 36°12′ E. *Branch County: SW. corner of SE. quarter of sec. 16, T. 7 S., R. 8 W.* (*U. S. L. S.*) is 208.9 meters (685 feet) from station on bearing S. 19°07′ E.

Plane coordinates: (C), $x=637,841.44$ feet; $y=130,190.37$ feet.

Fremont (**U. S. L. S.**) (Steuben County, Ind., U. S. Lake Survey, 1878; H. C. Warwick, 1932; 1935).—About 5 miles north and 1.5 miles east of Angola, about 2.5 miles southwest of Fremont, near center of west half of sec. 31, T. 38 N., R. 14 E., Fremont Township, and on land owned by H. B. Jordan, who lives on north side of section. To reach from Fremont railroad station and crossing, go west 1.1 miles on dirt road, go south 0.5 mile, west 0.3 mile to first farmhouse on right-hand side of road, follow dim road south across field about 0.25 mile to old buildings that may be seen from road, continue about 250 yards south of buildings, follow road into woods, proceed up steep hill, and continue straight ahead about 300 yards to station site. Station is in timbered area, 230 feet north of east-and-west fence line separating properties of H. B. Jordan and Harry Penner, 27 feet east of center of rock pile, and 20.5 feet east of north-and-south fence line. Originally marked by stone posts. In 1932 station recovered and surface mark, standard station disk in concrete, note 1a, stamped "Fremont 1879–1932 U. S. L. S.," was centered over original underground mark. Original reference marks (recovered in 1935) are stone posts at following distances and bearings from station: 46.5 meters (153 feet), N. 22°00′ W.; 55.7 meters (183 feet), S. 5°15′ W. (top of post broken off); and 22.9 meters (75 feet), N. 42°29′ E. (top of post broken up). In 1932 two additional reference marks and azimuth mark, standard reference disks in concrete, note 11a, were established. No. 1 projects 4 inches above ground, is at south edge of timbered area, on east-and-west fence line mentioned above, and 229.35 feet from station in azimuth 337°00′. No. 2 projects 5 inches above ground, is at west edge of timbered area, about 175 feet south of east-and-west fence line, and 83.79 feet from station in azimuth 111°34′. Azimuth mark projects 5 inches above ground, is on property of William McClue, 75 feet southeast of southeast corner of south wing of large barn, 300 feet east of house, 20 feet west of 18-inch black oak tree, 25 feet south of center line of dirt road, 9 feet south of east-and-west fence line, 70 feet west of north-and-south fence line, and approximately 0.5 mile from station in azimuth 161°14′04″. *Steuben County, Ind.: NW. corner of sec. 31, T. 38 N., R. 14 E.* (*U. S. L. S.*) is 834.6 meters (2,738 feet) from station on bearing N. 28°10′ W.

Plane coordinates: (E), $x=145,158.63$ feet; $y=78,787.08$ feet; grid azimuth to azimuth mark=162°05′57″.* (C), $x=714,003.26$ feet; $y=77,080.55$ feet; grid azimuth to azimuth mark=160°42′47″.*

Quincy (**U. S. L. S.**) (Branch County, U. S. Lake Survey, 1878).—About 2 miles northwest of Quincy (station on the New York Central Railroad), in SW¼ sec. 8, T. 6 S., R. 5 W., Quincy Township. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: Approximately on section line between sections 7 and 8, 41.5 meters (136 feet), S. 18°02′ W.; approximately on same line 46.25 meters (151.7 feet), N. 16°53′ W.; and 181.5 meters (595 feet), N. 35°13′ E. *Branch County: SW. corner of SE. quarter of sec. 7, T. 6 S., R. 5 W.* (*U. S. L. S.*) is 980.5 meters (3,217 feet) from station on bearing S. 56°55′ W.

Plane coordinates: (C), $x=725,169.61$ feet; $y=169,087.56$ feet. (E), $x=158,554.61$ feet; $y=170,506.93$ feet.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Reading (U. S. L. S.) (Hillsdale County, U. S. Lake Survey, 1878; H. C. Warwick, 1932).—At Reading, in sec. 26, T. 7 S., R. 4 W., Reading Township, on grounds of Acme Chair Co. (formerly Colby Wringer Co.) and 50.25 meters (164.9 feet) on bearing S. 51°05′ E. from southeast corner of factory of prior company. Marked by surface and underground stone posts. Reference marks were stone posts at following distances and bearings from station: 135.8 meters (446 feet), N. 48°28′ E.; 102.9 meters (338 feet), S. 83°12′ E.; and 147.8 meters (485 feet), N. 86°20′ W. In 1932 station recovered and reported to be under floor and near center of small frame building used as storehouse for odd equipment. All reference marks were reported destroyed. Station *Reading eccentric* is 9.671 meters (31.73 feet) from station in azimuth 249°07′. *Hillsdale County, Mich., corner of secs. 22, 23, 26, 27, T. 7 S., R. 4 W.* (*U. S. L. S.*) is 715.32 meters (2,346.8 feet) from station on bearing N. 44°11′ W., and *Hillsdale County, Mich.: NE. corner of sec. 26, T. 7 S., R. 4 W.* (*U. S. L. S.*) is 1,235.9 meters (4,055 feet) from station on bearing N. 65°57′ E.

Plane coordinates: (E), $x=206,973.35$ feet; $y=123,893.23$ feet. (C), $x=774,702.07$ feet; $y=123,666.91$ feet.

Hillsdale (U. S. L. S.) (Hillsdale County, U. S. Lake Survey, 1878; 1879).—About 1 mile west of Hillsdale, in NE¼ sec. 27, T. 6 S., R. 3 W., 1,898.5 meters (6,229 feet) from Hillsdale College clock tower on bearing S. 45°52′ W. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: On west section-line of section 27, 163.3 meters (536 feet), N. 35°03′ W.; on same line, 98.3 meters (323 feet), N. 74°02′ W.; and on north side of road, 64.4 meters (211 feet), S. 1°33′ W. *Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 27, T. 6 S., R. 3 W.* (*U. S. L. S.*) is 118.8 meters (390 feet) from station on bearing S. 51°51′ W. *Hillsdale County, Mich.: NW. corner of sec. 27, T. 6 S., R. 3 W.* (*U. S. L. S.*) is 742.5 meters (2,436 feet) from station on bearing N. 6°59′ W.

Plane coordinates: (E), $x=232,346.80$ feet; $y=154,788.51$ feet. (C), $x=799,317.45$ feet; $y=155,168.07$ feet.

Pittsford (U. S. L. S.) (Hillsdale County, U. S. Lake Survey, 1879; H. C. Warwick, 1932; 1935).—About 2½ miles south of Pittsford, in sec. 25, T. 7 S., R. 2 W., Jefferson Township, about ⅓ mile west of east line of Jefferson Township, and short distance north of south line of section. Originally marked by stone post 3 feet below surface of ground, with another stone post directly above as surface mark. In 1932 underground mark was recovered and station was remarked with standard station disk stamped "Pittsford U. S. L. S. 1879–1932." Station mark projects 3 inches above ground. Original reference marks were stone posts at following distances and bearings from station: 39.97 meters (313.1 feet), S. 81°35′ E.; 16.09 meters (52.8 feet) S. 5°45′ W.; and 18.70 meters (61.4 feet), N. 77°47′ W. In 1932 original reference marks could not be found, and two new reference marks and azimuth mark, standard reference disks in concrete, note 11a, were established and stamped "Pittsford U. S. L. S. 1879–1932." No. 1 projects 6 inches above ground, is in edge of woods, 42 feet north of east-and-west fence line, and 126.3 feet from station in azimuth 279°15′. No. 2 projects 6 inches above ground, is in edge of woods, 30 feet north of east-and-west fence line, and 81.2 feet from station in azimuth 54°27′. Azimuth mark (not visible from ground without clearing some trees) projects 7 inches above ground, is 25 feet west of center line of gravel section-line road which runs south from Pittsford, 1 foot east of west right-of-way fence, about 200 yards south of white farmhouse on west side of road, 3 feet south of small elm tree, and approximately 0.6 mile from station in azimuth 310°08′10″. *Hillsdale County, Mich.: SE. corner of sec. 36, T. 7 S., R. 2 W.* (*U. S. L. S.*), Jefferson Township, which is common corner of Jefferson, Pittsford, Wright, and Ransom Townships, is 1,719.0 meters (5,639 feet) from station on bearing S. 20°13′ E.

Plane coordinates: (E), $x=277,421.73$ feet; $y=119,797.46$ feet; grid azimuth to azimuth mark=310°40′51″.* (C), $x=845,229.06$ feet; $y=121,280.86$ feet; grid azimuth to azimuth mark=309°17′29″.*

Wheatland (U. S. L. S.) (Hillsdale County, U. S. Lake Survey, 1879; H. C. Warwick, 1932; 1935).—Six miles southwest of Addison, 4 miles northeast of Pittsford, in sec. 29, T. 6 S., R. 1 W., Wheatland Township. To reach from Addison, follow U. S. Route 127 south 4.25 miles to junction with County Route 326, turn right (west) onto Route 326, proceed 2.7 miles, turn left (south), go 1.0 mile, turn right (west), go 1.8 miles to Mr. Bavin's house on right (north)

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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side of road, turn in toward house, go through farmyard, follow farm lane north from house 0.35 mile to gap in rail fence leading to alfalfa pasture, pass through gap, follow south side of woods and north side of alfalfa pasture about 100 yards east to corner of woods, turn north, and continue 30 yards to opening in woods to west and station site. Station is in small open clearing with few old stumps, 35 feet west of edge of woods, 17 feet northeast of small triangular blaze on 16-inch basswood tree, and 85 feet north of south edge of woods around station. There is still light trace of trench used by old survey party to anchor tower. Originally marked by drill hole in 6 by 6-inch limestone post about 2 feet below surface of ground with another stone post directly above as surface mark. In 1932 underground mark recovered and new surface mark set, standard station disk in concrete, note 1a, projecting 6 inches above ground. Original reference marks were stone posts at following distances and bearings from station: One in road on west line of section 29 (not recovered in 1932), 351.6 meters (1,154 feet), N. 79°13′ W.; another in road on west line of section 29 (recovered in 1932), 411.2 meters (1,349 feet), S. 54°04′ W.; and one in road on south line of section 29 (reported destroyed in 1932), 662.2 meters (2,173 feet), S. 24°35′ E. Two additional reference marks, standard reference disks in concrete, note 11a, were established in 1932. No. 1 projects 4 inches above ground, is in edge of clearing for alfalfa field, and 49.15 feet from station in azimuth 229°58′. No. 2 projects 5 inches above ground, is in edge of clearing for alfalfa field, and 54.7 feet from station in azimuth 316°11′. *Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 29, T. 6 S., R. 1 W.* (*U. S. L. S.*) is 392.3 meters (1,287 feet) from station on bearing N. 59°46′ W., and *Hillsdale County, Mich.: corner of secs. 19, 20, 29, 30, T. 6 S., R. 1 W.* (*U. S. L. S.*) is 1,053.9 meters (3,458 feet) from station on bearing N. 18°50′ W.

Plane coordinates: (E), $x=285,380.17$ feet; $y=153,438.99$ feet.

Bunday (U. S. L. S.) (Hillsdale County, U. S. Lake Survey, 1879; H. C. Warwick, 1932).—About 12 miles south of Jackson, 2 miles west of Somerset Center, in sec. 7, T. 5 S., R. 1 W., Somerset Township, on Bunday Hill (said to be highest point in southern Michigan), and on land owned by C. S. Wertz. To reach from Jackson, go south about 15 miles on U. S. Route 127 to junction with U. S. Route 112 just east of Somerset Center, proceed west 2 miles on U. S. Route 112 to summit of long steep grade where highway passes over south side of Bunday Hill, thence north 0.1 mile on gravel drive up hill to station, 22 feet northwest of northeast corner of 50-foot wooden observation tower, and 24 feet northeast of northwest corner of tower. Marked by cross on top of stone post flush with ground (originally 2½ feet below surface of ground). Over and around mark is concrete pier, 1.2 by 2.4 by 3 feet high, with bottom cored out to permit access to surface mark, and marked with cross on top. Original reference marks were stone posts at following distances and bearings from station: One (recovered in 1932) on section line on east side of section 7, 132.0 meters (433 feet), N. 85°56′ E.; another (not recovered) on section line on east side of section 7, 161.7 meters (531 feet), S. 54°50′ E.; and one (not recovered) on north side of road south of station, 210.9 meters (692 feet), S. 14°47′ E. In 1932 recovered reference mark, with small hole marking center and letters "U. S." cut in stone, and projecting 4 inches above ground, 1 foot west of fence on east slope of Bunday Hill, about due east of tower, 17 feet south of 15-inch hickory tree on fence line, about 30 feet south of crest of ridge, and 434.2 feet (slope distance) from station in azimuth 266°55′43″. Reference mark No. 2 and azimuth mark are standard reference disks in concrete, note 11a, established in 1932. No. 2 projects 5 inches above ground, is 40 feet southeast of southeast corner of tower, 7 feet north of south edge of stone wall along road in front of tower, and 80.40 feet (slope distance) from station in azimuth 330°06′. Azimuth mark projects 6 inches above ground, is on right-of-way of U. S. Route 112, at east end of first curve in highway west of station, 45.4 feet north of center line of pavement, 1.5 feet south of right-of-way fence, and approximately 0.55 mile from station in azimuth 95°54′31″. Azimuth from station to center of White Swan Electric Tower, distant approximately 8 miles, is 290°14′56″. *Hillsdale County, Mich.: SE. corner of sec. 8, T. 5 S., R. 1 W.* (*U. S. L. S.*) is 2,166.0 meters (7,106 feet) from station on bearing S. 56°16′ E.

Plane coordinates: (E), $x=284,128.48$ feet; $y=203,023.96$ feet; grid azimuth to azimuth mark $=96°26′28″$.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Woodstock (U. S. L. S.) (Lenawee County, U. S. Lake Survey, 1879; H. C. Warwick, 1932; 1935).—About 18 miles east of south of Jackson, 1 mile east of Devil Lake, in SW¼ sec. 36, T. 5 S., R. 1 E., Woodstock Township, on highest point of hill in cultivated field, on land owned and occupied by Frank Berry, and about 0.3 mile east of his house. To reach from Jackson, go south about 15 miles on U. S. Route 127 to junction with U. S. Route 112, follow U. S. Route 112 east about 2.45 miles to second junction, proceed 0.75 mile on U. S. Route 127 to junction with U. S. Route 223, bear left onto U. S. Route 223, go 5.2 miles to gravel road leading to right (south) 0.8 mile east of White Swan sightseeing tower, proceed south 0.75 mile on gravel road to Berry's house on east side of road, pass through barn lot, turn south onto lane, go 120 yards to angle, turn east, and go about 0.3 mile to station, about 55 yards west of board gate at end of grassy lane, about 35 yards north of center line of lane, and about 8 yards south of small bent peach tree. Marked by cross on top of 6- by 6-inch stone post projecting about 6 inches above ground and originally over another stone post. Reference marks are 6- by 6-inch stone posts. (In 1932, numbers were arbitrarily assigned in clockwise direction, beginning at north.) No. 1 projects 7 inches above ground, is 2 feet west of 8-inch tree, 3 feet northeast of fence corner post, 2 feet north of south right-of-way fence of lane, 3 feet east of fence across lane at this point, and 197.7 feet (slope distance) from station in azimuth 305°21′. No. 2 projects 9 inches above ground, is in south right-of-way fence of lane, 1 foot east of limestone outcrop, 4 feet north of scrub oak tree, and 115.9 feet (slope distance) from station in azimuth 0°14′. No. 3 (with cross on top) projects 8 inches above ground, is in south right-of-way fence of lane, 5 feet south of 8-inch hickory tree, 2 feet east of limestone outcrop, and 142.2 feet (slope distance) from station in azimuth 34°59′. *Lenawee County; NE. corner of sec. 1, T. 6 S., R. 1 E.* (*U. S. L. S.*) is 1,132.9 meters (3717 feet) from station on bearing S. 88°58′ E. In 1935 all marks recovered as described in 1932, except that surface mark (stone post) had been broken off 8 inches below surface of ground. Field in which station is located belongs to Norman Fenis, who lives about 0.4 mile west-by-north of station, on east side of north-south road, and about 0.2 mile north of Frank Berry house. Lane leading east from Berry house to station is closed at fence line between property now owned by Fenis and property owned by Berry. Reference marks are on east-west fence line on south side of cultivated field and north side of woods. Station reached in 1935 by following U. S. Highway 223 to gravel road leading south, 0.8 mile east of White Swan observation tower at Devil Lake; thence south about 0.5 mile to Fenis' house, where directions should be obtained for passing through farm.

Plane coordinates: (E), $x=338,754.30$ feet; $y=177,934.50$ feet.

Fairfield (U. S. L. S.) (Lenawee County, U. S. Lake Survey, 1879).—About 6 miles south of Adrian, about ¼ mile north of village of Fairfield about 1½ miles north of railroad station Fairfield (on the Chicago & Canada Southern R. R.), on slight rise of ground near northeast corner of sec. 3, T. 8 S., R. 3 E., Fairfield Township. Mark is small drill hole in top of stone post, 2½ feet below surface of ground, with another stone post directly above as surface mark. Reference marks are stone posts with letters "U. S." cut on tops, at following distances and bearings from station: 21.5 meters (71 feet), N. 81°01′ E.; and 36.0 meters (118 feet), N. 86°25′ W. *Lenawee County: NE. corner of sec. 3, T. 8 S., R. 3 E.* (*U. S. L. S.*) marked with stone post with letters "U. S." cut on top, 3 inches below surface of ground, is 203.0 meters (666 feet) from station on bearing N. 51°44′ E. In 1935 this station was reported lost.

Plane coordinates: (E), $x=397,293.20$ feet; $y=115,208.84$ feet.

Raisin (U. S. L. S.) (Lenawee County, U. S. Lake Survey, 1879; J. S. Bilby, 1935).—About 6 miles northeast of Adrian, 4 miles south of Tecumseh, in sec. 14, T. 6 S., R. 4 E., Raisin Township. Marked by small drill hole in top of stone post 2½ feet below surface of ground, with stone post directly above as surface mark. Reference marks are stone posts with letters "U. S." cut in tops at following distances and bearings from station: 172.9 meters (567 feet), N. 35°41′ W.; and 127.7 meters (419 feet), S. 49°54′ W. *Lenawee County; corner of secs. 14, 15, 22, 23, T. 6 S., R. 4 E.* (*U. S. L. S.*) marked with stone post with letters "U. S." cut on top, 3 inches below surface of ground, is 454.8 meters (1,492 feet) from station on bearing S. 12°04′ W. In 1935 underground mark and two reference marks recovered, and station further described as being about 11.8 miles by road northwest of Blissfield, 8.1 miles by road northeast of Adrian, on property owned and occupied by Charles W. Frick, on northern one of two knolls in hayfield, about 200 paces north by east from Mr. Frick's house. Underground mark is stone post with drill

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hole in top 11 inches below surface of ground. Broken pieces of crockery were mixed with dirt around station to aid in its future recovery. Southwest reference mark is 3 inches below surface, 1.2 feet east of fence post at southwest corner of field and northwest corner of Mr. Frick's garden, 7 paces east of center line of north-south gravel road, and 50 paces northwest of Mr. Frick's house. Northwest reference mark is 2 inches below surface, in east-west fence line at northwest corner of field, 5.2 feet east of north-south road fence, and about 8 paces east of center line of gravel road. In 1935 station reached from Blissfield by going west on U. S. Highway 223 about 0.5 mile from traffic light to macadam road to right (north); thence north on macadam road 6.9 miles to east-west macadam road at gas station; thence west (left) on macadam road 3.0 miles to gravel road north (0.5 mile west of Holloway); thence north (right) 1.3 miles to Mr. Frick's house and station. Stone post marking section corner (above) not recovered in 1935.

Plane coordinates: (E), $x=429,766.30$ feet; $y=165,230.85$ feet.

Blissfield (U. S. L. S.) (Lenawee County, U. S. Lake Survey, 1879).—About 3 miles southwest of Deerfield, about 3 miles northeast of Blissfield, in sec. 22, T. 7 S., R. 5 E., Blissfield Township. Marked by stone post 3 feet below surface of ground with another stone post directly above as surface mark. Reference marks are stone posts at following distances and bearings from station: On east side of road, 39.0 meters (128 feet), N. 45°11′ E.; on west side of road, 10.86 meters (35.6 feet), N. 83°25′ E.; and on west side of road, 37.0 meters (121 feet), S. 21°01′ E. *Lenawee County: corner of secs. 22, 23, 26, 27, T. 7 S., R. 5 E.* (*U. S. L. S.*) is 351.4 meters (1,153 feet) from station bearing S. 3°35′ E. In 1935 this station was reported lost.

Plane coordinates: (E), $x=461,613.49$ feet; $y=128,403.78$ feet.

Dundee (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1879).—About 2½ miles from Dundee, about 2½ miles from Petersburg, on northwest side of road between Petersburg and Dundee, within few meters of line (Dundee and Summerfield Townships line) between sections 25 and 36, T. 6 S., R. 6 E. Marked by stone posts. Reference marks are stone posts at following distances and bearings from station: On northwest side of road, 22.4 meters (73 feet), N. 76°51′ E.; on northwest side of road, 17.55 meters (57.6 feet), S. 4°49′ E.; and on southeast side of road, 34.05 meters (111.7 feet), S. 18°53′ E. *Monroe County, Mich.: Corner of secs. 25, 26, 35, 36, T. 6 S., R. 6 E.* (*U. S. L. S.*) is 110.25 meters (361.7 feet) from station on bearing N. 87°32′ W. In 1935 this station was reported lost.

Plane coordinates: (E), $x=498,994.09$ feet; $y=154,658.78$ feet.

Bedford (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1879).—In sec. 5, T. 8 W., R. 7 E., Bedford Township, about 250 meters (820 feet) south of north quarter-section corner of section 5. Marked by small drill hole in top of stone post 2½ feet below surface of ground, with another stone post directly above as surface mark. Reference marks are stone posts at following distances and bearings from station: 32.8 meters (108 feet), S. 30°17′ E.; 33.0 meters (108 feet), S. 49°44′ W.; and 41.0 meters (135 feet), N. 39°12′ W. *Monroe County, Mich.: NE. corner of sec. 5, T. 8 S., R. 7 E.* (*U. S. L. S.*), is 823.2 meters (2,701 feet) from station on bearing N. 80°00′ E. In 1935 this station was reported lost.

Plane coordinates: (E), $x=513,211.82$ feet; $y=116,510.50$ feet.

Monroe (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1879).—About 4 miles west of Monroe, in Monroe Township, in cemetery of Monroe County poor farm, 34.6 meters (114 feet) from center of road between Raisinville and Monroe Townships. Marked by small drill hole in stone post 3 feet below surface of ground, with another stone post directly above as surface mark. Reference marks are stone posts in corners of cemetery lot and at following distances and bearings from station: 42.0 meters (138 feet), N. 13°32′ W.; 20.0 meters (66 feet), S. 5°22′ E.; and 31.4 meters (103 feet), S. 73°36′ W. *Monroe County, Mich.: SW. corner of private claim No. 432* (*U. S. L. S.*) is 745.3 meters (2,445 feet) from station on bearing S. 25°07′ W.

Plane coordinates: (E), $x=553,257.75$ feet; $y=152,334.33$ feet.

Cedar Point (U. S. L. S.) (Lucas County, Ohio, U. S. Lake Survey, 1877; 1879).—Near end of Cedar Point, on east side of Maumee Bay. Marked by stone posts. Upper post projects about 6 inches above ground. Reference marks are stone posts at following distances and bearings from station: 28.8 meters (94 feet), S. 61°05′ E.; 30.2 meters (99 feet), N. 61°00′ E.; and 35.5 meters (116 feet), N. 13°28′ E. In 1932 reported that station is probably destroyed.

Plane coordinates: (E), $x=590,557.66$ feet; $y=76,865.85$ feet.

Stony Point (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1877; 1879).—On end of Stony Point, a point projecting into western end of Lake Erie. Marked

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by drill hole in stone post below surface of ground, with another stone post directly above as surface mark. Reference marks are stone posts at following distances and bearings from station: 22.5 meters (74 feet), S. 15°03′ W.; 5.7 meters (19 feet), S. 84°14′ W.; and 16.7 meters (55 feet), N. 25°03′ W.

Plane coordinates: (E), $x=609,545.69$ feet; $y=157,525.52$ feet.

Supplementary points

Airway Beacon No. 6 (Laporte County, Ind., H. C. Warwick, 1932).—A 24-inch rotating beacon on 50-foot tower, located in northwest section of Stillwell, in sec. 23, T. 36 N., R. 2 W. In spring of 1932 the number of this beacon was changed from No. 7 to No. 6.

Plane coordinates:[1] (C), $x=265,757$ feet; $y=21,752$ feet.

Carlisle (U. S. L. S.) latitude station (St. Joseph County, Ind., W. Bowie, 1908).—About 14 miles west of South Bend, about 2 miles south of New Carlisle (station on the New York Central Railroad), in SE¼ sec. 11, T. 37 N., R. 1 W., Olive Township, about 1 mile from corner of common to sections 2, 3, 10, and 11 on bearing S. 39°10′ E., on proving grounds of the Studebaker Co., and on hill known as Studebaker Hill. Marked by wooden pier. Station is 12.63 meters (41.4 feet) or 0″.41 south and 22.86 meters (75.0 feet) east of station *Carlisle U. S. L. S.*).

Plane coordinates:[1] (C), $x=296,822$ feet; $y=62,066$ feet.

South Bend, Bendix Corporation, center of neon sign (St. Joseph County, Ind., H. C. Warwick, 1932).—Plane coordinates: (C), $x=350,610.10$ feet; $y=67,360.46$ feet.

South Bend, Bendix Corporation, stack (St. Joseph County, Ind., H. C. Warwick, 1932).—Plane coordinates: (C), $x=352,066.54$ feet; $y=66,090.14$ feet.

South Bend, Studebaker Corporation, slowly revolving light on tank (St. Joseph County, Ind., H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=362,008$ feet; $y=61,765$ feet.

South Bend, Notre Dame University, Administration Building, tip of gold dome (St. Joseph County, Ind., H. C. Warwick, 1932; 1935).—Plane coordinates: (C), $x=366,479.79$ feet; $y=74,334.82$ feet.

South Bend, Notre Dame University, Sacred Heart Church, tip of steeple (St. Joseph County, Ind., H. C. Warwick, 1932).—Plane coordinates: (C), $x=366,278.05$ feet; $y=74,071.80$ feet.

Sherman (U. S. L. S.) latitude station (St. Joseph County, W. Bowie, 1908).—Three and three-quarters miles north-northwest of Sturgis, in NE¼ sec. 22, T. 7 S., R. 10 W., Sherman Township, on high ground on land of Mrs. George Mahle. Marked by stone post, 35.351 meters (115.08 feet) in azimuth 329°51′ or 0″.99 of latitude south of station *Sherman* (*U. S. L. S.*).

Plane coordinates:[1] (C), $x=580,898$ feet; $y=126,395$ feet.

INDIANA-OHIO BOUNDARY

Principal points

Shaull (Williams County, Ohio, H. C. Warwick, 1932).—About 1 mile east and 2 miles south of Montpelier, near Wisman schoolhouse (school district No. 2) which is in southeast corner sec. 14, T. 7 N., R. 2 E., and on land owned by Louis Shaull, city marshal of Montpelier. To reach from southeast part of Montpelier, cross viaduct over railroad tracks, go south 0.2 mile, turn east 0.2 mile, turn south 0.3 mile, turn east 0.4 mile, and south 1 mile to station site. Station is 249 feet north of center line of east-and-west gravel road, 26 feet west of center line of north-and-south gravel road, and 124.8 feet northeast of northeast corner of concrete foundation under Wisman schoolhouse. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 8 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, and is on gentle slope to south, 20 feet east of center line of north-and-south gravel road, 1 foot west of west property-line fence of section 13, about 30 yards south of crest of small rise to north, and 126.80 feet from station in azimuth 200°11′. No. 2 projects 4 inches, and is 20 feet east of north-and-south gravel road, 1 foot west of property-line fence, 96 feet north of 8-inch hexagonal concrete corner post, and 141.35 feet (slope) from station in azimuth 341°26′. Azimuth mark projects 6 inches, and

[1] No check on this position.

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is on small rise of ground, 20 feet north of center line of gravel road which extends along south boundary of section 14, 4 feet east of 8-inch maple tree, 89 feet east of extension of north-and-south fence line on south side of road, and approximately 0.35 mile from station in azimuth 83°07′07″. Azimuth from station to *Airway beacon No. 17* is 256°58′37″.

Plane coordinates: (E), $x=246,198.60$ feet; $y=22,530.35$ feet; grid azimuth to azimuth mark=83°44′02″.* (C), $x=816,366.61$ feet; $y=23,284.43$ feet; grid azimuth to azimuth mark=82°21′06″.*

Alvarado (Steuben County, Ind., H. C. Warwick, 1932).—About 2 miles north and 5 miles east of Hamilton, about 1 mile east and ¾ mile south of Alvarado, about 2.5 miles west and 0.5 mile north of Edon, Ohio, on west side SW¼ sec. 21, T. 36 N., R. 15 E., and on land owned by Albert Russell. To reach from Edon, Ohio, go north from center of town 1.0 mile on Ohio Route 49, go west on gravel road 2.4 miles, and go south 0.5 mile to Russell farmhouse and station site. Station is 126 feet south by west of southwest corner of white farmhouse, on west edge of cultivated field, 0.3 mile north of east-and-west road, 0.5 mile south of another east-and-west road, 27.5 feet east of center line of north-and-south road, and 77.5 feet south of driveway leading east to farm. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is 1 foot north of fence line paralleling driveway, 10 feet south of driveway, 71 feet southeast of southwest corner of farmhouse, 48.2 feet southwest of southeast corner of farmhouse, 110 feet east of center line of north-and-south road, and 107.57 feet from station in azimuth 228°49′. No. 2 projects 6 inches, and is due west of driveway leading to Russell's farm, 19 feet west of center line of road, 1 foot west of fence line paralleling road, 107.3 feet bearing S. 80° W. from southwest corner of farmhouse, and 93.72 feet from station in azimuth 149°18′. Azimuth mark projects 5 inches, and is 26 feet north of center line of east-and-west gravel road, 15 feet west of telephone pole, 350 feet east of road intersection, on edge of cultivated field, and approximately 0.4 mile from station in azimuth 346°25′27″. *Airway beacon No. 15* is about 2.5 miles from station in azimuth 267°00′53″.

Plane coordinates: (C), $x=755,337.18$ feet; $y=24,710.03$ feet; grid azimuth to azimuth mark=345°48′18″.* (E), $x=185,219.33$ feet; $y=25,427.91$ feet; grid azimuth to azimuth mark=347°11′15″.*

Dury (Hillsdale County, H. C. Warwick, 1932).—About 8.5 miles north of Montpelier, Ohio, on land owned by Eaton Hukill, and on east side of north-and-south dirt road opposite farmhouse occupied by Will Dury. To reach from Montpelier, go north 3.7 miles on U. S. Route 20–S to junction with U. S. Route 20–N, and take gravel road to north 4.2 miles to station site. Station is 0.25 mile south of Hillsdale County Road No. 300, 88.7 feet bearing N. 75° E. from northwest corner of Dury's house, 1 foot west of fence line paralleling road, and 21.5 feet east of center line of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is in north-and-south fence line along road, 21 feet east of center line of road, and 81.60 feet from station in azimuth 179°53′. No. 2 projects 4 inches, and is near northwest corner of garden just north of Dury's house, 10 feet south of northwest corner of garden, 1 foot west of fence line, 30 feet east of round farm building, 88 feet east by south of southeast corner of barn, 95 feet northwest of northwest corner of house, 23 feet south of center of driveway leading to barn, and 180.60 feet from station in azimuth 93°22′. Azimuth mark projects 6 inches, and is about 0.2 mile east of T-road leading south to station, near northeast corner of cultivated field, 28.5 feet south of center of county highway No. 300, 21.5 feet west of oak tree about 2.5 feet in diameter, 11.7 feet west of northeast corner of field, 1 foot north of fence line along road, and approximately 0.4 mile from station in azimuth 219°08′43″. *Ohio-Michigan boundary monument No. 9* is 357.918 meters (1,174.27 feet) from station in azimuth 359°50′06″.

Plane coordinates: (E), $x=241,888.92$ feet; $y=75,943.08$ feet; grid azimuth to azimuth mark=219°46′27″.* (C), $x=810,767.98$ feet; $y=76,577.66$ feet; grid azimuth to azimuth mark=218°23′17″.*

Watts (Steuben County, Ind., H. C. Warwick, 1932).—About 10 miles east and 4½ miles north of Angola, 6 miles east and 2 miles south of Fremont, 0.7 mile north and 0.5 mile east of York, in sec. 33, T. 38 N., R. 15 E., on property line between Parker Watts on east and Ervin Hautz on west, about 0.5 mile west of

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Indiana–Ohio State line, and about same distance south of northwest corner of Ohio. To reach from south, go to U. S. Route 20 and follow to gravel road which is 1.1 miles west of Ohio-Indiana State line and leads north at filling station north of road and just south of abandoned brick school; follow this road north 5.8 miles to crossroads called York, continue north from Shook's grocery store 0.7 mile to Mr. Hautz's house, turn east through barn lot, and continue east along fence line 0.4 mile to station site. Station is 1 foot east of north-and-south fence line (third east of road at Hautz's house), 20 feet north of 10-inch wild-cherry tree, 30 feet north of fence corner, and 70 feet northeast of center of large mound of stones in cultivated field. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is in prolongation of east-and-west fence, just over brow of round knoll northwest of station, and 486.70 feet from station in azimuth 108°11′33″. No. 2 is 1 foot east of north-and-south fence, just over edge of slope north of station, and 86.90 feet from station in azimuth 180°50′. Azimuth mark is in fence line east of road on Mr. Hautz's property, approximately east of fence corner on west side of road, 0.5 mile north of Shook's grocery at York crossroads, and approximately 0.5 mile from station in azimuth 75°47′08″. *Ohio-Michigan boundary monument No. 1* is 507.244 meters (1,664.18 feet) from station in azimuth 291°19′29″.

Plane coordinates: (E), x=187,317.75 feet; y=74,126.99 feet; grid azimuth to azimuth mark=76°32′51″.* (C), x=756,258.59 feet; y=73,442.09 feet; grid azimuth to azimuth mark=75°09′41″.*

Supplementary points

Airway beacon No. 14 (Steuben County, Ind., H. C. Warwick, 1932).—A 24-inch rotating beacon on 75-foot tower, 1 mile southeast of Pleasant Lake. In spring of 1932 the number of this beacon was changed from No. 15 to No. 14.

Plane coordinates: (C), x=706,303.05 feet; y=22,450.64 feet. (E), x=136,139.83 feet; y=24,352.02 feet.

Airway beacon No. 15 (Williams County, Ohio, H. C. Warwick, 1932).—A 24-inch rotating beacon on 75-foot tower, ½ mile north of Edon, in sec. 16, T. 7 N., R. 1 E. In spring of 1932 the number of this beacon was changed from No. 16 to No. 15.

Plane coordinates: (E), x=198,381.67 feet; y=25,938.61 feet. (C), x=768,482.56 feet; y=25,538.08 feet.

Airway beacon No. 17 (Williams County, Ohio, H. C. Warwick, 1932).—A 24-inch rotating beacon on 51-foot tower, about 2½ miles east southeast of Montpelier, in sec. 17, T. 7 N., R. 3 E.

Plane coordinates:[1] (E), x=256,796 feet; y=24,862 feet. (C), x=826,905 feet; y=25,871 feet.

Ohio-Michigan boundary monument No. 1 (Williams County, Ohio; Hillsdale County, Mich., H. C. Warwick, 1932).—About 1 mile east and ¾ mile north of York, on Ohio-Michigan boundary. To reach from York crossroads, go east 1 mile on gravel road, turn left (north), proceed 0.5 mile to dirt road leading straight north, and continue 0.25 mile on dirt road to monument at bottom of slope, between road and fence. Marked by 10-inch square granite post projecting 20 inches, and marked: Top, "No. 1"; south, "Ohio"; north, "Mich."; and west, "Ind. line 20 feet." Station *Watts* (see description thereof) is 507.244 meters, (1,664.18 feet) from station in azimuth 111°19′44″.

Plane coordinates: (E), x=188,859.87 feet; y=73,501.16 feet; grid azimuth to station *Watts*=112°05′12″.** (C), x=757,815.31 feet; y=72,853.79 feet; grid azimuth to station *Watts*=110°42′03″.**

Ohio-Michigan boundary monument No. 9 (Williams County, Ohio; Hillsdale County, Mich., H. C. Warwick, 1932).—About 8.4 miles due north of Montpelier, on Ohio-Michigan boundary, 20.5 feet east of center line of road, and 3 feet west of fence paralleling road. Marked by 8 by 10-inch granite post projecting about 2 feet, and marked: Top, "No. 9"; north, "Mich."; and south "Ohio." Station *Dury* (see description thereof) is 357.918 meters (1,174.27 feet) from station in azimuth 179°50′06″.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.
** This azimuth has been computed by the first formula (p. 171), using both terms.
[1] No check on this position.

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Plane coordinates: (E), $x=241,879.45$ feet; $y=74,768.86$ feet.

Montpelier, municipal power plant, brick stack (Williams County, Ohio, H. C. Warwick, 1932).—Plane coordinates: (E), $x=242,280.10$ feet; $y=30,703.12$ feet. (C), $x=812,252.07$ feet; $y=31,360.31$ feet.

Reading, municipal water tank, finial (Hillsdale County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=205,300$ feet; $y=126,784$ feet. (C), $x=772,959$ feet; $y=126,516$ feet.

Reading eccentric (Hillsdale County, H. C. Warwick, 1932).—At Reading, in sec. 26, T. 7 S., R. 4 W., on grounds of Acme Chair Co., 75 feet east of east edge of main factory building, about 14 feet west of small frame building used as storehouse for odd equipment and 39 feet west of center line of driveway. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Station disks are stamped "U. S. L. S. Reading Ecc., 1878, 1932." Upper mark is flush with surface of ground. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 4 inches above ground. No. 1 is at southeast corner of large black tin building belonging to Acme Chair Co., and 214.35 feet from station in azimuth 197°28′. No. 2, destroyed in 1934, was on east bank of large ditch which parallels main factory building, 32 feet east of main building, 75 feet north of water tank, 75 feet south of red building, and 86.80 feet from station in azimuth 123°28′. Azimuth mark is 1 foot west of north-and-south fence line, 25 feet south of east-and-west fence line, and approximately 0.2 mile from station in azimuth 211°55′48″. Azimuth from station to *Reading, Acme Chair Co., red tank*, 53.1 feet distant, is 16°37′. Station *Reading* (*U. S. L. S.*) (see description thereof) is 9.671 meters (31.73 feet) from station in azimuth 69°07′.

Plane coordinates: (E), $x=207,003.16$ feet; $y=123,904.19$ feet; grid azimuth to azimuth mark=212°38′50″.* (C), $x=774,731.60$ feet; $y=123,678.59$ feet; grid azimuth to azimuth mark=211°15′27″.*

Reading, Acme Chair Co., red tank (Hillsdale County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=206,987.38$ feet; $y=123,853.57$ feet. (C), $x=774,717.07$ feet; $y=123,627.61$ feet.

LAKE ERIE TO LAKE ST. CLAIR

Principal points

Middle Sister (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1877; 1911).—On Middle Sister Island, near western end of Lake Erie, about 150 meters (492 feet) north of south end of island, and 15 meters (49 feet) from lake shore. Marked by nail leaded in solid rock, 1 or 2 feet below surface of ground. Reference marks are stone posts at following distances and bearings from station: 21.9 meters (72 feet), S. 39°57′ W.; 32.8 meters (108 feet), N. 33°49′ E.; and 21.9 meters (72 feet), S. 43°23′ E.

Plane coordinates: (E), $x=681,098.69$ feet; $y=127,520.39$ feet.

Point Pelé (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1877; 1911).—On northwest point of Point Pelee Island, in west end of Lake Erie, in grove about 210 meters (689 feet) south of lake shore, and 194.8 meters (639 feet) N. 53°36′ E. (magnetic) from east corner of stone house. Underground mark is drill hole in brass bolt which is leaded into solid limestone rock, 19 inches below surface of ground, and marked with letters "U. S." Surface mark is stone post. Reference marks are stone posts at following distances and bearings (magnetic) from station: 61.7 meters (202 feet), N. 22°44′ E.; 35.9 meters (118 feet), S. 80°12′ E.; and 31.5 meters (103 feet), S. 44°47′ W.

Plane coordinates: (E), $x=767,917.91$ feet; $y=115,971.71$ feet.

Middle Bass Island (U. S. L. S.) (Ottawa County, Ohio, U. S. Lake Survey, 1877; W. Mussetter, 1928).—On Middle Bass Island, in western end of Lake Erie, about 650 meters (2,133 feet) from east end of island, and about 4 feet from rocky beach, on land owned by Mr. Payer, and about ¼ mile west of his summer residence. Marked by nail leaded into solid rock, about 2½ feet below surface of ground. In 1910, concrete monument marked "U. S. L. S. 1877–1910" was placed over underground mark, and top was reported projecting above ground. In 1928, surface mark was reported broken off and lost. Reference marks are stone posts at following distances and bearings from station: 17.54 meters (57.5

[1] No check on this position.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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feet), N. 79°26′ E.; and 23.16 meters (75 feet), S. 81°06′ W. Station Middle Bass 2 is visible from ground at station. U. S. Lake Survey records also call this station "Middle Bass."

Plane coordinates: (E), $x=740,142.09$ feet; $y=72,866.36$ feet.

Locust Point (U. S. L. S.) (Ottawa County, Ohio, U. S. Lake Survey, 1877).—On Locust Point, about 10 meters (33 feet) from south shore of Lake Erie. Marked by stone post, 3 feet below surface of ground. Reference marks are stone posts at following distances and bearings from station: 45.0 meters (148 feet), S. 64°41′ E.; 24.3 meters (80 feet), S. 18°26′ W.; and 24.3 meters (80 feet), N. 86°30′ W. In 1932 station reported destroyed.

Plane coordinates: (E), $x=653,377.37$ feet; $y=42,479.91$ feet.

Mettawas (U. S. L. S.) (Essex District, Ontario, Canada, 1910).—In village of Kingsville, in Mettawas Park. Surface and underground marks are iron spikes surrounded by three other spikes in concrete monuments marked "U. S. L. S. 1910." Upper mark projects 8 inches above ground; underground mark is 14 inches below surface. Azimuth from station to old station Kingsville, under band stand and 67.71 feet distant, is 78°57′40″.

Plane coordinates: (E), $x=752,086.25$ feet; $y=193,290.62$ feet.

Colchester (U. S. L. S.) (Essex District, Ontario, Canada, 1910).—About 2 miles by road southwest of village of Harrow, on farm of Abner Ferriss, on stony knoll in wood lot at back of farm, and about 100 feet from north and west fences. Surface and underground marks are spikes surrounded by three other spikes in concrete monuments marked "U. S. L. S. 1910." Upper mark projects 12 inches above ground; underground mark is 12 inches below surface of ground.

Plane coordinates: (E), $x=698,555.21$ feet; $y=186,567.21$ feet.

Miner (U. S. L. S.) (Essex District, Ontario, Canada, 1910).—About 3 miles north of village of Kingsville, on farm of John Miner, about 60 feet from his west line and 600 feet from east-and-west road. Mark is spike in concrete monument marked "U. S. L. S. 1910" and projecting 10 inches above ground.

Plane coordinates: (E), $x=748,557.54$ feet; $y=211,107.09$ feet.

Cottam (U. S. L. S.) (Essex District, Ontario, Canada, 1909).—About 2 miles north of village of Cottam, about ¼ mile east of church at road corners, and 101.4 feet from road fence. Surface and underground marks are ⅜-inch bolts surrounded by three spikes in concrete monuments marked "U. S. L. S. 1909." Upper mark projects 8 inches above ground; underground mark is 12 inches below surface of ground. Following azimuths are from station: West culvert wing wall, southwest corner, distant 235.2 feet, 120°41′; schoolhouse cupola, 335°18′; frame church, east peak, 262°49′; 10-inch oak, distant 76.0 feet, 107°00′; 14-inch oak, distant 96.7 feet, 354°21′; large red brick house, southeast corner of eaves, 205°06′; and another large red brick house, northwest corner of eaves, 200°35′.

Plane coordinates: (E), $x=754,143.41$ feet; $y=238,915.89$ feet.

Maidstone (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1909).—About 2¼ miles southeast of village of Maidstone, on farm of John O'Connell, 190 feet from his north line, 70 feet in wood lot from north-and-south field fence, and about 1,200 feet from road. Surface and underground marks are large spikes surrounded by three other spikes in concrete monuments marked "U. S. L. S. 1909." Upper mark projects 8 inches above ground; underground mark is 12 inches below surface of ground.

Plane coordinates: (E), $x=702,024.19$ feet; $y=254,857.23$ feet.

Deerbrook (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1909; H. C. Warwick, 1932).—About 3 miles east of Belle River, in village of Deerbrook, in cultivated field, 150 yards west of steel highway bridge (which is about 20 yards east of gravel T-road to south), 69 feet south of center line of east-and-west gravel road, about 105 feet south of small white house, and (1910) on school lot (orchard) across road from hotel. To reach from Belle River post office, go east on paved highway 1.2 miles to T-intersection; turn left, go 0.2 mile; turn right, and go 2.0 miles to station site. Original surface and underground marks were ⅜-inch bolts surrounded by three spikes in concrete monuments marked "U. S. L. S. 1909." In 1932 underground mark was recovered in good condition and re-marked with standard station disk stamped "Deerbrook USLS 1909–1932." New surface mark is standard station disk, similarly stamped, in concrete monument, note 1a, and is below surface of ground. Reference mark No. 1, standard reference disk in concrete, note 11a, stamped with name and dates, and projecting 3 inches above ground, is 2 feet south of north right-of-way fence of road, 18 feet north of center line of road, 6 feet west of telephone pole, 25 feet southwest of southwest corner of green asbestos shingle house, about 18

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yards west of abandoned gas pump, and 124.68 feet from station in azimuth 242°33′. Reference mark No. 2, Geodetic Survey of Canada monument, 12 inches square at top, 24 inches square at base, and tip (pyramidal point) projecting about 18 inches, is 6 feet west of telephone pole, 7 feet north of south right-of-way fence of road mentioned above, 27 feet south of center line of road, about 40 yards south of old barn with two lightning rods on top, and 160.52 feet from station in azimuth 120°52′. Azimuth mark, standard reference disk in concrete, note 11a, stamped with names and dates, and projecting 6 inches, is 20 feet south of center line of road, 5 feet north of south right-of-way fence, 10 feet east of telephone pole, and approximately 0.2 mile from station in azimuth 110°59′05″. Following azimuth, are from station (in 1910): Northeast corner of orchard, 158°20′; west gate post, 218°00′; southwest corner of orchard, 348°46′; northwest corner of orchard road, 25°55′; northwest corner of hotel, 132°25′; southwest corner of hotel, 145°39′; southeast corner of east barn, 123°07′; and northwest corner of large barn, 275°53′.

Plane coordinates: (E), x=781,606.09 feet; y=291,063.18 feet; grid azimuth to azimuth mark=110°17′03″.*

Tecumseh (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey 1910; 1934).—On shore of Lake St. Clair, in East Sandwich Township, ⅛ mile east of point where electric railroad line turns south to village of Tecumseh, 38.85 feet north of north side of concrete walk at east side of driveway, 56.4 feet northeast of intersection of lot line with north side of walk, 43.3 feet east-northeast of 8-inch maple, and 57.2 feet southeast of 8-inch maple. Probably marked by bolt in concrete monument. In 1934 it was reported that station was under building.

Plane coordinates: (E), x=710,243.10 feet; y=304,261.42 feet.

Walpole (U. S. L. S.) (Kent District, Ontario, Canada, U. S. Lake Survey, 1909; H. C. Warwick, 1932).—On Walpole Island, about 4.4 miles south of post office and customhouse at north end of island, ¾ mile east of Blind Channel, at south edge of timber on island, 141.5 feet south of 24-inch oak tree which is 6 feet east of another of same size (both in south edge of woods), between main body of woods and small detached group of trees about 80 yards to south, and 85 feet west-southwest of northerly one and 129 feet west of southerly one of two lone 20-inch oak trees. To reach from Algonac, ride ferry to Walpole Island Customhouse, go south 0.3 mile along St. Clair River, continue along beach 1.1 miles, continue along edge of marsh 0.8 mile, bear left along fence line, go 0.5 mile to fork, follow right fork 1.55 miles to dim road leading toward small group of detached trees to left, follow dim road about 0.1 mile to point where two lone 20-inch oak trees (mentioned above) are visible in gap between main body of woods and small detached group, and then to station site. Original surface and underground marks were ⅜-inch bolts surrounded by 3 spikes in concrete monuments marked "U. S. L. S. 1909." Underground mark was 12 inches below surface. In 1932 surface mark was replaced by standard station disk in concrete, note 1a, and two reference marks and azimuth mark were set, standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is north of small detached group of trees, and 91.43 feet from station in azimuth 77°58′. No. 2 projects 3 inches, is 50 feet south of 24-inch oak tree (mentioned above), and 90.29 feet from station in azimuth 172°24′. Azimuth mark projects 8 inches, is 264.3 feet south-southwest of 20-inch oak tree at southwest corner of woods, and approximately 0.3 mile from station in azimuth 91°53′15″. Azimuth from station to midchannel light, main channel, is 82°03′43″.

Plane coordinates: (E), x=806,263.95 feet; y=387,203.09 feet; grid azimuth to azimuth mark=91°07′07″.*

Mount Clemens (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909; H. C. Warwick, 1932).—About 4 miles east of Mount Clemens, 1¾ miles northeast by east of Lakeside station on Shore Line Electric Railroad, on land owned in 1909 by Amiel Malece, and reported in 1932 as being under house, 3.8 meters (12 feet) west and 0.68 meter (2.2 feet) south of northeast corner. Surface and underground marks are ⅜-inch bolts surrounded by 3 spikes in concrete monuments marked "U. S. L. S. 1909." Upper mark projects 8 inches above ground; underground mark is 12 inches below surface of ground. Following azimuths are from station (1909): Red barn, cupola, 183°50′10″; Lakeside Inn, 67°57′40″; blazed 24-inch tree, 19.3 feet distant, 306°29′; and blazed 30-inch tree, 20.7 feet

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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distant, 121°43′. Station *Mount Clemens eccentric* is 16.552 meters (54.30 feet) from station in azimuth 120°10′00″.

Plane coordinates: (E), x=730,342.13 feet; y=392,487.75 feet; grid azimuth to red barn cupola=183°15′27″.*

Supplementary points

Green Island Lighthouse, (U. S. L. S.) (Ottawa County, Ohio, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=718,401 feet; y=54,039 feet.

Middle Island Lighthouse (U. S. L. S.) (Ottawa County, Ohio, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=769,565 feet; y=68,361 feet.

South Bass Island Lighthouse (U. S. L. S.) (Ottawa County, Ohio, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=725,562 feet; y=48,072 feet.

Pelée Island Lighthouse (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=780,017.38 feet; y=122,597.94 feet.

Pelée Passage Lighthouse (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=795,193.24 feet; y=130,223.28 feet.

Colchester Reef Lighthouse (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=710,767.42 feet; y=158,481.19 feet.

West Sister Lighthouse (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=651,753.43 feet; y=86,832.98 feet.

Bar Point (U. S L. S.) (Essex District Ontario, Canada, U. S. Lake Survey 1910).—Plane coordinates: (E), x=649,462.36 feet; y=202,695.56 feet.

Pointe Mouillée (U. S. L. S.) (Monroe County, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=632,090.63 feet; y=187,601.80 feet.

Kingsville, power house stack (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=753,592.90 feet; y=194,124.05 feet.

Leamington Lighthouse (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=788,919 feet; y=195,014 feet.

Stony Point Catholic Church (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates: (E), x=802,789.15 feet; y=295,087.98 feet.

Belle River, Catholic Church (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=760,039 feet; y=289,982 feet.

Thames River rear range light (U. S. L. S.) (Essex District, Ontario, Canada, U. S. Lake Survey, 1910).—Plane coordinates:[1] (E), x=828,149 feet; y=300,198 feet.

Mount Clemens, Catholic Church (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909).—Plane coordinates: (E), x=712,115.90 feet; y=401,845.83 feet.

Colony Tower Lighthouse (Macomb County, H. C. Warwick, 1932).—Plane coordinates: (E), x=782,812.77 feet; y=414,247.86 feet.

New Baltimore, standpipe (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=750,490 feet; y=430,655 feet.

New Baltimore, Catholic Church (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=750,112 feet; y=430,959 feet.

Richmond, standpipe (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=744,789 feet; y=479,073 feet.

LAKE ST. CLAIR TO THUNDER BAY

Principal points

Lenox (U. S. L. S.) (Macomb County, U. S. Lake Survey, 1909; 1932).—About 0.9 mile west of Memphis Ridge Road, on north side of Clay Road, in cultivated field on farm of Arthur Krause, in southwest corner of SE¼SE¼ sec. 22, T. 5 N., R. 14 E., Richmond Township, 444 feet from southeast corner of farmhouse, 364 feet from 24-inch elm tree, 38.3 feet north of section line, 20.4 feet north of east-and-west fence, and 81 feet east of north-and-south fence. Marked

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

[1] *No check on this position.*

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by ⅜-inch bolt surrounded by 3 spikes in concrete monument inscribed "U. S. L. S. 1909," 18 inches below surface of ground. Following distances and azimuths are from station (in 1909): Concrete reference mark, 20.6 feet, 140°43′; concrete reference mark, 23.2 feet, 226°26′; 18-inch oak tree, 212 feet, 185°09′; southeast corner of small house, 558 feet, 284°03′; well and windmill, 584 feet, 276°50′; northeast corner of barn, 600 feet, 274°52′; 6-inch elm tree, 31.0 feet, 235°22′; and 6-inch elm tree, 28.3 feet, 125°06′.

Plane coordinates: (E), x=737,963.26 feet; y=483,564.34 feet.

Casco (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909; 1932).—About 12 miles southwest of St. Clair, near center of E½ NW¼ NW¼ sec. 1, T. 3 N., R. 15 E., Ira Township, on south side of Marine City Highway, 0.2 mile east of Palms Road, on farm of Otto Schirmer, in southwest corner of orchard, 498 feet from southwest corner of house, 363 feet from southeast corner of barn, 8 feet from north-and-south fence, and 25 feet from fence corner. Marked by ⅜-inch bolt surrounded by 3 spikes in concrete monuments inscribed "U. S. L. S. 1909," underground mark being 12 inches below surface of ground. In 1932 underground mark only recovered. Following distances and azimuths are from station (in 1909): Northeast corner of field, 372 feet, 91°12′; southeast corner of field, 648 feet, 145°02′; southwest corner of field, 648 feet; northwest corner of field, 267 feet, 271°20′; J. Zentgraber's barn, cupola, 233°15′; William Schmidt's house, end of south gable, 287°07′; southwest corner of house, 645 feet, 344°56′; Schroeder's windmill, 334°12′; 16-inch elm tree, 428 feet, 107°11′; and southeast corner of barn, 477 feet, 336°31′.

Plane coordinates: (E), x=779,376.81 feet; y=447,232.33 feet.

St. Clair (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909; 1932).—In city of St. Clair, on hill north of Pine River, on west side of main highway, on lot belonging to James M. Cleland, 45 feet from fence on north side of lot, 156 feet from northwest corner of William Dale's house, 27 feet from 16-inch maple tree, 55 feet from 16-inch elm tree, and 27.0 feet from 18-inch pear tree. Marked by ⅜-inch bolt surrounded by 3 spikes in concrete monument, inscribed "U. S. L. S. 1909," 12 inches below surface of ground. In 1932 station reported also marked by surface mark projecting 6 inches above ground. Following distances and azimuths are from station (in 1909): Charles Parson's house, northeast corner, 265°50′; A. W. Collins' house, northwest corner, 156 feet, 253°48′; north line of fence lot, 44.7 feet, 0°00′; Hugel's (or Cleland's) house, northwest corner, 135 feet, 144°02′; Ed Beyschlag's barn, northeast corner, 81 feet, 192°38′; 10-inch maple tree, 420 feet, 18°24′; 12-inch elm tree, 37.6 feet, 41°00′; 10-inch maple tree, 27.5 feet, 63°56′; 6-inch catalpa tree, 38.1 feet, 97°25′; 8-inch maple tree, 20.3 feet, 128°09′; 7-inch maple tree, 41.7 feet, 159°50′; 14-inch elm tree, 54.6 feet, 171°42′; 16-inch pear tree, 27.0 feet, 239°25′; and 24-inch apple tree, 38.7 feet, 304°57′.

Plane coordinates: (E), x=816,714.41 feet; y=486,742.38 feet.

Avoca (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909; 1932).—About 3½ miles southwest of Avoca, on west side of Bricker Road, 1.8 miles south of Route M–138, on farm of Peter Boyce, in southwest corner of N½NE¼SE¼ sec. 18, T. 7 N., R. 15 E., Kenockee Township, 52 feet east of west north-and-south fence, 22 feet from large boulder, 205 feet from 18-inch basswood tree, and 425 feet from northwest fence corner. Surface and underground marks are ⅜-inch bolts surrounded by 3 spikes in concrete monuments, inscribed "U. S. L. S. 1909." Upper mark projects 8 inches above ground. Lower mark is 12 inches below surface of ground. In 1932 underground mark alone reported recovered. Following distances and azimuths are from station: Northwest corner of field fence, 171 feet (or 523 feet), 16°25′; southwest corner of field fence, 72 feet (or 171 feet), 219°46′; west fence, 72 feet; Boice's (or Boyce's) house, west peak (1909), 169°18′; Boice's barn, west peak (1909), 177°39′10″; and northeast corner of field fence, 523 feet, 94°30′.

Plane coordinates: (E), x=748,171.01 feet; y=561,374.44 feet.

Atkins (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—In SE¼NW¼ sec. 12, T. 7 N., R. 16 E., Clyde Township, on farm of William Cook. Surface and underground marks are ⅜-inch bolts surrounded by 3 large spikes in concrete monuments, inscribed "U. S. L. S. 1909." Upper mark projects 8 inches above ground. Following distances and relative directions (not referred to any cardinal points) are from station: Fence corner, 143 feet, 214°00′; northeast fence corner, 132 feet, 154°28′; north fence, 55 feet, 79°02′; west fence, 409 feet, 353°07′;

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brick house, northeast corner of chimney, 330°38′30″; and east peak of barn, 332°54′30″. In 1932 station reported destroyed.

Plane coordinates: (E), x=793,579.67 feet; y=570,770.42 feet.

Speaker (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909; 1932).—About 1 mile south of Speaker, in SE¼SE¼ sec. 22, T. 9 N., R. 14 E., Speaker Township, 0.2 mile northwest of intersection of Routes M–19 and M–90, 753 feet west of Route M–19, on highest knoll on farm of George Graves, 135 feet from east-and-west fence, 317 feet from 15-inch thorn tree, and 282 feet from 18-inch elm tree. Surface and underground marks are ⅜-inch bolts surrounded by 3 large spikes in concrete monuments, inscribed "U. S. L. S. 1909." Upper mark projects 8 inches above ground. Lower mark is 12 inches below surface of ground. In 1932 underground mark alone reported recovered. Following distances and azimuths are from station (in 1909): School at Yale, 161°14′; fence corner, 135 feet, 151°29′; fence corner, 268 feet, 221°21′; fence corner, 232 feet, 266°25′; fence corner, 295 feet, 293°58′; fence corner on road, 295 feet, 63°16′; and another fence corner on road, 329 feet, 101°33′.

Plane coordinates: (E), x=729,644.47 feet; y=617,811.62 feet.

Worth (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; 1932).—About 3 miles southwest of Lexington, in NW¼NW¼ sec. 15, T. 9 N., R. 16 E., Worth Township, on farm of S. D. Kinsey, in cultivated field about 1,000 feet north of farmhouse, under pile of field stones, 265 feet east of north-and-south fence along Route M–51, 380 feet from northwest fence corner, and 279 feet from east-and-west fence. Marked by large spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1909," flush with surface of ground. Following distances and azimuths are from station (in 1909): North section line, 323 feet, 0°00′; corner common to sections 9, 10, 15, and 16, 445 feet, 318°03′; west section line, 302 feet, 270°00′; Fenton's house, northeast corner, 483 feet, 243°00′; and south fence, 425 feet, 180°00′.

Plane coordinates: (E), x=787,851.90 feet; y=629,808.21 feet.

Cash (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; 1932).—About 1 mile south of Cash, in southwest corner of NE¼NW¼ sec. 1, T. 10 N., R. 14 E., Elk Township, on south side of County Route 31, in center of pasture field, on land owned by Paul Dorbant, about 9 feet east of center line of road to Cash if extended, 782 feet from southeast corner of Fred Ball's brick house, and 228 feet from 12-inch maple tree. Originally marked by ⅜-inch bolts surrounded by 3 spikes in concrete monuments, inscribed "U. S. L. S. 1908." Upper mark projects 12 inches above ground. Lower mark is 12 inches below surface of ground. In 1932 station reported marked by bolt in top of 3-by 2-foot granite boulder, inscribed "U. S. L. S. 1908," projecting about 1 foot above ground. Following distances and azimuths (mag. from north) are from station (in 1908): Brick house, southwest corner, 765 feet, 26°24′; southwest corner of barn, 820 feet, 14°17′; section corner, 607 feet, 1°05′; and fence south of station, 494 feet, 180°00′.

Plane coordinates: (E) x=734,494.47 feet; y=669,355.01 feet.

Applegate (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; 1932).—About 2 miles east of Applegate, about 2½ miles west of Lake Shore Road, near center of SE¼SW¼ sec. 29, T. 11 N., R. 16 E., Sanilac Township, on farm of William Cutler, 573 feet west of quarter-section line, 627 feet north of section line, 782 feet northwest of northwest corner of Cutler's house, and 95 feet east of north-and-south field fence. Marked by large spikes surrounded by 3 others in concrete monuments inscribed "U. S. L. S. 1908." Upper mark projects 12 inches above ground. Lower mark is 12 inches below surface of ground. Following azimuths are from station (in 1908): Cutler's barn, west peak, 69°38′20″; Cutler's barn, north peak, 64°54′00″; corner post south road fence and west of orchard, 97°22′10″; corner post northwest of station, 210°03′30″; chimney of brick house, 345°39′00″; and barn, cupola, 14°03′40″.

Plane coordinates: (E), x=783,842.48 feet; y=678,952.54 feet.

Custer (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; H. C. Warwick, 1932).—Three miles north and 1 mile west of Sandusky, near south side of SW¼ sec. 18, T. 12 N., R. 14 E., Custer Township, on land owned by William H. Hunter, in small open area in pasture with trees to north. To reach from Sandusky, go north 3.0 miles on gravel road to crossroads, and proceed west 0.85 mile on gravel road to station site. Station is directly across road from Ed. Gate's house, 62 feet north of center line of road, 32 feet north of fence, and 80 feet west of lone 24-inch maple tree in pasture. Original surface and underground marks

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were iron spikes surrounded by 3 others in top of 30-inch square concrete blocks, inscribed "U. S. L. S. 1908." Upper mark projected 16 inches above ground and lower mark was 12 inches below surface of ground. In 1932 underground mark recovered and surface mark reported removed. Two reference marks and azimuth mark, standard reference disks in concrete, note 11a, were established in 1932. No. 1 projects 5 inches above ground, is on right-of-way of county road, 27 feet south of center line of road, 1 foot north of fence, 80 feet east of center line of drive to Ed. Gate's house, and 156.47 feet from station in azimuth 303°47′. No. 2 projects 4 inches above ground, is on right-of-way of road, 26 feet south of center line of road, 66 feet northwest of northwest corner of Ed. Gate's house, and 107.00 feet from station in azimuth 34°39′. Azimuth mark projects 6 inches above ground, is at first crossroad west of station, 35 feet north of center line of east-and-west road, 26 feet east of center line of north-and-south road, 5 feet east of fence, 3 feet north of fence, and approximately 0.15 mile from station in azimuth 86°56′43″. Following distances and circle readings are from station (in 1908): Center of east-and-west road at quarter-mile fence, 480 feet, 101°35′; Ed. Gate's well, 170 feet, 177°00′; center of east-and-west road, 60 feet, 180°00′; northwest corner of Ed. Gate's house, 140 feet, 191°51′; and corner common to sections 18 and 19, Custer Township and sections 13 and 24, Moore Township, 886 feet, 270°00′.

Plane coordinates: (E), $x=716,922.15$ feet; $y=717,109.48$ feet; grid azimuth to azimuth mark=86°22′59″.*

McGregor (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; 1932).—In southwest corner of SE¼NW¼ sec. 16, T. 12 N., R. 15 E., Bridgehampton Township, on hill behind house of Tom Rich, 2,192 feet from north section line, 1,504 feet from west section line, 217 feet from double elm tree in fence line, and 435 feet from fence corner. In 1908 station was reported to be on farm of George Boice, 382 feet west of his lane, about 200 feet from his west fence line, 400 feet from his south fence line, and 105 feet west of small clump of cherry trees. Marked by spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1908." 12 inches below surface of ground.

Plane coordinates: (E), $x=754,558.40$ feet; $y=722,122.43$ feet.

Argyle (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; H. C. Warwick, 1932).—About 13 miles east of Cass City, 2 miles northeast of Argyle, in northeast corner of NW¼NW¼ sec. 2, T. 13 N., R. 13 E., Argyle Township, on land owned by Marshall Schagena. To reach from Argyle, go north 1.0 mile to crossroads, proceed east 1.0 mile to another crossroads, continue east 0.1 mile to gap in field to south, and continue 150 yards southeast to station site on top of knoll. Station is 48 feet north of east-and-west fence line, 100 feet west of north-and-south fence line, about 80 feet southwest of old pine stump surrounded by cherry bushes, and in 1908 was reported to be 52 feet south of fence, 352 feet south of section-line road, 311 feet east of fence, 590 feet from southwest corner of P. Lawrence's house on magnetic bearing 221°22′, and 1,274 feet from corner common to sections 2 and 3, Argyle Township, and sections 34 and 35, Appin Township, on magnetic bearing 105°40′. Original surface and underground marks were large spikes surrounded by 3 others in tops of concrete monuments, inscribed "U. S. L. S. 1908." Upper mark was flush with ground and lower mark was 18 inches below surface of ground. In 1932, upper mark was found to have been plowed up, and was replaced by standard station disk in concrete, note 1a, stamped "Argyle U S L S 1908–1932." Two reference marks and azimuth mark, standard reference disks in concrete, note 11a, were established in 1932 and marked in similar manner. No. 1 projects 4 inches above ground, is in north-and-south fence line, about 40 feet north of southeast corner of field, and 100.25 feet (slope distance) from station in azimuth 275°32′. No. 2 projects 3 inches above ground, is in east-and-west fence line, about 100 feet west of southeast corner of field, and 60.78 feet (slope distance) from station in azimuth 38°20′. Azimuth mark projects 4 inches above ground, is 17 feet west of center line of north-and-south section-line road, 2 feet east of west right-of-way fence of same road, about 45 yards south of crossroads with tall poplar tree in southeast corner, and approximately 0.2 mile from station in azimuth 97°10′27″. Azimuth from station to Argyle, Catholic Church, cross on tip of steeple, distant 2 miles, is 28°31′52″.

Plane coordinates: (E), $x=699,817.19$ feet; $y=763,819.64$ feet; grid azimuth to azimuth mark=96°39′15″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Palms (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908; H. C. Warwick, 1932).—Four miles south of Minden City, ½ mile east and 0.2 mile south of Palms, 5.8 miles north and 1.0 mile west of Deckerville, near southeast corner NW¼NW¼ sec. 31, T. 14 N., R. 15 E., Delaware Township, and in cultivated field on land owned by Ed. Donnelson of Palms. To reach from Deckerville, go north 6.0 miles on Route M-51, turn west onto gravel road, go 1.0 mile, turn south onto dirt road, and go 0.2 mile to large red brick house on east side of road and station site. Station is 116 paces northeast of house, on highest point of second small knoll northeast of house, and 210 feet east of east road fence. Surface and underground marks are large spikes surrounded by three others in tops of 18-inch square concrete blocks, inscribed "U. S. L. S. 1908." Upper mark projects 10 inches above ground and lower mark is 15 inches below surface of ground. Following distances and azimuths are from station (in 1908): Corner common to sections 30 and 31, Delaware Township, and sections 25 and 36 Minden Township, 1,120 feet, 166°32′53″; corner post of road and southwest corner of field, 352 feet, 35°39′53″; west lightning rod on red brick house, 175°09′53″; *Palms, Catholic Church* (*U. S. L. S.*) southwest corner of spire, 112°48′28″; and Donnelson's brick house, northwest corner, 445 feet, 21°07′53″.

Plane coordinates: (E), x=741,198.23 feet; y=770,703.01 feet; grid azimuth to *Palms Catholic Church*=112°10′14″.3.

Appin (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 4 miles southwest of Ubly, in sec. 31, T. 15 N., R. 13 E., Bingham Township, on farm of Alma O'Brien, 1 foot south of east-and-west fence, 18 feet east of north-and-south fence, 84 feet from 14-inch ash tree, 46 feet from 11-inch ash tree, and in 1908 at west edge of poplar woods, and 44.5 feet from double tree west of fence. Surface and underground marks are spikes surrounded by 3 others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark and lower mark are respectively 12 inches and 36 inches below surface of ground. Following distances and azimuths are from station (in 1908): Northeast corner of southwest quarter of section 31, 159.4 feet, 172°08′; east road fence corner, 1,312 feet, 94°21′48″; and peak of Richardson's barn, 227°29′48″.

Plane coordinates: (E), x=678,187.04 feet; y=797,426.98 feet.

Pollum (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—Near center of SE¼ sec. 33, T. 15 N., R. 14 E., Paris Township, on farm of Vincent Glaza, on knoll northwest of his house, 504 feet from northwest corner of barn, and (in 1908) 1,062.4 feet from corner of west line of George Pollum's farm at road fence, and 81.2 feet (perpendicular distance) from his west fence line. Surface mark is cross on copper plug in concrete monument, inscribed "U. S. L. S. 1906." Underground mark is large spike surrounded by 3 others in concrete monument, inscribed "U. S. L. S. 1906," 3 feet below surface of ground. In 1932 underground mark reported recovered about 1.6 feet below surface of ground. Following azimuths are from station: *Parisville, Catholic Church* (*U. S. L. S.*) 205°28′53″; Parisville, Lutheran Church, 269°59′06″.

Plane coordinates: (E), x=723,158.57 feet; y=798,182.50 feet; grid azimuth to *Parisville Catholic Church*=204°53′51″.6.

Bingham (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 2½ miles north of Ubly, in southeast corner of SE¼NW¼ sec. 10, T. 15 N., R. 13 E., Bingham Township, 61.2 feet west of north-and-south center line fence of section 10, 148 feet from southeast corner of field, and in 1908 at southeast edge of poplar woods on farm of Archibald Smith. Surface and underground marks are spikes surrounded by three others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark is about 1.5 feet below surface of ground. Following azimuths are from station (in 1908): Fence corner at southeast corner of field, 145 feet distant, 328°07′; German Lutheran Church spire, 203°42′41″; Shire's brick house, chimney, 122°20′21″.

Plane coordinates: (E), x=694,721.53 feet; y=819,017.94 feet.

Popple (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 6 miles west of Bad Axe, near southwest corner of sec. 31, T. 16 N., R. 12 E., Colfax Township, on small rise west of James Tait's house, 159 feet from post at north end of curved fence, and 174 feet from post at east end of curve. Surface and underground marks are spikes surrounded by 3 others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark is 15 inches below surface of ground. Following distances and azimuths are from station (in 1908): Corner common to Oliver, Grant, Sherman and Colfax Townships, 401.45 feet, 39°09′41″; fence

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corner of road at southwest corner of field, 357 feet, 38°08′11″; Keeler's barn, west lightning rod, 297°03′01″; and Tait's barn, northwest corner, 563 feet, 286°20′01″.

Plane coordinates: (E), $x=644,596.60$ feet; $y=825,258.69$ feet.

Verona (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About ¾ mile north by west of Verona Mills, on top of highest of ridge of hills near center of NW¼SE¼ sec. 13, T. 16 N., R. 13 E., Verona Township, on farm of Godfrey Zulendel, and 148 feet west of line fence. Surface and underground marks are spikes surrounded by 3 others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark projects 4 inches above ground.

Plane coordinates: (E), $x=705,453.69$ feet; $y=845,423.85$ feet.

Oak Point (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 1,200 feet from end of Oak Point, on sand ridge, 180 feet from waters edge, and 315.5 feet north of north edge of Route M–29. Surface and underground marks are large spikes surrounded by 3 others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark projects 10 inches above ground.

Plane coordinates: (E), $x=607,599.35$ feet; $y=902,168.29$ feet.

Port Austin (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About ¾ mile south of Port Austin, on rocky hill, on west side of north-and-south road, 235 feet south of east-and-west fence and 80 feet north of another east-and-west fence. Surface and underground marks are spikes surrounded by 6 others in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark projects 10 inches above ground. Lower mark rests on natural rock.

Plane coordinates: (E), $x=674,756.19$ feet; $y=923,271.71$ feet.

Point Lookout (U. S. L. S.) (Arenac County, U. S. Lake Survey, 1906; 1932).—On sand dune on south side of Point Lookout in Saginaw Bay, 97 feet north of cottage owned by S. T. Berdan. Surface and underground marks are spikes surrounded by 6 others in concrete monuments inscribed "U. S. L. S. 1906." Upper mark projects 7 inches above ground. Lower mark is about 5 feet below surface of ground. Concrete foundations for legs of tower are still in place.

Plane coordinates: (E), $x=521,703.40$ feet; $y=929,892.81$ feet.

Sand Point west base (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 7 miles from Caseville, 4 miles from Route M–29, on west end of Sand Point, just west of end of Crescent Beach Road, 1.5 feet east of gate in short north-and-south fence, 4.0 feet north of fence post at south end of gate, and 33.0 feet north of corner made by north-and-south fence and south road fence. Station reported to be set as nearly as possible, judging by old grading for base line, at angle of 1857 base. Surface and underground marks are crosses cut in 6-inch copper bolts in concrete monuments, inscribed "U. S. L. S. 1906." Upper mark projects 2 inches above ground. Lower mark is about 3½ feet below surface of ground.

Plane coordinates: (E), $x=570,798.09$ feet; $y=878,608.12$ feet.

Sand Point east base (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—About 3 miles southwest of Caseville, in T. 17 N., R. 10 E., Caseville Township, 269 feet east of corner common to sections 4, 5, 8, and 19, on Crescent Beach Road, 5 feet south of its north edge and 11 feet north of its south edge, and 718 feet west of west edge of Route M–29. Station reported to be over inscribed cross in limestone post, marking angle at east end of 1857 base. Station marked by cut stone monument flush with road surface. Reference marks (1857) are stones at right angles to base line, one north 37.55 feet, and one south 25.45 feet.

Plane coordinates: (E), $x=591,001.05$ feet; $y=880,303.06$ feet.

Charity (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906; 1932).—On Big Charity Island in Saginaw Bay, about 50 feet from shore on east side of island. Surface and underground marks are spikes surrounded by six others in concrete monuments inscribed "U. S. L. S. 1906." Upper mark projects 10 inches above ground. Lower mark is 4 feet below surface of ground.

Plane coordinates: (E), $x=560,603.09$ feet; $y=920,378.87$ feet.

Point au Sable (U. S. L. S.) (Iosco County, U. S. Lake Survey, 1905; 1932).—About ½ mile north of end of Au Sable Point, near center of fractional sec. 34, T. 23 N., R. 9 E., Au Sable Township, on small sand ridge about 350 feet from shore just north of two Lombardy poplar trees. Surface and underground marks are spikes surrounded by six others in concrete monuments, inscribed "U. S. L. S. 1905." Upper mark projects 10 inches above ground. Lower mark is 4 feet below surface of ground. Concrete foundations for legs of tower are visible.

Plane coordinates: (E), $x=586,922.81$ feet; $y=1,035,703.65$ feet.

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Laidlaw (U. S. L. S.) (Iosco County, U. S. Lake Survey, 1906; 1932).—About 4 miles northwest of Tawas City, in southwest part of sec. 9, T. 22 N., R. 7 E., Tawas Township, 702 feet from section corner, marked by 3-inch brass disk in concrete monument, on bearing N. 80° E., 82 feet north by west of triangular-blazed 18-inch Norway pine, and 48.5 feet southwest of triangular-blazed 7-inch white pine. Marked by double concrete monuments, both inscribed "U. S. L. S. 1906." Upper mark projects 7 inches above ground.

Plane coordinates: (E), $x=517,393.98$ feet; $y=1,023,492.98$ feet.

Wilber (U. S. L. S.) (Iosco County, U. S. Lake Survey, 1905; 1932).—In NE¼NW¼ sec. 13, T. 23 N., R. 7 E., Wilber Township, and about 780 feet north-northwest of barn on abandoned Cornett farm. Surface and underground marks are spikes surrounded by six others in concrete monuments, inscribed "U. S. L. S. 1905." Lower mark is 4 feet below surface of ground. In 1932 top of upper mark was reported broken off. Rubble concrete leg foundations for tower are visible.

Plane coordinates: (E), $x=534,270.95$ feet; $y=1,054,940.88$ feet.

Greenbush (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905; R. L. Pfau 1929; 1932).—On highest point of small hill in SW¼ sec. 4, T. 25 N., R. 9 E., Greenbush Township. To reach from Greenbush, go north about ¼ mile on Route 23 (road from Greenbush to Harrisville) to first road leading to left, follow this road (road to Mikado) 1.3 miles to point where station is about 50 feet to north. Surface and underground marks are spikes surrounded by six others in concrete monuments, inscribed "U. S. L. S. 1905." Upper mark projects about 10 inches above ground. Lower mark is 4 feet below surface of ground. In 1929 small mound of dirt was thrown up around surface monument almost to its top.

Plane coordinates: (E), $x=583,846.23$ feet; $y=1,126,751.60$ feet.

Hayes (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905; 1932).—About 3¼ miles northeast of Glennie, on north edge of high ridge, in NE¼ sec. 34, T. 26 N., R. 6 E., Miller Township, and 74 feet from triangle-blazed 14-inch Norway pine tree (nearest one of group of six) on bearing S. 10° E. Surface and underground marks are spikes surrounded by six others in concrete monuments, inscribed "U. S. L. S. 1905." Lower mark is 4 feet below surface of ground. In 1932 upper mark was reported broken off at ground surface.

Plane coordinates: (E), $x=494,803.12$ feet; $y=1,134,235.37$ feet.

Henry (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905; R. L. Pfau, 1929; 1932).—About 7 miles northeast of Lincoln, in NW¼ sec. 5, T. 27 N., R. 9 E., Hawes Township, on top of high hill about 1 mile east of U. S. Route 23, and about ¼ mile east of end of old railway cut. To reach from Lincoln, follow U. S. Route 23 (road from Lincoln to Alpena) 6.4 miles to point (0.8 mile beyond house of Eustace Barber known as Stanley ranch) where rather inconspicuous woods road turns to right, follow woods road about ¾ mile to far end of cut (known locally as "the Big Cut") and end of truck travel. From here proceed due east about ½ mile to highest point of logged off hill and station site. Marked by spike in center of triangle formed by three nails in top of 12-inch square concrete monument, inscribed "Henry U. S. L. S. 1905," projecting about 1 foot above ground.

Plane coordinates: (E), $x=573,306.87$ feet; $y=1,192,728.76$ feet.

Mills (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905; R. L. Pfau, 1929; 1932).—About 2½ miles northeast of Barton City, on south end of high ridge, in SW¼ sec. 23, T. 27 N., R. 7 E., Hawes Township. To reach from Mills' store in Lincoln, follow Hubbard Lake Road 7.8 miles (speedometer), keeping straight ahead onto sand road at point where road turns abruptly to right (90°). Set speedometer to zero. When speedometer reads 0.35 mile turn left onto road that roughly parallels one left for several hundred feet, and then proceeds left over ridge (only ridge crossed on way to station). Be careful not to turn left before this road (second fairly conspicuous one turning left) is reached. When speedometer reads 1.2 miles, go around left end of Potters Lake. When speedometer reads 1.6 miles follow right-hand road and enter very narrow valley which resembles a cut, continue up this valley (which gradually widens out) and when speedometer reads 3.0 miles station is opposite, on highest point of hill to left. Original surface and underground marks were large spikes surrounded by six others in concrete monuments, inscribed "U. S. L. S. 1905." In 1929 underground mark recovered and surface mark found broken off at ground surface. Point was re-marked with ⅜-inch steel rod in center of triangle, formed by 3 nails, set in concrete monument, and letters "U. S. L. S. 1905 Mills" inscribed on top.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (E), $x=527,022.78$ feet; $y=1,174,075.96$ feet.

Comstock (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905; 1932).—About 4½ miles west of south end of Hubbard Lake, in NE¼ sec. 2, T. 27 N., R. 6 E., Mitchell Township, 12 feet south of town line, 175 feet west of section corner, and 132 feet from large granite boulder on bearing S. 15° E. Marked by spike surrounded by six others in concrete monument, inscribed "U. S. L. S. 1905," projecting 12 inches above ground.

Plane coordinates: (E), $x=499,941.93$ feet; $y=1,191,851.83$ feet.

Supplementary points

Port Huron, Methodist Church (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: [1] (E), $x=830,799$ feet; $y=540,199$ feet.

Port Huron, St. Clair County Courthouse (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: [1] (E), $x=832,268$ feet; $y=541,396$ feet.

Port Huron, K. O. T. M. Temple, dome (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: [1] (E), $x=832,333$ feet; $y=541,808$ feet.

Port Huron, post-office building (U. S. L. S.) (St. Clair County, U. S. Lake Survey).—Plane coordinates: [1] (E), $x=832,068$ feet; $y=539,956$ feet.

Emmett, Catholic Church (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: (E), $x=741,280.36$ feet; $y=545,588.44$ feet.

Port Huron, Tunnel Power Co., stack (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: (E), $x=831,981.86$ feet; $y=534,311.71$ feet.

Hillock (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—On east side of sec. 7, T. 8 N., R. 17 E. (Burchville Township), on prominent point of bank near shore, east of group of large pine trees, south of large elm tree, and north of small creek with banks partly covered with cedar trees. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 8 inches above surface of ground.

Plane coordinates: (E), $x=811,922.38$ feet; $y=604,262.91$ feet.

Blackwell (U. S. L. S.) (Sarnia District, Ontario, Canada, U. S. Lake Survey, 1909).—Plane coordinates: [1] (E), $x=863,081$ feet; $y=558,968$ feet.

Fort Gratiot Lighthouse (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—Plane coordinates: [1] (E), $x=832,789$ feet; $y=551,361$ feet.

Linda (U. S. L. S.) (St. Clair County, U. S. Lake Survey, 1909).—About ¼ mile north of township line between Burchville and Fort Gratiot Townships, on sand knoll about 200 feet from shore of Lake Huron, about 15 feet north of small pine tree, and east of row of tall poplar trees. Marked by spike surrounded by three others in concrete monument projecting 8 inches above surface of ground.

Plane coordinates: (E), $x=819,328.22$ feet; $y=580,494.45$ feet.

Nun (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—In fractional sec. 18, T. 10 N., R. 17 E. (Lexington Township), on farm of William Nun, on bank near shore, and southeast of southeast corner of orchard. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 9 inches above surface of ground. Readings and distances from station to following objects are: Southeast corner of brick house, 134°40′30″; post at southeast corner of orchard, 180°33′, 64.5 feet; 6-inch birch tree (over bank), 263°10′, 53.6 feet; and east peak of Granger's barn, 67°00′20″.

Plane coordinates: (E), $x=802,379.99$ feet; $y=657,447.65$ feet; grid azimuth to Granger's barn, east peak=66°13′36″.*

Hyde (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—About 4 miles north of Lexington, in north part of sec. 7, T. 10 N., R. 17 E. (Lexington Township), on bank near shore, on farm of Erwin Hyde. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 6 inches above surface of ground. Azimuths and distances from station to following objects are: Adventist Church, 16°14′19″; schoolhouse, 116°36′09″; Port Sanilac Lighthouse, 175°50′35″; blazed 6-inch wild cherry tree, 249°09′, 26.9 feet; blazed 4-inch wild cheery tree, 272°35′, 17.9 feet; 12-inch elm tree in field, 110°41′; and 8-inch elm tree in field, 185°25′.

Plane coordinates: (E), $x=802,520.83$ feet; $y=666,884.87$ feet.

Jackman (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—About 2 miles south of Lexington, in sec. 8, T. 9 N., R. 17 E. (Worth Township), on bank near shore, 18.0 feet south of north section line, and 26.5 feet west of fence along

[1] No check on this position.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

bank. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 8 inches above surface of ground. Azimuths from station to following objects are: Lexington, tallest church, 169°23′39″; and schoolhouse, 165°55′49″. In 1914 it was reported that station mark was found dug out of ground.

Plane coordinates: (E), x=804,512.83 feet; y=636,353.50 feet; grid azimuth to Lexington, tallest church=168°36′40″.*

Croswell, Croswell Sugar Co., stack (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates: (E), x=779,791.33 feet; y=645,429.64 feet.

Port Sanilac, Catholic Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=782,732 feet; y=704,762 feet.

Port Sanilac, Methodist Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=798,107 feet; y=705,693 feet.

Port Sanilac, Congregational Church (U. S. L. S.) (Sanilac County, U. S. Lake Lake Survey, 1908).—Plane coordinates:[1] (E), x=797,359 feet; y=705,541 feet.

Port Sanilac Lighthouse (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=799,241 feet; y=704,987 feet.

Greenan (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—In sec. 26, T. 13 N., R. 15 E. (Marion Township), on land owned by John Greenan, on fence line ¼ mile north of southeast corner and 3.3 feet west of west road fence on east side of section. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 1 foot above surface of ground. Azimuths from station to following objects are: Church, 1 mile south, 359°07′40″; *Forestville, Lutheran Church*, 185°37′35″; and Richmondville, stack, 228°33′40″.

Plane coordinates: (E), x=768,125.06 feet; y=742,457.08 feet; grid azimuth to *Forestville, Luthern Church*=184°55′45″.**

Basler (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—In northwest corner of SW¼ sec. 29, T. 12 N., R. 16 E. (Sanilac Township), on farm of Charles Basler, just east of road in northwest corner of apple orchard, 24.4 feet southeast of apple tree in northwest corner of orchard, 23.2 feet south, 19.6 feet north, and 19.0 feet northeast of other apple trees, and 22.4 feet east of cherry tree. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 8 inches above surface of ground. Following azimuths are from station: *Forester, town hall*, 210°26′36″; *Forester, church*, 209°50′52″; *Port Sanilac, Congregational Church*, 288°33′46″; and Catholic Church, west of Port Sanilac, 336°52′42″.

Plane coordinates: (E), x=779,906.00 feet; y=711,157.07 feet; grid azimuth to *Forester, town hall*=209°43′05″.**

Wendt (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Near center of NE¼ sec. 13, T. 14 N., R. 15 E., on land owned by Mr. Wendt, 50.5 feet southeast of northeast corner of H. J. Trace's woods, 19.5 feet east of post in line fence, and 20.4 feet north of 10-inch birch tree. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 10 inches above surface of ground. Following readings are from station: Lutheran Church, 223°38′; Catholic Church, 246°25′; Lynnwood, church, 110°23′; and corner stone in road, 311°24′, distance (stadia), 1,770 feet.

Plane coordinates: (E), x=770,645.51 feet; y=787,558.97 feet.

Quast (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—About 3 miles north of Richmondville, in NW¼ sec. 32, T. 14 N., R. 16 E., on high bank on shore, 15 feet west of north-and-south fence, and 320 feet south of corner post at east-and-west fence, on land owned by Mrs. Louise Quast. Marked by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 10 inches above surface of ground. Following azimuths are from station: Post at fence corner, 163°43′; Richmondville, stack, 354°18′; *Forester, church*, 349°42′; and Pott's store, flag, 169°31′.

Plane coordinates: (E), x=782,998.57 feet; y=773,358.15 feet.

Conklin (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—About 2 miles north of Forester, on bank near lake shore, just south of mouth of Allen Creek, near northeast corner of sec. 33, T. 13 N., R. 16 E. (Forester Township), at intersection of north-and-south and east-and-west fences, 33 feet south of clump of small birch trees, 18 feet west of another clump of birch trees, 15.5 feet northwest of fence post, and 14.3 feet northeast of another fence post. Marked

[1] No check on this position.
*This azimuth has been computed by the first formula (p. 171), neglecting the second term.
**This azimuth has been computed by the first formula (p. 171), using both terms.

For notes in regard to marking of stations see p. 167.

by spike surrounded by three others in concrete monument, marked "U. S. L. S. 1909," and projecting 1 foot above surface of ground. Azimuths from station to following objects are: Richmondville, stack, 166°58′20″; *Forester, town hall,* 345°20′10″; and *Forester, church,* 347°00′11″.

Plane coordinates: (E), x=788,545.85 feet; y=742,162.89 feet; grid azimuth to *Forester, town hall*=344°35′11″.**

Forester, church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=791,180 feet; y=731,394 feet.

Forester, town hall (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=791,496 feet; y=731,461 feet.

Deckerville, Presbyterian Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=746,259 feet; y=739,819 feet.

Deckerville, school (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1908).—Plane coordinates:[1] (E), x=748,530 feet; y=740,142 feet.

Richmondville, church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=784,202 feet; y=757,387 feet.

Richmondville, school (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=783,454 feet; y=757,233 feet.

Argyle, Catholic Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=693,779 feet; y=752,469 feet.

Palms, Catholic Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=738,758 feet; y=771,697 feet.

Freiburger, Lutheran Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=699,774 feet; y=774,842 feet.

Forestville, Lutheran Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=772,155 feet; y=789,183 feet.

Forestville, Methodist Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey, 1909).—Plane coordinates:[1] (E), x=766,495 feet; y=789,043 feet.

Parisville, Catholic Church (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906).—Plane coordinates: (E), x=729,275.30 feet; y=811,361.27 feet.

German Lutheran Church (U. S. L. S.) (Sanilac County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=696,080 feet; y=822,110 feet.

Page Milk Co., stack (U. S. L. S.) (Sanilac County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=694,772 feet; y=807,333 feet.

Bad Axe, church (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=677,354 feet; y=840,589 feet.

Bad Axe, standpine (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=676,797 feet; y=839,468 feet.

Bad Axe, school (U. S. L. S.) (Huron County, U. S. Lake Survey, 1906).—Plane coordinates:[1] (E), x=677,297 feet; y=840,351 feet.

Stafford (U. S. L. S.) (Huron County, U. S. Lake Survey, 1908).—In SW¼ SE¼ sec. 23, T. 18 N., R. 14 E. (Huron Township), on farm of W. R. Stafford, and west of Huron district school No. 5. Marked by spike in concrete monument, marked "U. S. L. S. 1906." Following readings and distances are from station: *Pointe aux Barques Lighthouse,* 317°13′10″; *Port Hope, elevator,* 75°06′40″; district school No. 5, 56°55′20″; Redman, church, 165°22′55″; fence corner, 74°20′, 1,016 feet; and fence corner, 173°22′, 691 feet.

Plane coordinates:[1] (E), x=729,399 feet; y=903,448 feet.

Port Hope (U. S. L. S.) (Huron County, U. S. Lake Survey, 1908).—In NE¼ NE¼ sec. 2, T. 17 N., R. 14 E. (Bloomfield Township), on land owned by Aug. Shave, 206 feet from center of east-and-west road, 210 feet from north-and-south fence, 709 feet from center of north road, 759 feet from center of south road, and 456 feet from corner of William Sherrett's house. Marked by spike in concrete monument, marked "U. S. L. S. 1908." Following readings and distances are from station: Redman, church 262°20′45″; Port Hope, church, 208°19′40″; and fence corner ⅛ mile west of section corner, 57°00′00″, 272 feet.

Plane coordinates: (E), x=731,361.70 feet; y=892,192.62 feet.

Rubicon (U. S. L. S.) (Huron County, U. S. Lake Survey, 1908).—In SW¼ SE¼ sec. 19, T. 17 N., R. 14 E. (Rubicon Township), in partially cleared field belonging to Martin Gannon. Marked by concrete monument, marked "U. S. L. S. 1908," projecting 4 inches above surface of ground. Following azimuths and distances are from station: *Port Hope, Lutheran Church* 203°33′09″; Port Hope, German Reform Church, 207°39′; Port Hope, brick smokestack, 208°22′; fence

[1] No check on this position.

**This azimuth has been computed by the first formula (p. 171), using both terms.

For notes in regard to marking of stations see p. 167.

corner ¼ mile west of southeast section corner, 348°09′, 647 feet; north-and-south fence, 266°09′, 117 feet; and Harbor Beach Lighthouse, 297°38′.

Plane coordinates: (E), x=741,898.39 feet; y=872,410.44 feet.

Huron (U. S. L. S.) (Huron County, U. S. Lake Survey, 1908).—In SW¼ SW¼ sec. 2, T. 18 N., R. 14 E. (Huron Township), on north side of shore road, 315.5 feet east of section-line road (south to Redman), 17.8 feet from southeast fence line, and 46.0 feet from northwest fence line, and at base of pine tree 33 feet high. Marked by concrete monument. Following readings and distances are from station: Grindstone, elevator, 22°32′50″; triangle-blazed 10-inch beech tree, 243°34′, 11.5 feet; triangle-blazed 8-inch birch tree, 62°15′, 21.0 feet; southeast corner of road to Redman, 15°50′, 315.5 feet; Cleveland Co. stack, 24°38′50″; Pointe aux Barques Lighthouse, 159°25′30″; and Port Hope, tallest church, 226°13′20″.

Plane coordinates: (E), x=726,062.02 feet; y=919,547.95 feet.

Port Hope, Lutheran Church (U. S. L. S.) (Huron County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=749,732 feet; y=890,940 feet.

Port Hope, Methodist Church (U. S. L. S.) (Huron County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=750,333 feet; y=890,466 feet.

Port Hope, Presbyterian Church (U. S. L. S.) (Huron County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=750,508 feet; y=891,261 feet.

Port Austin Lighthouse (U. S. L. S.) (Huron County, U. S. Lake Survey).—Plane coordinates: (E), x=679,808.72 feet; y=941,736.38 feet.

Pointe aux Barques (U. S. L. S.) (Huron County, U. S. Lake Survey, 1908).—On Pointe aux Barques, beside isolated rock known as Turnip Rock, in T. 19 N., R. 13 E. (Port Austin Township), near corner of cobblestone fence, and about 35 feet from the falling bank. Marked by cross in bedrock about 1½ feet below surface of ground. Upper mark is 6-inch drain tile projecting about 8 inches above surface of ground. Following readings and distances are from station: Port Austin Lighthouse, 190°23′30″; triangle-blazed 6-inch oak tree, 151°12′00″, 18.4 feet; southeast corner of McBride's house, 129°30′00″, 116.6 feet; north corner of lighthouse property, 75°55′00″, 406 feet; triangle-blazed 6-inch oak tree, 302°20′00″, 23 feet.

Plane coordinates: (E), x=685,893.46 feet; y=936,661.02 feet.

Port Austin, Roman Catholic Church (U. S. L. S.) (Huron County, U. S. Lake Survey).—Plane coordinates:[1] (E), x=679,319 feet; y=928,266 feet.

Tovey (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905).—About 3 miles northwest of Harrisville, in Haynes Township, and on farm owned by Mr. Tovey. Marked by spike in top of concrete monument marked "U. S. L. S. 1905."

Plane coordinates:[1] (E), x=593,463 feet; y=1,161,324 feet.

Pierson (U. S. L. S.) (Alcona County, U. S. Lake Survey, 1905).—About 5 miles north of Harrisville, in Haynes Township, about 1 mile southwest of Pierson's house, on highest point of hill. Marked by spike in top of concrete monument marked "U. S. L. S. 1905."

Plane coordinates:[1] (E), x=593,251 feet; y=1,175,313 feet.

EAST SHORE OF LAKE MICHIGAN, SOUTHERN SECTION

Principal points

Bald Tom 2 (Berrien County, H. C. Warwick, 1932).—About 3½ miles soutkt west of Bridgman, 3.5 miles northwest of New Troy, 0.5 mile from shore of Laeh Michigan, 0.5 mile northwest of U. S. Route 12, on highest dune in vicinity known as Bald Tom and Tower Hill, on easterly end of highest ridge of dune, almost in line with macadam road coming north from Sawyer and crossing U. S. Route 12 obliquely just south of station, and 15 feet southwest of brushy knoll which is highest point of dune. To reach from Bridgman, go south 2.8 miles on U. S. Route 12 to Saw Bridge Lunch Shoppe, go across field to northwest of Lunch Shoppe about 200 yards to mouth of large covered ditch, and (end of truck travel), cross ditch, climb small steep sand ridge to right, and follow up along crest about 500 yards to top of dune and station site. Marked by standard station disk cemented in top of 11-foot section of 3-inch pipe sunk 9 feet into ground and anchored in 2 feet of concrete. Reference mark No. 1 is standard reference disk in tile and concrete, note 13a, just off crest to east of station, on trail, and 36.38 feet from station in azimuth 255°18′. Reference mark No. 2 is standard reference disk in concrete, note 11a, projecting 3 inches, 52.7 feet northeast of north-

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

east corner of Saw Bridge Lunch Shoppe, 46.4 feet west of Route 12, 8.5 feet north of I. & M. E. power pole, and 584.802 meters (1,918.64 feet) from station in azimuth 296°00′24″. Reference mark No. 3 is standard reference disk in tile and concrete, note 13a, on south slope of dune, just off crest, and 32.71 feet from station in azimuth 44°40′. Azimuth mark is standard reference disk in concrete, note 11a, projecting 4 inches, 26.8 feet west of west edge of U. S. Route 12, 29.1 feet southeast of I. & M. E. power pole, 40.9 feet right angle to center line of macadam crossroad coming north from Sawyer, 120 yards northeast of Swedish Coffee Cabin, and 953.024 meters (3,126.71 feet) from station in azimuth 0°13′02″. Distance between reference mark No. 2 and azimuth mark is 874.802 meters (2,870.08 feet). Azimuth from station to *New Carlisle, municipal water tank, finial light* is 341°57′10″; and to *Three Oaks, Warren Featherbone Co., water tank*, 4°49′21″. Station is in approximate location of station *Bald Tom* (*U. S. L. S.*) which was not recovered. Old reference post, described as N. 74°12′ E., distant 22.25 meters (73.0 feet), was recovered in leaning position, and probably will soon be destroyed by erosion of hill. Due to its location, it was not possible to tie in to present station.

Plane coordinates: (C), x=268,727.59 feet; y=148,837.31 feet; grid azimuth to azimuth mark=0°47′05″.*

David (Berrien County, H. C. Warwick, 1932).—About 5 miles north of Buchanan, 2½ miles south of Berrien Springs, on land owned by the House of David, on place called "Rocky Farm," in large apple orchard, about 100 yards northwest of group of barns and sheds, 19 feet east of center line of dirt road through orchard, 28 feet southwest of northwest corner of rectangular concrete reservoir, and 23 feet northwest of southwest corner of wooden shed adjoining reservoir. Shed is used as pump house and surrounds base of windmill. To reach from Berrien Springs, follow U. S. Route 31 across bridge 1.5 miles to macadam road leading to west, go west 2.9 miles to House of David lane west of road, follow lane west 0.3 mile to house, and follow orchard road about 200 yards to station site near reservoir. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference marks are standard reference disks in concrete, note 11a, flush with ground. No. 1 is 30 yards north of reservoir in orchard, and 103.8 feet north of station in azimuth 194°52′. No. 2 is 40 yards west of reservoir, and 101.08 feet from station in azimuth 64°04′. Azimuth from station to Berrien Springs, silver municipal water tank, finial, is 183°28′53″; and to *Niles, municipal standpipe*, 311°34′56″.

Plane coordinates: (C), x=337,411.39 feet; y=149,610.30 feet.

Stephensville (Berrien County, H. C. Warwick, 1932).—About 0.5 mile due west of Stevensville, 5.0 miles north of Bridgman, about 75 feet southwest of small high knoll, summit of which is highest point in vicinity, 300 feet north of intersection of U. S. Route 12 and macadam road leading east to Stevensville, 83.3 feet west of large brick posts at entrance to brick bungalow owned by W. A. Friesl, 36 feet west of center line of U. S. Route 12, and 20 feet east of east edge of wooded slope on west side of road. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is 2 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, and is on west edge of highway right-of-way, 100 feet northwest of high knoll mentioned above, 35.5 feet west of center line of U. S. Route 12, 48.2 feet south by west of last white post in guard rail on west side of highway, at edge of wooded area, and 187.00 feet from station in azimuth 180°39′. No. 2 projects 3 inches, is on east edge of right-of-way, 15 feet south of southernmost brick post marking entrance to driveway leading to W. A. Friesl's home, just west of flower garden to south of bungalow, 44.8 feet east of center line of highway, 5 feet north of an I. & M. E. power pole, 75 feet southwest of southwest corner of house, and 104.97 feet from station in azimuth 310°07′. Azimuth mark projects 4 inches, and is about opposite center of curve in highway, 125 feet east of Red Top Inn which is on small hill west of U. S. Route 12, 48 feet east of center line of U. S. Route 12, 21 feet west of west edge of vineyard, 6.8 feet northeast of I. & M. E. power pole, and approximately 0.2 mile from station in azimuth 358°29′04″.

Plane coordinates: (C), x=288,379.08 feet; y=188,752.88 feet; grid azimuth to azimuth mark=359°00′21″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Divis (Berrien County, H. C. Warwick, 1932).—About 12 miles northeast of Berrien Springs, 10 miles east of Benton Harbor, in SE¼ sec. 23, T. 4 S., R. 17 W., Bainbridge Township, on land owned and occupied by F. J. Divis, at junction of two grassy lanes which separate cultivated fields, about 25 feet south of south edge of cultivated field, 29 feet west of west edge of cultivated field, 28 feet north of north end of cultivated patch of dewberries, 20 feet northwest of group of small trees, approximately 250 yards north of section of woods, and 100 yards southeast of highest part of hill. To reach from Benton Harbor, follow Route M-139 southeast 1.0 mile to point where it turns south, continue southeast 1.1 miles on county road towards Sodus to paved crossroads, turn east onto Napier road, follow east 8.5 miles to Niles-Watervliet road, proceed east 0.5 mile to narrow road leading north, proceed north 0.65 mile to Divis' house on right, and follow lane east 0.25 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is flush with ground, in north-south lane, 7 feet east of east edge of cultivated field, 3 feet south of small tree, and 185.5 feet from station in azimuth 185°26′. No. 2 is flush with ground in east-west lane, about 15 feet north of north end of cultivated strawberry patch, and 175.3 feet from station in azimuth 96°20′. Azimuth mark projects 6 inches, and is 6 feet south of hickory tree, 30 feet east of center of north-south dirt road, 60 feet south of fence corner, 130 feet southwest of red barn, and approximately 0.6 mile from station in azimuth 228°31′00″.

Plane coordinates: (C), x=365,046.24 feet; y=219,877.64 feet; grid azimuth to azimuth mark=228°51′00″.*

Henley (Berrien County, H. C. Warwick, 1932).—About 2 miles due north of Benton Harbor, on property owned by Dr. Henley, on ridge which parallels lake, about 250 yards west of road leading to Benton Harbor, 100 feet west of west edge of large vineyard, 200 yards west of gray church, 250 yards northwest of small house with large brick chimney, 75 feet southwest of summit of brushy knoll which is highest point in vicinity, 14 feet east of edge of bluff, 17 feet west of 4 trees grouped together in very small area, and 65 feet southwest of similar group of 5 trees. To reach from Benton Harbor, cross tracks at northeast end of Pere Marquette Railway station, follow paved street north and northeast past Baker-Vawter plant 2.05 miles to Dr. Henley's home, which is large house on hill on east side of road, turn west into lane opposite house, continue to small house with large chimney at south side of vineyard, continue along vineyard to ridge on lake shore and go north about 120 yards up ridge to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is east of and at foot of brushy knoll mentioned above, and 80.60 feet (slope) from station in azimuth 255°04′. No. 2 projects 5 inches, and is about 100 feet west of vineyard, 20 feet east of bluff, in depression near base of ridge, and 119.30 feet (slope) from station in azimuth 32°27′. Azimuth mark projects 6 inches, is on west side of road leading to Benton Harbor, in line with row of maple trees, 10 feet south of nearest tree, 165 feet north of east-west crossroad, 31 feet west of center line of main road, and approximately 0.2 mile from station in azimuth 358°11′19″.

Plane coordinates: (C), x=310,302.67 feet; y=237,239.13 feet; grid azimuth to azimuth mark=358°39′29″.*

Van Auken (Van Buren County, H. C. Warwick, 1932).—Three miles northeast of Hartford, in SE¼ sec. 35, T. 3 S., R. 16 W., Bangor Township, on northwest end of prominent barren sand hill which forms part of range known as the Webster Hills, on land owned by D. E. Van Auken, who lives about ¼ mile west of hill, and 120 yards north of road. Hill is fast disappearing due to wind erosion. To reach from Hartford, follow Van Buren County Route 687 north 2.7 miles to crossroads, turn east onto gravel road and follow 1.7 miles to top of high sand hill and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 7 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is in edge of small patch of grape vines, 7 feet lower than station mark, and 53.72 feet (slope) from station in azimuth 240°38′. No. 2 projects 4 inches, and is on ridge, 174.29 feet (slope) from station in azimuth 346°31′. Azimuth mark projects 8 inches, and is 1 foot north of Mr. Ottinger's north property line fence, 106 feet east of east side of Mr. Ottinger's house, 20 feet south of center line of gravel road, and 1.0 mile from station in azimuth 83°28′28″. Azimuth from station to *Watervliet, silver municipal tank, finial,* is 57°46′36″.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (C), $x=395,858.18$ feet; $y=271,789.21$ feet; grid azimuth to azimuth mark=83°43′59″.*

Thunder (Van Buren County, H. C. Warwick, 1932).—On westerly tip of highest ridge of high prominent and well-known sand dune called Thunder Mountain, about 11.5 miles north of Benton Harbor, in NE¼ sec. 36, T. 2 S., R. 18 W., and on land owned by Lulu Burgess who lives at foot of dune. To reach from Benton Harbor, go north 11.4 miles on U. S. Route 31 to Roger's Creek, turn west onto dirt road just north of creek, continue 200 yards to point where road leads down hill, and end of truck travel, and follow trail leading up Thunder Mountain just to right of road at this point. Marked by standard station disk cemented in top of 11-foot section of 3-inch pipe which is sunk 9 feet into ground and anchored in 2 feet of concrete. Reference mark No. 1 is standard reference disk in tile and concrete, note 13a, flush with ground, on east edge of right-of-way of U. S. Route 31, 18.3 feet east of east edge of concrete, on fill over Roger's Creek, slightly north of west of north end of east concrete culvert abutment under fill, and 397.500 meters (1,304.13 feet) from station in azimuth 324°34′38″. Reference mark No. 2 is standard reference disk in concrete, note 11a, projecting 3 inches, and is on west slope of dune, 5 feet lower than station, and 64.49 feet from station in azimuth 109°47′. Azimuth mark is standard reference disk in tile and concrete, note 13a, projecting 4 inches, and is on east edge of right-of-way of U. S. Route 31, about 800 feet north of dirt road running west to lake shore, 29 feet east of center of concrete, and 473.155 meters (1,552.34 feet) from station in azimuth 291°34′16″. Distance between reference mark No. 1 and azimuth mark is 257.738 meters (845.60 feet). Azimuth from station to St. Joseph, pierhead, rear range light, is 37°43′54″.

Plane coordinates: (C), $x=338,107.25$ feet; $y=276,062.23$ feet; grid azimuth to azimuth mark=291°58′24″.*

Bangor (Van Buren County, H. C. Warwick, 1932; 1934).—About 1½ miles northeast of Bangor, in SW¼ sec. 5, T. 2 S., R. 15 W., Arlington Township, on land owned and occupied by Frank Seely who lives ¼ mile south of station, on highest summit of hill in orchard, in line with north-south row of apple trees which is first row east of row of cherry trees, and about 20 feet west of small peach tree which stands alone between rows. To reach from Bangor, go north 0.15 mile from point where Route M–43 turns south in Bangor, turn east onto gravel road, go 1.1 miles to Seely's house on north side of road, turn north past Seely's house, and go between row of trees ¼ mile to station site at top of hill. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is 24.745 meters (81.18 feet) from station in azimuth 24°00′. No. 2 projects 4 inches, and is 22.567 meters (74.04 feet) from station in azimuth 135°57′. Azimuth mark projects 6 inches, and is 27 feet south of center line of east-west section-line road, about 250 feet southeast of large red barn, 6 inches north of south right-of-way fence of road, 0.1 mile east of cemetery, and approximately 0.5 mile from station in azimuth 314°57′46″. Azimuth from station to *Bangor, black municipal tank, finial* is 68°32′35″.

Plane coordinates: (C), $x=408,358.52$ feet; $y=299,036.68$ feet; grid azimuth to azimuth mark=315°11′27″.*

Brandywine (Van Buren County, H. C. Warwick, 1932).—About 17 miles northeast of Benton Harbor, about 6 miles south of South Haven, in northeast corner sec. 5, T. 2 S., R. 17 W., Covert Township, and on east end of highest part of prominent sand dune situated about midway between U. S. Route 31 and Lake Michigan. To reach from either Benton Harbor or South Haven, follow U. S. Route 31 to dune which is 0.7 mile north of highway bridge over Brandywine Creek. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is sunk 10 feet into ground and anchored in 2 feet of concrete. Reference and azimuth marks are standard reference disks in tile and concrete, note 13a. No. 1 projects 6 inches, and is near top of dune, down 30-foot slope, on crest of ridge (north side of which is very steep), and 210.2 feet (slope) from station in azimuth 157°58′. No. 2 is flush with ground, east of U. S. Route 31, 62.1 feet southeast by east of center of east end of concrete culvert, 42.6 feet north of 6-inch wild-cherry tree which is half-way up north slope of sand dune which runs perpendicular to highway, and 904.705 feet (computed) from station in azimuth 289°18′02″. No 3 projects 6 inches, and is down 50-foot slope, on

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

crest of small ridge, 20 feet east of small group of trees, and 143.3 feet (slope) from station in azimuth 21°41′. Azimuth mark is flush with ground, 91 feet east of east edge of concrete of highway, 25 feet east of east edge of cut, 41 feet northeast of wild-cherry tree near edge of cut, and 787.912 feet (computed) from station in azimuth 242°32′04″. Azimuth from station to *South Haven, Everett Piano Co., water tank*, is 198°16′02″ to *Watervliet, silver municipal tank, finial* 345°54′03″ and to *South Haven, pierhead front range light*, 191°13′06″. In 1937 the station was reported lost.

Plane coordinates: (C), x=349,046.26 feet; y=301,304.98 feet; grid azimuth to azimuth mark=242°54′37″.*

Leifsen (Allegan County, H. C. Warwick, 1932).—Six miles northeast of Grand Junction, about 100 yards northeast of northeast corner of cemetery, in SE¼ sec. 19, T. 1 N., R. 14 W., Lee Township, on land owned and occupied by Anker Leifsen, on high summit ¼ mile southwest of his buildings, and 195 feet north of center line of east-west gravel road along southern boundary of his property. To reach from Grand Junction, follow County Route 677 north 2.3 miles to crossroads at railroad tracks, turn east across railroad tracks, and proceed east and north 5.9 miles to small cemetery on south side of road. Marked by standard station disk in drill hole in boulder, note 4, flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 12 inches, is in right-of-way of road, 238 feet east of center of concrete culvert headwall, 38 feet north of center line of gravel road, 4 feet west of 18-inch maple tree, and 242.55 feet (slope) from station in azimuth 309°12′. No. 2 projects 8 inches, is about 7 feet east of 18-inch maple tree, 68.6 feet north of fence along north side of cemetery, and 234.18 feet (slope) from station in azimuth 48°25′. Azimuth mark projects 3 inches, is in right-of-way of road, 0.2 mile north of Leifsen's building, 2 feet east of Leifsen's east property line fence, 27 feet west of center line of gravel road, and 0.5 mile from station in azimuth 214°52′18″.

Plane coordinates: (C), x=433,227.12 feet; y=345,635.35 feet; grid azimuth to azimuth mark=215°02′19″.*

Catt (Allegan County, H. C. Warwick, 1932).—About 6 miles north of South Haven, on land owned and occupied by M. B. Catt, in SW¼ sec. 7, T. 1 N., R. 16 W., Casco Township, in opening in old apple orchard situated between two houses owned by Mr. Catt, 110.7 feet southeast of southeast corner of house occupied by Mr. Catt, 117 feet south of center line of Route M–406, 142 feet north of north face of large red barn, and 105.5 feet west of vacant house owned by M. B. Catt. To reach from South Haven, go north 6.1 miles on U. S. Route 31 to junction with Route M–406, turn east on to Route M–406, and go 0.15 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is flush with ground, at east edge of garden just south of house occupied by Mr. Catt, 54.2 feet south of southeast corner of house, 48 feet west of center line of lane running from highway to barns, and 145.40 feet from station in azimuth 39°59′. No. 2 projects 4 inches, is at west edge of orchard, 36 feet south of center line of highway, 107.6 feet north of northwest corner of house at west edge of orchard, and 100.78 feet from station in azimuth 142°05′. Azimuth mark projects 4 inches, is 27.3 feet east of center line of U. S. Route 31, about 50 feet south of crest of small hill, 15.6 feet north of small maple tree, about 400 feet north of filling station, about 1,600 feet north of junction of U. S. Route 31 and Route M–406, and approximately 0.3 mile from station in azimuth 187°29′30″.

Plane coordinates: (C), x=366,860.71 feet; y=358,832.59 feet; grid azimuth to azimuth mark=187°49′30″.*

Walker (Allegan County, H. C. Warwick, 1932).—About 8 miles west of Allegan, 7 miles southeast of Fennville, in SE¼ sec. 19, T. 2 N., R. 14 W., Valley Township, on low wooded sand hill, 100 yards southwest of highest summit of hill, 75 yards north of narrow sand road which leads to station, and about 250 yards east of deserted yellow house. To reach from Fennville, follow Route M–89 south 3 miles and east 4¼ miles to gravel road leading south, proceed south 1.0 mile to narrow sand road to east, proceed east 0.65 mile to triangular blaze on 16-inch oak tree on north edge of road, and follow blazes northeast about 125 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches,

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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and is 81.39 feet from station in azimuth 219°45′. No. 2 projects 6 inches, and is 83.03 feet (slope) from station in azimuth 308°38′.

Plane coordinates: (C), x=432,086.50 feet; y=377,545.02 feet.

Johnston (Allegan County, H. C. Warwick, 1932).—About 14 miles north of South Haven, about 3 miles south of Douglas, in NE¼ sec. 32, T. 3 N., R. 16 W., Saugatuck Township, on property of H. W. Johnston, on small sand ridge covered with sassafras, 86 feet west of center line of U. S. Route 31, just north of apple orchard, and 38 feet north of northernmost tree in orchard. To reach from South Haven, go north 14.9 miles on U. S. Route 31 to junction with Route M-83, and continue north 0.7 mile on U. S. Route 31 to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is at west end of apple orchard, 59.0 feet east of center line of U. S. Route 31, 56.1 feet northeast of 14-inch maple tree, and 171.65 feet from station in azimuth 236°28′. No. 2 projects 10 inches, is 40.0 feet east of center line of U. S. Route 31, 14 feet northwest of apple tree, and 199.60 feet from station in azimuth 319°34′. Azimuth mark is flush with ground, on land owned by Mr. Barthelmess, at east edge of berry patch, 36.5 feet west of center line of U. S. Route 31, 8 feet south of telephone pole, 7 feet north of 10-inch maple tree, 200 feet southeast of farmhouse owned by Mr. Barthelmess, 200 feet southwest of farmhouse owned by Mr. Chase, and approximately 0.15 mile from station in azimuth 182°19′04″.

Plane coordinates: (C), x=375,699.54 feet; y=402,536.85 feet; grid azimuth to azimuth mark=182°37′49″.*

Kotman (Allegan County, H. C. Warwick, 1932).—About 4.5 miles northeast of Saugatuck, in SW¼ sec. 31, T. 3 N., R. 15 W., Fillmore Township, on land owned and occupied by Harm Kotman, 34 feet south of barn, 38 feet north of center line of County Route 436, and 22.5 feet northwest of barbed-wire fence corner. To reach from Saugatuck, follow U. S. Route 31 north 2.4 miles from post office to junction with County Route 436, and follow County Route 436 east 2.3 miles to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is in County Route 436 right-of-way, 21 feet south of center line, 11 feet east of fence corner, 9 feet northeast of hedge tree, and 130.39 feet from station in azimuth 295°09′. No. 2 projects 2 inches, is in northwest corner of cherry orchard, directly south of Kotman's house, 27 feet south of center line of County Route 436, 10 feet north of northwest corner tree, 11 feet east of fence corner, and 174.77 feet from station in azimuth 67°17′. Azimuth mark projects 6 inches, is in north-south road right-of-way, 15 feet east of center line of gravel road, 7 feet south of telephone pole, and approximately 0.8 mile from station in azimuth 243°05′40″. Azimuth from station to *East Saugatuck, church steeple*, distant 2.0 miles, is 237°43′53″, and to *Overisel, church steeple*, 242°09′28″.

Plane coordinates: (C), x=398,535.24 feet; y=430,833.72 feet; grid azimuth to azimuth mark=243°21′01″.*

Meiste (Allegan County, H. C. Warwick, 1932).—About 2.8 miles northeast of Hamilton, in SW¼ sec. 20, T. 4 N., R. 14 W., Overisel Township, on land owned and occupied by Albert Meiste, 89.5 feet south of south side of barn, 32 feet north of center line of narrow gravel road, 58.5 feet west of 28-inch elm tree, and 39.2 feet southwest of southwest corner of concrete under granary. To reach from Holland, follow Route M-43 southeast 8.0 miles to Hamilton, proceed north 2.2 miles on County Route 699 to crossroads, and go east 0.8 mile on narrow gravel road to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is 18 feet south of center line of gravel road, 40 feet southeast of 30-inch elm tree, and 96.56 feet from station in azimuth 302°32′. No. 2 is along south wall of Meiste's barn, and 88.25 feet from station in azimuth 178°05′. Azimuth mark is 0.6 mile east of County Route 699, 18 feet north of center line of narrow gravel road, 10 feet east of telephone pole, and 0.2 mile from station in azimuth 90°47′07″. High Point School is 0.75 mile from station in azimuth 355°18′32″.

Plane coordinates: (C), x=435,214.45 feet; y=441,224.08 feet; grid azimuth to azimuth mark=90°56′56″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Haddock (Allegan County, H. C. Warwick, 1932).—About 4 miles north of Saugatuck, about 7 miles southwest of Holland in NW¼ sec. 26, T. 4 N., R. 16 W., Laketown Township, on land owned by Mr. Haddock, 0.3 mile east of U. S. Route 31, 0.4 mile southeast of concrete store at intersection of east-west road and U. S. Route 31, on high point of brushy sand knoll, 120 feet west of old sand road leading south, 166 feet north of tar-paper house with concrete chimney, and 24 feet south of 8-inch cherry tree which is largest tree on knoll. To reach from Saugatuck, go north 4.4 miles from post office on U. S. Route 31 to concrete store at crossroads, go east 0.3 mile to crossroads, turn south onto sand road, and continue 0.3 mile to station site. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is sunk 10.5 feet in ground and anchored in 2 feet of concrete. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is 15 feet west of old sand road, 110 feet north of road forks, and 183.138 feet from station in azimuth 235°28′. No. 2 projects 6 inches, and is just north of brushy knoll, about 50 feet north of top of hill, 150 feet south of road forks, 12 feet east of sand road, and 214.90 feet from station in azimuth 316°59′. Azimuth mark projects 5 inches, and is in northeast corner of apple orchard, 20 feet northeast of apple tree, 25 feet south of center line of dirt road leading east, 125 yards east of U. S. Route 31, and approximately 0.4 mile from station in azimuth 139°44′48″.

Plane coordinates: (C), x=387,086.33 feet; y=440,057.47 feet; grid azimuth to azimuth mark=140°01′54″.*

Primary traverse station No. 39 Y (U. S. G. S.) (Berrien County, H. C. Warwick, 1932).—About 7 miles northwest of Buchanan, 0.5 mile west of Glendora, in southwest corner of Glendora crossroads, in T. 7 S., R. 19 W., and between road signs and an "Emlong Nursery" sign. To reach from Galien, follow Route M–60 north 6 miles to Glendora crossroads. To reach from Buchanan, go north on Main Street and keep paved road north and west 10 miles to Glendora crossroads. Marked by standard U. S. Geological Survey tablet stamped "Prim. Trav. Sta. No. 39–Y–1925" in concrete post. Reference mark No. 1 is square cut in concrete curb at southwest corner of filling station at crossroads, 149.92 feet from station in azimuth 212°35′. Azimuth from station to Glendora, Trinity Lutheran Church, base of cross on steeple, is 266°08′45″.

Plane coordinates: (C), x=297,331.80 feet; y=141,113.07 feet; grid azimuth to Glendora, Trinity Lutheran Church, base of cross on steeple=266°38′34″.*

Primary traverse station No. 37 Y (U. S. G. S.) eccentric (Berrien County, H. C. Warwick, 1932).—About 2 miles northeast of Millburg, on land owned by R. F. Scherer, 250 feet south of fork of two macadam roads, 43 feet northwest of center line of North Bainbridge road, 23 feet south of triangular blaze on 18-inch oak tree, and 23 feet northeast of triangular blaze on 10-inch walnut tree. To reach from Millburg, go north 2 miles on North Bainbridge road to fork and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 1 inch, and is in northeast corner of apple orchard, 32 feet south of center line of East Bainbridge road, 25 feet west of center line of gravel road, and 551.60 feet from station in azimuth 259°18′27″. No. 2 is flush with ground, in edge of apple orchard, 11 feet south of fence line, 24 feet southeast of center line of North Bainbridge road, and 70.70 feet from station in azimuth 0°18′19″. *Primary traverse station No. 37 Y (U. S. G. S.)* is 75.594 meters (248.01 feet) from station in azimuth 241°09′.

Plane coordinates: (C), x=348,577.81 feet; y=232,774.11 feet; grid azimuth to reference mark No. 1=259°40′55″.*

St. Joe (Berrien County, H. C. Warwick, 1932).—In southwest part of St. Joseph, on bluff of lake shore, on land owned and occupied by C. A. Clausius, about 45 yards west of his house, 131 feet southwest of southwest corner of house, 15 feet north of small hedge which forms boundary of Clausius' property, and 25 feet east of brink of bluff. To reach from St. Joseph, go south from Whitcomb Hotel 1.2 miles on U. S. Route 12 to St. Joseph auto camp on west side of road, and continue to brick house on hill south of camp, which is Mr. Clausius' house. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projected 4 inches, and was 10 feet east of east edge of pavement of U. S. Route 12 directly east of southeast corner of Clausius' house, 33 feet northwest of center of 24-inch locust tree, and 261.65 feet from station in azimuth 288°28′. In September 1932,

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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reference mark No. 1 was moved 3.85 feet due east of original position, and is now 266.4 feet from station in azimuth 288°13′. No. 2 projects 1 inch, is at foot of small slope, 6 feet east of 12-inch locust tree, 29 feet southwest of 24-inch oak tree, and 82.23 feet (slope) from station in azimuth 189°47′. Azimuth mark projects 1 inch, is on beach, 76.6 feet west of northwest corner of St. Joseph waterworks, 28 feet west of center line of brick pavement, 24.9 feet east of flagpole, and 0.25 mile from station in azimuth 183°19′29″. Azimuths from station to *St. Joseph pierhead, front range light*, 179°02′08″; *St. Joseph south pierhead light*, 179°38′27″; and St. Joseph pierhead, rear range light, 181°22′08″.

Plane coordinates: (C), x=298,055.03 feet; y=218,046.62 feet; grid azimuth to azimuth mark=183°49′25″.*

Saugatuck (Allegan County, H. C. Warwick, 1932).—One-fourth mile west of Saugatuck, about ½ mile southeast of mouth of Kalamazoo River, about ¼ mile east of shore of Lake Michigan, on high prominent sand dune known as Bald Head, on land owned by State, at narrow curved ridge at top of dune, 8 feet southwest of northeast slope of dune, and 75 feet northwest of observation platform at top of stairway up side of dune. To reach from U. S. Route 31 at right-angle turn at Douglas water tank, follow gravel road leading north along Kalamazoo River 1.3 miles to foot of stairway leading up dune to left, and climb stairs to top of dune and station site. Marked by standard station disk cemented in top of 11-foot section of 3-inch pipe which is sunk 10 feet into ground and anchored in 2 feet of concrete. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is in Saugatuck, on right-of-way of Water Street, on east side of street in front of Tourist Home Hotel, 25.55 meters (83.8 feet) north of north edge of concrete sidewalk on Mary Street, 7.35 meters (24.1 feet) northwest of northwest corner of house in northeast intersection of above-named streets, 3.1 meters (10 feet) southwest of 36-inch locust tree, and 429.386 meters (1,408.74 feet) from station in azimuth 312°37′05″. No. 2 is on top of small mound at south end of ridge of dune, 50 feet southwest of top of stairway, and 42.214 meters (138.50 feet) from station in azimuth 3°31′. No. 3 is on top of and 10 feet from northwest end of ridge near steep slopes on north and south, and 19.132 meters (62.77 feet) from station in azimuth 137°30′. Azimuth mark is in Saugatuck, in proposed city-park area, west of prolongation of Water Street, 15.20 meters (49.9 feet) northwest of center line of gravel road which curves into Water Street, and 322.395 meters (1,057.72 feet) from station in azimuth 272°44′19″.

Plane coordinates: (C), x=376,523.08 feet; y=423,485.72 feet; grid azimuth to azimuth mark=273°02′59″.*

Primary traverse station No. 53 Y (U. S. G. S.) eccentric (Van Buren County, H. C. Warwick, 1932).—An unmarked point 50.175 meters (164.62 feet) in azimuth 115°59′ from *Primary traverse station No. 53 Y (U. S. G. S.)*.

Plane coordinates: (C), x=366,391.29 feet; y=319,212.06 feet.

South Haven (Van Buren County, H. C. Warwick, 1932).—At north edge of South Haven, 120 yards southeast of Virginia Beach Hotel, on high point of ground, 362 feet east of center line of North Shore Drive, 63 feet south of center line of Base Line Road, and 116 feet southeast of large brick corner post on north side of road. (A proposed road passes over station and if built station will be destroyed.) To reach from South Haven, follow U. S. Route 31 north 1.3 miles to Virginia Beach Hotel at city limits. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 94 feet east of large brick corner post, 23 feet north of center line of Base Line Road, and 81.01 feet from station in azimuth 188°55′. No. 2 is flush with ground, south of Virginia Beach Hotel, 27 feet east of center line of North Shore Drive, 63 feet south of center line of Base Line Road, 43 feet southeast of center of sewer pump cover, and 334.85 feet from station in azimuth 89°52′35″. Azimuth mark projects 6 inches, is 350 feet east of center line of U. S. Route 31, on land owned by Mr. Epstiens, 22 feet south of center line of road, 34 feet east of east side of Mr. Epstiens' house, and 0.25 mile from station in azimuth 201°22′04″.

Plane coordinates: (C), x=359,422.42 feet; y=335,340.28 feet; grid azimuth to azimuth mark=201°43′08″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Zeeland (Ottawa County, H. C. Warwick, 1932; 1934).—About 7 miles northeast of Holland, 2 miles northeast of Zeeland, in NE¼ sec. 8, T. 5 N., R. 14 W., Zeeland Township, on land owned by Mrs. Ponstein and rented by James Driesenga, in barn lot, 60 feet northeast of northeast corner of Driesenga's house, and 19 feet south of row of trees which runs approximately east-west. To reach from Zeeland, go northeast on Route M–21 for 1.6 miles to gravel section road leading north, turn north across railroad on this road and go 1.3 miles to farm lane leading east up hill to station site on summit. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is 4 feet north of northwest corner of large barn, about 40 yards east of Driesenga's house, and 87.62 feet (slope) from station in azimuth 275°56′. No. 2 projects 1 inch, is 5 feet west of northwest corner of shed which is southeast of Driesenga's house, and 113.99 feet (slope) from station in azimuth 9°58′. Azimuth mark projects 6 inches, is 6 yards west of center line of north-south section-line road, 2 feet south of telegraph pole, 250 yards south of T-road leading west, and approximately 0.5 mile from station in azimuth 169°51′16″. Azimuth from station to *Zeeland, Mead Johnson & Co., tank*, is 21°26′51″.

Plane coordinates: (C), x=436,183.82 feet; y=488,147.80 feet; grid azimuth to azimuth mark=170°00′58″.*

Park (Ottawa County, H. C. Warwick, 1932; 1934).—About 5 miles west of Holland, on highest point of highest sand dune north of entrance to Holland Harbor, in SW¼ sec. 28, T. 5 N., R. 16 W., Park Township, just south of Eagle Crest Park, 150 feet east of lake shore, 22.4 feet west of blazed tree, on east slope and 28.1 feet north of blazed tree on southeast slope. To reach from Holland follow U. S. Route 31 north 1.2 miles to junction with Lakewood Boulevard, go west 2.1 miles on boulevard (paved) to paved road leading south at Standard Oil station and "Waukazoo Park" sign, follow paved road south and west 3.0 miles to gravel road at "Eagle Crest Park" sign, follow this road west about 200 yards, and north about 100 yards to cinder road leading west between two brick posts, follow this road 0.45 mile to picnic grounds at base of dune and end of truck travel, and follow trail to top of grade and to right, up steep slope to top of dune and station site. North, south, and east slopes of dune are wooded. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is sunk 9 feet in ground and anchored in 2 feet of concrete. In 1934 sand dune had shifted so that about 8 feet of pipe projects above ground. Reference marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is 10.5 meters (34 feet) west of center line of Ottawa Beach Drive (gravel road leading north), 5.0 meters (16 feet) south of 12-inch beech tree, 8.3 meters (27 feet) southeast of 36-inch beech tree, 18.7 meters (61 feet) north of corner of rustic arch at entrance to Eagle Crest Park, and 1,013.085 meters (3,323.76 feet) from station in azimuth 253°28′12″. No. 2 is 4.8 meters (16 feet) east of center line of Ottawa Beach Drive, 23.6 meters (77 feet) northeast of cobblestone pier north of entrance to house labeled "Manito Beach," on outside range with power-line pole and tall dead tree which is northernmost of three dead trees on top of nearest dune to southwest, and 995.080 meters (3,264.69 feet) from station in azimuth 274°04′31″.

Plane coordinates: (C), x=376,903.83 feet; y=468,477.08 feet; grid azimuth to reference mark no. 1=253°46′53″.*

De Junge (Ottawa County, H. C. Warwick, 1932; 1934).—About 13 miles northeast of Holland, 14 miles southeast of Grand Haven, 2 miles southwest of Allendale, on west edge of property owned by Henry De Junge, in SW¼ sec. 29, T. 7 N., R. 14 W., Allendale Township, on narrow strip of land between county road and cultivated field occupied by long row of maple trees, 29 feet west of center line of road, 19 feet south of 30-inch maple tree, and 18 feet north of blazed 9-inch maple tree. To reach from Holland, go north 13.4 miles on U.S Route 31 to junction with Route M–50, turn east onto Route M–50, continue 9.4 miles to crossroads, turn south onto narrow road, and go 0.8 mile to station site. County road is narrow and runs mostly north and south. There is cross-road 0.8 mile north of station and another 0.15 mile to south. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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standard reference disks in concrete, note 11a. No. 1 projects 3 inches, and is 24 feet east of center line of road, 56 feet east of second maple tree north of station, and 75.00 feet from station in azimuth 222°02′. No. 2 projects 3 inches, and is 25 feet east of center line of road, 58 feet east of third maple tree south of station, and 85.51 feet from station in azimuth 319°45′. Azimuth mark projects 4 inches, and is 0.1 mile west of crossroads, on top of small knoll, 35 feet north of center line of east-and-west county road, 9 feet west of 30-inch maple tree, 1 foot south of fence line, 15 feet north of 8-inch oak tree near edge of road, and approximately 0.3 mile from station in azimuth 24°38′43″. *Primary traverse station No. 108 Y (U. S. G. S.)* is 328.2458 meters (1,076.920 feet) from station in azimuth 354°05′05″.

Plane coordinates: (C), x=434,878.69 feet; y=532,216.20 feet; grid azimuth to azimuth mark=24°48′40″.*

Olive (Ottawa County, H. C. Warwick, 1932).—About 10 miles northwest of Holland, 3½ miles west of West Olive, ½ mile north of Pigeon Lake, on highest dune in vicinity, in NE¼ sec. 16, T. 6 N., R. 16 W., Sheldon Township, and on land owned by N. Holman of Chicago. To reach from Holland, go north 9.5 miles on U. S. Route 31 from main intersection traffic light to West Olive, proceed west 2.25 miles on cinder road and then south 0.5 mile to crossroads, turn west onto sand road, follow 0.45 mile to Schofield Farm on south side of road, follow farm lane southwest from house ¼ mile between cultivated fields to point where lane enters woods with fence line on right, follow fence line west about 50 yards and bear left on old wagon trace through woods about 100 yards to wreck of old wagon, go straight up side of dune to sharp break in slope about half-way up, turn left, and continue to station site at summit. Marked by standard station disk cemented in top of 11-foot section of 3-inch galvanized-iron pipe which is sunk in ground and anchored in 2 feet of concrete. Top of pipe projects 8 inches. Reference mark No. 1 is standard reference disk in concrete, note 11a 4.7 meters (15 feet) north of 8-inch ash tree north of old sand road, 1 foot north of east-west fence line, 8.8 meters (29 feet) north of center line of sand road, 6.6 meters (22 feet) northwest of 14-inch oak tree, 200 yards west of Mr. Schofield's house, and 516.425 meters (1,694.30 feet) from station in azimuth 206°54′37″. Reference marks Nos. 2 and 3 are standard reference disks in tile and concrete, note 13a. No. 2 is about 6 feet lower than station, flush with sand, at point of dune which is gently sloping, and 158.31 feet (slope) from station in azimuth 1°31′. No. 3 is on highest point of dune, about 10 feet south of line of brush which extends almost to the summit, and 95.95 feet (slope) from station in azimuth 109°15′. Azimuth mark is standard reference disk in concrete, note 11a, 13.3 meters (44 feet) southeast of 30-inch wild-cherry tree, 6.7 meters (22 feet) west of center line of cinder road, and 1,231.692 meters (4,040.98 feet) from station in azimuth 238°58′33″. To reach mark from Holland, follow directions for reaching station to point where cinder road turns south 2.25 miles west of U. S. Route 31, and continues south 0.4 mile to mark which is 0.1 mile north of crossroads where lane goes to Mr. Schofield's house. Azimuth from station to *Thompson Aeronautical Corp. airway beacon, west of Coopersville* is 230°26′36″; and to *Holland, municipal standpipe*, 326°52′05″.

Plane coordinates: (C), x=377,662.99 feet; y=513,901.64 feet; grid azimuth to azimuth mark=239°17′12″.*

Crisp (Ottawa County, H. C. Warwick, 1932).—About 6 miles north of Holland, 0.75 mile southwest of Crisp crossroads, in NE¼ sec. 28, T. 6 N., R. 15 W., Olive Township, on right-of-way of county road, about 150 yards east of residence of Abel Neinhuis, 21 feet north of center line of east-west road, 106 feet east of center line of north-south road, and 1 foot south of fence. To reach from Holland, follow Route M-21 east 1½ miles to junction with Ottawa County Route 677, proceed north 6 miles to dirt county road, and go west on this road ½ mile to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is on right-of-way of county road, in line with transmission-line poles, 33 feet east of center line of north-south road, 58 feet south of center line of east-west road, 6.5 feet south of transmission-line pole, and 106.61 feet from station in azimuth 41°16′. No. 2 is on property line along county road, 24 feet east of center line of north-south road, 69 feet north of center line of east-west road, 44.5 feet north of fence corner, and 94.07 feet from station in azimuth 119°06′. Azimuth mark

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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is in northeast corner of property owned by Johanna Knooihuizen, ¼ mile south of Crisp crossroads, 23 feet south of center line of east-west road, 39 feet west of Ottawa County Route 677, and approximately 0.5 mile from station in azimuth 271°12′45″. Azimuth from station to South Olive, Christian Reformed Church, steeple, distant 0.5 mile, is 244°22′55″.

Plane coordinates: (C), x=409,009.05 feet; y=502,326.45 feet; grid azimuth to azimuth mark=271°26′37″.*

Rosymound (Ottawa County, H. C. Warwick, 1932; 1934).—About 2½ miles south of Grand Haven, in northwest (or southwest) quarter sec. 4, T. 7 N., R. 16 W., Grand Haven Township, and on ridge north of highest point of highest dune in vicinity. To reach from junction of U. S. Route 31 and Route M–50, go north 2.7 miles on Route 31 to crossroads at Stone School, turn west onto sand road, follow 0.75 mile to T road, proceed north 0.8 mile to "Cedar View" house on east, turn west onto sandy lane opposite barn, follow 300 yards to small triangular blaze on small tree to right, follow wheel tracks north 100 yards to blow pit which is end of truck travel, go north 100 yards across blow pit to foot of dune, follow old bleached-out road leading up dune at triangular blaze on small tree, and follow trail bearing to right up ridge to station site on summit. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is filled with concrete and set in mass of concrete 2 feet deep at base of pipe. Top of pipe projects 6 inches. Reference mark No. 1 is standard reference disk in tile and concrete, note 13a, flush with surface, on northeastern end of ridge, and 50.70 feet (slope) from station in azimuth 222°09′. Reference mark No. 2 is standard reference disk in concrete, note 11a, projecting 4 inches, and is 51 feet west of center line of U. S. Route 31, 87 feet northwest of intersection of Route 31 with east-west section-line road, 3 feet east of north-south fence line, 20 feet north of medium-sized ash tree, 2 miles south of Grand Haven, and 1,664.117 meters (5,459.69 feet) (computed) from station in azimuth 241°04′14″. Reference mark No. 3 is standard reference disk in tile and concrete, note 13a, flush with surface, on west slope of dune at short break in slope, and 45.03 feet (slope) from station in azimuth 144°10′. Azimuth mark is standard reference disk in concrete, note 11a, projecting 2 inches, and is 26 feet east of center line of U. S. Route 31, 91 feet northwest of northwest corner of large brown frame farmhouse, in line of north-south row of maple trees, about half-way between two of the trees in west edge of orchard, 3 miles south of Grand Haven, and 1,722.994 meters (5,652.86 feet) (computed) from station in azimuth 300°03′43″. Azimuth from station to *Grand Haven, First Congregational Church, steeple*, is 178°15′26″; and to *Spring Lake, municipal tank*, 200°10′26″.

Plane coordinates: (C), x=373,504.63 feet; y=555,401.78 feet; grid azimuth to azimuth mark=300°23′05″.*

Aebig (Ottawa County, H. C. Warwick, 1932; 1934).—About 12 miles northeast of Grand Haven, 2 miles north of Dennison, in SW¼ sec. 4, T. 8 N., R. 14 W., Polkton Township, on land owned and occupied by G. B. Aebig, just east of farm buildings, in lane leading east from barns, 227.3 feet east of east side of main barn, 9 feet south of north fence line of lane, 12 feet east of gate in lane, and 88 feet east of 36-inch elm tree. To reach from Grand Haven, follow U. S. Route 31 north across bridge to junction with U. S. Route 16, follow U. S. Route 16 east 10.2 miles to crossroads at schoolhouse, turn north on gravel road 2.0 miles to crossroads, turn east 1.0 mile to crossroads, turn north 0.1 mile to Mr. Aebig's farm and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 4 inches. No. 1 is on south edge of lane, and 127.95 feet from station in azimuth 281°21′. No. 2 is on south edge of lane, 163 feet east of barn, 19 feet east of elm tree, and 69.32 feet from station in azimuth 67°23′. Azimuth mark is 26 feet north of center line of east-west gravel road, about 0.2 mile east of crossroads, 22.8 feet west of 10-inch elm tree, and approximately 0.3 mile from station in azimuth 295°58′09″.

Plane coordinates: (C), x=437,035.93 feet; y=585,236.74 feet; grid azimuth to azimuth mark=296°07′49″.*

Jones (Muskegon County, H. C. Warwick, 1932; 1934).—About 10½ miles east of Muskegon, 2 miles north of Sullivan, in SW¼ sec. 36, T. 10 N., R. 15 W., Eggleston Township, on land owned by J. V. Fisher, 205 feet south of southeast corner of Jones School, 186 feet east of center line of north-south section-line road which goes north from Sullivan to Route M–46, 173 feet southwest of southeast

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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fence corner of school yard, 135 feet northwest of northwest foundation of fire lookout tower, and in woods on summit which is 3 feet lower than point where tower is located. To reach from Muskegon, go east 9.4 miles on Route M–46 from junction with U. S. Route 31 to gravel road leading south to Sullivan, proceed south 1.5 miles to crossroads at Jones School, turn east to northeast corner of school yard, and south 120 yards into woods to fire tower and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects about 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is 135 feet southeast of southeast corner of Jones School, 60 feet south of east-west fence line which forms south boundary of school lot, 105 feet southwest of southeast corner of school lot, and 78.68 feet from station in azimuth 194°37′. No. 2 is 10 feet southeast of southwest foundation of tower, 11 feet southwest of southeast foundation, and 150.83 feet from station in azimuth 304°39′. Azimuth mark is in an east-west fence line 30 feet south of center line of east-west road, 54 feet east of center line of north-south section-line road, about ½ mile north of Jones School, and 0.5 mile from station in azimuth 177°11′18″.

Plane coordinates: (C), x=420,804.33 feet; y=624,103.98 feet; grid azimuth to azimuth mark=177°23′30″.*

Norton (Muskegon County, H. C. Warwick, 1932; 1934).—About 6 miles south of Muskegon, 1.5 miles south of Lake Harbor, in southwest corner sec. 24, T. 9 N., R. 17 W., Norton Township, on high conical sand dune owned by Muskegon Motorcycle Club and used as hill climb, 22 feet southwest of observation tower, 30 feet south of gin pole, and 12 feet west of stairway to tower. Wooden stairway leads from foot of dune to 30-foot-high observation tower on highest point of dune. To reach from Muskegon Heights, turn west onto Broadway, follow main paved road west and southwest 3.8 miles to bridge over Mona Lake at Lake Harbor, continue south on main paved road 1.6 miles to crossroads, turn west onto narrow lane between two wire fences, and go 0.25 mile to base of dune. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is sunk 11 feet into sand and anchored in 2 feet of concrete. Reference marks are standard reference disks in concrete, note 11a, projecting 4 inches. No. 1 is 1 foot north of wire fence on north side of motorcycle club plot, 7 meters (23 feet) south of center line of road leading to dune, 30 meters (98 feet) east of base of dune and stairway leading to top, and 125.447 meters (411.57 feet) from station in azimuth 273°44′28″. No. 2 is 1 foot north of fence line on south side of club grounds, 7 meters (23 feet) north of fork in woods road which leads to beach, 75 meters (246 feet) east of woods line at base of dune just to south of Norton dune, and 263.266 meters (863.73 feet) from station in azimuth 313°09′26″. Azimuth from station to *Muskegon, Campbell Wyant Foundry, water tank, finial* is 193°00′58″; to *Muskegon, Piston Ring Co., tallest stack,* 201°41′27″; to *Spring Lake, municipal tank,* 318°38′46″; and to Muskegon, airport beacon, 235°37′52″.

Plane coordinates: (C), x=357,606.21 feet; y=600,818.65 feet; grid azimuth to reference mark No. 2=313°31′20″.*

Grand Haven (Ottawa County, H. C. Warwick, 1932; 1934).—On high stable dune in Grand Haven, near city water tanks, on highest point of dune, about 30 meters (98 feet) east of center of north water tank, and 9 feet east of blaze on 8-inch oak tree. To reach from Ferry Hotel in Grand Haven, follow Water Street south around shore 0.95 mile to Emmet Street, follow Emmet Street up steep grade 0.25 mile to end of street and truck travel, turn right and walk over soft sand, descend steep chicken ladder to trail following narrow ridge to east, and follow trail 250 yards up ridge to station site. Marked by standard station disk cemented in top of 12-foot section of 3-inch galvanized-iron pipe sunk in ground with top projecting 6 inches. Reference mark No. 1 is standard reference disk in concrete, note 11b, southwest of cut used as wagon road which runs into open glade between first and second ridges of dune, 12.6 meters (41 feet) northwest of 12-inch evergreen tree, 4.4 meters (14 feet) southeast of 20-inch beech tree, and 117.82 meters (386.5 feet) from station in azimuth 229°22′25″. Reference marks Nos. 2 and 3 are standard reference disks in tile and concrete, note 13a, projecting about 3 inches. No. 2 is on top of dune, and 28.43 feet from station in azimuth 333°11′. No. 3 is on top of dune, and 15.32 feet from station in azimuth 58°39′. Azimuth mark is standard reference disk in concrete, note 11b, in open glade, 60 meters (197 feet) east of foot of dune, 8.5 meters (28 feet) southwest of 24-inch

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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beech tree, and 136.80 meters (448.8 feet) from station in azimuth 274°24′53″. To reach reference mark No. 1 and azimuth mark, go south on Second Street 0.4 mile from its intersection with Washington Street to Williams Street, go to right 150 yards on Williams Street to its foot, follow wagon road southwest 200 yards from house to steep short grade which is end of truck travel, and follow wagon tracks through cut to above-mentioned open glade. Azimuth from station to *Grand Haven, pierhead, rear range light,* distant 0.7 mile, is 93°37′58″.

Plane coordinates: (C), x=369,844.91 feet; y=567,527.05 feet; grid azimuth to azimuth mark=274°44′50″.*

Casnovia (Muskegon County, H. C. Warwick, 1932).—About 20 miles east of Muskegon, 3 miles northwest of Casnovia, in NW¼ sec. 15, T. 10 N., R. 13 W., Casnovia Township, on land owned by Floyd Bull, 2 feet south of east-west fence line which forms south boundary of woods and north boundary of clearing, about 150 yards west of north-south fence line, 20 yards east of west edge of clearing, and on highest ground in vicinity. To reach from Muskegon, go east 23 miles on Route M–46 to junction with Route M–37 about 1 mile west of Casnovia, go north 2.0 miles on Route M–37 to gravel road leading west from curve just west of bridge over railroad, turn west, follow gravel road 1.35 miles to Bull's farm (gray house on north, red barn on south), and follow lane south past barn 0.4 mile to station site in clearing in wooded tract. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, No. 1 projects 5 inches, is 1 foot south of east-west fence line, 120 yards west of north-south fence line, and 80.33 feet from station in azimuth 270°35′. No. 2 projects 4 inches, is in south edge of clearing, about 25 yards east of west edge of clearing, and 118.68 feet from station in azimuth 349°57′. Azimuth mark is approximately 20 feet west of center line of north-south section-line gravel road, about equidistant between 2 apple trees in north-south fence line, 100 feet south of east-west fence line, 200 feet north of large red barn, and approximately 0.7 mile from station in azimuth 274°15′32″.

Plane coordinates: (C), x=475,011.18 feet; y=640,998.67 feet; grid azimuth to azimuth mark=274°19′23″.*

Dietrich (Ottawa County, H. C. Warwick, 1932).—About 12 miles northwest of Grand Rapids, 4 miles southeast of Conklin, in SW¼ sec. 35, T. 9 N., R. 13 W., Chester Township, on land owned and occupied by Aloys Dietrich, 175 feet east of east side of his residence, 100 feet southeast of southeast corner of barn, 115 feet north of center line of road, 25 feet east of north-south fence, 53 feet north of east-west fence, and 19 feet southeast of 18-inch apple tree. To reach from Muskegon, follow Route M–46 east 19 miles to intersection with Ottawa County Route 661, proceed south 8.9 miles on County Route 661 to Big Springs School, and go east 1.3 miles from school on gravel road to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 1 foot west of north-south fence, 99 feet north of fence corner, 160 feet north of road, and 98.12 feet from station in azimuth 242°07′. No. 2 is 3 feet west of large stump, 1 foot north of east-west fence, 34.5 feet west of fence corner, 61 feet north of center line of road, and 74.24 feet from station in azimuth 314°57′. Azimuth mark is about 0.9 mile south of Wright Crossroads, on right-of-way of county road in front of property owned by Katie Miller of Grand Rapids, 1 foot west of fence, 29 feet east of center line of road, 200 feet northeast of 48-inch elm tree on west side of road, 235 feet north of property line fence, and 1.5 miles from station in azimuth 336°40′51″. Lutheran Church spire, is 1.0 mile from station in azimuth 170° 36′40″.

Plane coordinates: (C), x=481,088.75 feet; y=589,790.64 feet; grid azimuth to azimuth mark=336°43′45″.*

Kent (Kent County, C. D. Meaney, 1931; 1932).—About 2 miles north-northeast of Kent City, on knoll in cultivated field, in center of south half of NW¼ sec. 21, T. 10 N., R. 12 W., 35 meters (115 feet) east of north-and-south row of trees and on center line (extended) of road leading to station site. To reach from Kent City, follow the Casnovia road north 1.0 mile from Route M–46, turn right (east gravel) 0.5 mile, turn left (north) onto gravel road and continue 0.6 mile. About 200 yards beyond red farmhouse on west side of road, turn left through gate (just north of stubble field and fence) and continue west on road ¼ mile between

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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fence lines and peach orchard to top of knoll and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on north-and-south fence line between cultivated field and wood lot, about 30 meters (98 feet) south of north side of field, and approximately ¼ mile from station in azimuth 253°34′29″. No. 2 was on edge of field, on east edge of north-and-south row of trees, and 58.12 meters (190.6 feet) from station in azimuth 146°14′. In 1932, this reference mark was moved to point 197.25 feet from station in azimuth 144°32′.

Plane coordinates: (C) $x=501,027.00$ feet; $y=635,465.29$ feet; grid azimuth to reference mark No. 1=253°34′19″.*

Ballards (Kent County, C. D. Meaney, 1931; 1934).—About 3 miles south and 1 mile west of Sparta, about 0.2 mile southwest of northeast corner of NW¼ sec. 3, T. 8 N., R. 12 W., in center of apple orchard, 8 meters (26 feet) west of center line of dim north-and-south wagon road through orchard, 48.8 meters (160 feet) west of north-and-south wire fence between two orchards, 38.4 meters (126 feet) east-northeast of T-intersection of two farm roads, and 87.8 meters (288 feet) south of east-and-west corral fence. To reach from Sparta, go 1½ blocks west from post office and turn left (south) onto asphalt Route M-37, continue south 2.9 miles and keep gravel road straight south where main asphalt road turns left, proceed about 200 feet and turn right at T-road (church in northwest angle), and follow gravel road 0.5 mile (150 yards beyond jogged crossroads). Station is about 300 feet south of Miss Elsie Field's house (first one on south side of road beyond jogged crossroads), on highest ground in apple orchard. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in north-and-south wire fence line between two apple orchards, and 48.74 meters (287.9 feet) from station in azimuth 270°28′. No. 2 is 2 feet south of east-and-west corral fence, 19.0 meters (62 feet) west of center line of dim road at gate leading into orchard from main highway, and 87.78 meters (287.9 feet) from station in azimuth 178°59′. Azimuth from station to church spire, ½ mile distant, is 259°00′24″.

Plane coordinates: (C), $x=507,509.48$ feet; $y=588,699.17$ feet; grid azimuth to church spire=258°59′15″.*

Dake (Muskegon County, H. C. Warwick, 1932).—About 10 miles northwest of Muskegon, about 6 miles southwest of Whitehall, on high sand dune at south end of group of dunes lying west of Duck Lake, on land owned by E. B. Dake of Muskegon, and at north end of narrow ridge on highest part of dune. To reach from Muskegon, follow U. S. Route 31 north 3.3 miles to junction with Scenic Drive in North Muskegon, turn left onto Scenic Drive, continue west and north 12.0 miles to foot of dune east of station, and climb about 100 yards to top of dune and station site. Foot of dune is at summit of grade after crossing Muskrat Lake and opposite apple orchard on east side of road. There is triangular blaze on 6-inch tree west of road. Dune is very steep, and slopes and top are heavily wooded. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is at top of grade, 5 feet east of telephone pole, 0.85 foot west of fence line, 29.4 feet east of center line of highway, 15 feet south of signboard (Idlewood Hotel), and 104.901 meters (344.16 feet) from station in azimuth 219°00′33″. Azimuth mark is flush with surface, on right-of-way of highway, about 100 feet north of foot of hill, on fill above Muskrat Lake, 14 feet east of center line of highway, 2 feet west of white guard rail, and 194.351 meters (637.63 feet) from station in azimuth 328° 19′28″.

Plane coordinates: (C), $x=326,888.67$ feet; $y=667,772.48$ feet; grid azimuth to azimuth mark=328°46′15″.*

Whitehall (Muskegon County, H. C. Warwick, 1932).—About 1½ miles southeast of Whitehall, in NW¼ sec. 34, T. 10 N., R. 16 W., Whitehall Township, on land owned and occupied by Lester Benston, 44 feet north of center line of east-west section-line road, 27 feet northwest of fence corner, 19 feet west of north-south fence line, 102 feet southeast of southeast corner of Benston's house, and 37 feet east of center line of driveway to house. To reach from Muskegon, go north about 12 miles on U. S. Route 31 to gravel road leading west which is 1.5 miles north of point where Route 31 turns north after leading west ¾ mile and

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

about 2 miles south of Whitehall, and proceed west 0.7 mile to station site at Benston's house on north side of road. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete note 11a. No. 1 projects 3 inches, is 17 feet south of center line of section-line road, 2 feet southwest of telegraph pole, 112 feet east of point where Benston's driveway leaves road, and 95.08 feet from station in azimuth 310°56′. No. 2 projects 6 inches, is 17 feet south of center line of section-line road, 4 feet east of telegraph pole, 78 feet west of point where driveway leaves road, and 129.67 feet from station in azimuth 63°58′. Azimuth mark projects 6 inches, is 12 feet south of center line of section-line road, 3 feet east of telegraph pole, 8 feet north of east-west fence line, about 60 feet east of point where road goes north to farmhouse, about 90 feet east of barn on south side of road, and approximately 0.2 mile from station in azimuth 88°50′05″.

Plane coordinates: (C), $x=347{,}304.51$ feet; $y=690{,}095.96$ feet; grid azimuth to azimuth mark=89°13′46″.*

Montague (Muskegon County, H. C. Warwick, 1932).—About 4.5 miles S. 75° W. of Whitehall, 1.25 miles north of White River entrance, in southwest corner sec. 35, T. 12 N., R. 18 W., White River Township, about 200 feet east of Lake Michigan, on extreme west point of prominent sand dune which is heavily wooded on all but west slope which is loose sand, 8 feet south of tree with twisted limb, 19 feet north of 10-inch wild-cherry tree, 5 feet south of blazed 3-inch maple tree, and 36.5 feet west of 36-inch oak tree which is largest in vicinity. To reach from Montague, go northwest 2 blocks from traffic light to point where street starts up hill, turn left (west) at beach hotel signs, follow macadam road southwest 5.3 miles to beach, and proceed north 0.9 mile to foot of dune. Marked by standard station disk cemented in top of 11-foot section of 3-inch iron pipe which is sunk 10.5 feet into sand and anchored in 2 feet of concrete. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, and is on north slope of hill, and 83.82 feet (slope) from station in azimuth 219°59′. No. 2 projects 4 inches, and is on top of ridge, 37 feet east of oak tree mentioned above, and 58.62 feet (slope) from station in azimuth 253°10′.

Plane coordinates: (C), $x=318{,}685.81$ feet; $y=690{,}847.58$ feet.

Muskegon (Muskegon County, H. C. Warwick, 1932; 1934).—In North Muskegon, at north end of Stewart Street, on edge of low bank overlooking Bear Lake to northwest, 173 feet north of center of North Muskegon municipal water tank, and 56.8 feet northwest of northwest corner of Kilkare cottage. To reach, follow U. S. Route 31 to Ruddiman Avenue in North Muskegon, proceed west 0.3 mile on Ruddiman Avenue to Fowler Street, proceed north 2 blocks to Moulton Avenue, proceed west 2 blocks to Stewart Street, and proceed north 100 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 27 feet southwest of triangular blaze on 18-inch oak tree, 13 feet north of 110-volt high-line pole, and 66.50 feet from station in azimuth 212°46′. No. 2 projects 4 inches, is 160.5 feet northeast of northeast corner of Kilkare cottage, 16.5 feet southwest of triangular blaze on 15-inch oak tree, and 179.59 feet from station in azimuth 297°34′. Azimuth mark projects 5 inches, is on land owned by Fred Andry, 95.8 feet northwest of northwest corner of his house, 28 feet south of center line of gravel road, and 1.25 miles from station in azimuth 169°31′26″. To reach from junction of U. S. Route 31 and Ruddiman Avenue, go north 0.6 mile on Route 31 to gravel road, and follow west 0.5 mile to mark. Azimuth from station to North Muskegon municipal water tank, distant 173.0 feet, is 41°44′.

Plane coordinates: (C), $x=361{,}724.28$ feet; $y=641{,}366.53$ feet; grid azimuth to azimuth mark=169°52′47″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Supplementary points

New Carlisle, municipal tank, finial light (St. Joseph County, Ind., H. C. Warwick, 1932).—Plane coordinates: (C), $x=291,525.88$ feet; $y=76,446.43$ feet.

Three Oaks, Warren Featherbone Co., water tank (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=265,208.23$ feet; $y=111,532.91$ feet.

Niles, municipal standpipe (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=363,597$ feet; $y=126,048$ feet.

Bridgeman, municipal water tank, finial (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=283,503.30$ feet; $y=162,290.77$ feet.

Benton Harbor, black municipal standpipe, finial (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=309,737$ feet; $y=225,160$ feet.

Benton Harbor, Baker Vawter Co., white stack (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=308,945.60$ feet; $y=229,238.60$ feet.

Benton Harbor, High School, stack (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=308,043$ feet; $y=220,272$ feet.

Saint Joseph, municipal standpipe, finial (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=301,953.48$ feet; $y=223,634.96$ feet; grid azimuth to station *Henley*$=211°32'18''.2$.

Saint Joseph, Berrien County Courthouse, dome (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=302,775.08$ feet; $y=222,680.28$ feet; grid azimuth to station *St. Joe*$=45°31'45''.0$.

Saint Joseph, Catholic Church, steeple (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=302,543.85$ feet; $y=222,549.75$ feet.

Saint Joseph, J. Wallace Sons & Co., western stack (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=300,815.57$ feet; $y=223,515.14$ feet.

Saint Joseph Lighthouse (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=298,293$ feet; $y=225,346$ feet.

Saint Joseph, pierhead front range light (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=297,995$ feet; $y=225,445$ feet.

Saint Joseph, south pierhead, light (Berrien County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=298,072$ feet; $y=225,047$ feet.

Saint Joseph, Whitcomb Hotel, spire on dome (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=301,468.30$ feet; $y=223,373.50$ feet.

Primary traverse station No. 37 Y (U. S. G. S.) (Berrien County, H. C. Warwick, 1932).—At junction of East Bainbridge and Coloma-Bainbridge roads, on property of R. F. Scherer, 30 feet northeast of 30-inch oak tree, and 6 feet south of fence line. Marked by standard U. S. Geological Survey bronze tablet stamped "P. T. sta. No. 37 Y 1926," in concrete post projecting 6 inches. *Primary traverse station No. 37 Y eccentric* is 75.59 meters (248.0 feet) from station in azimuth 61°09′.

Plane coordinates: (C), $x=348,795.30$ feet; $y=232,818.45$ feet.

Primary traverse station No. 53 Y (U. S. G. S.) (Van Buren County, H. C. Warwick, 1932).—About 2¾ miles southeast of South Haven, at Maple Grove School, 20 feet north of center line of Route M-43, 25 feet southeast of center line of gravel road, 12 feet east of tip of triangular grass plot formed by intersection of above-mentioned roads, 2 feet west of telephone pole, and 8 feet south of 12-inch maple tree which is last tree in line of trees southeast of gravel county road. To reach from South Haven, go south about 0.5 mile on U. S. Route 31 to junction with Route M-43, and proceed southeast 2.1 miles on Route M-43 to station site at Maple Grove School. Marked by standard U. S. Geological Survey tablet stamped "P. T. Sta. No. 53 Y 1926," in top of 6- by 6-inch concrete post flush with surface.

Plane corrdinates: (C), $x=366,540.09$ feet; $y=319,141.66$ feet.

Watervliet, silver municipal tank, finial (Berrien County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=361,491.66$ feet; $y=250,343.90$ feet.

Bangor, black municipal tank, finial (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=402,493.76$ feet; $y=296,758.46$ feet.

South Haven, rear range light (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=355,497$ feet; $y=329,007$ feet.

South Haven, pierhead front range light (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=354,705$ feet; $y=328,883$ feet.

South Haven, Everett Piano Co., water tank (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=357,163.09$ feet; $y=325,363.35$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

South Haven, Everett Piano Co., south stack (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=357,263.17$ feet; $y=325,347.96$ feet.

South Haven, St. Basil's Catholic Church, steeple (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=356,190.15$ feet; $y=328,179.18$ feet.

South Haven, municipal concrete storage tank (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=362,853.86$ feet; $y=329,012.78$ feet.

South Haven, municipal standpipe (Van Buren County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=358,723.95$ feet; $y=329,856.35$ feet.

Fennville, black municipal water tank, finial (Allegan County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=403,704.09$ feet; $y=399,197.42$ feet.

Douglas, municipal tank, finial (Allegan County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=375,573.01$ feet; $y=416,874.59$ feet.

Saugatuck Lighthouse (Allegan County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=374,657$ feet; $y=429,149$ feet.

East Saugatuck, church steeple (Allegan County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=407,586$ feet; $y=436,492$ feet.

Belvedere Farm, gray water tank (Allegan County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=388,217.75$ feet; $y=432,666.11$ feet.

Overisel, church steeple (Allegan County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=430,640$ feet; $y=447,608$ feet.

Holland, north of State park zoo, Getz farm, tank (Ottawa County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=377,299$ feet; $y=475,947$ feet.

Holland, Holland Furnace Co., tank (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=406,161$ feet; $y=465,686$ feet.

Holland, Bush Lane Piano Co., tank (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=406,493.40$ feet; $y=465,598.06$ feet.

Holland, Heinz Canning Co., stack (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=398,492.72$ feet; $y=467,904.13$ feet.

Holland, Holland Shoe Co., stack (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=399,377.53$ feet; $y=468,334.16$ feet.

Holland, City Light Co., stack (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=405,524.77$ feet; $y=471,434.81$ feet.

Holland, municipal standpipe (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=405,266.99$ feet; $y=471,103.74$ feet.

Holland, Black Lake, front range light (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=374,943.55$ feet; $y=464,029.23$ feet.

Holland, Black Lake, rear range light (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=375,826.67$ feet; $y=464,080.46$ feet.

Graafschap, church steeple (Allegan County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=397,102$ feet; $y=456,643$ feet.

Zeeland, municipal tank, west side (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=424,376.84$ feet; $y=478,106.56$ feet.

Zeeland, Mead Johnson Co., tank (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=432,403.50$ feet; $y=478,604.41$ feet.

Primary traverse station No. 108–Y (U. S. G. S.) (Ottawa County, H. C. Warwick, 1932).—About 2 miles southwest of Allendale, in T. 7 N., R. 14 W., 43 feet southeast of center of road intersection, 7 feet east of 36-inch blazed tree, and 22 feet south of center line of east-west road. Marked by standard U. S. Geological Survey tablet stamped "P. T. Sta. No. 108–Y 1926" in top of concrete post. Station *De Junge* (see description thereof) is 328.246 meters (1,076.92 feet) from station in azimuth 174°05′05″.

Plane coordinates: [1] (C), $x=434,987$ feet; $y=531,145$ feet.

Coopersville, municipal tank, finial (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=451,913.93$ feet; $y=569,482.48$ feet.

Thompson Aeronautical Corporation, west of Coopersville, airway beacon (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=444,332.66$ feet; $y=568,363.87$ feet.

Grand Haven, pierhead front range light (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=364,780$ feet; $y=567,738$ feet.

Grand Haven, pierhead rear range light (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=365,359.30$ feet; $y=567,838.02$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Grand Haven, First Congregational Church, steeple (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=373,152$ feet; $y=569,630$ feet.

Grand Haven, Eagle Ottawa Leather Co., stack (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=378,389$ feet; $y=570,193$ feet.

Challenge Refrigerator Co., stack (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=374,693.27$ feet; $y=571,633.78$ feet.

Spring Lake, municipal tank (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=380,593.49$ feet; $y=574,364.87$ feet.

Spring Lake, Holland Church, white steeple (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=381,130$ feet; $y=574,131$ feet.

Dietrich, Lutheran Church steeple 1 mile north of (Ottawa County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=480,204.28$ feet; $y=595,168.42$ feet.

Primary traverse station No. 16 F (U. S. G. S.) eccentric (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=390,157.90$ feet; $y=595,033.01$ feet.

Primary traverse station No. 16 F (U. S. G. S.) (Muskegon County, H. C. Warwick, 1932).—About 8 miles southeast of Muskegon and 0.5 mile northwest of Fruitport, in T. 9 N., R. 16 W., 13 paces north of center line of road, 10 paces east of center line of old interurban grade line, 6 paces northwest of 18-inch cottonwood, 8 paces south of guyed transmission-line pole, 4 paces west of small cedar, and 4 feet north of corner fence post. To reach from Grand Haven, follow concrete road to Fruitport, continue north from center of village 0.6 mile to crossroads at end of pavement, turn west onto sand road, and continue 0.3 mile to station site. Marked by standard U. S. Geological Survey tablet stamped "P. T. Sta. No. 16–F 1928" in concrete post flush with surface.

Plane coordinates: (C), $x=390,171.39$ feet; $y=595,033.34$ feet.

Muskegon, American Showcase Co., stack (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=371,620$ feet; $y=625,438$ feet.

Muskegon, courthouse, tip of spire (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=368,389.71$ feet; $y=632,590.63$ feet.

Muskegon, Central Paper Co., tall stack (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=352,209.85$ feet; $y=625,230.31$ feet.

Muskegon, breakwater, front range light (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=340,909.87$ feet; $y=628,819.95$ feet.

Muskegon, north breakwater light (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=340,606.93$ feet; $y=629,342.70$ feet.

Muskegon, pierhead rear range light (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=342,630$ feet; $y=629,340$ feet.

Muskegon, Campbell-Wyant Foundry, water tank, finial (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C). $x=362,403.64$ feet; $y=620,985.47$ feet.

Muskegon, municipal standpipe, center (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=367,152.16$ feet; $y=621,469.37$ feet.

Muskegon, Bennet Pump Co., water tank, finial (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=371,049.25$ feet; $y=620,450.70$ feet.

Muskegon, Brunswick Radio Corp., brick stack (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=364,944.31$ feet; $y=627,545.44$ feet.

Muskegon, Piston Rings Co., tallest stack (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=367,624.21$ feet; $y=625,544.64$ feet.

White River, pierhead light (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=319,323.22$ feet; $y=683,958.07$ feet.

White River Lighthouse (Muskegon County, H. C. Warwick, 1932).—About 5 miles southwest of Whitehall. To reach from Whitehall, follow Scenic Drive south 1.0 mile from main corner, proceed west 4.5 miles on main macadam road to macadam crossroads, continue straight ahead at crossroads, follow pavement 1.25 miles to point where it turns east to landing, turn west, and go 100 yards to lighthouse which is yellow-brick octagonal tower attached to dwelling well up from shore on south bank of White River and lake entrance.

Plane coordinates: (C), $x=320,714.74$ feet; $y=683,904.25$ feet.

Whitehall, Eagle Ottawa Leather Co., stack (Muskegon County, H. C. Warwick 1932).—Plane coordinates: (C), $x=339,923.86$ feet; $y=693,323.90$ feet.

Whitehall, municipal standpipe, finial (Muskegon County, H. C. Warwick 1932).—Plane coordinates: (C), $x=344,370.86$ feet; $y=694,956.51$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

EAST SHORE OF LAKE MICHIGAN, NORTHERN SECTION

Principal points

Sleeping Bear (Leelanau County, H. C. Warwick, 1932).—About 4 miles north of Empire, 2½ miles southwest of Glen Haven, in sec. 36, T. 29 N., R. 15 W., on prominent sand dune known as Sleeping Bear, and 10 feet northeast of and 1 foot below highest point of dune. To reach from Traverse City, follow Route M–22 west and north 1.5 miles to junction with County Route 612, proceed west 23.4 miles on Route 612 to junction with Route M–22 at Empire, proceed north 2.0 miles on Route M–22 to junction with Route M–109, proceed northwest 3.1 miles on Route M–109 to fenced lane leading west to foot of sand dune, follow lane west 300 yards to board gate, continue north through gate and along west edge of cherry orchard 85 yards to gap in fence at left, proceed northwest across pasture 150 yards to foot of sand dune at saddle, climb dune to summit which is broad sandy plateau, and go southwest across this desert about 1 mile to station site which is on high dune rising above plateau and overlooking Lake Michigan. Marked by standard station disk cemented in top of 12-foot section of 3-inch pipe which is sunk 11 feet in sand, filled with concrete, and anchored in mass of concrete. Reference mark No. 1 is standard reference disk cemented in boulder, on plateau about 100 feet lower than station, 35 yards east of edge of sand bank on shore of Lake Michigan, and 467.52 meters (1,533.9 feet) from station in azimuth 170°12′27″. Reference mark No. 2 is standard reference disk cemented in top of 12-foot section of 3-inch pipe which is sunk 11 feet into sand and anchored in mass of concrete, 193.166 meters (633.75 feet) east of reference mark No. 1, and 412.50 meters (1,353.3 feet) from station in azimuth 194°32′52″. *Day Forest estate, water tank,* is approximately 3 miles from station in azimuth 251°13′22″.

Plane coordinates: (C), x=417,401.23 feet; y=1,229,473.86 feet; grid zimuth to *Day Forest Estate, water tank, finial*=251°26′51.8″.

Cedar (Leelanau County, H. C. Warwick, 1932).—Twelve miles northwest of Traverse City, in NE¼ sec. 11, T. 28 N., R. 13 W., on land leased by the State but owned by Leo Gauthier, in old apple orchard, 4.53 meters (14.9 feet) north of northeast leg of Cedar fire lookout tower, and 8.01 meters (26.3 feet) northeast of northwest leg. To reach from Traverse City, follow Route M–22 west and north 1.2 miles to junction with County Route 612, follow this road west 2.8 miles to County Route 616 which is paved, turn north onto County Route 616, follow pavement north and west 9.2 miles to Cedar, continue west on same road 2.6 miles to dirt road leading south up steep hill opposite Cedar tower sign, and follow dirt trail south 0.5 mile to fire tower and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is in apple orchard, between fourth and fifth rows of trees from west side of orchard, midway between fifth and sixth rows of trees from south side, 31.43 meters (103.1 feet) north of northeast tower leg, and 26.90 meters (88.3 feet) from station in azimuth 181°10′. No. 2 is in third row of trees from west side of orchard, 15 feet south of fourth tree from south end of row, 8.6 meters (28 feet) northwest of northwest tower leg, and 14.53 meters (47.7 feet) from station in azimuth 84°30′. *Cedar, fire lookout tower* is 8.48 meters (27.8 feet) from station in azimuth 21°21′.

Plane coordinates: (C), x=475,763.77 feet; y=1,218,879.30 feet.

Pyramid (Leelanau County, H. C. Warwick, 1932).—About 6 miles northeast of Glen Haven, on point of bluff overlooking Lake Michigan known as Pyramid Point, in NE¼ sec. 31, T. 30 N., R. 13 W., on land owned by Miss Mary Miller, 15 feet south of edge of bluff at highest point, 20 feet southeast of small clump of basswoods on brink of bluff, and 18 feet west of partially dead 2-foot basswood. To reach, from Maple City, follow County Route 671 north 6 miles to Route M–22, proceed west 3.45 miles to road to north at cemetery on north side of road, follow main road north and west 1.85 miles to fork at which main-traveled road goes straight ahead, turn east onto sand road, follow 0.5 mile to wire gate which is entrance to Miss Mary Miller's house, follow lane north 175 yards to house, continue north on wagon tracks 200 yards to northwest edge of small cornfield, proceed east up north edge of cornfield 140 yards to bars at northeast corner of meadow and end of truck travel, pass through bars, follow old road through woods 180 yards to clearing to northeast, continue northeast 80 yards across clearing and enter trace of old road near post and 12-inch maple, follow northeast 140 yards to edge of bluff, turn left along edge of bluff, and continue

For notes in regard to marking of stations see p. 167.

southwest 75 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is south of point of bluff, lower than station, on practically level ground in midst of small trees and bushes, and 80.48 feet (slope) from station in azimuth 318°00′. No. 2 projects 2 inches, is at about same elevation as station, on same bluff, and 46.42 feet (slope) from station in azimuth 78°34′.

Plane coordinates: (C), x=454,962.09 feet; y=1,263,881.79 feet.

Barnard (Benzie County, H. C. Warwick, 1932).—About 9 miles east of Benzonia, 5 miles north of Thompsonville, in NW¼ sec. 5, T. 25 N., R. 13 W., Colfax Township, on land owned and occupied by George Barnard, about 200 yards south of his house, 85 yards east of fence along east edge of woods, on top of knoll in cultivated field, and 80 feet south of forked black-cherry tree in south edge of orchard. To reach from Benzonia, go east 5 miles on County Route 608 from junction with U. S. Route 31 to junction with County Route 671, proceed north 0.5 mile on County Route 671, proceed east 3.0 miles to crossroads, proceed south 1.5 miles to crossroads at school, turn east onto section-line road which bears left, continue up valley 0.65 mile to fork at mail box, follow main (left) fork up valley to Barnard's house where public road turns east, follow farm lane south between barn and house along edge of woods 200 yards to southwest corner of orchard, and continue southeast across field 100 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is 8 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is in east-west fence line, about 50 feet west of southeast corner of orchard, and 115.76 feet (slope) from station in azimuth 226°11′. No. 2 projects 6 inches, is in south edge of orchard, about 2 feet south of young quince tree, and 108.24 feet (slope) from station in azimuth 142°47′. Azimuth mark projects 4 inches, is in north edge of woods, about 60 feet east of southwest corner of cultivated field, and approximately 0.45 mile from station in azimuth 339°47′41″. To reach azimuth mark, go east about 100 yards and south on farm road about 0.35 mile along edge of woods until road ends at north edge of woods, proceed east 100 yards, and then south about 80 yards to mark.

Plane coordinates: (C), x=456,714.15 feet; y=1,129,312.60 feet; grid azimuth to azimuth mark=339°54′41″.*

Kirby (Benzie County, H. C. Warwick, 1932).—About 1½ miles northeast of Frankfort, in NE¼ sec. 23, T. 26 N., R. 15 W., on land owned and occupied by Earl Kirby, at east edge of wooded area, about 85 yards south of road, 250 feet west of Kirby's house, 12 feet east of 6-inch maple tree with triangular blaze and 27 feet east-southeast of double wild-cherry tree. To reach from Standard Oil station at Frankfort, go north 0.25 mile on Route M–22 to point where pavement bears left, turn right (northeast) onto gravel road on east side of park, proceed 0.25 mile, turn east, continue 1.5 miles to gravel crossroads, proceed north 0.6 mile on gravel road to sand road to west, proceed west 0.45 mile to driveway to Kirby's house, follow drive south to top of hill, and proceed west 85 yards across ravine to station site. Surface and underground station marks are standard station disks in concrete, notes 1a and 7a. Upper mark is 8 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is 50 yards north of Kirby's house, 7.5 feet east of center line of drive to Kirby's house, 48 yards south of center line of road, and 236.95 feet from station in azimuth 247°59′. No. 2 projects 4 inches, is 38 feet southwest of southwest corner of Kirby's house, 16 feet west of 18-inch maple tree, and 234.86 feet from station in azimuth 302°10′. Azimuth mark projects 6 inches, is on right-of-way of county road, 1 foot east of right-of-way fence, 20 feet west of center line of gravel road, 97 feet south of center line of dirt road, and 0.45 mile from station in azimuth 267°05′56″.

Plane coordinates: (C), x=380,391.36 feet; y=1,147, 359.96 feet; grid azimuth to azimuth mark=267°25′19″.*

Honor (Benzie County, H. C. Warwick, 1932).—About 1½ miles south of Honor, near Honor fire lookout tower, in NE¼ sec. 20, T. 26 N., R. 14 W., on land leased by State but owned by Don Marshall, 5.46 meters (17.9 feet) southeast of southwest leg of tower, and 5.35 meters (17.6 feet) southwest of southeast leg. To reach from main corner in Beulah, follow U. S. Route 31 north

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

0.3 mile to gravel road leading east known as Narrow Gauge Road, follow this road east 2.3 miles to fork, follow left fork 0.8 mile northeast to crossroads, proceed east 0.5 mile on gravel road to crossroads at fire tower sign, continue straight east 0.5 mile on sandy road to another fire tower sign, follow sand road south 0.25 mile into woods to its end, and continue south up path 200 meters (656 feet) to fire tower and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 4 inches. No. 1 is in edge of woods, 7.1 meters (23 feet) northeast of southeast tower leg, 8.8 meters (29 feet) southeast of northeast tower leg, and 11.115 meters (36.47 feet) from station in azimuth 238°39′. No. 2 is in edge of woods, 14.25 meters (46.8 feet) south of southeast tower leg, 4.0 meters (13 feet) west of 10-inch beech tree, 1.6 meters (5 feet) southeast of 12-inch maple tree, and 9.900 meters (32.48 feet) from station in azimuth 344°26′. *Honor fire lookout tower* is 7.46 meters (24.5 feet) from station in azimuth 175°32′.

Plane coordinates: (C), x=427,552.49 feet; y=1,145,483.26 feet.

Downs (Benzie County, H. C. Warwick, 1932).—Four miles north of Frankfort, in SE¼ sec. 33, T. 27 N., R. 16 W., on land owned by Crystal Downs Country Club, 75 yards west of road, in unimproved wooded area on high point of ground, 8 feet southeast of 6-inch cedar tree, and 9 feet northwest of triangular blaze, on 12-inch beech tree To reach from Frankfort, follow Route M–22 north 4.6 miles from Standard Oil station to gasoline station on left side of road, turn left onto private road of Crystal Downs Country Club, follow 0.3 mile through woods to point where road makes sharp turn to right just beyond summit of first grade, and proceed west 75 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference and azimuth marks are standard reference disks in concerte, note 11a. No. 1 projects 5 inches, is down steep slope toward road, 9 feet west of 10-inch beech tree, and 58.5 feet from station in azimuth 270°11′. No. 2 projects 5 inches, is down gentle slope, 9 feet west of 10-inch birch tree, 4 feet northeast of 6-inch fir tree, and 49.2 feet from station in azimuth 19°31′. Azimuth mark is 0.15 mile east of private road leading to country club, 50 feet north of center line of Route M 22, 24.5 feet west of center line of gravel road, and 0.4 mile from station in azimuth 291°50′45″.

Plane coordinates: (C), x=372,131.57 feet; y=1,165,743.93 feet; grid azimuth to azimuth mark=292°11′30″.*

Buck (Benzie County, H. C. Warwick, 1932).—About 10 miles northeast of Bear Lake, 3 miles west of Thompsonville, on highest point of prominent ridge known locally as Sleepy Buck Hills, in NE¼ sec. 33, T. 25 N., R. 14 W., Weldon Township, and on State land. To reach from Bear Lake go north 5.1 miles on U. S. Route 31 to Gulf gasoline station and grocery at Warren Corners, proceed east 3.9 miles on County Route 604, proceed north 1 mile, east 3.0 miles and again north 2.5 miles on narrow graded road to junction with County Route 671, turn west onto sand road, follow along south side of fence 0.65 mile to point 50 yards beyond where road bears to southwest near triangular blaze on 5-inch maple tree on right, follow trace of old woods road northwest up valley to point where brush was thrown across it and blazed trail leads to left, and follow blazed trail west 0.25 mile to station site on highest knoll which is bare except for sumac and brush. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark is flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is flush with ground, and 52.83 feet from station in azimuth 32°35′. No. 2 is flush with ground, and 100.09 feet (slope) from station in azimuth 164°22′. Azimuth mark projects 4 inches, and is 1 foot west of north-south fence line, 16 feet north of northeast corner of small apple orchard, 10 feet south of small tree, 32 feet west of center line of County Route 671, 100 yards north of yellow frame farmhouse, 0.2 mile north of above-mentioned crossroads and sand road along fence, and approximately 1.0 mile from station in azimuth 267°34′07″. Azimuth from station to Benzonia, light on tank, is 142°06′10″.

Plane coordinates: (C), x=435,158.43 feet; y=1,102,020.66 feet; grid azimuth to azimuth mark=267°44′35″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Lemley (Benzie County, H. C. Warwick, 1932).—About 3 miles northeast of Arcadia, 6 miles south of Frankfort, in NE¼ sec. 35, T. 25 N., R. 16 W., on land owned by L. B. Putney of Kalamazoo and occupied by Mrs. Ethel Lemley, about 600 yards north of east-west county road, on fence line between hayfield on south and woods on north, 51 feet west of fence and 11 feet south of 10-inch wild-cherry tree with triangular blaze. To reach from Arcadia, follow Route M–22 east and north 3.3 miles to gravel road to east, proceed east 0.7 mile to dirt road to north which is just west of Mrs. Lemley's octagonal concrete house, go north 0.25 mile on dirt road to gap in field on west, enter gap, and drive north across field 175 yards to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is 1 foot west of fence on east side of hayfield, 12 feet west of center line of dirt road, 162 feet south of fence on north side of hayfield, and 170.60 feet (slope) from station in azimuth 351°19′. No. 2 is 1 foot south of fence on north side of hayfield, 55 feet west of 10-inch elm tree, and 151.00 feet (slope) from station in azimuth 82°19′. Azimuth mark is about 200 yards south of east-west county road, 400 yards southwest of Lemley's house, on fence line between apple and cherry orchard on west and uncultivated field on east, 70 feet southeast of corner tree of apple orchard, 66 feet northwest of large pile of stones, and approximately 0.5 mile from station in azimuth 8°39′18″.

Plane coordinates: (C), x=382,369.77 feet; y=1,104,631.23 feet; grid azimuth to azimuth mark=8°58′17″.*

Glover (Manistee County, H. C. Warwick, 1932).—About 6 miles northeast of Bear Lake post office, 0.75 mile east of Glovers Lake, and in SE¼ sec. 12 or NE¼ sec. 13, T. 24 N., R. 15 W., Pleasanton Township. Section line could not be definitely determined, but land to north is owned by Starke Lumber Co. and to south by C. Swenson. To reach from Bear Lake, go north 5.1 miles on U. S. Route 31 to Warren's Corners (small store and filling station on left), turn east onto County Route 604, follow east and southeast 3.9 miles to T-road, proceed north 1.0 mile on County Route 604 to point where it turns east at crossroads, turn west at road 0.75 mile past church, continue to end of traveled road near house, and continue 0.15 mile up little-used grade to point where road turns to north near triangular blaze on tall slim elm tree and end of truck travel. Continue straight west 200 yards following blazes to end of old grade, and continue on blazed trail 150 yards to station site on summit of knoll on high ridge which is bare except for few small elms, choke cherries and sumac. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, and is 145.04 feet from station in azimuth 299°41′. No. 2 projects 3 inches, and is 52.65 feet from station in azimuth 94°40′. Azimuth mark projects 5 inches, is 95 feet northeast of center line of County Route 604, 35 feet northeast of center line of single-track railroad, 6 feet south of corner post of fence, 25 feet south of center line of little-used road, about 75 feet east of grade crossing, ½ mile east of east end of Glovers Lake, and approximately 0.7 mile from station in azimuth 38°47′56″.

Plane coordinates: (C), x=418,722.68 feet; y=1,088,556.05 feet; grid azimuth to azimuth mark=39°01′02″.*

Brethren (Manistee County, H. C. Warwick, 1932; 1936).—About 16 miles northeast of Manistee, 2 miles northeast of Brethren, 3 miles south of Kaleva, in NW¼ sec. 3, T. 22 N., R. 14 W., Brethren Township, and on conical hill on extreme western end of Dixon ridge which is covered with thick growth of scrub oak and poplar. To reach from Kaleva, go south 3.5 miles on County Route 699 from junction with east-west macadam road in west edge of Kaleva, go east 1.5 miles on sand road, proceed north 1.0 mile to blaze on 16-inch oak tree on left, follow trace of old woods road northwest up valley 150 yards to triangular blaze and stick arrow on right, turn left onto blazed trail, and follow west 250 yards to station site on top of hill. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a, flush with ground. No. 1 is 29.19 feet (slope) from station in azimuth 226°17′. No. 2 is 50.13 feet from station in azimuth 356°55′. Azimuth mark is 15 feet south of center line of east-west sand road, about 50 yards northwest of barn,

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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150 yards west of gate at point where road turns south, and approximately 0.7 mile from station in azimuth 144°38′44″. To reach azimuth mark from junction of County Route 594 and County Route 669, go north 2.0 miles to sand road to west, and follow west 0.9 mile to mark on south side of road.

Plane coordinates: (C), x=436,483.95 feet; y=1,032,694.86 feet; grid azimuth to azimuth mark=144°48′55″.*

Onekama (Manistee County, H. C. Warwick, 1932).—About 3½ miles northwest of Onekama, about 150 meters (492 feet) northwest of Mr. O'Lass' house, on ridge 20 meters (66 feet) west of west edge of woods, 13.85 meters (45.4 feet) northwest of old flagpole, and 10.20 meters (33.5 feet) north of fence line. To reach from Park Road in Manistee, go northeast 4 miles on U. S. Route 31 to junction with Route M–22 on left, go north 7.8 miles on Route M–22 to Onekama, proceed northwest 3.2 miles on Route M–22 to gravel road to west and sign "Point Lookout," proceed west 1.05 miles on gravel road to fork, follow right-hand dirt trail west and north around edge of field to Mr. O'Lass' house, continue north 0.1 mile bearing west between edge of field and wooded lot, and continue southwest 20 meters (66 feet) up steep slope to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 10 meters (33 feet) north of 8-inch beech tree, 2.6 meters (9 feet) west of fence line, and 25.58 meters (83.9 feet) (slope) from station in azimuth 227°40′. No. 2 projects 4 inches, is 6.6 meters (22 feet) north of old fence line, 6.25 meters (20.5 feet) northeast of 6-inch oak tree, and 16.78 meters (55.1 feet) from station in azimuth 73°59′. Azimuth mark is on first low ridge northeast of station, 1 meter (3 feet) southwest of 8-inch maple tree which is southernmost tree in group of three (one beech and one oak), 9 meters (30 feet) southwest of southwest corner of old dilapidated barn, and approximately 0.3 mile from station in azimuth 201°46′09″. Azimuth from station to Ruggles-Rademaker Salt Co., stack, is 15°41′18″; and to *Portage Lake, pierhead light*, 18°41′54″.

Plane coordinates: (C), x=370,196.58 feet; y=1,059,310.83 feet; grid azimuth to azimuth mark=202°07′00″.*

Scott (Manistee County, H. C. Warwick, 1932; 1936).—Eight miles northeast of Manistee, in NW¼ sec. 12, T. 21 N., R. 17 W., Manistee Township, on land owned and occupied by Mrs. Scott, on ridge which runs in northeast-southwest direction and is covered by light growth of slender wheat grass, near 2 large boulders lying on top of ground, 12 feet east of smaller boulder, 65 feet west of fence line, and 9 feet north of east-west fence line. To reach from Manistee, follow U. S. Route 31 from Standard Oil station at north side of town northeast 9.1 miles to north-south gravel crossroad which is about 0.25 mile southwest of small country church, turn north onto gravel road, follow 0.6 mile to crossroads, proceed west 0.5 mile to road leading south, go 0.3 mile to Mrs. Scott's house on west side of road, follow lane around south side of barn, and continue west about 200 yards to top of hill and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 12 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 48 feet north of fence corner, 1 foot east of fence line, 15 feet south of crest of steep slope to north, and 73.61 feet (slope) from station in azimuth 240°43′. No. 2 projects 6 inches, is 1 foot west of fence line, 65 feet south of fence corner, 12 feet west of lane used for livestock, and 107.02 feet from station in azimuth 336°12′. Azimuth mark projects 3 inches, is 0.15 mile west of road which leads south to Mrs. Scott's house, in T-fence corner, 22 feet north of center line of east-west road, and approximately 0.3 mile from station in azimuth 179°54′33″.

Plane coordinates: (C), x=383,406.58 feet; y=1,030,483.50 feet; grid azimuth to azimuth mark=180°13′14″.*

Wellston (Manistee County, H. C. Warwick, 1932; 1936).—About 12 miles southeast of Manistee, about 9 miles northeast of Free Soil, on high prominent hill occupied by Wellston fire lookout tower, in SW¼ sec. 25, T. 21 N., R. 15 W., 20 feet southwest of northwest corner of tower, and 21 feet northwest of southwest corner of tower. To reach from Manistee, go north 2.1 miles on U. S. Route 31 (across bridge) to junction with Route M–55 (unmarked) near State highway-maintenance garage, turn right (southeast) onto Route M–55, follow new gravel road southeast and east 14 miles to point where road makes slight bend to left

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

and ungraded dirt road leads south at sign "State Fire Tower 4½ miles," proceed southwest 4.0 miles on this dirt road keeping right-hand fork along telephone line at 1 mile to road to right at fire-tower sign, and follow this road northwest 0.7 mile to station site at fire tower. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is 40 feet southeast of southwest corner of tower, 43 feet south of northeast corner of tower, 11 feet southeast of telegraph pole, and 60.58 feet from station in azimuth 303°25′. No. 2 projects 4 inches, is 27 feet west of center line of road to tower, surrounded by small bushes, and 86.39 feet from station in azimuth 147°21′. Azimuth mark projects 2 inches, is 3 feet west of fence post in north boundary fence of sand road, 15 feet north of center line of road, 90 yards west of point where road turns north, and approximately 0.6 mile from station in azimuth 346°43′41″. Mark is not visible without clearing trees close to station. Azimuth from station to *Wellston, fire lookout tower*, 8.23 meters (27.0 feet) distant, is 273°22′.

Plane coordinates: (C), $x=412{,}819.38$ feet; $y=978{,}841.47$ feet; grid azimuth to azimuth mark=346°57′35″.*

Manistee (Manistee County, H. C. Warwick, 1932; 1936).—About 1¼ miles north of business district of Manistee, in west edge of Manistee Cemetery, and on top of high dune overlooking Manistee harbor and lake. To reach from Manistee, follow U. S. Route 31 north across bridge 1.2 miles to junction with paved road to left which leads to State Park and with Standard Oil filling station in forks, follow park road north about 20 yards, turn west (left) at railroad track onto gravel road, go 0.2 mile to cemetery gate, continue northwest on main driveway about 0.2 mile to mounted ornamental cannon on left at foot of dune, take trail up side of dune just west of cannon, and continue about 200 yards to top of dune and station site. Marked by standard station disk in top of 12-foot section of 4-inch galvanized-iron pipe sunk 11 feet into sand and filled with cement. Reference mark No. 1 is standard reference disk in concrete, note 11a, projecting 4 inches, on Parkdale-Eastlake road, 26 feet south of south end of guard rail of concrete bridge over Manistee River, 18 feet east of center line of road between guard posts Nos. 3 and 4 south of bridge, and 2,175.27 meters (7,136.7 feet) from station in azimuth 271°20′52″. To reach reference mark No. 1, continue east 0.9 mile on U. S. Route 31 from Standard Oil filling station to gravel road to south, turn south, and continue to concrete bridge mentioned above. Reference mark No. 2 is standard reference disk in pipe similar to station mark, down slope of dune and 22.24 meters (73.0 feet) from station in azimuth 132°36′. Azimuth mark is standard reference disk in concrete, note 11a, projecting 6 inches, on west side of Parkdale-Eastlake road, about 0.75 mile south of bridge, 14.5 feet east of 18-inch oak tree, 22 feet west of center line of road, 100 feet south of road intersection, and 3,115.19 meters (10,220.4 feet) from station in azimuth 292°59′38″. Azimuth from station to *Big Sable Lighthouse* is 33°53′33″, and to *Manistee, pierhead light*, is 54°57′44″. In 1936 it was reported that the iron pipe holding the station mark was unstable and could be moved about ½ inch.

Plane coordinates: (C), $x=350{,}127.56$ feet; $y=1{,}007{,}911.17$ feet; grid azimuth to azimuth mark=293°23′36″.*

Gun (Mason County, H. C. Warwick, 1932; 1936).—About 10 miles northeast of Scottville, 2½ miles north of Fountain, 1½ miles southeast of Free Soil, in NW¼ sec. 35, T. 20 N., R. 16 W., on land owned by Leo Dufon who lives 1½ miles southwest, 50 yards northwest of cabin, on highest ground in vicinity which is dotted with burnt stumps, in poplar scrub, and 40 feet north of north edge of cultivated field. To reach from Scottville, go north 10.4 miles on U. S. Route 31 to macadam road to east, proceed east 4.3 miles passing through Free Soil to ungraded road leading south, go south 0.95 mile to fork, take right-hand road which is little used, and go 0.3 mile to end at field and tumbledown cabin. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is between cultivated field and poplar brush at point where there is distinct angle in line of brush, and 41.09 feet (slope) from station in azimuth 26°49′. No. 2 is in north edge of cultivated field, and 82.74 feet (slope) from station in azimuth 84°47′.

Plane coordinates: (C), $x=383{,}533.99$ feet; $y=943{,}380.48$ feet.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Hamlin (Mason County, H. C. Warwick, 1932).—About 8 miles north of Ludington, 200 yards south of Hamlin Lake, in SE¼ sec. 2, T. 19 N., R. 18 W., Hamlin Township, on property owned by Captain Johnson of Ludington, in wooded area on highest point in vicinity, 110 feet south of east-west road, 100 yards west of north-south road, and 18 feet southwest of 18-inch beech tree with triangular blaze. To reach from Ludington, follow U. S. Routes 31 and 10 east 1.0 mile from their junction to tar-macadam road to north, proceed north 7.6 miles to point where road turns west just south of Hamlin Lake, and proceed west 100 yards on road and south 110 feet through trees to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is 25 feet north of center line of east-west road, 7 feet east of telephone pole, 5 feet south of large stump, 90 yards west of north-south road, and 140.91 feet (slope) from station in azimuth 199°47′. No. 2 is at east edge of narrow trail through trees, 32 feet south of center line of road, and 151.22 feet (slope) from station in azimuth 127°40′. Azimuth mark is on bank of cut on east side of road, about 60 yards northwest of house on east side of road, 70 yards northeast of barn on west side of road, 1 foot west of fence, 15 feet north of 20-inch poplar tree which is northern one of line of poplar trees, 25 feet east of center line of road, and approximately 0.25 mile from station in azimuth 342°55′36″. *Big Sable Lighthouse* is 4 miles from station in azimuth 81°52′02″.

Plane coordinates: (C), x=323,496.35 feet; y=936,322.22 feet; grid azimuth to azimuth mark=343°23′37″.*

Tamarack (Manistee County, H. C. Warwick, 1932; 1936).—In southwest corner of Manistee, near southwest corner of fence surrounding lawn just back of Country Club Stables, 10 meters (33 feet) east of center line of Tamarack Avenue, and 13.5 meters (44 feet) west of 12-inch maple tree. To reach from downtown Manistee, follow U. S. Route 31 south to First Street, proceed west 0.45 mile on First Street to Spruce Street, proceed south 0.25 mile on Spruce Street to Bryant Avenue, proceed west 0.25 mile on Bryant Avenue to Tamarack Avenue, and proceed south 0.15 mile on Tamarack Avenue to top of hill and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 0.5 meter (2 feet) west of fence line, 9.5 meters (31 feet) east of center line of Tamarack Avenue, 25 meters (82 feet) southwest of southwest corner of Country Club Stables, and 133.75 feet from station in azimuth 180°52′. No. 2 projects 5 inches, is in old fence corner, 18.8 meters (62feet) southwest of southwest iron fence corner post of fence inclosing flower garden, and 40.20 meters (131.9 feet) from station in azimuth 290°01′. Azimuth mark projects 2 inches, is in right-of-way of narrow road, 12.5 meters (41 feet) west of north-south fence line, 11.5 meters (38 feet) south of center line of road, 0.3 meter (1 foot) north of fence line, and 0.2 mile from station in azimuth 60°40′24″. Azimuth from station to *Manistee, breakwater light*, is 135°00′32″; and to *Manistee, pierhead light*, 141°55′28″.

Plane coordinates: (C), x=346,912.87 feet; y=999,141.95 feet; grid azimuth to azimuth mark=61°04′51″.*

Kintner (Mason County, H. C. Warwick, 1932).—About 11 miles south of east of Ludington, 3½ miles southeast of Scottville, in NW¼ sec. 33, T. 18 N., R. 16 W., on land owned and occupied by G. D. Kintner, in center of small grassy pasture lane which goes west from Mr. Kintner's house to small woods, 10 feet south of north boundary fence of lane, 9 feet north of south fence, 44 feet west of small black cherry tree, 68 feet south of most southerly of four walnut trees in field to north, about 175 feet east of east edge of woods, and about 200 yards west of Mr. Kintner's house. To reach from Scottville, go south 2.5 miles from traffic light to gravel road leading east, proceed east 2.5 miles, proceed south 0.3 mile to lane leading west, follow lane 400 yards passing Mr. Kintner's yellow house to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark flush with ground. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is in south boundary fence of lane, 58 feet east of black cherry tree mentioned above, and 101.25 feet from station in azimuth 282°49′. No. 2 is on north-south fence line, about 75 feet north of southeast corner of woods, in bottom of small draw which runs through cultivated field into woods, and 198.93 feet from station in azimuth 67°38′. Azimuth mark is 15 feet west of center

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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line of north-south road, 1 foot east of west right-of-way fence of same road, 15 feet south of 24-inch beech tree, 120 feet northwest of northwest corner of small stone (imitation) farmhouse, and 0.25 mile from station in azimuth 322°58′42″.

Plane coordinates: (C), x=373,046.52 feet; y=880,084.89 feet; grid azimuth to azimuth mark=323°18′45″.*

Summit (Mason County, H. C. Warwick, 1932).—About 3½ miles south of Ludington, in NW¼ sec. 2, T. 17 N., R. 18 W., Summit Township, on land owned and occupied by Dominick Romanofsky, on east bank of cut, 8.9 meters (29 feet) east of center line of road, 0.30 meter (1.0 foot) east of fence line, and on high point of small ridge which runs northwest-southeast. To reach from Ludington, follow U. S. Route 31 south and east 3 miles to south bridge over Marquette River, continue south 0.8 mile on U. S. Route 31 to Kozy Korner filling station, proceed west 0.25 mile on gravel road to school, proceed south 0.25 mile to cinder road to west, follow cinder road 0.75 mile to crossroads, proceed south 0.5 mile to another cross road, and continue south 0.2 mile to station site at top of grade in cut. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No 1 projects 8 inches, is in small draw which runs along fence line to south from station, 7.9 meters (26 feet) east of center line of road, 0.2 meter (1 foot) east of fence line, 2.44 meters (8.0 feet) south of farm gate, and 32.94 meters (108.1 feet) (slope) from station in azimuth 0°37′. No. 2 projects 3 inches, is on top of ridge which leads northwest from station, 4 meters (13 feet) west of west bank of deep cut, 0.28 meter (0.9 foot) east of fence line, and 28.64 meters (94.0 feet) (slope) from station in azimuth 130°44′. Azimuth mark projects 8 inches, is 9.80 meters (32.2 feet) east of center line of gravel road, 0.5 meter (2 feet) northeast of corner post, 22.7 meters (74 feet) southeast of 8-inch oak tree, and 0.5 mile from station in azimuth 181°32′17″.

Plane coordinates: (C), x=319,765.86 feet; y=876,556.20 feet; grid azimuth to azimuth mark=182°00′44″.*

McDonald (Mason County, H. C. Warwick, 1932).—About 3.5 miles southeast of Ludington, 0.5 miles south of Marquette River, in SW¼ sec. 25, T. 18 N., R. 18 W., Ludington Township, on property owned by Charles McDonald, on highest point in vicinity, about 200 yards northeast of service station at curve in highway, 450 feet east of U. S. Route 31, on fence line between pasture on east and cultivated field on west, 162 feet north of angle in fence, 18 feet north of 6-inch white-oak tree on fence line, and 18 feet east of 8-inch white-oak tree. To reach from Ludington, follow U. S. Route 31 south 3 miles to south bridge of Marquette River, continue south 0.55 mile to point just beyond service station on west and to gate in pasture on east, enter gate, go north across ravine to fence, and follow fence east and north to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is on fence line between pasture and cultivated field, 16 feet northeast of 10-inch white-oak tree, 26 feet southwest of angle in fence, and 181.33 feet from station in azimuth 349°02′. No. 2 is on right-of-way of U. S. Route 31, 0.5 foot south of right-of-way fence, 32 feet east of center line of U. S. Route 31, 15 feet north of center of gate, 22 feet north of telephone pole, 300 feet north of service station on west side of highway, and 431.02 feet (slope) from station in azimuth 59°54′36″. Azimuth mark is on right-of-way of cinder road, 0.25 mile north of north bridge over Marquette River, 17 feet south of center line of cinder road, 56 feet west of center line of U. S. Route 31, and approximately 0.9 mile from station in azimuth 172°29′34″.

Plane coordinates: (C), x=324,883.60 feet; y=883,632.46 feet; grid azimuth to azimuth mark=172°57′14″.*

Crystal (Oceana County, H. C. Warwick, 1932; 1937).—About 9 miles northeast of Hart, 2½ miles southeast of Crystal Valley, in NW¼ sec. 26, T. 16 N., R. 16 W. Crystal Township, on land owned by J. J. Straley of Muskegon and rented by Floyd Arnold, 172 feet east of center line of north-south sand road, and 300 yards south of Arnold's house. To reach from Hart, go north 3.1 miles on U. S. Route 31 to gravel road leading east at Crystal Valley sign, go east 5.75 miles, north 2.0 miles, and east 2.25 miles to road leading south, proceed south 1.45 miles to top of grade in cut, and go east 172 feet to station site on knoll. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

disks in concrete, note 11a. No. 1 projects 6 inches, is opposite point where road goes through 6-foot cut, 25 feet east of center line of road and 183.63 feet (slope) from station in azimuth 54°00′. No. 2 projects 3 inches, is 18 feet east of center line of road, 8 feet south of small quaking asp tree, and 206.84 feet (slope) from station in azimuth 134°13′. Azimuth mark projects 6 inches, is 18 feet west of center line of road 38 feet northwest of intersection of road and driveway into white frame house, 80 feet west of white house, and approximately 0.35 mile from station in azimuth 174°05′01″. In 1935 due to highway construction the azimuth mark and reference marks were reset. Reference mark No. 1 is 160.30 feet (slope) from station in azimuth 54°00′, and No. 2 is 190.80 feet (slope) from station in azimuth 134°13′. Azimuth mark is approximately 0.35 mile from station in azimuth 173°21′01″.

Plane coordinates: (C), x=381,672.05 feet; y=820,972.42 feet; grid azimuth to azimuth mark=173°39′36″.*

Pentwater (Oceana County, H. C. Warwick, 1932).—About 0.5 mile southwest of business section of Pentwater, northwest of fire lookout tower, and on highest and most stable part of sand dune. To reach from U. S. Route 31 at Commercial Hotel and Verback Tavern in Pentwater, go west and south (across bridge) 0.75 mile on main-traveled road to ungraded road leading west (right) at base of dune, follow this road which winds back into dunes 0.55 mile to point where it turns to left down a hill, and follow sand trail leading west and north about 100 yards to top of dune and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is just south of lookout tower, and 21.38 meters (70.1 feet) (slope) from station in azimuth 314°41′. No. 2 is down slope of dune, and 21.88 meters (71.8 feet) (slope) from station in azimuth 76°26′. Azimuth mark is north of Lake Pentwater, in south edge of Pentwater, 32 meters (105 feet) west of municipal tank, 1 meter (3 feet) west of cement walk, 1 meter (3 feet) north-northeast of city water plug, in grass plot between highway and pavement, 7.4 meters (24 feet) west of center line of U. S. Route 31, 49 meters (161 feet) south of intersection of U. S. Route 31 and Third Street, and approximately 0.5 mile from station in azimuth 233°05′02″. *Pentwater fire lookout tower* is 21.90 meters (71.9 feet) from station in azimuth 305°15′. Azimuth from station to *Transit traverse station No. 36 Tex* (*U. S. G. S.*) is 213°18′51″.

Plane coordinates: (C), x=317,940.66 feet; y=829,451.82 feet; grid azimuth to azimuth mark=233°33′39″.*

Bald (Oceana County, H. C. Warwick, 1932).—On bald part of dune, about 15 feet south of summit, 15 yards south of large blow pit, and 23 feet east of triangular blaze on 8-inch oak tree. To reach from Pentwater post office, go north 1.6 miles on U. S. Route 31 to steep gravel road to west which goes up grade into deep cut, follow this road which winds to north and west among steep wooded hills 0.5 mile to crossroads near house to northwest and end of motor travel, follow sand path northwest past house and on up to top of narrow ridge which winds around in northeast direction, and follow ridge east and north 250 yards to station site. Marked by standard station disk cemented in top of 12-foot section of iron pipe which was driven into ground and anchored in 2 feet of concrete. Pipe is filled with concrete and top projects 6 inches. Reference mark No. 1 is standard reference disk in concrete, note 11a, 1.7 miles north of Pentwater post office, 8 feet east of east edge of pavement of U. S. Route 31, in place where grading changes from cut on south to fill on north, and 535.755 meters (1,757.72 feet) from station in azimuth 288°32′42″. Reference marks Nos. 2 and 3 are standard reference disks in tiles, note 13a, projecting 2 inches. No. 2 is up on dune, 15 feet east of clump of small oak trees, 10 feet northwest of small path which leads to top of dune, and 75.69 feet (slope) from station in azimuth 47°27′. No. 3 is down dune toward lake, 19 feet northeast of 8-inch oak tree, and 59.55 feet (slope) from station in azimuth 100°13′. Azimuth mark is standard reference disk in concrete, note 11a, flush with surface, 2.0 miles north of Pentwater post office, 11 feet east of east edge of pavement of U. S. Route 31, in side of cut, and 595.228 meters (1,952.84 feet) from station in azimuth 256°52′50″. Distance between azimuth mark and reference mark No. 1 is 313.814 meters (1,029.57 feet). Azimuth from station to *Transit traverse station No. 36 Tex* (*U. S. G. S.*) is 236°27′05″.

Plane coordinates: (C), x=320,521.97 feet; y=840,394.21 feet; grid azimuth to azimuth mark=257°21′04″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Shelby (Oceana County, H. C. Warwick, 1932).—Four miles northeast of Shelby, in NE¼ sec. 12, T. 14 N., R. 16 W., Shelby Township, on land owned by Lige Toner of Muskegon, 0.25 mile south of F. B. Atherton's house, 100 feet south of east-west fence line, in heavy woods on highest part of high prominent hill, and 9 feet north of small triangular blaze on small hickory tree. To reach from Shelby, go east 2.6 miles on gravel road from Kozy Korners filling station on U. S. Route 31 in northeast edge of town to gravel road just east of small culvert, proceed north 1.0 mile, proceed east 0.9 mile to Atherton's house on south side of road, and go south 0.25 mile on foot to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 is flush with ground, and 61.27 feet from station in azimuth 42°43′. No. 2 projects 6 inches, and is 73.02 feet from station in azimuth 269°37′.

Plane coordinates: (C), $x=358{,}011.16$ feet; $y=774{,}921.76$ feet.

Benona (Oceana County H. C. Warwick, 1932).—About 7 miles northwest of Shelby, 0.5 mile east of Little Sable Lighthouse, in NE¼ sec. 6, T. 14 N., R. 18 W., Benona Township, 0.3 mile west of farmhouse of F. E. Little, 175 feet west of east edge of woods, and on highest point of ridge. To reach from Shelby, follow Little Sable road west 6.7 miles from Standard Oil station to road leading north, turn right at white bungalow with tar-paper roof in southwest corner of intersection, continue north 2.25 miles to F. E. Little's house on west side of road, follow lane past barns west to pasture, proceed west along summit of ridge to edge of woods, and continue 175 feet into woods to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, and is on ridge, and 107.89 feet from station in azimuth 254°50′. No. 2 projects 7 inches, and is in woods north of station, and 70.05 feet from station in azimuth 339°30′.

Plane coordinates: (C), $x=300{,}504.46$ feet; $y=782{,}007.32$ feet.

Rose (Oceana County, H. C. Warwick, 1932).—About 2 miles southeast of Shelby, 2 miles north of New Era, in SW¼ sec. 22, T. 14 N., R. 17 W., Shelby Township, on land owned and occupied by Frank De Rose, 300 yards northwest of his house, 200 yards north of county road, 165 feet east of fence at east edge of woods, 99 feet west of fence at edge of cultivated field, and 14 feet northeast of clump of slippery elm bushes. To reach from Shelby, follow gravel road (Ferry Road) at Standard Oil service station east 1.0 mile, south 0.25 mile, east 0.25 mile, and south 1.25 miles to crossroads (Ferry road turns east 1 mile north of this point), proceed east 0.25 mile under branches of large tree to gate into pasture in small valley on north, enter gate, and follow east side of draw north 250 yards up hill to station site at summit. Marked by standard station disk in gray granite boulder, note 4. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is 0.5 foot west of north-south fence, 112 feet south of fence corner, and 113.08 feet from station in azimuth 238°47′. No. 2 is on slight ridge between two small ravines, 0.5 foot west of north-south fence, and 165.50 feet from station in azimuth 321°49′. Azimuth mark is 15 feet south of center line of road, 2 feet south of fence, 220 yards east of center line of county road, and 0.3 mile from station in azimuth 20°38′12″. To reach azimuth mark, go south to road, proceed west on road 0.25 mile to north-south road, proceed south 0.2 mile to narrow lane to east, and go east on lane 220 yards to mark. Azimuth from station to New Era, white Catholic Church, cross, distant 2 miles, is 3°04′58″.

Plane coordinates: (C), $x=345{,}692.67$ feet; $y=761{,}629.33$ feet; grid azimuth to azimuth mark=21°02′18″.*

Middlecamp (Oceana County, H. C. Warwick, 1932).—About 10 miles northeast of Whitehall, 4 miles east of New Era, in SE¼ sec. 6, T. 13 N., R. 16 W., Otto Township, on land owned and occupied by J. Middlecamp, 114 feet south of center line of east-west road, 82 feet south of east-west fence line, 123 feet east of southeast corner of cultivated field, 186 feet north of northeast corner of field, on top of steep sandy knoll which is dotted with old stumps and small bushes, about 250 yards south of east of Middlecamp's house, and about 200 yards east of his barn. To reach from Whitehall, go north 10.4 miles on U. S. Route 31 to gravel road leading east at point ½ mile south of New Era and 3.0 miles north of Rothbury, proceed east 0.6 mile, south 0.5 mile, and east 3.7 miles to gravel crossroads, proceed north 0.5 mile to T-road, and proceed west 0.4 mile to station site

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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on south side of road. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is in southwest corner of T-road, 54 feet south of center line of east-west road, 34 feet west of north-south road, in north-south fence line, 19 feet south of fence corner, and approximately 0.4 mile from station in azimuth 269°55′49″. No. 2 projects 2 inches, is 10 feet north of center line of east-west road, 15 feet west of southeast fence corner of orchard (also used as pasture), 2 feet north of east-west fence line, 100 yards east of Middlecamp's house, and 367.6 feet (slope) from station in azimuth 111°58′08″. Azimuth mark projects 6 inches, and is 38 feet west of northwest corner of district schoolhouse, 24 feet west of well shaft, 20 feet east of center line of north-south road, and approximately 0.8 mile from station in azimuth 126°24′24″. To reach azimuth mark proceed as to station, continue 0.6 mile to road leading north, and proceed north 0.5 mile to schoolhouse mentioned above.

Plane coordinates: (C), x=363,345.06 feet; y=747,108.00 feet; grid azimuth to azimuth mark=126°45′43″.*

Claybank (Oceana County, H. C. Warwick, 1932).—About 8 miles northwest of Whitehall, 2 miles southwest of Claybank town hall, in SW¼ sec. 21, T. 13 N., R. 18 W., Claybank Township, on land owned by Mr. Oosterhaus of Grand Haven, about 300 yards northwest of Oosterhaus' home, 200 yards west of road, 100 yards north of old orchard, 200 yards east of Lake Michigan, and on top of prominent hill in open pasture. To reach from traffic light at Montague, follow Route M–99 northwest 3.3 miles to macadam T-road, turn north with Route M–99, continue 6.5 miles to crossroads at schoolhouse, turn west at gravel road, go 1.0 mile to Claybank town hall, proceed south 0.5 mile on gravel road, proceed west 1.65 miles on sand road to T-road, proceed south 0.3 mile to gate leading to Mr. Oosterhaus' house west of road (barn on east side of road) go through gate, and continue west 150 yards on wagon road and north up valley to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is on east slope of hill, and 78.69 feet from station in azimuth 293°53′. No. 2 is on west slope of hill, and 80.13 feet from station in azimuth 81°31′. Azimuth mark is 78.3 feet south of southwest corner of stone foundation under barn (on east side of road), 1 foot west of fence, 2 feet south of first post south of jog in fence, and approximately 0.25 mile from station in azimuth 311°35′05″. *Transit traverse station No. 1 Tex.* (*U. S. G. S.*) is 301.221 meters (988.26 feet) from station in azimuth 183°17′30″. Stone monument with triangle and letters "U. S." chiseled on top was found lying on ground 50.00 feet from station in azimuth 285°.

Plane coordinates: (C), x=308,504.02 feet; y=731,783.03 feet; grid azimuth to azimuth mark=312°04′54″.*

Twin Lake (Muskegon County, H. C. Warwick, 1932; 1934).—About 11.5 miles northeast of Muskegon, 115 feet east of center line of dirt trail, at fire lookout tower, 52 feet southeast of southwest tower leg, 34 feet southeast of southeast leg, and 52 feet southeast of northeast leg. To reach from Muskegon, go north 2.7 miles across river on U. S. Route 31 to junction with Route M–20, follow Route M–20 northeast 8.5 miles to Twin Lake, continue northeast 0.4 mile on Route M–20 to dirt trail to right, and follow trail 150 yards to tower and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 25 feet east of center line of unimproved road, 51 feet southeast of triangular blaze on 15-inch oak tree, 122 feet southwest of southwest leg of tower, and 126.04 feet (slope) from station in azimuth 44°22′. No. 2 projects 4 inches, is 27 feet northwest of northwest corner of tower, 46 feet northwest of southwest corner of tower, 33 feet east of center line of unimproved road, and 97.57 feet from station in azimuth 122°20′. Azimuth mark projects 5 inches, is 36 feet south of unimproved trail, 2 feet southwest of barbed-wire fence corner, 29 feet northwest of triangular blaze on 12-inch oak tree, and 0.2 mile from station in azimuth 254°13′43″.

Plane coordinates: (C), x=391,765.39 feet; y=680,296.52 feet; grid azimuth to azimuth mark=254°30′29″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Transit traverse station No. 36 Tex. (U. S. G. S.) (Oceana County, H. C. Warwick, 1932).—About 3½ miles northeast of Pentwater, at northeast corner of sec. 1, T. 16 N., R. 18 W., Pentwater Township, in north-and-south fence line, 25 feet south of center line of gravel Mason-Oceana County-line road, and on projection of U. S. Route 31 to north. To reach from Pentwater, follow U. S. Route 31 north and east 3.75 miles to point where highway turns from east to north, and continue straight ahead about 100 feet on gravel road to station site. Marked by standard U. S. Geological Survey tablet, stamped "T. T. 36 Tex 1930." Station *Bald* and *Pentwater* are visible from ground in azimuths 56°28′24″ and 33°20′33″, respectively.

Plane coordinates: (C), x=328,927.39 feet; y=845,869.03 feet; grid azimuth to station *Bald*=56°55′19″.3.

Anderson (Oceana County, H. C. Warwick, 1932).—Five miles southwest of Hart, 1.5 miles west of village of Mears, in sec. 22, T. 15 N., R. 18 W., on land owned and occupied by William Anderson, on high point of ground in southeast corner of pasture, in grove of maple trees, 45 feet northwest of southeast pasture fence corner, 8 feet north of south pasture fence line, 25 feet southwest of triangular blaze on 24-inch maple tree, and 37 feet southeast of triangular blaze on 15-inch maple tree. To reach from Hart, follow gravel road west and south 4 miles to Mears, proceed west 1.4 miles on State park road to Anderson's house on north side of road (large white house just west of old blue house), follow farm road between house and barn, continue northwest through orchard 300 yards to pasture and station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 85 feet south of north pasture fence, 22 feet southeast of 18-inch maple, 1 foot west of east pasture fence, and 98.79 feet from station in azimuth 204°59′. No. 2 projects 6 inches, is 1 foot north of south pasture fence, 54 feet southwest of 24-inch maple tree, and 82.85 feet from station in azimuth 85°15′. Azimuth mark projects 4 inches, is on ridge about 200 yards north of State park road, 1 foot east of west pasture fence, 144 feet north of double maple growing near small cedar tree, and 0.2 mile from station in azimuth 85°54′27″.

Plane coordinates: (C), x=314,941.93 feet; y=796,412.35 feet; grid azimuth to azimuth mark=86°23′27″.*

Portage (Manistee County, H. C. Warwick, 1932).—About 10 miles northeast of Manistee, 1.5 miles southeast of Onekama, in SW¼ sec. 31, T. 22 N., R 16 W., Bear Lake Township, on right-of-way of county road, 29 feet east of center line of road, 5 feet east of bank of cut, 10 feet west of fence, and 11 feet northwest of 6-inch gum tree with triangular blaze. To reach from Manistee, follow U. S. Route 31 from junction of State park road northeast 7.9 miles to gravel road to north, and proceed north 1.9 miles to station site. To reach from Onekama, follow County Route 598 east to gravel road leading south in east edge of town, and proceed south 0.7 mile to station site. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 is on right-of-way of road, 1 foot east of fence, 37 feet west of center line of road, and 79.95 feet from station in azimuth 55°02′. No. 2 is on right-of-way of road, 36 feet west of center line of road, 1 foot east of fence, 34 feet south of fence corner, and 85.70 feet from station in azimuth 130°52′. Azimuth mark is on right-of-way of road, at top of first hill north of station, 24 feet west of center line of road, 7 feet east of fence, 5.5 feet southwest of 20-inch elm tree, 60 feet south of summit of grade, and approximately 0.25 mile from station in azimuth 178°50′23″. Azimuth from station to *Portage Lake pierhead light* is 99°51′52″.

Plane coordinates: (C), x=386,888.02 feet; y=1,038,849.00 feet; grid azimuth to azimuth mark=179°08′31″.*

Denton (Benzie County, H. C. Warwick, 1932).—About 1¼ miles northeast of Frankfort, in NW¼ sec. 23, T. 26 N., R. 16 W., on right-of-way of unused county road, 5.7 feet west of right-of-way fence, 42.5 feet east of center line of vehicle track, 60 feet east of right-of-way fence, 15.5 feet south of center of gate, and about 500 feet south of east-west county road. To reach from main street in Frankfort, follow Route M-22 north 0.25 mile to park, continue straight north through park 0.75 mile to dirt road to east, proceed east (keeping right fork at 0.15 mile) 0.65 mile to track leading south where main road bears left (downhill), and follow this track south 0.1 mile to station site. Surface and underground marks are standard

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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station disks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is on right-of-way of road, 1 foot west of right-of-way fence, 72 feet north of center of gate, and 87.30 feet from station in azimuth 182°16′. No. 2 projects 4 inches, is on right-of-way of road, 1 foot east of right-of-way fence, and 58.74 feet from station in azimuth 90°02′. Azimuth mark projects 4 inches, is on right-of-way of same road at top of first hill north of station, about 200 yards southwest of small house, 19 feet west of center line of road, 46 feet west of east right-of-way fence, 92.5 feet south of 8-inch beech tree, and approximately 0.25 mile from station in azimuth 177°57′10″.

Plane coordinates: (C), x=377,692.46 feet; y=1,147,281.57 feet; grid azimuth to azimuth mark=178°16′59″.*

Supplementary points

North Manitou Island Lighthouse (Leelanau County, H. C. Warwick, 1932).—Plane coordinates: (C), x=444,892.62 feet; y=1,298,691.28 feet.

South Manitou Island Lighthouse (Leelanau County, H. C. Warwick, 1932).—Plane coordinates: (C), x=411,098.14 feet; y=1,278,540.77 feet.

Mission Point Lighthouse (Grand Traverse County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=570,002 feet; y=1,272,540 feet.

Day Forest estate, water tank (Leelanau County, H. C. Warwick, 1932).—Plane coordinates: (C), x=434,526.12 feet; y=1,235,221.15 feet.

Cedar, fire lookout tower (Leelanau County, H. C. Warwick, 1932).—Plane coordinates: (C), x=475,753.65 feet; y=1,218,853.49 feet.

Point Betsie Lighthouse (Benzie County, H. C. Warwick, 1932).—Plane coordinates: (C), x=368,618.58 feet; y=1,163,447.31 feet.

Honor, fire lookout tower (Benzie County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=427,551 feet; y=1,145,508 feet.

Frankfort, south breakwater light eccentric (Benzie County, H. C. Warwick, 1932).—One mile west of Elberta, near outer (west) end of new south pier of Frankfort harbor entrance, 54.5 feet southeast of pierhead light, 66.3 feet southeast of end of pierhead, 12.6 feet east of end of breakwater, 4.5 feet north of south edge of breakwater, and 3.0 feet south of north edge. To reach from Frankfort, follow Route M–22 south 2 miles to junction of Route M–115 at Elberta, proceed west on Route M–115 to Coast Guard Station, and walk out south breakwater 0.5 mile to station site. Marked by standard station disk cemented in drill hole in top of concrete pier. Reference mark No. 1 is standard reference disk cemented in drill hole in top of breakwater, 10 feet west of angle in breakwater, 4 feet north of south edge, 3 feet south of north edge, and 341.611 meters (1,120.77 feet) from station in azimuth 304°06′26″. Reference mark No. 2 is standard reference disk cemented in drill hole in top of northeast corner of pierhead, and 48.20 feet from station in azimuth 144°. Azimuth from station to north breakwater light is 242°05′, and to south breakwater light, 141°34′.

Plane coordinates: (C), x=369,288.98 feet; y=1,140,874.82 feet.

Transit traverse station No. 22 W (U. S. G. S.) (Benzie County, H. C. Warwick, 1932).—About 5 miles northwest of Thompsonville, 5 miles east of Benzonia, 4 miles southeast of Honor, at southeast corner of sec. 33, T. 26 N., R. 14 W., about 9 paces west of center line of County Route 671, just north of turn where road jogs to east, 20 paces north of center line of east-west road, 2 feet east of west right of way fence, and 200 yards northwest of deserted house. To reach from Benzonia follow County Route 608 east 0.5 mile to Route 671, and proceed south 1.0 mile to station site. Marked by standard U. S. Geological Survey tablet stamped "T. T. 22 W 1930" in concrete.

Plane coordinates: (C), x=435,361.63 feet; y=1,130,691.22 feet.

Portage Lake, pierhead light (Manistee County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=364,518 feet; y=1,042,861 feet.

Manistee, pierhead light (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), x=343,615.82 feet; y=1,003,412.74 feet.

Manistee, breakwater light (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), x=342,820.30 feet; y=1,003,294.39 feet.

Manistee, Guardian Angel Catholic Church, spire (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), x=350,055.23 feet; y=999,819.12 feet.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.
[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Manistee, Ruggles & Rademaker Salt Co., stack (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=353,204.62$ feet; $y=1,000,192.02$ feet.

Manistee, Mercy Hospital, cupola finial (Manistee County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=352,475$ feet; $y=997,180$ feet.

Manistee, Woodrow Wilson High School (Manistee County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=349,074$ feet; $y=1,001,091$ feet.

Manistee, First Congregational Church, spire (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=349,237.85$ feet; $y=1,000,324.66$ feet.

Filer City, Fiber Paper Co., taller of two stacks (Manistee County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=359,981.12$ feet; $y=989,974.42$ feet.

Wellston, fire lookout tower (Manistee County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=412,846$ feet; $y=978,840$ feet.

Transit traverse station No. 2 W (U. S. G. S.) (Manistee County, H. C. Warwick, 1932).—Five miles south of Manistee, in SE¼ sec. 35, T. 20 N., R. 17 W., on north side of right-of-way of east-and-west gravel road, and on line of center line of gravel road leading south. To reach from Scottville, go north 16 miles on U. S. Route 31 to Mason-Manistee county line, turn west onto gravel road along county line, and follow 1.2 miles to station site. Marked by standard U. S. Geological Survey tablet stamped "T. T. 2 W 1930" in concrete post.

Plane coordinates: (C), $x=347,744.17$ feet; $y=976,177.25$ feet.

Big Sable Lighthouse (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=299,080.35$ feet; $y=933,033.93$ feet.

Dunbar, fire lookout tower (Mason County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=410,391$ feet; $y=901,211$ feet.

Scottville, western municipal water tank, finial (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=360,445.18$ feet; $y=895,649.89$ feet.

Scottville, eastern municipal water tank (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=360,493.46$ feet; $y=895,651.10$ feet.

Ludington, Emanuel Lutheran Church, spire (Mason County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=317,818$ feet; $y=894,196$ feet.

Ludington, high school belfry, finial (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=317,936.61$ feet; $y=894,696.46$ feet.

Ludington, north pierhead, rear range light (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=312,378.87$ feet; $y=894,711.92$ feet.

Ludington, Morton Salt Co., white brick stack (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=319,649.88$ feet; $y=889,361.21$ feet.

Ludington, north breakwater, front range light (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=310,566.49$ feet; $y=894,974.71$ feet.

Ludington, Mason County Courthouse, cupola, finial (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=317,194.38$ feet; $y=895,434.88$ feet.

Ludington, south pierhead light (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=312,389.84$ feet; $y=894,449.27$ feet.

Ludington, Pere Marquette Co., radio mast (Mason County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=319,611$ feet; $y=889,747$ feet.

Ludington, Carrom Co., tank (Mason County, H. C. Warwick, 1932).—Plane coordinates: [1] (C), $x=316,909$ feet; $y=900,645$ feet.

Ludington, south breakwater light (Mason County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=310,516.11$ feet; $y=894,498.43$ feet.

Pentwater, municipal tank, finial (Oceana County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=319,802.54$ feet; $y=830,747.84$ feet.

Pentwater pierhead light (Oceana County, H. C. Warwick, 1932).—At Pentwater. Marked by light mounted in center of red square pyramidal tower with upper part enclosed. To reach from Pentwater go to bridge across channel into Pentwater Lake, and from bridge walk west along south side of channel 0.25 mile to light. Structure is mounted on rapidly decaying wooden breakwater. Reference marks are standard reference disks in concrete, note 11a. No. 1 is flush with surface, 4.4 feet east of east edge of concrete drive which parallels beach, near curve where drive leaves beach, 37.4 feet southeast of 3-inch tree northwest of curve, 9.8 feet west of 3-inch elm tree southeast of curve, and 339.71 meters (1,114.5 feet) from station in azimuth 237°59′33″. No. 2 projects 6 inches, and is north of channel, inside small circular loop made by concrete drive, 33.9 feet

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

southwest of drinking fountain, 3.3 feet northeast of east edge of concrete, and 198.39 meters (650.9 feet) from station in azimuth 262°07′50″.

Plane coordinates: (C), x=316,769.18 feet; y=832,321.53 feet; grid azimuth to reference mark No. 2=262°36′38″.*

Pentwater, fire lookout tower (Oceana County, H. C. Warwick, 1932).—Plane coordinates: (C), x=317,999.37 feet; y=829,409.50 feet.

Transit traverse station No. 10 Tex (U. S. G. S.) (Oceana County, H. C. Warwick, 1932).—About 4½ miles north of Hart, 5½ miles east of Pentwater, in southeast corner of sec. 22, T. 16 N., R. 17 W., near northwest corner of crossroads, and just south of north right-of-way fence. To reach from Hart, go north 4.1 miles on U. S. Route 31 to Weare town hall and point where highway turns west, turn east onto gravel road, and follow 2.0 miles to crossroads and station site. Marked by standard U. S. Geological Survey tablet stamped "T. T. 10–Tex–1930," in concrete post.

Plane coordinates: (C), x=349,857.33 feet; y=824,289.61 feet.

Hart, Catholic Church spire 3 miles NNE. of (Oceana County, H. C. Warwick, 1932).—Plane coordinates: (C), x=344,640.07 feet; y=819,142.93 feet.

Little Sable Lighthouse (Oceana County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=298,998 feet; y=788,784 feet.

Transit traverse station No. 1 Tex (U. S. G. S.) (Oceana County, H. C. Warwick, 1932).—About 8 miles northwest of Whitehall, 6½ miles west of Rothbury, 2 miles southwest of Claybank town hall, in T. 13 N., R. 18 W., on land owned by Mr. Oosterhaus of Grand Haven, and 37 feet south and 42 feet west of center of T-road intersection. Marked by standard U. S. Geological Survey disk stamped "T. T. 1–Tex–1930," in concrete block projecting 4 inches. Station *Claybank* is 301.221 meters (988.26 feet) from station in azimuth 3°17′31″.

Plane coordinates:[1] (C), x=308,564 feet; y=732,769 feet.

Fremont, water tank, finial (Newaygo County, H. C. Warwick, 1932).—Plane coordinates: (C), x=446,455.50 feet; y=716,765.40 feet.

Blue Lake, fire lookout tower and primary traverse station No. 53 F (U. S. G. S.) eccentric (Muskegon County, H. C. Warwick, 1932).—Plane coordinates: (C), x=374,050.26 feet; y=713,068.94 feet.

Primary traverse station No. 53 F (U. S. G. S.) (Muskegon County, H. C. Warwick, 1932).—About 16 miles west of Fremont, 7 miles northeast of Whitehall, in SE¼SE¼ sec. 4, T. 12 N., R. 16. W., in open area around State fire lookout tower "Blue Lake," just west of T-intersection of two sand roads, and about 6 meters (20 feet) northeast of northeast leg of tower. To reach from Muskegon, follow U. S. Route 31 and Route M–20 to railroad crossing at Twin Lake, turn north onto macadam road, proceed 0.4 mile to curve to left and beginning of gravel road, continue 6.0 miles on gravel road to sand road on left at sign "State Fire Tower 3 Miles," follow main track of sand road 1.0 mile to sharp turn to right, and follow road along telephone line 2 miles to station site. Marked by standard U. S. Geological Survey tablet, stamped "P. T. Sta. No. 53 F 1928" in top of 6 by 6-inch concrete post projecting about 3 inches.

Plane coordinates: (C), x=374,059.32 feet; y= 713,091.77 feet.

Twin Lake, fire lookout tower (Muskegon County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=391,730 feet; y=680,332 feet.

STURGIS TO BIG RAPIDS

Principal points

Sturgis west base (St. Joseph County, R. L. Pfau, 1931).—Seven miles west by south of Sturgis, 4.5 miles east by south of White Pigeon, 0.75 mile south of western end of Klinger Lake, 1.5 miles west of Oakwood (station on New York Central R. R.), on prolongation of south rail of tangent of above-mentioned railroad, 28.0 meters (92 feet) south of south rail of railroad, 6.1 meters (20 feet) west of north-and-south Osage-orange hedge fence, 11.7 meters (38 feet) south of south right-of-way fence, and 100.7 meters (330 feet) west-southwest of concrete railroad station post No. 1235. Surface and underground marks are standard station disks in concrete, notes 1a and 7a; upper mark is 10 inches below surface. Reference marks are standard reference disks in concrete, note 11a; both project 4 inches. No. 1 is 1 foot inside of south right-of-way fence, 6.2 meters (20 feet) west of Osage-orange hedge, 16 meters (52 feet) south of south rail of railroad,

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

and 12.01 meters (39.4 feet) from station in azimuth 359°26′. No. 2 is 30.1 meters (99 feet) southeast of railroad station post No. 1235, 16 meters (52 feet) south of south rail, about 1 meter (3 feet) south of prolongation of south rail of tangent to east, 0.5 meter (2 feet) inside south right-of-way fence, opposite large chestnut tree, and 118.9 meters (390 feet) (slope distance) from station in azimuth 261°59′34″.

Plane coordinates: (C), x=552,433.83 feet; y=105,188.92 feet; grid azimuth to reference mark No. 2=261°51′53″.*

Sturgis east base (St. Joseph County, R. L. Pfau, 1931).—In northwestern outskirts of Sturgis, on right-of-way of New York Central Railroad, about 0.2 mile west of intersection of railroad and Centerville Street, 26.4 meters (87 feet) east of stone mile post marked "C 131" and "B 409," 17.98 meters (59.0 feet) southwest of concrete railroad station post numbered 1575, 10.7 meters (35 feet) southwest of stone whistle post, and 11.64 meters (38.2 feet) south of south rail. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a; upper mark projects 2 inches. Reference marks are standard reference disks in concrete, note 11a; both project 4 inches. No. 1 is 3 feet inside of north right-of-way fence, 4 paces west of point directly opposite station post No. 1575, and 25.550 meters (83.83 feet) from station in azimuth 183°09′. No. 2 is 185 paces west of intersection of railroad and Centerville Street, 18 inches inside south right-of-way fence, 15.8 meters (52 feet) south of south rail, 60 paces west-southwest of railroad block signal, and 246.2 meters (808 feet) from station in azimuth 262°22′28″. Azimuth from station to Sturgis, church spire with cross, is 295°16′31″; and to railroad station post No. 1575, 17.985 meters (59.01 feet) distant, is 295°17′.

Plane coordinates: (C), x=586,347.94 feet; y=110,227.98 feet; grid azimuth to reference mark No. 2=262°09′48″.*

Jewell (St. Joseph County, C. D. Meaney, 1931).—About 5 miles northwest of Three Rivers, on highest ground in immediate vicinity, on land owned by Oscar Jewell who lives ½ mile northwest of station. To reach from Three Rivers, go north out of town on U. S. Route 131, taking distances from point where highway crosses New York Central Railroad about 1½ miles north of main part of town. Continue on U. S. Route 131 to 1.0 mile, then take road turning out to left (west); at 2.5 miles turn right (north) and continue to four corners at 3.0 miles. Turn left (west) and continue to 5.7 miles where station will be on highest point of ground in cultivated field to right, about 225 meters (738 feet) north of east-and-west road, about ¼ mile northwest of small house with red trimmings, 9.4 meters (31 feet) south of east-and-west wire fence on north side of field between wood lot and field, 60.7 meters (199 feet) west of north-and-south wire fence between cultivated fields, and about 30 meters (98 feet) east of edge of trees in northwest corner of field. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 2 meters (7 feet) north of east-and-west row of bushes separating road right of way and cultivated field, 5 meters (16 feet) south of dirt road, about 200 meters (656 feet) east-southeast of white house with red trimmings on north side of road, and approximately ⅓ mile from station in azimuth 300°11′23″. No. 2 is 1 foot east of north-and-south fence line between cultivated fields, about 40 meters (131 feet) south of row of trees in fence line, about 200 meters (656 feet) north of row of trees in fence line, about 200 meters (656 feet) north of east-and-west road, and 139.9 meters (459 feet) from station in azimuth 57°04′38″. Azimuth from station to *Three Rivers, Eddy Paper Co., stack*, is 315°18′14″.

Plane coordinates: (C), x=509,927.19 feet; y=179,542.97 feet; grid azimuth to reference mark No. 1=300°09′55″.*

Mendon (St. Joseph County, C. D. Meaney, 1931).—About 2¾ miles north-northwest of Mendon, on high timbered hill, on land belonging to Peter White estate, on high ground in timbered land on south side of highway, approximately 100 meters (328 feet) south of farmhouse, and approximately 20 meters (66 feet) south of center line of highway. To reach from Mendon, go north on Nottawa Street 2.5 miles from intersection with Route 60 to four corners, turn right and go 0.5 mile to station. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 10 inches below surface. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

embankment on south side of highway, approximately 10 meters (33 feet) south of center line of highway, and 25.18 meters (82.6 feet) from station in azimuth 242°53′. No. 2 is on embankment on south side of highway, approximately 10 meters (33 feet) south of center line of highway, and 25.97 meters (85.2 feet) from station in azimuth 117°39′.

Plane coordinates: (C), $x=584,500.43$ feet; $y=197,852.55$ feet.

Stevens (Kalamazoo County, C. D. Meaney, 1931).—Ten miles southwest of Kalamazoo, 6½ miles northwest of Schoolcraft, on highest ground in vicinity, on land owned and occupied by H. Stevens. To reach from Schoolcraft, go north out of town on U. S. Route 131. At 2.0 miles turn right (east) with highway; at 3.2 miles turn left (north) with highway; at 5.2 miles where highway turns to right, continue straight ahead on sand road along telephone line; at 6.0 miles turn left (west), and continue to four corners at 8.0 miles, continue ahead (west) to four corners at 11.5 miles, being 1 mile beyond schoolhouse on north side of road. Continue west for 0.1 mile where station will be on highest point of land in alfalfa pasture about 250 meters (820 feet) north of road, 27.9 meters (92 feet) south of east-and-west fence line above north side of pasture, and 60.1 meters (197 feet) southwest of northeast corner-post of pasture. Small wood lot with lone small house is on west side of pasture. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 1 foot west of north-and-south fence line between pasture and vineyard, 43 meters (141 feet) north of south side of pasture, 60 meters (197 feet) south of north side of the pasture, and 58.64 meters (192.4 feet) from station in azimuth 299°40′. No. 2 is on top of slight hill on east-and-west road, 4 meters (13 feet) north of center line of road, 1 foot south of fence, 25 meters (82 feet) east of corner of fence along south-and-west side of pasture, and ½ mile from station in azimuth 52°47′46″. Azimuth from station to *Kalamazoo State Hospital, standpipe*, is 222°04′01″.

Plane coordinates: (C), $x=509,697.65$ feet; $y=250,969.79$ feet; grid azimuth to reference mark No. 2=52°46′19″.*

McKain (Kalamazoo County, C. D. Meaney, 1931).—About 2½ miles south-southwest of Scotts and ¾ mile south of McKain Corners, on land owned and occupied by Edgar McKain. To reach from Scotts, follow surfaced highway south 1½ miles to second four corners; turn west and continue 1 mile to McKain Corners; thence south ¾ mile to McKain's house on east side of road, through barnyard and up old lane on south side of field. Station is on highest ground about 300 meters (984 feet) east of house, 6.1 meters (20 feet) south of north fence, 9.8 meters (32 feet) north of south fence, and 3 meters (10 feet) north of center line of lane. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on north side of highway, in fence line on south side of graveyard, 7 meters (23 feet) east of southwest corner of graveyard, 10 meters (33 feet) north of center line of highway, and approximately 1 mile from station in azimuth 179°03′02″. No. 2 is 4 meters (13 feet) south of center line of lane, 0.6 meter (2 feet) north of south fence, and 18.38 meters (60.3 feet) from station in azimuth 58°18′.

Plane coordinates: (C), $x=587,283.40$ feet; $y=241,227.73$ feet; grid azimuth to reference mark No. 1=178°50′04″.*

Berky (Kalamazoo County, C. D. Meaney, 1931; 1934).—About 6 miles west and 1 mile north of center of Kalamazoo, on highest ground in pasture owned by Mr. Berky, about 200 meters (656 feet) east of road and directly across road from F. D. Mason's house. From Kalamazoo go to junction of Routes U. S. 131 and U. S. 12, and take combined Routes U. S. 12 and M-43 west; keep on Route M-43 6.0 miles past junction with Route 131; turn right (farmhouse in northeast angle), and go north 1.3 miles to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 1 foot north of east-and-west fence line, 12 meters (39 feet) west of 10-inch cherry tree, about 50 meters (164 feet) east of center line of north-and-south gravel road leading to station, and 85.80 meters (281.5 feet) from station in azimuth 48°57′. No. 2 is 1 foot west of north-and-south fence line, 8 meters (26 feet) east of center line of north-and-south gravel road, 6 meters (20 feet) north of 12-inch oak tree which stands in fence line, 0.1 mile south of T-intersection of roads, and ¼ mile from

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

station in azimuth 152°28′32″. Azimuth from station to *Kalamazoo State Hospital, standpipe*, is 295°18′38″.

Plane coordinates: (C), x=512,169.67 feet; y=296,731.19 feet; grid azimuth to reference mark No. 2=152°26′43″.*

Comstock (Kalamazoo County, C. D. Meaney, 1931).—About ½ mile northeast of Comstock, suburb east of Kalamazoo. To reach from Comstock by Route 12, go 0.1 mile east from Price's meat market to road leading north just east of bridge over creek, follow main road north 0.5 mile, thence east ¼ mile, and turn into field to south across road from tar-papered house and just before road drops down steep grade. Follow east along north side of field and then south about 300 meters (984 feet) to station. Station is on small knoll south of road, approximately 200 meters (656 feet) east of small grove of trees. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches above ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on east side of north-and-south road by yellow house, 9 meters (29 feet) east of center line of road, 50 meters (164 feet) northwest of yellow house, 10 meters (33 feet) north of center line of driveway leading to house, and approximately ½ mile from station in azimuth 253°35′24″. No. 2 is on same knoll as station, and 26.85 meters (88.1 feet) from station in azimuth 337°50′.

Plane coordinates: (C), x=567,525.92 feet; y=288,976.37 feet; grid azimuth to reference mark No. 1=253°25′19″.*

Otsego (Allegan County, C. D. Meaney, 1931).—About 2½ miles northwest of Plainwell and 1½ miles northeast of Otsego, in sec. 13, T. 1 N., R. 11 W., on land owned by Robert Drew of Otsego. To reach from Plainwell follow U. S. Route 131 north 2.0 miles from traffic light, thence west on gravel road 1.3 miles to left curve at house on north side of road. Enter board gate 50 yards southwest of house, leading to gravel pit on northwest side of road. Keep to left of pit, then bear right, up steep hill 100 yards to station, in sheep pasture, on summit of knoll which slopes steeply to east and south, 26.5 meters (87 feet) north of lone 30-inch hickory tree, and 5.0 meters (16 feet) east of north-and-south wire fence between apple orchard and pasture. Surface and undergound marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 2 meters (7 feet) west of twin 6-inch hickory tree, and 41.81 meters (137.2 feet) from station in azimuth 283°24′. No. 2 is 1 foot east of north-and-south fence line between orchard and pasture, and 27.95 meters (91.7 feet) from station in azimuth 170°16′. Azimuth from station to stack at Plainwell is 325°33′54″.

Plane coordinates: (C), x=521,628.94 feet; y=354,477.59 feet; grid azimuth to Plainwell, stack=325°30′39″.*

Doster (Barry County, C. D. Meaney, 1931).—About 2½ miles east of Doster, and about 0.3 mile west of southeast corner of sec. 16, T. 1 N., R. 10 W., on small knoll in southwest corner of pasture, on the north side of east-and-west road, 43.9 meters (144 feet) east of west fence of pasture, and 12 meters (39 feet) north of south pasture fence. Reached from Doster by gravel road east from post office 2.7 miles to gate on north side of road about 100 feet west of top of grade. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete note 11a. No. 1 is in fence line, 1.2 meters (4 feet) east of east end of gate, approximately 5 meters (16 feet) north of center line of the road, and 40.20 meters (131.9 feet) from station in azimuth 340°39′. No. 2 is in fence line on east side of north-and-south road, approximately 60 meters (197 feet) southwest of old house, and approximately ¼ mile from station in azimuth 29°01′54″.

Plane coordinates: (C), x=570,409.02 feet; y=351,659.98 feet; grid azimuth to reference mark No. 2=28°51′20″.*

Fox (Allegan County, C. D. Meaney, 1931).—About 3.7 miles south of Bradley, on east side of U. S. Route 131, on property owned by Harold Fox. To reach from Bradley go south 0.7 mile on Route 131 to vacant farm with new red barn on east side of road. Station is in farmyard, in line with south face of new red barn, 5.62 meters (18.4 feet) west of southwest corner of barn, 43.9 meters (144 feet) east-southeast of southeast corner of vacant house, and about 96 meters (315 feet) east of center line of Highway 131. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in telephone line right-

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

of-way, directly opposite "No Parking on Pavement" sign on east of highway, 8 meters (26 feet) west of center line of Route 131, about 50 meters (164 feet) north of mail box on west side of highway opposite T-intersection of dirt road with Route 131, and ⅓ mile from station in azimuth 11°49′40″. No. 2 is in farmyard, at southwest corner of concrete form for windmill, 4.75 meters (15.6 feet) east of northeast corner of vacant house, and 39.29 meters (128.9 feet) from station in azimuth 122°14′.

Plane coordinates: (C), x=529,264.13 feet; y=408,211.44 feet; grid azimuth to reference mark No. 1=11°45′15″.*

French (Barry County, C. D. Meaney, 1931; 1936).—About 8 miles south-southwest of Middleville, near center of sec. 25, T. 3 N., R. 10 W. To reach from Middleville by County Route 611, go south 6.3 miles to small crossroads, turn east at crossroads and go 0.5 mile to gate on right side of road. Station is on high hill about ¼ mile due south from this gate. Truck can be driven to edge of woods well up on hillside. Go on up through timber about 250 yards to highest ground near south edge of timber. Station is 4.40 meters (14.4 feet) south of blazed hickory tree. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches above ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on north side of Route M-46, by oak tree, approximately 2 miles east of intersection of M-46 and County Route 611, and approximately 1 mile from station in azimuth 354°55′14″. No. 2 projects 4 inches above ground, and is 22.343 meters (73.30 feet) from station in azimuth 308°12′.

Plane coordinates: (C), x=584,576.14 feet; y=407,921.39 feet; grid azimuth to reference mark No. 1=354°42′28″.*

Dias (Kent County, C. D. Meaney, 1931; 1934).—About 12 miles south of center of Grand Rapids, on summit of Dias Hill, about 0.3 mile west of northeast corner of sec. 30, T. 5 N., R. 11 W. To reach from Grand Rapids, take Route 131 south out of town about 10 miles to "Wayside" service station (brick, west side). From here keep to south on Route 131 2.0 miles and turn left on dirt road just beyond top of grade and 150 feet south of "Staroline" sign. Continue east on this road 0.9 mile to top of grade in front of S. Grantham's house (north side of road). Station is about 0.60 meter (2.0 feet) south of road at the point and about 20 feet higher, on round bald knob (highest ground), in open pasture, 47.5 meters (156 feet) south of east-and-west fence line, and 58.8 meters (193 feet) east of north-and-south fence line. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 1 foot below the surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 1 foot south of east-and-west fence line, 8 meters (26 feet) south of the center line of east-and-west dirt road, and 47.2 meters (155 feet) from station in azimuth 187°37′. No. 2 is in right-of-way of road, 2 feet south of T-fence line intersection, 6 meters (20 feet) north of center line of east-and-west road, about 100 meters (328 feet) east of white house on north side of road, and approximately ⅓ mile from station in azimuth 100°12′04″.

Plane coordinates: (C), x=526,830.85 feet; y=472,489.98 feet; grid azimuth to reference mark No. 2=100°07′59″.*

Barnes (Barry County, C. D. Meaney, 1931).—About 1½ miles east and 1¼ miles north of Middleville, in sec. 13, T. 4 N., R. 10 W., Thornapple Township, on land owned by James Barnes, on top of small knoll on east side of north-and-south gravel road, 11.5 meters (38 feet) east of center line of road, 3.6 meters (12 feet) east of fence line on east side of road, and approximately 200 meters (656 feet) north of old unpainted house. Reached from Middleville by Route M-37 east 1¾ miles to narrow gravel road leading north. Follow this road north 1¼ miles to station. To reach from station *Barry*, follow road west 1.3 miles, thence south on sand road 1.8 miles to station. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in fence line on east side of road, 5.6 meters (18 feet) east of center line of road, and 36.82 meters (120.8 feet) (slope distance) from station in azimuth 206°33′. No. 2 is in fence line on north side of road, 5 meters (16 feet) north of center line of road, approximately 50 meters (164 feet) east of old unpainted house, and approximately 200 meters (656 feet) from station in azimuth 339° 39′31″.

Plane coordinates: (C), x=586,311.49 feet; y=447,844.17 feet; grid azimuth to reference mark No. 2=339°26′26″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Barry (Barry County, C. D. Meaney, 1931; 1933).—About 5 miles west of Freeport and 4½ miles northeast of Middleville, in north edge of sec. 8, T. 4 N., R. 9 W., Irving Township, on right-of-way of little-used county road. To reach from Middleville, go north 2.9 miles on County Route 611 to narrow road leading east. This road is 1 mile south of the Barry-Kent county line. Turn east and follow lightly graveled road 2.5 miles to where main road turns north and dirt road continues east. Follow dirt road 0.3 mile to top of grade and station site. Station is 14.0 meters (46 feet) southwest of 3-foot butt of bottle-shaped oak tree, 6 meters (20 feet) south of center line of east-and-west road, and 4.6 meters (15 feet) north of east-and-west fence line. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on north side of road, 5 meters (16 feet) north of center line of road, 4.3 meters (14 feet) east of above-mentioned oak, and 16.0 meters (52 feet) from station in azimuth 227°24′. No. 2 is on south side of road, 5.4 meters (18 feet) south of center line of road, 5.8 meters (19 feet) north of east-and-west fence line, and 25.4 meters (83 feet) from station in azimuth 92°17′.

Plane coordinates: (C), $x=593,597.39$ feet; $y=457,283.03$ feet.

Dygert (Kent County, C. D. Meaney, 1931).—About 2 miles west and 1 mile south of Alto and 3 miles east of Alaska, on south side of County Route 456, on land owned by Charles Dygert. To reach from Grand Rapids, follow Route M-50 10 miles to Cascade, continue southeast on pavement 2 miles to County Route 611 leading to right, turn right and go 3.3 miles to Route 456 leading east, and follow Route 456 east 2¼ miles to station. Station is 35.10 meters (115.2 feet) south of center line of Route 456, and 0.3 meter (1 foot) west of north-and-south fence line. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches above ground. Reference marks are standard disk reference marks in concrete, note 11a. No. 1 is on west side of West Bowne Road, 8 meters (26 feet) west of center line of road 0.3 meter (1 foot) east of fence line, 0.1 mile south of intersection of West Bowne Road and County Route 456, and approximately ½ mile from station in azimuth 279°07′58″. No. 2 is 0.5 meter (2 feet) south of east-and-west fence line, 8 meters (26 feet) south of Route 456, 3.5 meters (11 feet) west of north-and-south fence line, and 24.87 meters (81.6 feet) from station in azimuth 167°19′.

Plane coordinates: (C), $x=588,722.34$ feet; $y=488,856.66$ feet; grid azimuth to reference mark No. 1=278°54′28″.*

Alpine (Kent County, C. D. Meaney, 1931; 1934).—About 1½ miles west of Comstock Park, suburb north of Grand Rapids, about ¼ mile south of center of sec. 35, T. 8 N., R. 12 W. To reach from Comstock Park, take Walker-Comstock Park road (gravel) west from post office and cross paved road M-37 at Platte Corners 1.2 miles distant, continue west from this corner 0.5 mile and turn right (north) on dirt road exactly ¼ mile to top of grade and east-and-west fence line between two cultivated fields on west side of road. Station is in northeast corner of cultivated field, 18 feet west of north-and-south wire fence, 42 feet west of center line of north-and-south road leading to station, and 19 feet south of east-and-west wire fence. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 1 foot east of north-and-south wire fence, 23 feet west of center line of road leading toward station, and 23.83 meters (78.2 feet) from station in azimuth 191°05′. No. 2 is ¼ mile east of where road leading to station turns off, 1 foot south of fence, 16 feet south of center line of east-and-west gravel road, 10 feet east of 14-inch walnut tree, 0.3 mile west of junction of gravel road with highway M-37, and approximately ½ mile from station in azimuth 313°28′59″.

Plane coordinates: (C), $x=513,498.47$ feet; $y=558,465.27$ feet; grid azimuth to reference mark No. 2=313°26′55″.*

Randall (Kent County, C. D. Meaney, 1931).—About 10 miles east and about 2 miles north of Grand Rapids and 4 miles south of Cannonsburg, on land owned by Ed. Randall of Grand Rapids and farmed by J. M. Dagley. To reach from Grand Rapids by Route M-21, go east 10 miles to Ada, thence across bridge and north on county road 2.9 miles to where main road turns to left. Keep right-hand local road down hill and east for 0.5 mile to station. Station is 10 meters (33 feet) south of center line of road, 4 meters (13 feet) west of northwest corner of red barn, 3.47 meters (11.4 feet) east of east side of gate, and approximately

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

50 yards southeast of rambling house north of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on north side of road, 2 meters (7 feet) south of fence line, 18 meters (59 feet) west of southeast corner of orchard, and approximately 100 meters (328 feet) from station in azimuth 259°20′05″. No. 2 is on north side of road, 3 meters (10 feet) east of east end of gate leading to rambling house, 7 meters (23 feet) north of center line of road, and 22.11 meters (72.5 feet) from station in azimuth 147°31′.

Plane coordinates: (C), $x=577,156.08$ feet; $y=547,143.35$ feet; grid azimuth to reference mark No. 1=259°08′17″.*

Hammond (Kent County, C. D. Meaney, 1931).—About 4½ miles east of Rockford and ½ mile east of Brower Lake, on land owned and occupied by Fred Hammond. To reach from Rockford by County Route 490, go 4.4 miles to gravel road leading north at jogged crossroads east of Brower Lake. Turn north and follow road ¼ mile to wire gap into field on east side, just north of large divided oak tree, and follow north side of fence east 135 yards to station, on summit of knoll approximately 135 yards east of road, 0.3 meter (1 foot) north of east-and-west fence, and 3 meters (10 feet) northwest of 8-inch hickory tree. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches above ground. Reference marks are standard reference disks in concrete, note 11a. Both marks project 4 inches above ground. No. 1 is 7.5 meters (25 feet) north of east-and-west road (County Route 490), and approximately ½ mile from station in azimuth 43°32′13″. No. 2 is 0.7 meter (2 feet) north of east-and-west fence, and 26.92 meters (88.3 feet) from station in azimuth 90°38′.

Plane coordinates: (C), $x=574,899.11$ feet; $y=590,945.15$ feet; grid azimuth to reference mark No. 1=43°20′43″.*

Grannis (Kent County, C. D. Meaney, 1931).—About 4½ miles east and 1 mile north of Cedar Springs, on north side of County Route C–510, on land owned by Frank Clark and Ralph Grannis, who live 1 mile north of station. To reach from Cedar Springs by Route C–510, go 4.0 miles east from traffic signal, thence north 1 mile and east 0.5 mile to station, in field on north side of Route C–510, 0.4 mile east of intersection of Nelson Sand Lake Road and Route C–510, approximately 50 meters (164 feet) northwest of yellow farmhouse on south side of highway, 18.89 meters (62.0 feet) north of center line of highway, and 6.4 meters (21 feet) north of woven-wire fence. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 12 meters (39 feet) north of center line of highway, 11 meters (36 feet) west of center of gate on north side of highway, and 20.69 meters (67.9 feet) from station in azimuth 289°51′. No. 2 is 8 meters (26 feet) east of center line of Nelson Sand Lake Road, 25 meters (82 feet) north of center line of Route C–510, in southwest corner of field, by telephone pole, and approximately 0.4 mile from station in azimuth 90°49′26″.

Plane coordinates: (C), $x=576,537.65$ feet; $y=632,388.46$ feet; grid azimuth to reference mark No. 2=90°37′38″.*

Fisk (Kent County, C. D. Meaney, 1931; 1932).—About 5 miles northwest of Cedar Springs, about 0.4 mile north of southeast corner of sec. 4, T. 10 N., R. 11 W., in grass oval, 16.28 meters (53.4 feet) east-southeast of center of Fisk Knob scenic lookout tower. To reach from Cedar Springs, take U. S. Route 131 south about ¼ mile, turn right on Route M–46 (at stop light) and go west 3.0 miles, turn right (north) on Kent County Route 633 and go 4.4 miles, and there turn left onto road to lookout tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 8 meters (26 feet) east of center line of Route 633, 1 foot west of iron corner post, 15 meters (49 feet) west-northwest of northwest corner of small white house, 14 meters (46 feet) north of center line of road leading to house, and ¾ mile from station in azimuth 185°04′35″. No. 2 is under center of lookout tower, and 16.28 meters (53.4 feet) from station in azimuth 111°32′. Azimuth from station to white church spire is 245°41′06″.

Plane coordinates: (C), $x=536,602.48$ feet; $y=649,800.59$ feet; grid azimuth to reference mark No. 1=184°58′56″.*

Howard south base (Montcalm County, C. D. Meaney, 1931; 1932).—About 6 miles south of Howard City and 1 mile north of Sand Lake, on west side of Pennsylvania Railroad and U. S. Route 131, 10 meters (33 feet) west of west rail, 3.9

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

meters (13 feet) east of north-and-south fence, and 38 meters (125 feet) west of center line of U. S. Route 131. Reached from Howard City by U. S. Route 131 south 6.3 miles to station or from Sand Lake by U. S. Route 131 north 1.2 miles to station. Station is on railroad right-of-way. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 14.36 meters (47.1 feet) northwest of center line of Route 131, 7.24 meters (23.8 feet) west of south end of culvert, 12.02 meters (39.4 feet) east of east rail of railroad, 0.5 meter (2 feet) north of telephone pole, and 26.42 meters (86.7 feet) from station in azimuth 321°52′. No. 2 is 12 meters (39 feet) west of center line of highway, approximately 10 meters (33 feet) east of east rail of railroad, 41 meters (135 feet) south of culvert on west side of highway, 0.9 meter (3 feet) north of telephone pole, and approximately ½ mile from station in azimuth 23°03′58″.

Plane coordinates: (C), x=565,131.09 feet; y=658,683.85 feet; grid azimuth to reference mark No. 2=22°53′54″.*

Ensley (Newaygo County, C. D. Meaney, 1931; 1932).—About 7 miles west and 2 miles south of Howard City, and 2 miles north and 1 mile east of Ensley Center, on summit of high prominent hill owned by Mrs. Johanssen and known as Hillman Hill, in open area, on south edge of apple orchard, 42 meters (138 feet) north of edge of woods, 47.5 meters (156 feet) west of center line of north-and-south gravel road, and about 100 meters (328 feet) south-southwest of T-intersection of north-and-south road with east-and-west road leading to station, in sec. 10, T. 11 N., R. 11 W. To reach from Howard City, follow U. S. Route 131 south about 2 miles to gravel crossroads, with lone house in northeast corner of intersection. Follow gravel road, which becomes sandy in places, straight west 6.2 miles to station. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in south edge of field at edge of woods, 31.7 meters (104 feet) west of center line of north-and-south road, at bend where dim road in field turns north toward station, and 42.03 meters (137.9 feet) from station in azimuth 339°18′. No. 2 is 9 meters (30 feet) north of center line of east-and-west gravel road, 2 feet south of fence line, 4 meters (13 feet) west of lane leading into farmyard, 40 meters (131 feet) south of barn on north side of road, 25 meters (82 feet) north of barn on opposite side of road, 3 meters (10 feet) north-northeast of 30-inch wild-cherry tree, 30 meters (98 feet) northeast of house on south side of road, and approximately ⅓ mile from station in azimuth 103°52′12″.

Plane coordinates: (C), x=539,101.84 feet; y=679,916.84 feet; grid azimuth to reference mark No. 2=103°46′09″.*

Howard north base (Montcalm County, C. D. Meaney, 1931; 1932).—About 1 mile north of Howard City, on west side of Pennsylvania Railroad and U. S. Route 131, on right-of-way of Pennsylvania Railroad, 5.6 meters (18 feet) east of right-of-way fence, 8.72 meters (28.6 feet) west of gage line of west rail of Pennsylvania Railroad, 39.6 meters (130 feet) west of center line of U. S. Route 131, and approximately 80 meters (262 feet) north of railroad crossing. To reach from Howard City by U. S. Route 131, go north 0.9 mile to gravel road leading west over track. Turn north on west side of track and follow about 130 yards to station. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 9 meters (29 feet) northeast of intersection of crossroads, 0.3 meter (1 foot) north of telephone pole, and approximately ¼ mile from station in azimuth 287°29′04″. No. 2 is 7.5 meters (24.6 feet) east of center line of gravel road, 0.3 meter (1 foot) north of telephone pole, and 34.02 meters (111.6 feet) from station in azimuth 61°06′. Azimuth from station to *Howard City, municipal water tank* is 2°34′54″.

Plane coordinates: (C), x=575,357.04 feet; y=696,580.64 feet; grid azimuth to reference mark No. 1=287°17′22″.*

Lakeview (Montcalm County, C. D. Meaney, 1931; 1932).—About 7 miles (airline) east-northeast of Howard City and about ¼ mile west of center of sec. 24, T. 12 N., R. 9 W. To reach from Howard City by Route M-46, go 9.5 miles to road leading south, follow this road for 1 mile to farm road leading west, and follow road around red barn and around fields to foot of hill. From here walk up ridge bearing a little northwest to top of ridge. Station is on high ground at northwest end of ridge at small opening in birch grove. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark pro-

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

jects about 4 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on same ridge as station, and 30.708 meters (100.75 feet) (slope distance) therefrom in azimuth 308°56′. No. 2 is at east corner of wire fence by wooden gate, 7 meters (23 feet) north of west of center line of northeast-and-southwest road, and approximately ¾ mile from station in azimuth 33°29′39″. Azimuth from station to *Lakeview, municipal water tank* is 235°33′04″.

Plane coordinates: (C), $x=609,674.42$ feet; $y=698,650.71$ feet; grid azimuth to reference mark No. 2=33°12′38″.*

Huston (Mecosta County, C. D. Meaney, 1931; 1932).—About 8 miles (airline) southeast of Big Rapids and 5 miles east-northeast of Stanwood, about 0.2 mile north of southwest corner of sec. 11, T. 14 N., R. 9 W. To reach from Big Rapids, go east from North Michigan Avenue 6.5 miles on Route M–20 to Mecosta County Route 601, thence 4.8 miles to dirt road on left; turn left and follow main-traveled road 1.1 miles to crossroads, turn left and follow 0.7 mile to top of grade. Station is on low hill in clearing, 25 meters (82 feet) east of center line of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches above ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on east side of road, 12 meters (39 feet) east of center line of north-and-south road, and approximately 125 meters (410 feet) from station in azimuth 4°06′48″. No. 2 is 6.4 meters (21 feet) east of center line of north-and-south road, 12 meters (39 feet) north of lone 12-inch oak tree, and 24.1 meters (79 feet) from station in azimuth 138°05′. Azimuth from station to *Lakeview, municipal water tank* is 340°51′11″, and *Mecosta, fire look-out tower* is 176°12′59″.

Plane coordinates: (C), $x=602,395.03$ feet; $y=770,952.25$ feet; grid azimuth to reference mark No. 1=3°50′48″.*

Spicer (Newaygo County, C. D. Meaney, 1931; 1937).—About 6 miles west and 1½ miles south of Big Rapids, in east edge of sec. 22, T. 15 N., R. 11 W., in open field, on south edge of heavy low brush, about 200 meters (656) feet north of second house on road, owned and occupied by Charles Spicer, 4.3 meters (14 feet) west of north-and-south wire fence, and 13.4 meters (44 feet) west of center line of north-and-south sand road. To reach from Big Rapids by U. S. Route 131, go south about 1 mile from center of town to junction with Route M–20, and follow Route M–20 (gravel) west 6.1 miles to road leading south. Follow this road south 0.6 mile to station site on west side of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 2 feet west of north-and-south wire fence, 7.6 meters (25 feet) east of center line of north-and-south sand road, and 39.16 meters (128.5) feet from station in azimuth 328°02′. No. 2 is on west edge of open field, at edge of heavy low brush, and 93.42 meters (306.5 feet) from station in azimuth 86°51′.

Plane coordinates: (C), $x=539,177.56$ feet; $y=793,494.64$ feet.

Howard base A station (Montcalm County, C. D. Meaney, 1931; 1932).—About 4½ miles south of Howard City and 2 miles north of Sand Lake, on east side of right-of-way of Pennsylvania Railroad, 19.2 meters (63 feet) west of center line of Route 131, and 10.8 meters (35 feet) east of east rail of railroad at point of intersection of curve. Reached from Howard City by Route 131 south 4½ miles to station. Station mark is standard disk station mark in concrete, note 1a. It projects 6 inches above ground.

Plane coordinates: (C), $x=569,801.82$ feet; $y=668,822.52$ feet.

Supplementary points

Sturgis water tank (St. Joseph County, C. D. Meaney, 1931).—Plane coordinates:[1] (C), $x=588,446$ feet; $y=109,094$ feet.

White Pigeon, tall stack (St. Joseph County, C. D. Meaney, 1931).—Plane coordinates:[1] (C), $x=528,149$ feet; $y=105,268$ feet.

Three Rivers, Eddy Paper Co., stack (St. Joseph County, C. D. Meaney, 1931).—Plane coordinates:[1] (C), $x=532,110$ feet; $y=157,143$ feet.

Schoolcraft, water tank (Kalamazoo County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=531,865.71$ feet; $y=224,275.81$ feet.

Vicksburg, water tank (Kalamazoo County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=559,152.97$ feet; $y=226,996.38$ feet.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Kalamazoo, State Hospital, standpipe (Kalamazoo County, C. D. Meaney 1931).—Plane coordinates: (C), $x=539,376.50$ feet; $y=283,881.90$ feet.

Grand Rapids, silver water tank (Kent County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=533,142.50$ feet; $y=523,161.81$ feet.

Grand Rapids, National Bank, red light on dome (Kent County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=521.035.62$ feet; $y=534,256.07$ feet.

Grand Rapids, black water tank (Kent County, C. D. Meaney, 1931).—Plane coordinates:[1] (C), $x=503,772$ feet; $y=542,753$ feet.

Primary traverse station No. 4 (U. S. G. S.) (Kent County, C. D. Meaney, 1931).—About 4 miles southwest of Sparta, 3 miles west of Ballardsville, in northwest corner of sec. 33, T. 9 N., R. 12 W., in northwest corner of Buck's school yard, 19.17 meters (62.9 feet) northwest of northwest corner of schoolhouse, 1 meter (3 feet) north of corner post between cultivated field and yard, and 11.3 meters (37 feet) south-southeast of T-intersection of gravel road with Kent County Route 490. To reach from Sparta, go 1½ blocks west from post office and turn left (south) on asphalt Route M–37, thence south 2.9 miles keeping to gravel road straight south where main asphalt road turns left. Proceed about 200 feet and turn right (west) at T-road (church in northwest angle). Follow this west road 1.9 miles to Buck's schoolhouse on south side of road. Station mark is U. S. Geological Survey iron pipe in concrete, stamped "Prim. Trav. Sta. No. 4, Mich. 1915" and projecting 1 foot above ground.

Plane coordinates: (C), $x=500,067.49$ feet; $y=589,426.71$ feet.

Cedar Springs, water tank (Kent County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=552,700.55$ feet; $y=628,840.11$ feet.

Primary traverse station No. 2 (U. S. G. S.) eccentric (Kent County, C. D. Meaney, 1931).—About 3 miles west and 2 miles north of Cedar Springs, in northeast corner of sec. 21, T. 10 N., R. 11 W., in northeast corner of crossroads at Solon Center, 11 meters (36 feet) north of center line of east-and-west road, 18 meters (59 feet) northeast of intersection of highways, and 13.7 meters (45 feet) east of north-and-south Kent County Route 633. To reach from Cedar Springs, go south on Route 131 just out of town, then west on Route M–46 (gravel) 3 miles, and north on Kent County Route 633 (gravel) 2 miles to Solon Center. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 16 meters (52 feet) east of center line of Kent County Route 633, south of stump fence between two cultivated fields, and approximately ¼ mile from station in azimuth 180°07′32″. No. 2 is 8.2 meters (27 feet) south of center line of east-and-west road, 4.6 meters (15 feet) east of 10-inch maple, 21.3 meters (70 feet) southwest of southeast corner of concrete porch of store, and 42.18 meters (138.4 feet) from station in azimuth 60°36′. *Primary traverse station No. 2 (U. S. G. S.)* is iron post with cap stamped "Prim. Trav. No. 2, Mich. 1915," in southwest angle across road from store, a few yards off curve, in road corner, 3.2 meters (10 feet) west of 12-inch maple tree, and 31.26 meters (102.6 feet) from station in azimuth 49°35′.

Plane coordinates: (C), $x=537,029.57$ feet; $y=637,205.13$ feet; grid azimuth to reference mark No. 1=180°01′49″.*

Primary traverse station No. 2 (U. S. G. S.) (Kent County, C. D. Meaney, 1931).—About 3 miles west and 2 miles north of Cedar Springs, at Solon Center, in sec. 21, T. 10 N., R. 11 W. Mark is iron post with cap stamped "Prim. Trav. Sta. No. 2, Mich. 1915," and is in southeast angle across road from store, a few feet off curve, in road corner, 3.2 meters (10 feet) west of 12-inch maple tree. *Primary traverse station No. 2 (U. S. G. S.) eccentric* is 31.26 meters (102.6 feet) from station in azimuth 229°35′.

Plane coordinates: (C), $x=536,951.60$ feet; $y=637,138.49$ feet.

Fisk Knob, scenic lookout tower (Kent County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=536,552.75$ feet; $y=649,820.04$ feet.

Howard City, municipal water tank (Mecosta County, C. D. Meaney, 1931).—Plane coordinates: (C), $x=575,179.92$ feet; $y=692,307.43$ feet.

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[1] No check on this position.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

GRAND TRAVERSE BAY TO BIG RAPIDS

Principal points

Charlevoix 2 (Charlevoix County, H. W. Hemple, 1931).—About 1 mile northeast of Charlevoix, on high sand dune known as Mount McSauba. To reach from Charlevoix, go northeast on U. S. Route 31, 0.6 mile from canal bridge, keep straight ahead on Michigan Avenue where Route 31 bears right, turn left at Hooker's Riding Academy sign and follow winding gravel road 0.6 mile to dirt trail to left at point where main road turns right, follow trail northwest about 100 yards to foot of dune. Climb stairway and bear left to station. Station is about 30 feet southwest of highest point, in center of wide sandy trail. In 1931 original U. S. L. S. mark was found thrown over side of dune, and new mark set underground in approximately same position as old mark. New mark is standard disk station mark in concrete, note 7a. Old reference marks were found in good condition and measurements taken to new station mark. Reference marks are copper bolts set in concrete. No. 1 is 13.7 meters (45 feet) (slope distance) from station in azimuth 17°56′. No. 2 is 18.03 meters (59.2 feet) from station in azimuth 272°17′.

Plane coordinates: (C), $x=629,582.15$ feet; $y=1,398,014.47$ feet.

Ellsworth (Antrim County, H. W. Hemple, 1931).—About 2 miles south by west of Ellsworth, about ½ mile southeast of Eaton Lake, in sec. 21, T. 32 N., R. 8 W., on land owned by Herman Van Stedun, in wooded area just across road from and east of house owned by Jean Best, 98 meters (321 feet) east of north-and-south road, 3 meters (10 feet) east of north-and-south fence line, and in west edge of woods. To reach from Atwood, little village on U. S. Route 31, follow that route north 0.4 mile to gravel road leading right, follow gravel road 4.1 miles to crossroads, turn right and go 1.5 miles to another crossroads, keep straight ahead here and go 0.4 mile to station. Marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 4 inches below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in north-and-south fence line, on east side of north-and-south road, 3 meters (10 feet) east of center line of road, and approximately 300 meters (984 feet) from station in azimuth 30°49′08″. No. 2 is in second north-and-south fence line east of the road, and 19.63 meters (64.4 feet) from station in azimuth 153°30′.

Plane coordinates: (C), $x=625,679.55$ feet; $y=1,332,955.58$ feet; grid azimuth to reference mark No. 1=30°28′24″.*

Central Lake (Antrim County, H. W. Hemple, 1931; 1932).—About 1.6 miles west-southwest of Central Lake, near ¼ corner between secs. 21 and 28, T. 31 N., R. 8 W., on land owned by Mr. A. F. Albrecht and occupied by Mr. Welch, on ridge in pasture, 50 meters (164 feet) west of north-and-south fence line, 58 meters (190 feet) west of center line of dirt road, 12 meters (39 feet) east of point where ridge slopes to west in timber, and approximately 200 meters (656 feet) southwest of Mr. Welch's house which is of red brick. To reach from Central Lake follow county road west 1.7 miles from Standard Oil station to dirt road turning off to left where main road turns right; follow dirt road to left 0.35 mile to Mr. Welch's house on east side of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 4 inches below surface. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in fence corner at northeast corner of pasture, 4 meters (13 feet) west of center line of dirt road, 8 meters (26 feet) northwest of fork between farm road and main dirt road, approximately 125 meters (410 feet) northwest of Mr. Welch's house, and approximately 250 meters (820 feet) from station in azimuth 194°59′56″. No. 2 is in north-and-south fence line, 8 meters (26 feet) west of center line of dirt road, 18 meters (59 feet) east of center line of ridge, and 115.7 meters (380 feet) (slope distance) from station in azimuth 335°11′41″.

Plane coordinates: (C), $x=617,498.61$ feet; $y=1,300,132.95$ feet; grid azimuth to reference mark No. 1=194°40′37″.*

Swenson (Leelanau County, H. W. Hemple, 1931; 1932).—About 3 miles southwest of Northport and 3 miles northwest of Omena, on high sandy wooded hill, on property owned and occupied by Harry Swenson. To reach from Northport, just south of town limits, at signboard, go west on Route 22, macadam becoming County Route 633. Follow gravel Route 22 southwest 2.0 miles to gravel road leading south. Follow this road south 1.4 miles to end of gravel at Swenson's

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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house. Station is about ¼ mile southwest of house, on highest hill in vicinity, in grove of trees immediately south of pasture which lies back of Swenson's orchard. Old wagon road leads from house to station, which is in east side of grove, 8.2 meters (27 feet) west of north-and-south wire fence between pasture and wooded lot, and 9.7 meters (32 feet) north-northeast of newly blazed 6-inch maple tree. Surface and underground marks are standard station disks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is approximately 0.5 mile from station in azimuth 297°05′11″. It is reached from Swenson's house by following dirt road south 0.3 mile, thence left (east) 0.15 mile, thence right (south) into field along fence line, thence left (east) along fence line 0.05 mile to reference mark. No. 2 is in small open area, 3.5 meters (11 feet) west of north-and-south wire fence, 10.6 meters (35 feet) north-northwest of 6-inch white elm tree in fence line at bend, and 130.32 feet (slope distance) from station in azimuth 12°33′.

Plane coordinates: (C), x=526,841.68 feet; y=1,305,587.02 feet; grid azimuth to reference mark No. 1=297°00′46″.*

Fulford (Kalkaska County, H. W. Hemple, 1931; 1932).—About 15 miles east of Traverse City and 5 miles east by south of Williamsburg, in sec. 8, T. 27 N., R. 8 W., on land of Dowling estate, now owned and farmed by M. L. Fulford. To reach from Traverse City, go east 7.3 miles on U. S. Route 31 to Acme, turn east on County Route 612 and follow 9.0 miles to small school and white house on left side of road, 4.4 miles east of Williamsburg. Turn south on gravel road and follow 1.9 miles to Fulford's house on east side of road. Follow this lane east to foot of hillside pasture, thence up hill, across pasture, southeast 0.3 mile to station, on highest hill in vicinity, in small unworked orchard approximately ½ mile east of Mr. Fulford's house and approximately ¾ mile southeast of lake known locally as Dowling Lake (also as Crescent Lake). East side of hill is timbered. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on top of the same hill as station, and 24.76 meters (81.2 feet) from station in azimuth 14°39′. No. 2 is on west side of road, by gate, 8 meters (26 feet) west of center line of road, approximately 100 meters (328 feet) southwest of Fulford's house, approximately 100 meters (328 feet) south of south end of lake, and approximately ½ mile from station in azimuth 99°44′01″.

Plane coordinates: (C), x=614,341.12 feet; y=1,185,488.41 feet; grid azimuth to reference mark No. 2=99°25′25″.*

Whiting (Grand Traverse County, H. W. Hemple, 1931; 1932).—About 5 miles west of Traverse City, on land owned by Howard Whiting of Traverse City. To reach from Traverse City, go west on Front Street ¾ mile to where Route 22 turns north. Continue straight ahead and follow main road 0.85 mile to artesian well. Keep straight ahead 0.35 mile to fork. Keep right-hand fork and follow gravel road north and west 1.85 miles to crossroad. Keep gravel road west 0.5 mile to old track bearing right, across meadow, to old gravel pit, 300 yards, thence to right 100 yards to station, on high bare knoll, in meadow, about 100 meters (328 feet) south of gravel pit, 1 meter (3 feet) west of north-and-south wire fence, 79 meters (259 feet) north of fence corner where fence turns east, about ½ mile west of white house on north side of the road, and about 224 meters (735 feet) north of center line of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in same fence line near which station is located, about 50 meters (164 feet) southeast of gravel pit, and 56.06 meters (183.9 feet) (slope) from station in azimuth 184°03′. No. 2 is in fence corner, 8 meters (26 feet) north of center line of gravel road, 50 meters (164 feet) south of old shed, 12 meters (39 feet) northeast of 24-inch elm tree on south side of road in fence line, 8 meters (26 feet) west of west end of rock pile, and 480 yards from station in azimuth 44°46′31″. Space between rock pile and corner is used as entrance to meadow.

Plane coordinates: (C), x=512,488.10 feet; y=1,190,794.07 feet; grid azimuth to reference mark No. 2=44°44′29″.*

Garfield (Kalkaska County, H. W. Hemple, 1931).—About 9 miles east-northeast of Fife Lake, near center of NE¼ sec. 6, T. 25 N., R. 7 W., on same land occupied by Garfield fire lookout tower. To reach from Fife Lake, follow Route 131 eastward 1.9 miles from railroad station, thence right-hand road where main road turns left at Springfield town hall, thence main road in easterly direction 5.9 miles, thence left and north 1.7 miles (crossing gravel road at 1 mile), and

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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turn left at State fire tower sign and follow winding road 0.3 mile to fire tower. Station is in cleared place, 8.02 meters (26.3 feet) northwest of center of Garfield fire lookout tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 19.04 meters (62.5 feet) northeast of fire tower, and 22.598 meters (74.14 feet) from station in azimuth 276°52′. No. 2 is 19.04 meters (62.5 feet) southwest of fire tower, and 14.915 meters (48.93 feet) from station in azimuth 2°26′. Azimuth from station to *Garfield, fire lookout tower*, 8.02 meters (26.3 feet) distant, is 331°24′.

Plane coordinates: (C), x=643,731.41 feet; y=1,128,375.66 feet.

Kingsley (Grand Traverse County, H. W. Hemple, 1931).—About 12 miles south of Traverse City and 2 miles south of west from Kingsley, on high wooded hill on which is located the Kingsley fire look-out tower, 139 feet east-northeast of center of tower, in small opening in woods in growth of ferns, on land owned and occupied by Seely Cronkhite. To reach from Traverse City, follow U. S. Route 31 south about 8 miles to macadam road leading straight south where Route 31 turns west. Follow macadam road leading to Cadillac south to corner, distant 13.3 miles from Traverse City. Turn east on macadam road and follow 3.5 miles to gravel crossroads. Turn south on gravel road 0.7 mile to Cronkhite's barn on left. Turn east on dirt road to look-out tower 0.15 mile. Wagon tracks lead around tower to station. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in woods, and 25.75 meters (84.5 feet) from station in azimuth 40°59′. No. 2 is in woods, and 19.53 meters (64.1 feet) from station in azimuth 143°55′. Azimuth from station to *Kingsley, fire lookout tower* is 76°06′47″.

Plane coordinates: (C), x=544,133.07 feet; y=1,120,603.46 feet.

Manton (Wexford County, H. W. Hemple, 1931).—About 7 miles north-northwest of Cadillac, 4.5 miles south-southwest of Manton, near center sec. 32, T. 23 N., R. 9 W. To reach from Cadillac by Route 131, go north from last signal light 4 miles to gravel road (old Route 131) leading to left about 20 yards north of railroad crossing. Follow gravel road for 2.3 miles to sand road leading west about 80 yards south of "Drink water approved" sign, and follow sand road in northwesterly direction 0.9 mile to saddle between two low hills at fork in road (do not take any dim roads to right or left). Station is on top of easterly of these two hills, about 80 yards distant from and 30 and 40 feet higher than road, in center of cut-over timber and hedgy growths, approximately 1 mile east of white house in valley which is a few degrees off line to west from station to look-out tower at Selma. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches above ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is close to point where hill slopes to south, and 29.608 meters (97.14 feet) (slope distance) from station in azimuth 6°53′. No. 2 is on hill northwest of station, 30 meters (98 feet) south of old gravel pit, and approximately ¼ mile from station in azimuth 111°26′57″.

Plane coordinates: (C), x=585,578.11 feet; y=1,039,497.97 feet; grid azimuth to reference mark No. 2=111°13′14″.*

Brier Hill (Wexford County, H. W. Hemple, 1931).—About 15 miles northwest of Cadillac and 3½ miles southeast of Mesick, in sec. 29, T. 23 N., R. 11 W., on land said to belong to the State, on high bushy knoll and southeast of Brier Hill fire look-out tower. To reach from Manton, go west on gravel Route 42 about 13 miles to sign on north side of road "5 miles to fire tower." Gravel road leads off to south to fire tower, which can be seen from highway. Follow signs on old road to fire tower and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 3.1 meters (10 feet) north of last telephone pole leading to fire tower, and 14.47 meters (47.5 feet) from station in azimuth 210°23′. No. 2 is 3 meters (10 feet) north of center line of road leading to tower, on top of first slight rise of ground on road east of tower, and approximately 100 meters (328 feet) from station in azimuth 313°34′24″. Azimuth from station to *Brier Hill, fire lookout tower*, 11.9 meters (39.0 feet) distant, is 153°22′56″

Plane coordinates: (C), x=518,466.03 feet; y=1,044,479.40 feet; grid azimuth to reference mark No. 2=313°31′26″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Selma (Wexford County, H. W. Hemple, 1931).—On high pointed hill, about 9 miles northwest of Cadillac, about ¾ mile southeast of Tayoff Lake, about 0.2 mile north of quarter corner between sections 8 and 5, T. 22 N., R. 10 W., directly south of Selma fire look-out tower of Michigan State Conservation Commission, and on downward slope of hill. Tower is steel structure 102 feet high, surmounted by inclosed platform and is on highest part of hill. To reach from Cadillac, go north on U. S. Route 131 for 2.1 miles from its intersection with street on which post office is located. Turn left and go past airport, for distance of 2½ miles; then turn north on gravel road for 3.0 miles, and follow main road west for 3.0 miles; turn left on dirt road, where main road makes sharp turn to right, and follow dirt road 1.3 miles to crossroad; here turn right for about 100 feet to dirt road bearing to left, and follow right-hand road 0.4 mile to hill on which station is located. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is at telephone pole alongside dirt road, and approximately ½ mile from station in azimuth 28°02′05″. No. 2 is on west side of hill, directly west of look-out tower, and 15.72 meters (51.6 feet) from station in azimuth 135°51′. Azimuth from station to *Selma, fire lookout tower,* 11.20 meters (36.7 feet) distant, is 176°45′28″.

Plane coordinates: (C), $x=553,131.55$ feet; $y=1,030,299.33$ feet; grid azimuth to reference mark No. 1=27°53′34″.*

Cadillac (Wexford County, H. W. Hemple, 1931).—About 4.5 miles south of Cadillac, near center of NE¼ sec. 29, T. 21 N., R. 9 W. To reach from Cadillac, go south from post office 4.0 miles on Route 131 to crossroads; turn west and follow 0.5 mile to road leading south; follow this road 0.4 mile, turn right into lane about 80 yards south of Swedish Lutheran Church on west side of road, and follow this lane past house of John G. Anderson to top of grade and station site. Station is on highest ground in field, 62 meters (203 feet) southwest of southeast corner of farmhouse, 26.8 meters (88 feet) west of lone apple tree, and 4.3 meters (14 feet) north of east-and-west wagon road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is on west side of north-and-south road, in fence line just across road (west) from old church, and approximately ½ mile from station in azimuth 346°27′01″. No. 2 is in north-and-south fence line, 6 meters (20 feet) south of northeast corner of fence, 8 meters (26 feet) south of center line of wagon road, and 50.44 meters (165.5 feet) from station in azimuth 70°03′.

Plane coordinates: (C), $x=587,190.09$ feet; $y=979,975.68$ feet; grid azimuth to reference mark No. 1=346°13′07″.*

Harrietta (Wexford County, H. W. Hemple, 1931).—About 15 miles west of Cadillac and 4½ miles south of Harrietta, in sec. 6, T. 21 N., R. 11 W. To reach from Cadillac by U. S. Route 131, go south 0.7 mile to junction with Route M–55 at Manistee sign. Turn west and follow Route M–55 3.2 miles to State Park, turn left and at 1.7 miles bear to left on macadam road, and follow to end at crossroads at 3.0 miles. Turn west onto Manistee road and follow 10.4 miles to white schoolhouse and red church. Turn north and follow gravel road 3.3 miles to dim road leading to right into timber, just north of field. Follow this old road, keeping right fork, which is blazed, to station, 0.4 mile. Station is on highest hill in vicinity, in scrub timber, and about 5 meters (16 feet) east of old gravel pit. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in brush, 8.74 meters (28.7 feet) from station in azimuth 276°48′. No. 2 is 8.8 meters (29 feet) north of center line of gravel road, 1 foot west of north-and-south wire fence on west side of pasture, 3.8 meters (12 feet) north of 16-inch elm tree in wire fence, 1 meter (3 feet) north of telephone pole, 6.5 meters (21 feet) north of north gate post in fence, and approximately ¾ mile from station in azimuth 46°26′34″.

Plane coordinates: (C), $x=514,679.80$ feet; $y=999,617.65$ feet; grid azimuth to reference mark No. 2=46°24′13″.*

Le Roy (Osceola County, H. W. Hemple, 1931; 1932).—About 3.5 miles east-southeast of Le Roy, in NW¼ sec. 22, T. 19 N., R. 9 W., on land owned by William Portous of Le Roy. To reach from Le Roy by Route 131, go north about 200 feet from Edward Larson's general store and turn right on gravel road, and follow this road east 1.5 miles to T-road. Turn south and go 0.5 mile, thence east 2.0

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

miles to top of grade. Station is on flat-topped knoll about 400 feet south of road, and 25 meters (82 feet) north-northeast of 9-inch hickory tree. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches above ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is at foot of maple tree, and 24.31 meters (79.8 feet) from station in azimuth 233°23′. No. 2 is 8 meters (26 feet) west of center line of north-and-south road, 0.6 meter (2 feet) east of north-and-south fence line, approximately 75 meters (246 feet) north of center line of east-and-west road, and approximately ¼ mile from station in azimuth 119°04′52″.

Plane coordinates: (C), $x=597,496.26$ feet; $y=921,909.57$ feet; grid azimuth to reference mark No. 2=118°49′24″.*

Luther (Lake County, H. W. Hemple, 1931).—About 9 miles west of Le Roy and 3 miles east of Luther, in sec. 16, T. 19 N., R. 11 W., on knoll, in cut-over timber area, in brush. Knoll is most accessible one on ridge. To reach from Le Roy by U. S. Route 131, go southwest 3 miles to junction with Route M-63. Follow west to crossroads at school, where branch of Route M-63 from south comes in, thence west 4.0 miles to crossroads. Turn north toward A. C. Genung's house on south side of road, then into road through orchard west of house, go through gate and keep right-hand fork at 50 yards beyond, follow old post road south, through wire gap 0.65 mile to blazes on poplar trees on right, just over crown of grade. Station is 180 yards southwest of this point. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in pine stump area amid low brush, and 13.42 meters (44.0 feet) from station in azimuth 354°42′. No. 2 is in pine stump area, and 21.03 meters (69.0 feet) from station in azimuth 107°36′.

Plane coordinates: (C), $x=532,664.38$ feet; $y=924,887.89$ feet.

Hersey (Osceola County, C. D. Meaney, 1931).—About 5.5 miles north-northeast of Hersey, near center of sec. 28, T. 18 N., R. 9 W. To reach from Reed City, follow combined Routes 131 and 10 south about ½ mile to where Route 10 turns left. Follow Route 10 in easterly direction 7.1 miles and turn north on gravel road opposite Shell service station on south side of Route 10. Keep straight road north 1.8 miles to T-road; take right-hand road 0.3 mile; then north 0.5 mile, right 100 yards, left on main-traveled road 0.5 mile, turn left for 0.2 mile to where it turns north. Go north 0.5 mile and take dim road to left, about 1,000 feet north of abandoned farm buildings; follow this dim road between two fence lines 0.4 mile to top of grade. Station is about 200 yards south and a little east of here, on highest ground, on northwest end of ridge running northwest and southeast. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 6 inches below surface of ground. Reference marks are standard reference disks in concrete, note 11a. No. 1 is 8 meters (26 feet) west of center line of north-and-south road, 1 meter (3 feet) west of fence on west side of road, approximately 100 meters (328 feet) north of old farmhouse, and approximately ½ mile from station in azimuth 256°38′10″. No 2 is at foot of small tree, and 32.83 meters (107.7 feet) from station in azimuth 344°17′.

Plane coordinates: (C), $x=594,094.29$ feet; $y=882,383.73$ feet; grid azimuth to reference mark No. 1=256°23′18″.*

Orono (Lake County, C. D. Meaney, 1931).—About 7 miles northwest of Reed City and 4½ miles south of west of Orono, in sec. 22 or 27, T. 18 N., R. 11 W., on low stumpy knoll, in brushy wilderness. To reach station from Reed City, turn right on U. S. Route 10 at main corner in city, go 6.5 miles to crossroads, then turn north and go 1.9 miles to crossroads with three mail boxes, thence to right (east) and follow 1.0 mile to sandy corner. Take left-hand road through woods and go 1.1 miles to small triangular mound on right of road. Station is about 20 yards northeast of this mound. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in brush, 17.95 meters (58.9 feet) from station in azimuth 197°18′. No. 2 is in brush, about 4 meters (13 feet) west of center line of dim road leading toward station, and 22.22 meters (72.9 feet) from station in azimuth 79°54′.

Plane coordinates: (C), $x=538,059.03$ feet; $y=885,121.10$ feet.

Boyd (Osceola County, C. D. Meaney, 1931).—About 4½ miles southeast of Hersey, near center of SW¼ sec. 35, T. 17 N., R. 12 W. To reach from Reed City,

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

follow Route 131 south 2.2 miles to county road, turn left on county road and go 3.3 miles to First Congregational Church in Hersey; turn right on gravel road for 0.7 mile, thence right about 100 yards east of bridge for 0.3 mile, and follow road around to left for 0.8 mile, thence south for 1.5 miles and follow main gravel road left for 0.5 mile; thence south 0.6 mile, and take left gravel road bearing southeast for 1.4 miles; thence left gravel road bearing east for 1.1 miles. Turn north onto sandy road where main road turns sharply to south a few hundred feet east of Burt Boyd's barn, and follow north 1 mile to point where sand road turns west. To reach station from this turn walk north along west edge of timber about 150 yards, turn right into valley between two timbered ridges. Follow cow trail leading up valley 200 yards and bear left up to top of south ridge. Station is on top of south ridge. Surface and underground marks are standard disk station marks in concrete, notes 1b and 7a. Reference marks are standard reference disks in concrete, note 11b. No. 1 is 16.98 meters (55.7 feet) from station in azimuth 279°52′. No. 2 is 9.47 meters (31.1 feet) from station in azimuth 50°42′.

Plane coordinates: (C), $x=602,028.15$ feet; $y=845,151.80$ feet.

Paris (Newaygo County, C. D. Meaney, 1931; 1937).—About 8 miles southwest of Reed City, and 5½ miles west of Paris, in sec. 15, T. 16 N., R. 11 W. Ownership of land not known, but said to belong to State. To reach from Reed City by U. S. 131, go south to about 2½ miles south of Paris to gravel road leading west. Follow west 6.0 miles to Parks Corners, thence north on gravel road 1.0 mile, thence straight north across crossroads on sand road ½ mile to two farms. Road here becomes just a trail. Continue straight north from houses ¼ mile to gravel pit at top of short sandy hill. Pass through pit on old road through woods in northerly direction 0.25 mile to better road on railroad grade. Bear left on this road 0.1 mile to blazed 6-inch oak tree at junction of roads. Follow right-hand road northeast 0.4 mile and keep to right-hand fork which is dim at small pit in sand, continue on to second group of sand pits just over low knoll. Follow 0.2 mile to top of grade near blazed stumps. Turn right and follow crest of ridge southwest 0.15 mile to station, on low cut-over brushy knoll, 11 meters (36 feet) west of 6-inch triangle-blaze trimmed oak tree. Dim tracks lead directly to tree and station. Surfaced underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference marks are standard reference disks in concrete, note 11a. No. 1 is in pine stump area, and about 30 meters (98 feet) northeast of old road leading toward station, and approximately ¼ mile from station in azimuth 236°23′00″. No. 2 is in open area, and 31.27 meters (102.6 feet) from station in azimuth 116°17′.

Plane coordinates: (C), $x=536,611.14$ feet; $y=828,302.29$ feet; grid azimuth to reference mark No. 1=236°17′15″.*

Supplementary points

Beaver Island Lighthouse (Charlevoix County, H. W. Hemple, 1932).—Plane coordinates: (C), $x=545,208.18$ feet; $y=1,485,510.72$ feet.

Charlevoix, water tank (Charlevoix County, H. W. Hemple, 1932).—Plane coordinates: (C), $x=625,567.68$ feet; $y=1,392,217.67$ feet.

Garfield, fire lookout tower (Kalkaska County, H. W. Hemple, 1932).—Plane coordinates: [1] (C), $x=643,744$ feet; $y=1,128,352$ feet.

Kingsley, fire lookout tower (Traverse County, H. W. Hemple, 1932).—Plane coordinates: [1] (C), $x=544,000$ feet; $y=1,120,570$ feet.

Brier Hill, fire lookout tower (Wexford County, H. W. Hemple, 1932).—Plane coordinates: [1] (C), $x=518,448$ feet; $y=1,044,514$ feet.

Selma, fire lookout tower (Wexford County, H. W. Hemple, 1932).—Plane coordinates: [1] (C), $x=553,129$ feet; $y=1,030,336$ feet.

Cadillac, white stack (Wexford County, H. W. Hemple, 1932).—Plane coordinates: [1] (C), $x=589,607$ feet; $y=1,007,774$ feet.

LAKE HURON TO BIG RAPIDS

Principal points

Nichol (Sanilac County, H. C. Warwick, 1932).—About 8 miles east of Cass City, in NE¼ sec. 35, T. 14 N., R. 12 E., east of right-of-way fence between north-and-south section-line gravel road and property of Frank Nichol, 28 feet west of center line of road, and 19 feet southwest of white hickory tree, about 30 yards

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.
[1] No check on this position.

For notes in regard to marking of stations see p. 167.

north of center line of private road to east, and about 50 yards west of concrete silo. To reach from Cass City, go east 8.0 miles on Route M-81 to crossroads with large barn in southwest corner, turn right (south), and proceed 0.35 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is in east right-of-way fence of road, 26 feet east of center line of road, about 30 yards north of southwest corner of orchard, 70 feet southeast of 18-inch elm tree on west side of road, and 156.58 feet from station in azimuth 201°01′. No. 2 projects 5 inches, is 22 feet east of center line of road, 34 feet south of center line of above-mentioned private road, about 100 feet west of white farmhouse, and 129.11 feet from station in azimuth 335°49′. Azimuth mark projects 6 inches, is 27 feet east of center line of north-and-south road, 1 foot west of east right-of-way fence, about 50 yards south of intersection of crossroads, about 60 yards east of large barn, and approximately 0.35 mile from station in azimuth 181°16′50″.

Plane coordinates: (E), x=672,093.37 feet; y=765,860.39 feet; grid azimuth to azimuth mark=180°49′57″.*

Arnold (Sanilac County, H. C. Warwick, 1932).—About 8 miles northwest of Sandusky, 1½ miles northwest of Snover, on land owned by William E. Arnold about 450 yards southwest of Arnold's house, 450 yards west of road, 117 feet north of fence corner, 14 feet west of fence at small angle in fence, 30 feet southeast of break of slope on northwest side of hill, and 25 feet east of gravel pit on west slope of hill. To reach from Kingston, go east 11.0 miles on Route M-46 to gravel road to north, proceed north 3.0 miles to Snover, proceed west 1.0 mile on gravel road to road to north, proceed north 0.6 mile to Arnold's house which is on hillside 100 yards west of road, follow farm road west ¼ mile through pasture and bear left around base of hill to its northwest side, and climb steep slope of hill to left to station site at top. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 1 foot west of fence, 12 feet southeast of break of slope on northwest side of hill, and 72.60 feet from station in azimuth 203°12′. No. 2 projects 4 inches, is 1 foot north of fence, 54 feet east of fence corner, and 129.58 feet from station in azimuth 332°38′. Azimuth mark projects 5 inches, is on right-of-way of public road, 28 feet west of center line of road, 21 feet north of center of gate, 75 feet west of concrete silo on east side of road, and approximately 0.25 mile from station in azimuth 301°14′42″. Azimuth from station to Snover, high school, ball on belfry, distant approximately 1½ miles, is 291°38′43″.

Plane coordinates: (E), x=678,156.30 feet; y=717,933.40 feet; grid azimuth to azimuth mark=300°47′00″.*

Cass (Tuscola County, H. C. Warwick, 1932).—About 0.6 mile north of main corner of Cass City, in NW¼ sec. 27, T. 14 N., R. 11 E., on land owned by J. E. Seeds, 106 feet east of center line of north-and-south gravel section-line road which goes north from main corner of Cass City, in barnyard, 8 feet south of east-and-west fence line, 55 feet north of center of well shaft, and 99 feet west of northwest corner of concrete foundation of large barn. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 8 inches, is in northeast fence corner of barn lot, 47 feet northeast of northeast corner of concrete foundation of barn, and approximately 173 feet from station in azimuth 265°01′. No. 2 is 1 foot east of east right-of-way fence of section-line road, 26 feet east of center line of same road, 14 feet north of small maple tree, and 101.97 feet from station in azimuth 50°04′. Azimuth mark projects 6 inches, is 0.1 mile east of crossroads, 3 feet north of south right-of-way fence of east-and-west gravel road, 23 feet south of center line of same road, 3 feet west of telephone pole, 29 feet east of 18-inch beech tree, about 100 yards west of yellow farmhouse, and approximately 0.4 mile from station in azimuth 191°11′05″. Azimuth from station to Cass City, Nestles Food Co., small tank, distant 1 mile, is 37°59′16″.

Plane coordinates: (E), x=630,356.67 feet; y=769,256.91 feet; grid azimuth to azimuth mark=190°50′43″.*

Wilmot (Tuscola County, H. C. Warwick, 1932).—About 9 miles east-southeast of Cass City, 5 miles northeast of Kingston, 3 miles east of Wilmot, in SW¼

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

sec. 12, T. 12 N., R. 11 E., on right-of-way of county road, on highest point in vicinity, in rail fence line 25 feet north of center line of road, and about 150 yards west of white house on north side of road. To reach from Caro, go northeast about 2 miles on Route M–81 to gravel county road to east marked by sign "Deford 9 Miles," follow east 9 miles to road crossing at Deford, proceed south 3.5 miles on gravel road to Wilmot, continue south 0.25 mile to crossroads, proceed east 2.5 miles on gravel road to T-intersection, proceed north 0.5 mile on gravel road to road intersection just north of bridge over small stream, proceed east on dirt road to road intersection at group of farm buildings, and continue north 0.75 mile and east 0.2 mile on dirt road to station site. To reach from Cass City, go east 4.0 miles on Route M–81 to end of pavement at junction with Route M–53, proceed south 9.0 miles on Route M–53 to crossroads ¾ mile north of Hemans railway station, proceed west 1.0 mile, north ¼ mile, and west 0.8 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is on right-of-way fence line, 18 feet south of center line of the road, 45 feet west of fence corner, and 72.60 feet from station in azimuth 308°11′. No. 2 projects 4 inches, is on right-of-way fence line, 18 feet south of center line of road, and 80.82 feet from station in azimuth 53°17′. Azimuth mark projects 7 inches, is on right-of-way of north-and-south county road, 21 feet east of center line of road, 1 foot west of right-of-way fence, 4 feet north of fence at north edge of apple orchard, 102 feet north of center line of drive to small yellow house on east side of road, and approximately 0.2 mile from station in azimuth 39°39′46″. Azimuth from station to *Cass City, municipal water tank,* distant approximately 9 miles, is 161°45′57″.

Plane coordinates: (E), x=643,906.28 feet; y=720,317.95 feet; grid azimuth to azimuth mark=39°17′23″.*

Caro (Tuscola County, H. C. Warwick, 1932).—About 4 miles northeast of Caro, in SE¼ sec. 13, T. 13 N., R. 9 E., on land owned by Mrs. Rena McCrea, 43 feet west of center line of north-and-south gravel road, 14 feet west of west right-of-way fence of same road, 11 feet south of east-and-west fence line, 48 feet north of northernmost of three oak trees, and about 60 yards northeast of McCrea's house. To reach from Caro, go northeast 3.7 miles on Route M–81 to filling station on west at point where highway bears to northeast, and continue straight north 0.75 mile on gravel road to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 29 feet west of center line of above-mentioned road, 1 foot west of west right-of-way fence of road, and 109.59 feet from station in azimuth 185°22′. No. 2 projects 5 inches, is 2 feet east of northeast corner of shed, 16 feet south of fence corner, and 96.97 feet from station in azimuth 73°12′. Azimuth mark projects 6 inches, is 0.1 mile east of M. P. Church at crossroads, 10 feet west of maple tree, 28 feet south of center line of east-and-west road, 1 foot north of south right-of-way fence of same road, 80 feet west of center of concrete culvert, and approximately 0.7 mile from station in azimuth 184°12′47″. Tip of belfry of M. P. Church is approximately 0.7 mile from station in azimuth 179°39′42″.

Plane coordinates: (E), x=584,087.29 feet; y=744,835.16 feet; grid azimuth to azimuth mark=183°59′40″.*

Tuscola (Tuscola County, H. C. Warwick, 1932).—About 8 miles southeast of Caro, in SW¼ sec. 5, T. 11 N., R. 10 E., on land owned by Tuscola County, on top of bare hill, about 115 yards southwest of southwest corner of barn, 50 yards east of west end of ridge, 125 yards southeast of highest point of hill, and 200 yards west of road. To reach from Caro, go south 6.0 miles on Route M–85 to junction with Route M–46, proceed east 3.5 miles on Route M–46 to crossroads, proceed south 0.55 mile on gravel and dirt road to summit of grade, and go west 200 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is on right-of-way of county road, 27 feet east of center line of road, about 150 feet northeast of northeast corner of stone house, 130 feet south of fence at south edge of apple orchard, and approximately 0.15 mile from station in azimuth 213°06′44″. No. 2 projects 4 inches, is on right-of-way of

* This azimuth has been computed by the first formula (p.)171, neglecting the second term.

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road, 32.5 feet east of center line of road, 0.5 foot west of fence, 7.5 feet south of 6-inch wild-cherry tree, and 528.75 feet (slope) from station in azimuth 303°07′46″. Azimuth mark projects 6 inches, is on right-of-way of road at bottom of grade north of station, 24 feet east of center line of road, 22 feet north of fence corner, 27 feet north of 36-inch pipe culvert under road, and approximately 0.35 mile from station in azimuth 190°04′56″. Finial of belfry on schoolhouse is approximately 1.0 mile from station in azimuth 108°28′53″.

Plane coordinates: (E), $x=593,112.58$ feet; $y=692,849.33$ feet; grid azimuth to azimuth mark=189°50′29″.*

Carpenter (Tuscola County, H. C. Warwick, 1932).—About 3.0 miles west of Caro, in southeast corner of intersection of two gravel section-line roads, on small knoll in schoolyard which is in northwest corner of sec. 8, T. 12 N., R. 9 E., 27.15 feet northwest of northwest corner of schoolhouse, 57.6 feet northwest of southwest corner of schoolhouse, 40 feet east of center line of gravel road, 68 feet southeast of road intersection, and 56 feet south of center line of road. To reach from Caro, follow Route M–81 to southwest part of town, and proceed west 2.0 miles on section-line road to Carpenter Schoolhouse and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in east edge of schoolyard, 1.5 feet west of schoolyard fence, 74.1 feet northeast of northeast corner of schoolhouse, 46 feet south of center line of road, and 123.85 feet (slope) from station in azimuth 264°01′. No. 2 projects 4 inches, is 91.5 feet southwest of southwest corner of schoolhouse, 18 feet east of center line of section-line road, and 133.87 feet (slope) from station in azimuth 5°53′. Azimuth mark projects 8 inches, is 25 feet north of center line of east-and-west gravel road, in north-and-south fence line, and 0.3 mile from station in azimuth 266°23′08″.

Plane coordinates: (E), $x=558,522.94$ feet; $y=721,852.66$ feet; grid azimuth to azimuth mark=266°14′02″.*

Bernie (Tuscola County, H. C. Warwick, 1932).—About 3 miles due north of Fairgrove, 1.5 miles due west of Akron, in orchard in northwest road corner, on land owned by Mr. Arthur Bernie, 49 feet north of point where paved road north from Fairgrove intersects center line of east-and-west road south of station, 21 feet north of north right-of-way fence of east-and-west road, 22 feet south of "Polarine Motor Oil" sign, 25 feet southwest of apple tree which is southeast tree of orchard, about 7 feet west of projected center line of road south to Fairgrove at point where road jogs east about 60 feet, and about 65 feet west of center line of same road to north. To reach from Fairgrove, go north 3.0 miles on paved road direct to station site near point where road jogs to east. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 7 inches, is 1 foot west of west right-of-way fence of north-and-south gravel road, 20 feet west of center line of road, 24 feet north of small oak tree also in fence line, and 116.54 feet from station in azimuth 206°00′. No. 2 projects 8 inches, is 1 foot north of north right-of-way fence of east-and-west road, 18 feet north of center line of road, and 98.62 feet from station in azimuth 77°17′. Azimuth mark projects 6 inches, is 3 feet southwest of small elm tree, 40 feet east of fence corner, 20 feet south of paved east-and-west road to east, and approximately 0.3 mile from station in azimuth 272°01′50″.

Plane coordinates: (E), $x=532,417.36$ feet; $y=752,963.03$ feet; grid azimuth to azimuth mark=271°56′47″.*

Cole (Tuscola County, H. C. Warwick, 1932).—About 9 miles east of Reese, 8 miles west of Caro, in village of Watrousville, in NE¼ sec. 16, T. 12 N., R. 8 E., on land owned by Maurice Cole, in his barnyard on west side of road which is on opposite side from his house, 58 feet west of center line of road, 37.3 feet east-northeast of southeast corner of barn, and 65.3 feet southeast of northeast corner of barn. To reach from Caro, go west 8 miles on Route M–81 to crossroads at Watrousville, and proceed south 0.25 mile on gravel county road to summit of grade and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is on right-of-way of county road, 23 feet east of center line of road, 11 feet south of 15-inch maple tree, 70 yards northwest of Cole's

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

† For notes in regard to marking of stations see p. 167.

residence, and 94.45 feet from station in azimuth 240°03′. No. 2 projects 3 inches, is 28 feet west of center line of road, on line with fence at north side of Cole's yard on east side of road, and 116.10 feet from station in azimuth 343°09′. Azimuth mark projects 6 inches, is at top of south bank of Route M-81, 44 feet south of center line of pavement, 5 feet east of telephone pole, about 0.1 mile east of crossroad, straight across highway from door of Methodist Church, and approximately 0.3 mile from station in azimuth 203°50′53″. Center of small chimney on east end of roof of red school is approximately 0.25 mile from station in azimuth 189°44′55″.

Plane coordinates: (E), x=538,133.28 feet; y=710,052.19 feet; grid azimuth to azimuth mark=203°44′57″.*

Grew (Tuscola County, H. C. Warwick, 1932).—About 7 miles west and 2 miles north of Fairgrove, 7 miles north and ¾ mile east of Saginaw-Tuscola county line, in southeast road corner, in small orchard, 54 feet north of northwest corner of Mr. Louie Grew's house, 11 feet south of south right-of-way fence of east-and-west section-line road, 48 feet south of center line of same road, 27 feet southeast of southeast corner of large concrete culvert, and 58 feet east of southwest corner of culvert. To reach from post office in Reese, go east ¾ mile on Route M-81 to crossroads at village limits, and proceed north 7 miles to Van Buren School, District No. 6, in northwest corner of crossroads. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 18 feet north of center line of above-mentioned east-and-west road, 60 feet east of northeast corner of culvert, and 81.64 feet from station in azimuth 213°00′. No. 2 projects 6 inches, is 3 feet northeast of southeast corner of Van Buren School, 50 feet northwest of intersection of center lines of crossroads, and 143.33 feet from station in azimuth 128°50′. Azimuth mark projects 5 inches, is 18 feet north of above-mentioned east-and-west road, 1 foot south of north right-of-way fence of road, 3 feet east of fence corner, and approximately 0.15 mile from station in azimuth 94°27′30″.

Plane coordinates: (E), x=495,832.82 feet; y=747,476.61 feet; grid azimuth to azimuth mark=94°28′09″.*

Bernthal (Tuscola County, H. C. Warwick, 1932).—About 1¾ miles east and ¾ mile south of Reese post office, on land owned by Mather Bernthal, 75 yards northeast of his house, 215 feet east of center line of road, 185 feet east of right-of-way fence, 26.5 feet southwest of 8-inch apple tree, and 24.5 feet south-southeast of 10-inch apple tree. These two trees are only ones near center of pasture. To reach from Saginaw, go east 12 miles on Route M-81 to Reese, continue east 1¾ miles on Route M-81 to crossroads with white school in southeast corner, proceed south 0.8 mile on gravel county road to Bernthal's house and farm buildings on east side of road, turn east in driveway just south of house, enter pasture by gate just behind house, and go north about 50 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is about 10 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in same pasture as station, 32 feet east of center line of road, 1 foot east of fence, 29.5 feet north of fence corner at southwest corner of pasture, 30 feet northwest of 10-inch apple tree, and 206.40 feet from station in azimuth 61°38′. No. 2 projects 5 inches, is in same pasture as station, 31 feet east of center line of road, 0.5 foot east of fence, 21 feet south of fence corner at northwest corner of pasture, 40 yards west of 24-inch oak tree, and 272.76 feet from station in azimuth 137°00′. Azimuth mark projects 5 inches, is on right-of-way of county road, 30 feet east of center line of road, 4 feet west of right-of-way fence, 2 feet south of fence corner, across road from drive to farmhouse on west side of the road, and approximately 0.25 mile from station in azimuth 170°21′26″. Finial of belfry on schoolhouse is 0.75 mile from station in azimuth 177°11′10″.

Plane coordinates: (E), x=501,852.50 feet; y=706,672.87 feet; grid azimuth to azimuth mark=170°21′09″.*

Jonas (Bay County, H. C. Warwick, 1932).—About 5 miles southeast of Bay City, in NE¼ sec. 6, T. 13 N., R. 6 E., Portsmouth Township, in east right-of-way fence between north-and-south gravel road and property of Arthur Jonas, and 17 feet east of center line of road. To reach from Bay City, go south 1.0 mile on Michigan Avenue from corner of Salzburg to Cass City road, proceed east 3.8 miles on this road to T-road to south, turn south onto this road, and continue 0.4

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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mile to the station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is in east right-of-way fence of above-mentioned road, 18 feet east of center line of road, and 105.85 feet from station in azimuth 181°31′. No. 2 projects 7 inches, is in east-and-west fence line, about 28 yards west of center line of road, and 298.29 feet from station in azimuth 23°15′. Azimuth mark projects 6 inches, is 2 feet south of north right-of-way fence of Cass City road (half strip of concrete), 23 feet north of center line of road, 5 feet east of telephone pole, 50 yards east of point where T-road goes south from Cass City road to station, and approximately 0.4 mile from station in azimuth 184°17′07″. Azimuth from station to Merritt Lutheran Church, tip of steeple, distant 1 mile, is 335°09′28″; *Bay City, Murray Body Co. plant, stack*, 108°12′33″; and *Bay City, St. Stanislaus Catholic Church, north steeple*, 111°50′52″.

Plane coordinates: (E), x=462,595.85 feet; y=750,393.08 feet; grid azimuth to azimuth mark=184°22′57″.*

Kaul (Saginaw County, H. C. Warwick, 1932).—About 8½ miles east of Saginaw, in NW¼ sec. 21, T. 12 N., R. 6 E., at southwest corner of land owned by Mike Reinbold, about 200 yards west of his barn, 29 feet north of center line of gravel county road, 1 foot north of right-of-way fence, and 2 feet east of property line between Reinbold's and John Kaul's property. To reach from intersection of James and Genese Streets in Saginaw, go east 4.5 miles on James Street and paved road to crossroads, and continue straight east 3.2 miles on gravel county road to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is on land owned by Joe Kaul, 28 feet south of center line of road, 1 foot south of right-of-way fence, 106 feet east of property line between Joe Kaul's and John Kaul's property, and 117.90 feet from station in azimuth 298°22′. No. 2 projects 3 inches, is on land owned by John Kaul, 30 feet south of center line of road, 1 foot south of right-of-way fence, 1 foot east of fence between cultivated field on east and apple orchard on west, and 141.00 feet from station in azimuth 66°16′. Azimuth mark projects 6 inches, is on right-of-way of county road, 27 feet south of center line of road, 0.5 foot north of right-of-way fence line, 28 feet west of fence corner, and approximately 0.35 mile from station in azimuth 271°40′44″. Finial of school belfry is about ¾ mile from station in azimuth 220°38′12″.

Plane coordinates: (E), x=472,460.59 feet; y=702,952.89 feet; grid azimuth to azimuth mark=271°45′01″.*

Appold (Bay County, H. C. Warwick, 1932).—About 10 miles north of Saginaw, 5 miles southwest of Bay City, in NW¼ sec. 2, T. 13 N., R. 4 E., Frankenlust Township, in projection of right-of-way fence between north-and-south road and property of George J. Appold, 26 feet west of center line of road, 21 feet south of southernmost tree of north-and-south row of pine trees in front of Mr. Appold's house, and about 40 yards southeast of his house. To reach from junction of U. S. Route 10 and Route M-47 (2 miles west of Saginaw), go north 8.1 miles on Route M-47 to the Michigan House, turn west (left) onto concrete half slab, follow 0.4 mile to point where it turns south, keep straight ahead (west) 0.1 mile on gravel road, and proceed north 0.55 mile to station site. Surface and under ground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 8 inches. No. 1 is 36 feet east of center line of north-and-south road, and 107.26 feet from station in azimuth 326°23′. No. 2 is in east-and-west fence line, about 100 feet west of road, about 55 feet south of southeast corner of outhouse, and 114.49 feet from station in azimuth 66°43′. Azimuth mark is 29 feet north of center line of east-and-west section-line road, about 0.1 mile east of crossroad, and approximately 0.35 mile from station in azimuth 195°49′31″. Azimuth from station to *Saginaw Consumers Power Co., north stack*, is 333°51′18″; *Bay City, City Hall*, 239°02′37″; and *Bay City, Columbia Sugar Co., stack*, 246°27′00″.

Plane coordinates: (E), x=421,108.53 feet; y=750,991.87 feet; grid azimuth to azimuth mark=196°01′49″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Saginaw (Saginaw County, H. C. Warwick, 1932).—On top of Michigan Bell Telephone Building at corner of Washington and Janes Streets, Saginaw, about 6 feet south of middle of north parapet, and 15 feet northeast of chimney. Marked by standard station disk in drill hole in top of extended concrete column. Column is solid concrete, about 20 inches square, and projects about 3 inches above roof. Reference marks are standard reference disks in similarly extended concrete columns. No. 1 is 31.59 feet from station in azimuth 339°52′. No. 2 is in column near chimney, 20.21 feet from station in azimuth 59°14′. Azimuth from station to *Saginaw, City Hall, foot of flagpole* is 24°45′13″; to *Saginaw, Holy Family Catholic Church, belfry*, 26°15′26″; and to Lufkin Rule Co., stack, 2°02′41″.

Plane coordinates: (E), x=427,316.35 feet; y=703,685.93 feet; grid azimuth to Saginaw City Hall=24°56′30″.**

De Shone (Saginaw County, H. C. Warwick, 1932).—About 5 miles northwest of Saginaw, 4¾ miles southeast of Freeland, about ¼ mile north of crossroads at Lawndale, on land owned by E. D. De Shone, in barnyard just north of house, 100 feet north-northeast of northeast corner of house, 41 feet west of center line of road, 17 feet west of fence, 18 feet north of fence, and 89 feet east of east edge of concrete silo base. To reach from junction of U. S. Route 10 and Route M–47 in Saginaw, go north 1.0 mile on Route M–47 to crossroads with school in northwest corner just north of railroad crossing, proceed west 3.0 miles on gravel road to T-intersection, proceed north 2.0 miles on gravel road to crossroads at Lawndale just north of railroad crossing, and continue north about 0.25 mile to De Shone's buff-colored brick house. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No 1 projects 10 inches, is 23 feet west of center line of road, 1 foot west of fence, 43 feet north of fence in line with north side of barn, and 114.71 feet from station in azimuth 186°31′. No. 2 projects 3 inches, is 1 foot south of south edge of concrete silo base, and 93.90 feet from station in azimuth 94°38′. Azimuth mark projects 6 inches, is 23 feet east of center line of road, 1 foot west of fence, 24 feet south of fence corner, about 100 feet southwest of southwest corner of house, and approximately 0.3 mile from station in azimuth 180°35′27″. Spire of small wooden church is about 1 mile from station in azimuth 136°32′29″.

Plane coordinates: (E), x=402,399.27 feet; y=723,371.00 feet; grid azimuth to azimuth mark=180°50′38″.*

Bay City (Bay County, H. C. Warwick, 1932).—On tower of large brick factory building of Bay City Stone Co., in southwest part of Bay City, 7.34 feet northeast of inside of southwest parapet, and 7.13 feet northwest of inside of southeast parapet. To reach, follow Salzburg Street west across river bridge in south central part of town, continue ¼ mile west of bridge to old concrete pavement leading south on Morton Street, and follow Morton Street south-southwest 0.55 mile to building which has station site. Building has large brick tower which extends high above center of main part of building. Marked by copper bolt embeded in concrete roof and covered with tar. Reference marks are standard reference disks in drill holes in stone copings of parapets around station. No. 1 is in northeast coping, and 17.50 feet from station in azimuth 212°04′. No. 2 is in northwest coping, and 17.82 feet from station in azimuth 108°04′. Azimuth from station to *Bay City, City Hall*, is 218°29′02″; and to *Bay City, water works, stack*, 186°49′53″.

Plane coordinates: (E), x=435,073.25 feet; y=755,334.58 feet; grid azimuth to Bay City, water supply stack=187°00′01″.**

Freeland (Saginaw County, H. C. Warwick, 1932).—About 9 miles northwest of Saginaw, 1 mile east of Freeland, in NW¼ sec. 23, T. 13 N., R. 3 E., on land owned by Mr. William Wagner, 1 foot east of east right-of-way fence of north-and-south concrete road, 29 feet east of center line of road, 35 feet north of northeast corner of concrete culvert, and about 20 yards west of large unpainted barn. To reach from Saginaw River Bridge, go west 9.2 miles on U. S. Route 10 to point where U. S. Route 10 goes to left and concrete road goes to right (north) (this point is 4.1 miles northwest of junction of U. S. Route 10 and Route M–47), turn north onto concrete road, and go 2.6 miles to station site opposite barn. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference marks in concrete, note 11a. No. 1 projects 6 inches,

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.
** This azimuth has been computed by the first formula (p. 171), using both terms.

For notes in regard to marking of stations see p. 167.

is 44 feet north of northeast corner of above-mentioned barn, 6 feet west of northwest corner of small shed, and 136.95 feet from station in azimuth 254°58′. No. 2 projects 5 inches, is in east right-of-way fence, 28 feet east of center line of above-mentioned concrete road, about 50 yards southwest of southtwest corner of barn, and 158.51 feet from station in azimuth 1°13′. Azimuth mark projects 5 inches, is 27 feet west of center line of north-and-south concrete road, 3 feet north of telephone pole, 15 feet northwest of northwest corner of concrete culvert, and approximately 0.35 mile from station in azimuth 2°34′49″.

Plane coordinates: (E), x=387,561.55 feet; y=737,449.03 feet; grid azimuth to azimuth mark=2°52′20″.*

Borm (Saginaw County, H. C. Warwick, 1932).—About 6 miles south and 2 miles west of Bell Telephone building in Saginaw, on property of Mr. Richard Borm, on highest point in pasture, about 300 feet south by west of Borm's farmhouse, about 300 feet southeast of T-intersection, about 400 feet north of Pere Marquette Railway, 75 feet east of north-and-south road, 67 feet east of group of 5 maple trees growing from same base, and 84.5 feet south of large oak tree which has flat side. To reach from Saginaw, follow Route M-46 to bridge across Tittabawassee River, cross bridge, continue west 0.3 mile to first crossroads, turn south, continue 1.0 mile to crossroads, turn right, and go 0.9 mile to Borm's farm and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is on fence line paralleling north-and-south road, 25 feet east of center line of road, 35 feet south of 18-inch oak tree, 24 feet north of 24-inch oak tree, 20 feet west of 24-inch maple tree, and 109.75 feet from station in azimuth 61°11′. No. 2 projects 5 inches, and is on north-and-south fence line, 18 feet east of center line of road, and 180.92 feet from station in azimuth 146°55′. Azimuth mark projects 8 inches, is 10.5 feet east of center line of road, in northwest corner of field, 1 foot east of north-and-south fence line, 2 feet south of east-and-west fence line, and approximately 0.25 mile from station in azimuth 176° 49′37″. Silo on Tim O'Hern's farm is 1 mile from station in azimuth 127°18′05″; oak tree is 84.5 feet distant in azimuth 173°; and maple tree is 67 feet distant in azimuth 92°.

Plane coordinates: (E), x=392,455.51 feet; y=692,865.56 feet; grid azimuth to azimuth mark=177°06′18″.*

Sand (Midland County, H. C. Warwick, 1932).—About 16 miles west-northwest of Saginaw, 7 miles south of Midland, 2 miles north of Saginaw-Midland county line, on highest part of sand ridge through which section-line road is cut, on right-of-way of section line road at top of bank of cut, 73 feet south of center line of road, 17 feet north of fence, and about 0.35 mile east of north-and-south road. To reach from Saginaw, go west 15 miles on Route M-46 to Hemlock, proceed north from Ford garage 6.5 miles on gravel road to crossroads, proceed west 0.6 mile on sand road to summit of grade in cut through sand ridge, and climb sand bank on south side of road to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is on top of bank of cut, 40 feet north of center line of road, 3 feet north of right-of-way fence, and 139.70 feet from station in azimuth 219°24′. No. 2 projects 4 inches, in on west slope of sand ridge, 48 feet south of center line of road, 17 feet south of fence, 1 foot west of another fence, and approximately 117 feet from station in azimuth 101°46′. Azimuth mark projects 5 inches, is at first crossroads west of station, 54 feet north of center line of east-and-west dirt road, 28 feet west of center line of north-and-south road, 1 foot east of fence, 15 feet north of fence corner, 20.55 feet north of *Primary traverse station No. 14* (*U. S. G. S.*) and 2,093.57 feet from station in azimuth 92°05′50″. Azimuth from station to *Midland, Dow Chemical Co., largest stack*, is 182°18′07″.

Plane coordinates: (E), x=347,459.83 feet; y=733,150.52 feet; grid azimuth to azimuth mark=93°02′05″.*

Wilkins (Saginaw County, H. C. Warwick, 1932).—About 16 miles southwest by west of Saginaw, 3.5 miles east-southeast of Merrill, 2 miles southwest of Hemlock, 5⅔ miles east of Gratiot-Saginaw county line, on property of Mr. Wilkins, about 300 feet west of Wilkins' farm buildings, and just beyond barn and vitrified-tile silo. To reach from Hemlock, go west 1.0 mile on Route M-46 to crossroads, turn south, continue 1.5 miles to T-intersection, turn west, and go 0.3 mile to highest point on local sand ridge on south side of an east-and-west section-line

*This azimuth has been computed by the first formula (p. 171) neglecting the second term.

For notes in regard to marking of stations see p. 167.

road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is on east-and-west fence line, about 15 feet northwest of sink hole, 21 feet south of center line of east-and-west road, 40 feet east of two birch trees, and 141.90 feet from station in azimuth 211°57′. No. 2 projects 4 inches, is on east-and-west fence line, 30 feet south of center line of east-and-west road, 75 feet east of T-intersection, and 167.50 feet from station in azimuth 129°32′. Azimuth mark projects 7 inches, is about 86 feet north of first farmhouse west of station, 1 foot south of fence line, 28 feet north of center line of east-and-west road, and approximately 0.15 mile from station in azimuth 97°48′40″. Finial of cupola on white barn is 1½ miles from station in azimuth 37°27′25″.

Plane coordinates: (E), x=342,841.85 feet; y=689,755.34 feet; grid azimuth to azimuth mark=98°13′02″.*

Poplar (Midland County, H. C. Warwick, 1932).—About 7 miles north and 1 mile east of Wheeler, near high point of small sandy ridge covered with growth of scrub poplar, about 25 feet southeast of 8-inch oak tree on left side of road marked with 2 triangular blazes, and 48 feet south of center line of little-used woods road. To reach from intersection of Route M–46 and main street in Wheeler, go east ½ mile on Route M–46 to four-corner intersection, turn left onto Gratiot County Route 505, go north 7.0 miles to crossroads with schoolhouse in northwest corner, turn right, go 1 mile, turn left, go north about 0.7 mile on very poor sandy road to road to left, turn left onto this road, and go along top of ridge 200 meters (656 feet) to above-mentioned 8-inch oak tree on left. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 15 feet south of center line of woods road, and 87.41 feet from station in azimuth 261°55′. No. 2 projects 4 inches, is 20 feet northwest of center line of woods road, and 75.31 feet from station in azimuth 156°20′.

Plane coordinates: (E), x=302,302.09 feet; y=736,749.38 feet.

Wheeler (Gratiot County, H. C. Warwick, 1932).—At northern edge of Wheeler, in northwest corner of intersection of main street and T-road leading west, west of cemetery which is just east of main street, 1 foot south of east-and-west fence line paralleling T-road, 35 feet north of center line of T-road, 15 feet northwest of lone pear tree, 125 feet west of center line of main street, and 46 meters (151 feet) west of northwest corner of cemetery. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 5 inches. No. 1 is 15 feet north of northwest corner of cemetery, 25 feet east of center line of main street, 18 inches west of fence line, and 42.035 meters (137.91 feet) from station in azimuth 275°56′. No. 2 is 1 foot north of fence line, 35 feet south of center line of T-road, 150 feet west of main street, and 28.815 meters (94.54 feet) from station in azimuth 46°03′. Azimuth mark is 0.25 meter (0.8 foot) north of fence line, 8.6 meters (28 feet) south of center line of road, 3.1 meters (10 feet) east of gate, and approximately 0.35 mile from station in azimuth 88°04′04″. *Northwest corner of Ezra Hasken's tombstone* is 46.02 meters (151.0 feet) from station in azimuth 291°17′. Azimuth from station to red silo southwest of Wheeler is 5°46′35″.

Plane coordinates: (E), x=294,615.57 feet; y=698,906.36 feet; grid azimuth to azimuth mark=88°35′57″.*

Silvernail (Midland County, H. C. Warwick, 1932).—Fifteen miles due south of Coleman, 10 miles southeast of Mount Pleasant, 5 miles east and ¾ mile north of Shepherd, about 200 meters (656 feet) south-southeast of Bohanan school, on property of Ray Silvernail, about 175 feet east of his house, 45 feet southeast of southwest corner of his barn, and 36 feet south of southeast corner of his barn. To reach from U. S. Route 27 in St. Louis, go north 4 miles on County Route 521 to end of pavement, turn right with main road, continue 1 mile, turn left, and continue 4.9 miles to Mr. Silvernail's house on right-hand side of road just before reaching crossroads at Bohanan school. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is about 25 yards east of northeast corner of barn, 20 feet south of northwest corner of cultivated field, 1 foot west of north-and-south fence line, and 149.18 feet from station in azimuth 217°59′. No. 2

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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projects 4 inches, is 55 feet north of north side of Mr. Silvernail's house, 112 feet east of center line of north-and-south section-line road, 1 foot south of east-and-west fence line, and 184.34 feet from station in azimuth 118°58′. Azimuth mark projects 6 inches, is about 0.2 miles east of above-mentioned north-and-south section-line road, 3 feet north of east right-of-way fence of east-and-west lane, 18 feet south of center line of same lane, and approximately 0.25 mile from station in azimuth 244°47′00″.

Plane coordinates: (E), $x=255,853.76$ feet; $y=743,533.56$ feet; grid azimuth to azimuth mark=245°25′03″.* (C), $x=808,292.83$ feet; $y=744,312.04$ feet; grid azimuth to azimuth mark=243°58′57″.*

St. Louis (Gratoit County, H. C. Warwick, 1932).—In south part of St. Louis, near fence separating property of Butler Lott on north from Bourcier estate on south, about 100 feet south of old unused sand pit, 9 feet north of above-mentioned east-and-west fence line, and about 150 feet west of southeast corner of cultivated field. To reach from traffic light, go east 1 block on U. S. Route 27, turn south (right) with Route 27, continue 3 blocks to church on left-hand side, proceed to left for 3 blocks, turn right, go to end of street at "Keep Off" sign, and continue to station site on highest point of ground to right, about 150 feet distant. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 1 foot below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 1 foot west of north-and-south fence line, 8 feet north of above-mentioned east-and-west fence line, and 146.50 feet (slope) from station in azimuth 270°31′. No. 2 projects 4 inches, is 1 foot north of above-mentioned east-and-west fence line, and 8.59 feet from station in azimuth 358°48′. Azimuth mark projects 4 inches, is in northwest corner of yard of C. J. Bernard, 75 feet northwest of his house, and approximately 0.3 mile from station in azimuth 290°06′06″. Azimuth from station to tip of steeple of church, distant approximately 0.6 mile, is 141°58′40″; to *St. Louis, Great Lakes Sugar Co., tall concrete stack*, 208°01′17″; and to center of brick stack, 208°50′46″.

Plane coordinates: (E), $x=251,081.21$ feet; $y=694,511.75$ feet; grid azimuth to azimuth mark=290°44′43″.* (C), $x=804,747.99$ feet; $y=695,185.98$ feet; grid azimuth to azimuth mark=289°18′49″.*

Thomas (Isabella County, H. C. Warwick, 1932).—About 2¾ miles south of Shepherd, about 100 yards east of U. S. Route 27, 1 foot north of east-and-west fence north of lane which is east of large red barn with two cupolas, 86.6 feet east of northeast corner of barn, and on land owned by Mrs. Mary C. Shepherd. To reach from Shepherd, go south 2¾ miles on U. S. Routes 27 and 27A to red brick house east of road and large red barn as described above. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 7 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 1 foot north of fence north of lane, and 85.95 feet from station in azimuth 270°30′. No. 2 projects 4 inches, is 1½ feet east of north-and-south fence, 73 feet south of stone wall which extends eastward from barn, and 113.12 feet (slope) from station in azimuth 24°25′. Azimuth mark projects 5 inches, is 21 feet east of east edge of concrete of U. S. Route 27, 13 feet south of southernmost tree of line of 5 cottonwood trees east of road, and approximately 0.25 mile from station in azimuth 158°47′02″. Azimuth from station to *Shepherd, municipal water tank, finial*, is 168°52′54″.

Plane coordinates: (C), $x=782,648.65$ feet; $y=724,208.29$ feet; grid azimuth to azimuth mark=158°03′04″.* (E), $x=229,714.12$ feet; $y=723,953.92$ feet; grid azimuth to azimuth mark=159°29′05″.*

O'Brien (Isabella County, H. C. Warwick, 1932).—About 3 miles south and 3 miles west of Mount Pleasant, in SW¼ sec. 5, T. 12 N., R. 4 W., on land owned by William O'Brien and farmed by W. J. Fitzpatrick, on low ridge running northeast from Fitzpatrick's house to woods, about 300 yards northeast of house, 75 yards south of southwest corner of woods, in unused, fenced north-and-south lane, and 1 foot east of west fence of lane. To reach from intersection of Main Street and Broadway in Mount Pleasant, go south 0.8 mile on Main Street to its end at school grounds, jog west 1 short block, follow gravel road south 0.6 mile to T-intersection, turn right across railroad track, follow gravel road west 1.5 miles to crossroads, proceed south on gravel road 2.0 miles to crossroads, proceed west on gravel road 1.0 mile to crossroads at Gulick Church, proceed south on gravel and dirt road 0.85 mile to Fitzpatrick's house on east side of road, follow lane to north of house

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

and barn 100 yards to gate at northeast of barn, continue east 110 yards to end of lane in pasture, follow north along fence 50 yards to end of lane at rail fence, pass through fence, and follow unused lane north 100 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 1 foot west of east fence of lane, and 68.47 feet (slope) from station in azimuth 190°36′. No. 2 projects 5 inches, is 1 foot east of east fence of lane, and 69.75 feet (slope) from station in azimuth 346°47′. Azimuth mark projects 6 inches, is along north-and-south gravel-and-sand road, on small knoll through which road is cut, 22 feet east of center line of road, 1 foot east of right-of-way fence, 45 yards north of center of gate, 90 yards north of R. McKay's house on west side of road, and approximately 0.25 mile from station in azimuth 134°40′05″.

Plane coordinates: (C), $x=745{,}251.25$ feet; $y=745{,}926.35$ feet; grid azimuth to azimuth mark=134°01′51″.* (E), $x=192{,}870.32$ feet; $y=746{,}726.60$ feet; grid azimuth to azimuth mark=135°27′58″.*

Guild (Montcalm County, H. C. Warwick, 1932).—About 14 miles southwest of Mount Pleasant, 2 miles northwest of Riverdale, in NW¼ sec. 25, T. 12 N., R. 5 W., on land owned by George Guild, 25 feet east of center line of gravel road, 25 feet north of 15-inch pine tree at fence corner which is most northerly of line of pines along east side of road, and 84 feet west of southwest corner of old stone foundation of burned house. To reach from Riverdale, go west 1.5 miles on Route M–46, proceed north 0.5 mile to point where Route M–46 turns west, and continue straight north on gravel road about 300 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is in edge of cultivated field, 64 feet south of 15-inch oak tree, 23 feet west of center line of gravel road, and 111.49 feet from station in azimuth 24°52′. No. 2 projects 6 inches, is 27 feet west of center line of road, 6 feet southeast of southeast corner of fence around pasture, and 97.95 feet from station in azimuth 146°54′. Azimuth mark projects 6 inches, is in edge of cultivated field, 30 feet north of center line of Route M–46, 15 feet west of 4-inch sassafras tree, 80 yards west of concrete culvert under highway, and approximately 0.1 mile from station in azimuth 61°22′22″.

Plane coordinates: (C), $x=735{,}114.08$ feet; $y=694{,}432.17$ feet; grid azimuth to azimuth mark=60°45′53″.* (E), $x=181{,}447.25$ feet; $y=695{,}498.08$ feet; grid azimuth to azimuth mark=62°11′47″.*

Bundy (Isabella County, H. C. Warwick, 1932).—About 15 miles west of Mount Pleasant, 5 miles northeast of Remus, in NE¼ sec. 8, T. 14 N., R. 6 W., Bloomfield Township, on high prominent hill known as Bundy Hill, on land owned by Frank Metcalf who lives at northwest corner of section 8, about 25 yards north of east-and-west wire fence, and 6 paces from a large pine stump with several names carved on it. To reach from Mount Pleasant, go west 14.7 miles on Route M–20 to dirt road leading north at point 6.1 miles west of second crossing of Chippewa River, go north 1.2 miles on dirt road to George Whitney's house on east side of road just north of railroad crossing, turn in east past house, pass through bars south of house, follow traces of old woods roads and railroad grade northeast 1.05 miles across stumpy pasture to saddle at head of valley where ground slopes down steeply to east, and proceed northeast 75 yards (over fence) to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, and is 123.69 feet (slope) from station in azimuth 201°12′. No. 2 projects 2 inches, and is 124.28 feet (slope) from station in azimuth 83°59′. Azimuth mark projects 4 inches, is 20 feet east of center line of north-and-south gravel road, about 120 feet west of barn, about 75 yards north of house, about 0.3 mile south of a railroad crossing, in north-and-south fence line, and approximately 1.0 mile from station in azimuth 350°04′23″. To reach azimuth mark, turn north onto gravel road which is 13.7 miles along Route M–20 from Mount Pleasant, and go north 0.7 mile to mark opposite barn. Azimuth from station to *Mecosta fire lookout tower* is 101°28′12″; and to Mount Pleasant, Isabella Sugar Co., center of tallest stack, 271°06′52″.

Plane coordinates: (C), $x=685{,}378.44$ feet; $y=772{,}490.83$ feet; grid azimuth to azimuth mark=349°35′24″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Edmore (Montcalm County, H. C. Warwick, 1932).—About 2 miles north of Edmore, 100 yards northeast of southwest corner of sec. 8, T. 12 N., R. 6 W., on land owned by J. T. Faught, on sandy mound directly east of fill with white-board guard fence on each side of County Route 571, 18 feet north of north edge of shallow sand pit, 100 yards southwest of stone house, and 91.8 feet northeast of 6-inch blazed wild-cherry tree. To reach from Edmore, go north 2.1 miles on County Route 571 to sandy drive to Faught's house at north end of fill and white guard fence on each side of road, proceed east about 100 yards to Faught's house, pass around rear of house bearing right to bars leading to gravel pit, pass through bars, and go southwest about 80 yards to top of mound and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks and azimuth mark are standard reference marks in concrete, note 11a, projecting 6 inches. No. 1 is 18.5 feet southwest of 8-inch maple tree, 117 feet south of wire fence, and 91.00 feet (slope) from station in azimuth 244°26′. No. 2 is 102 feet south of wire fence, 107 feet north of above-mentioned blazed wild-cherry tree, and 91.45 feet from station in azimuth 125°27′. Azimuth mark is 10.1 meters (33 feet) west of center line of County Route 571, 0.7 meter (2 feet) east of fence west of road, about 100 meters (328 feet) south of east-and-west road, on west bank of shallow cut, and approximately 0.8 mile from station in azimuth 176°14′35″. Azimuth from station to *Edmore Danish Lutheran church, tip of weather vane*, is 355°41′00″.

Plane coordinates: (C), x=687,709.56 feet; y=706,894.51 feet; grid azimuth to azimuth mark=175°45′26″.*

Mason (Mecosta County, H. C. Warwick, 1932).—About 6 miles south of Remus, 4 miles west of Blanchard, in NW¼ sec. 21, T. 13 N., R. 7 W., on top of bare knoll in pasture owned by Mrs. Mason of Blanchard, 48 feet north of fence on top of ridge, 100 yards north of west of northwest corner of woods lot, 80 yards north of west of pole bars at end of lane, and about 20 yards east of west edge of section 21. To reach from Mount Pleasant, go west 19.7 miles on Route M–20 to Remus, continue south 5.4 miles on Route M–66 to junction with County Route 548 at school and filling station, turn west onto County Route 548, proceed 0.5 mile to first road to south, turn south, go 0.65 mile to first house on west side of road, turn into lane just north of buildings, follow farm lane through barnyard and woods lot west 0.45 mile to pole bars at end of lane, pass through bars, and continue west along fence to top of sandy ridge and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is in pasture on first slight rise east of station, and 138.3 feet (slope) from station in azimuth 270°16′. No. 2 projects 2 inches, is on same knoll as station, 2.2 feet north of wire fence, and 55.58 feet from station in azimuth 36°46′. Azimuth mark projects 4 inches, is 1 foot east of fence, 7.5 meters (25 feet) west of center line of road, 19.6 meters (64 feet) southwest of 24-inch tree east of road, between second and third telephone poles north of house, and approximately 0.75 mile from station in azimuth 267°41′34″. Azimuth from station to *Mecosta fire lookout tower* is 136°32′25″.

Plane coordinates: (C), x=655,392.29 feet; y=732,386.73 feet; grid azimuth to azimuth mark=267°17′22″.*

Supplementary points

Sandusky, Borden Milk Co., stack (Sanilac County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=720,271 feet; y=702,316 feet.

Sandusky, municipal water tank (Sanilac County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=721,755 feet; y=702,639 feet.

Cass City, municipal water tank (Tuscola County, H. C. Warwick, 1932).—Plane coordinates: (E), x=628,692.16 feet; y=765,506.08 feet.

Caro, W. N. Clark Co., stack (Tuscola County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=574,045 feet; y=724,306 feet.

Caro, Michigan Sugar Co., north stack (Tuscola County, H. C. Warwick, 1932).—Plane coordinates: (E), x=571,758.54 feet; y=721,786.78 feet.

Caro, Michigan Sugar Co., south stack (Tuscola County, H. C. Warwick, 1932).—Plane coordinates: (E), x=571,652.51 feet; y=721,675.47 feet.

Caro, municipal standpipe (Tuscola County, H. C. Warwick, 1932).—Plane coordinates: (E), x=568,808.23 feet; y=727,315.98 feet.

[1] No check on this position.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Wahjamega, Epileptic Institute, stack (Tuscola County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=559,282$ feet; $y=711,980$ feet.

Primary traverse station No. 13 (U. S. G. S.) (Saginaw County, H. C. Warwick, 1932).—About 9 miles east-southeast of Saginaw, in southwest corner of road intersection, on land owned by Mr. Biekel, just outside fence at corner, about 5 feet south of edge of ditch, and 18.0 feet southwest of intersection of center line of crossroads. To reach from Saginaw, go east about 10 miles on Route M-46 to junction with Route M-83, turn right (south), go 2.0 miles, turn right (west), and go 1.0 mile to crossroads and station site. Marked by standard U. S. Geological Survey iron post stamped "Prim. Trav. Sta. No. 13, 1915, Mich." in end of 4-inch iron pipe, which projects about 10 inches.

Plane coordinates: (E), $x=475,505.63$ feet; $y=684,912.81$ feet.

Munger, Merritt Lutheran Church (Bay County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=469,120$ feet; $y=736,949$ feet.

Bay City, Eastern High School, tip of dome (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=445,107.61$ feet; $y=761,140.77$ feet.

Bay City, Murray Body Co. plant, stack (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=443,949.68$ feet; $y=756,562.03$ feet.

Bay City, City Hall (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=441,124.67$ feet; $y=762,900.73$ feet.

Bay City, red light, tip of tall transmission tower (Bay County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=440,584$ feet; $y=743,385$ feet.

Bay City, Columbia Sugar Co., stack (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=433,199.64$ feet; $y=756,210.31$ feet.

Bay City, First Baptist Church, clock tower, spire (Bay County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=442,339$ feet; $y=764,456$ feet.

Bay City, Bigelow Flooring Co., water tank finial (Bay County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=443,904$ feet; $y=770,516$ feet.

Bay City, water works stack (Bay County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=439,114$ feet; $y=788,244$ feet.

Bay City, James Clements Airport, beacon (Bay County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 51-foot tower, at James Clements Airport, ½ mile south of city limits of Bay City.

Plane coordinates: (E), $x=440,552.12$ feet; $y=746,035.13$ feet.

Bay City, St. Stanislaus Church, north steeple (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=443,153.44$ feet; $y=758,226.66$ feet.

Bay City, St. Stanislaus Church, south steeple (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=443,154.17$ feet; $y=758,167.63$ feet.

Saginaw, Consumers Power Co., north stack (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=434,231.49$ feet; $y=724,014.20$ feet.

Saginaw, Holy Family Catholic Church, belfry (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=424,735.28$ feet; $y=698,496.61$ feet.

Saginaw, Consumers Power Co., south stack (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=434,024.44$ feet; $y=723,630.38$ feet.

Saginaw, Chevrolet Foundry, stack (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=432,374.55$ feet; $y=710,668.18$ feet.

Saginaw, Bean Co., sign, letter A (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=426,226.02$ feet; $y=703,787.94$ feet.

Saginaw, Consumers Heating Co., stack (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=427,980.64$ feet; $y=703,559.12$ feet.

Saginaw, City Hall, foot of flagpole (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=425,413.27$ feet; $y=699,593.84$ feet.

Saginaw, Sonora Talking Machine Co., flagpole (Saginaw County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=417,135$ feet; $y=694,622$ feet.

Saginaw, Sacred Heart Church (Saginaw County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=430,978$ feet; $y=702,533$ feet.

Saginaw, courthouse (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=420,651.05$ feet; $y=698,976.29$ feet.

Frankenlust, St. Paul's German Lutheran Church, spire (Bay County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=426,807.97$ feet; $y=751,939.43$ feet.

Mike Hagle's estate, water tank (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=397,521.10$ feet; $y=712,769.51$ feet.

Primary traverse station No. 14 (U. S. G. S.) (Midland County, H. C. Warwick, 1932).—Seven miles south of Midland, 2 miles north of Saginaw-Midland county line, in T. 13 N., R. 2 E., in northwest corner of road intersection, on

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

west edge of ditch, 7.7 feet southeast of corner fence post, 33.5 feet north-northwest of west end of concrete retaining wall of culvert over ditch south of east-and-west road, and 20.55 feet south-southeast of azimuth mark of station *Sand*. To reach from eastern edge of Hemlock, go north 6.5 miles to crossroads, and proceed west 1.0 mile to four-corner intersection and station site. Marked by standard U. S. Geological Survey iron post stamped "Prim. Trav. Sta. No. 14, Mich. 1913" in end of 4-inch iron pipe which projects about 20 inches. Station *Sand* is 638.121 meters (2,093.57 feet) from station in azimuth 272°05′31″. Ditch which is west of north-and-south road has been widened, and mark will eventually fall over as bank sloughs off.

Plane coordinates: (E), x=345,368.33 feet; y=733,241.61 feet; grid azimuth to station *Sand*=272°29′35″.**

Midland, municipal water tank (Midland County, H. C. Warwick, 1932).—Plane coordinates: (E), x=345,199.09 feet; y=772,037.18 feet.

Midland, Dow Chemical Co., northern stack (Midland County, H. C. Warwick, 1932).—Plane coordinates: (E), x=348,840.07 feet; y=768,248.29 feet.

Midland, Dow Chemical Co., largest stack (Midland County, H. C. Warwick, 1932).—Plane coordinates: (E), x=349,066.83 feet; y=767,248.89 feet.

Transit traverse (B. M. 693) (U. S. G. S.) (Midland County, H. C. Warwick, 1932).—At southeast corner of Ithaca Quadrangle, at common corner of secs. 23, 24, 25, and 26, T. 13 N., R. 2. W., and in southwest corner of Dow Chemical Co.'s enclosure. To reach from Breckenridge, go west 1.5 miles on Route M–46 to crossroads with white schoolhouse in northwest corner, turn right, continue 6 miles on gravel road to road to left at Jasper Grove filling station on left-hand side of road and Dow Chemical Co. plant on right side, and continue to station site. Marked by standard U. S. Geological Survey iron-pipe stamped "693 Mich."

Plane coordinates: (E), x=276,573.33 feet; y=728,266.76 feet. (C), x=829,388.54 feet; y=729,568.52 feet.

Northwest corner of Ezra Haskens tombstone (Gratiot County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=294,756 feet; y=698,850 feet.

St. Louis, Great Lakes Sugar Co., brick stack (Gratiot County, H. C. Warwick, 1932).—Plane coordinates: (E), x=252,815.56 feet; y=697,576.02 feet. (C), x=806,405.23 feet; y=698,292.63 feet.

St. Louis, Great Lakes Sugar Co., tall concrete stack (Gratiot County, H. C. Warwick, 1932).—Plane coordinates: (E), x=252,805.94 feet; y=697,666.65 feet. (C), x=806,393.35 feet; y=698,383.00 feet.

Alma, municipal water tank (Gratiot County, H. C. Warwick, 1932).—Plane coordinates: (E), x=237,286.08 feet; y=686,331.16 feet. (C), x=791,161.58 feet; y=686,663.38 feet.

Alma, Consumers Light & Power Co., stack (Gratiot County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=237,929 feet; y=685,676 feet. (C), x=791,820 feet; y=686,024 feet.

Shepherd, municipal water tank, finial (Isabella County, H. C. Warwick, 1932).—Plane coordinates: (C), x=779,492.78 feet; y=739,246.86 feet. (E), x=226,935.59 feet; y=739,191.21 feet.

Primary traverse station No. 9 (U. S. G. S.) (Isabella County, H. C. Warwick, 1932).—About 9 miles southwest of Mount Pleasant, 1 mile south of Winn, and at quarter corner of secs. 15 and 22, T. 13 N., R. 5 W., Fremont Township. To reach from Winn, go east to first dirt road leading south, and go south 1.0 mile to crossroads, and station site in northwest corner of crossroads. Marked by iron post with standard U. S. Geological Survey tablet stamped "Prim. Trav. Sta. No. 9, Mich. 1915."

Plane coordinates: (C), x=726,596.92 feet; y=733,795.08 feet. (E), x=173,916.44 feet; y=735,065.32 feet.

Edmore, Hart Canning Co., tallest stack (Montcalm County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=689,358 feet; y=695,212 feet. (E), x=135,720 feet; y=697,422 feet.

Edmore, Danish Lutheran Church, spire (Montcalm County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=688,592 feet; y=696,391 feet. (E), x=134,983 feet; y=698,620 feet.

Lakeview, municipal water tank (Montcalm County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), x=624,301 feet; y=708,791 feet.

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[1] No check on this position.

** This azimuth has been computed by the first formula (p. 171), using both terms.

For notes in regard to marking of stations see p. 167.

Mecosta, fire lookout tower (Mecosta County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=601,127.84$ feet; $y=788,847.66$ feet; grid azimuth to station *Mason*$=316°08'11.''2$.

HILLSDALE TO SAGINAW

Principal points

Hatt (Jackson County, H. C. Warwick, 1932; 1934).—About 6 miles south of Jackson, about 3 miles south of Hague Park, about 7.5 miles west and 0.5 mile south of Napoleon, on highest point of prominent hill on property of M. Hatt, and about 300 feet west of prominent rock tower which is about 50 feet high. To reach from center of Jackson go west about 1 mile on U. S. Route 12 to junction with U. S. Route 127, turn left onto U. S. Route 127, continue 2.4 miles to point in park where U. S. Route 127 swings left and County Route 503 continues ahead, continue 4.7 miles on Route 503 to sign "Coplin's First House" (Mr. Hatt lives in first house to south on right-hand side of road), and continue about 0.7 mile northeast of farmhouse on old road across fields to station site. Hill is heavily wooded and quite steep, and can not be reached by truck. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, and is 43.35 feet from station in azimuth 31°49′. No. 2 projects 4 inches, is 10 feet north of road, and 57.15 feet from station in azimuth 112°57′. Flagpole on stone tower is approximately 300 feet from station in azimuth 263°25′.

Plane coordinates: (E), $x=302,761.86$ feet; $y=239,855.62$ feet.

Lammon (Washtenaw County, H. C. Warwick, 1932; 1934).—About 15 miles east-southeast of Jackson, 6 miles east and 1 mile north of Napoleon, about 0.2 mile east of Jackson-Washtenaw County line, near highest point of rise on ground owned and occupied by Mrs. Harry Lammon, 1 foot south of north right-of-way fence of east-and-west grassy lane, about 70 yards east of 18-inch hickory tree in same fence line, and 32 feet west of corner post of field and west end of wooden gate. To reach from school building on U. S. Route 12 in east part of Grass Lake, go south ¼ mile on road along east side of school, turn left with road, continue about 0.7 mile to road to south, turn south onto this road, continue 5.7 miles to crossroads at foot of hill, turn left (east), go 3.0 miles to county-line road to north, proceed north 1 mile on this road to road to left opposite group of farm buildings, go through barnyard, and follow lane east about 0.2 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is in north-and-south fence line between two cultivated fields, 48 feet north of above-mentioned corner post, and 60.90 feet from station in azimuth 214°02′. No. 2 projects 3 inches, is in north right-of-way fence of lane, about 50 yards east of hickory tree and 54.93 feet from station in azimuth 88°57′. Azimuth mark projects 6 inches, is 20 feet east of center line of north-and-south road which is Jackson-Washtenaw County line, 1 foot west of east right-of-way fence, 12 feet south of 15-inch maple tree, 3 feet southwest of large outcrop of limestone, and approximately 0.3 mile from station in azimuth 122°26′48″.

Plane coordinates: (E), $x=374,885.33$ feet; $y=249,669.43$ feet; grid azimuth to azimuth mark$=122°45'24''$.*

Sackrider (Jackson County, H. C. Warwick, 1932; 1934).—About 3.7 miles north of Grass Lake, on Sackrider Hill on land owned by Mr. Winters. To reach from Stockbridge, follow Route M-92 south and east about 2 miles to point where gravel road branches off to right (south), follow 0.2 mile, turn right onto gravel road to west, go west about 1.2 miles to large brick church at crossroads, turn left (south) onto County Route 487, follow main gravel road south 1 mile and west 1.5 miles, continue south 4.5 miles on main gravel road (making several jogs) to crossroads, and keep straight ahead 1.5 miles on Route 487 to Sackrider Hill. To reach from Grass Lake, follow Route 487 north 3.7 miles to Sackrider Hill. Sackrider Hill is prominent bare hill on west side of Route 487. Continue to point east of top of hill at point where highway reaches crest of ridge, pass through gate into pasture, and follow light trail west ¼ mile up hill to station site. Marked by standard disk station mark in top of 4-inch pipe filled with concrete and projecting 8 inches. Pipe is 12 feet long and bottom end is anchored to large ball of concrete. Reference marks are standard reference disks in top of

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

pipe, 5 feet long, filled with concrete and anchored in ball of concrete. No. 1 projects 5 inches, is about 15 feet below station down slope to north, and 56.6 feet (slope) from station in azimuth 194°28′. No. 2 projects 2 inches, and is 63.1 feet (slope) from station in azimuth 303°34′. Azimuth mark is standard reference disk in concrete, note 11a, projecting 4 inches, is 23 feet southwest of center line of County Route 487, 24 feet northwest of triple pear tree, 25 feet southeast of telephone pole, and 0.25 mile from station in azimuth 260°31′27″. Azimuth from station to Chelsea, tank, is 264°02′14″; and to *Airway beacon No. 20*, 16°19′49″.

Plane coordinates: (E), x=353,258.69 feet; y=292,715.92 feet; grid azimuth to azimuth mark=260°53′21″.*

Prospect (Jackson County, H. C. Warwick, 1932; 1934).—About 14 miles northeast of Jackson, 6½ miles west of Chelsea, 2 miles south and ½ mile west of Waterloo, at south end of Clear Lake, on highest point of bare-topped knob of ridge, in fence line about 100 meters (328 feet) north of road, and 45 feet south of 12-inch oak tree of which one of lower limbs has been sawed off. To reach from Waterloo, follow County Route 382 for 0.5 mile to point where it turns west, keep straight ahead 2.0 miles to crossroads, turn left (east), go about 0.4 mile to crest of ridge, continue about 75 meters (246 feet) beyond crest to pole gate on right-hand side of road and at northeast corner of cornfield, and follow fence line leading north to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is on east slope of hill, about 50 feet east of 12-inch oak tree, and 74.24 feet (slope) from station in azimuth 230°52′. No. 2 projects 7 inches, is on east slope of hill, 34 feet east of north-and-south fence line, 6 feet southwest of small bush, and 63.29 feet (slope) from station in azimuth 330°49′. Azimuth mark projects 6 inches, is 20 feet north of center line of road, 10 feet southwest of hickory tree, 3 feet south of north right-of-way fence of road, 35 feet west of corner post of field, and approximately 0.4 mile from station in azimuth 309°03′59″. Finial of silver-colored tank in Dexter is about 15 miles from station in azimuth 267°30′09″.

Plane coordinates: (E), x=370,358.76 feet; y=300,922.99 feet; grid azimuth to azimuth mark=309°23′21″.*

Peck (Jackson County, H. C. Warwick, 1932; 1934).—About 8 miles north-northeast of Jackson, 7 miles south-southeast of Leslie, near highest point of locally prominent hill, on land owned by the J. N. Peck estate and occupied by two elderly ladies who are looking after property, 45 feet east of west edge of hill, 56 feet east-southeast of most southerly of four apple trees, and 12 feet west of west end of pole gate leading to garden. To reach from traffic light in Leslie, follow U. S. Route 27 toward Jackson 6 miles to junction with County Route 388, turn east onto Route 388, continue 0.5 mile to road leading south, proceed south 1.5 miles, turn east with road, continue 1.0 mile to road crossing at Zion Church, continue east 1.0 mile to point where road angles south, continue 0.2 mile on same road to point where road turns east, continue 0.1 mile to two-story white house south of road and mail box bearing name of J. N. Peck on north side of road, turn right onto road leading along west side of house, go through wire-gap gate at southeast corner of barn, and continue on old road to top of hill and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 14 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is at north edge of garden, 45 feet east of old road leading to station, and 89.36 feet from station in azimuth 224°15′. No. 2 projects 3 inches, is at south edge of garden, about 100 feet north of woods, and 86.94 feet from station in azimuth 347°58′. Azimuth mark projects 5 inches, is on north side of east-and-west road, about 150 feet west of old road leading to station, at south edge of garden, 50 feet southwest of small white house, 75 feet northeast of another small white house, and approximately 0.1 mile from station in azimuth 162°06′32″.

Plane coordinates: (E), x=312,647.06 feet; y=313,038.25 feet; grid azimuth to azimuth mark=162°34′33″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Hicks (Livingston County, H. C. Warwick, 1932; 1934).—About 3 miles east and 1¾ miles north of Stockbridge, 3 miles north of Livingston-Ingham county line, near highest point of prominent ridge on property belonging to Mr. Hicks, on highest point on north-and-south fence line, about 12 yards east of center line of farm road, and about 35 yards west of lone pine tree. To reach from Stockbridge, go east 3.2 miles on Route M-106 to road to north, proceed north 1 mile to crossroads at Fulmer School, proceed west ¼ mile to road to north on west side of fence and hedgerow, turn north onto this farm road, and go 0.2 mile to station site on top of hill. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in north-and-south fence line, 6 feet south of 16-inch hickory tree, and 50.00 feet (slope) from station in azimuth 177°49′. No. 2 projects 4 inches, is in east-and-west row of trees, about midway between hickory tree on east and oak tree on west, and 138.35 feet (slope) from station in azimuth 50°46′. Azimuth mark projects 6 inches, is 23 feet west of center line of north-and-south section-line gravel road, 1 foot east of west right-of-way fence, 8 feet south of corner between farmyard and garden, opposite Mr. Taylor's barn, and approximately 0.25 mile from station in azimuth 238°51′30″.

Plane coordinates: (E), x=376,536.22 feet; y=353,790.26 feet; grid azimuth to azimuth mark=239°10′02″.*

Zakrzewski (Ingham County, H. C. Warwick, 1932; 1934).—About 2 miles east and 1 mile south of Leslie, 1⅓ miles north of Ingham-Jackson county line, on property owned and occupied by Frank Zakrzewski, in cultivated field east of road, about 40 feet west of highest point of hill, 84 feet east of center line of road, and 138 feet north of fence at south edge of Zakrzewski's property. To reach from traffic light in Leslie, go south and east 1.1 miles on U. S. Route 127 to point where it turns south, continue straight ahead 1.0 mile on County Route 204 to crossroads, and proceed south ¾ mile to crest of ridge just south of Zakrzewski's two-story house on west side of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Surface mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 1 foot north of property-line fence, 76 feet east of center line of road, 48 feet east of right-of-way fence, and 137.65 feet from station in azimuth 2°19′. No. 2 projects 5 inches, is 29 feet east of center line of road, and 86.31 feet from station in azimuth 141°49′. Azimuth mark projects 8 inches, is on right-of-way of first road south of station, 1 foot south of fence, 30 feet north of center line of road, 150 feet east of center line of north-and-south road which goes by station, and approximately 0.25 mile from station in azimuth 356°57′32″.

Plane coordinates: (E), x=303,723.03 feet; y=343,568.34 feet; grid azimuth to azimuth mark=357°26′59″.* (C), x=866,065.52 feet; y=345,640.38 feet; grid azimuth to azimuth mark=356°02′37″.*

Jackson (Jackson County, H. C. Warwick, 1932; 1934).—In Jackson, on highest part of roof of Union and Peoples Bank Building, 10.1 feet north of south edge of coping stone along south edge of elevated portion of roof, and on line between two reference marks in coping at east and west sides of elevated part of roof. Marked by 8-penny nail driven in tar-and-gravel-covered roof. Reference marks are standard reference disks cemented in drill holes in coping stones. No. 1 is in center of coping stone along east side of elevated portion of roof, 10.1 feet north of south (outer) edge of coping stone along south side of elevated portion of roof, and 9.20 feet from station in azimuth 269°41′. No. 2 is in center of coping stone along west side of building, 2.75 feet north of north edge of small upright stone projecting above coping, and 8.57 feet from station in azimuth 89°45′. Azimuth from station to Jackson Motor Shaft Co., finial of tank, distant 1 mile, is 260°28′52″; and to *Jackson, old State prison, flagpole*, distant 0.5 mile, 182°47′06″.

Plane coordinates: (E), x=299,614.60 feet; y=273,297.59 feet; grid azimuth to Jackson Motor Shaft Co., finial of tank=260°58′43″.*

Wemple (Ingham County, H. C. Warwick, 1932; 1934).—Three miles south of Dansville, in southwest corner of alfalfa field, 50 feet east of center line of gravel road, 22 feet east of east edge of deep roadway cut, 65 feet northwest of 10-inch hickory tree, 182 feet west-northwest of 4-foot boulder, and on property occupied by George Wemple whose buildings are about 200 yards to north. To

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

reach from Stockbridge, follow Route 402 west and north (one short jog to south) about 6 miles to T-road intersection where Route 402 turns to left (south), take right-hand road to north, follow main-traveled road west and north 3.2 miles to four-corner intersection at Bunker Hill, turn right (north), continue 1.0 mile to another crossroads, keep straight ahead on main-traveled winding road 1.8 miles to road to left (north), and continue to station site which is 0.3 mile north of this point on high point of ground on east side of road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is about 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 11 feet west of 24-inch oak tree, between two fields, 41 feet east of 4-foot boulder, and 222.65 feet from station in azimuth 275°28′. No. 2 projects 3 inches, is 1 foot east of fence line, 18 feet southeast of south end of guard rail, 30 feet east of center line of gravel road, and 101.6 feet from station in azimuth 182°16′. Azimuth mark projects 3 inches, is near T-road intersection, 51.5 feet south-southeast of south end of guard rail, 32 feet east of projected center line of north-and-south gravel road, 31 feet north of center line of east-and-west gravel road, 63 feet northeast of 24-inch oak tree, and 0.25 mile from station in azimuth 7°40′23″. *Primary traverse station No. 17* (*U. S. G. S.*) is 11.436 meters (37.52 feet) from station in azimuth 56°38′14″.

Plane coordinates: (E), x=327,524.71 feet; y=370,263.34 feet; grid azimuth to azimuth mark=8°06′19″.*

Warner (Ingham County, H. C. Warwick, 1932; 1934).—About 13.5 miles southwest of Lansing, 5 miles east and 3 miles north of Mason, 5 miles north and 2 miles west of Dansville, 25 feet south of highest point of locally prominent hill on property owned and occupied by W. L. Warner, about 150 yards southwest of Warner's house, 212 feet south of south fence of lane leading west from barn, and 158 feet south of lone 15-inch apple tree. To reach from Dansville, follow County Route 497 north 3 miles, east 1 mile, and north 2 miles to road to west, proceed west 3 miles to crossroads, turn left, continue 0.15 mile to house and farm buildings on west side of road, turn into barnyard, continue up lane behind barn about 200 feet to gate in south fence of lane, go through this gate, and continue south about 200 feet to station site on top of hill. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 15 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 1 foot south of south fence of lane, 32 feet west of fence at east end of gate, 53 feet north of 15-inch apple tree, on east slope of ridge, about 20 feet lower than station, and 211.50 feet (slope) from station in azimuth 194°52′. No. 2 projects 5 inches, is on crest of ridge, 1 foot south of south fence of lane, 145 feet east of fence corner at right angle in lane, and 281.91 feet from station in azimuth 136°36′. Azimuth mark projects 5 inches, is on right-of-way of county road, about 300 yards west of large white house on north side of road, 25 feet north of center line of road, 1 foot south of fence, 80 feet west of 24-inch maple tree, and approximately 0.8 mile from station in azimuth 253°40′06″. Azimuth from station to Webberville, tank, distant approximately 9 miles, is 259°49′10″.

Plane coordinates: (E), x=318,463.62 feet; y=411,185.63 feet; grid azimuth to azimuth mark=254°07′31″.* (C), x=879,140.71 feet; y=413,605.31 feet; grid azimuth to azimuth mark=252°42′51″.*

Grostick (Livingston County, H. C. Warwick, 1932).—About 3 miles south and 2½ miles west of Fowlerville, 3½ miles south and 2½ miles east of Webberville, 1¼ miles east of Ingham-Livingston county line, on northern point of locally prominent hill, on land owned and occupied by Henry Grostick, 80 feet south of center line of east-and-west section-line gravel road, and about 200 feet south of house on north side of the road. Road goes through deep cut at this point and station is about 20 feet higher than road. Station possibly may be moved at some time in future to get gravel out of hill. To reach from traffic light in Webberville, go east 1.2 miles on U. S. Route 16 to crossroads, turn right (south), go 2¼ miles to T-intersection, turn left (east), go 3.0 miles, turn right (south), go 1.5 miles to T-intersection, turn left (east), and go 1.1 miles to station site opposite white house. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 8 inches, 1 foot east of north-and-south fence line, 17 feet west of

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

center line of farm road, 18 feet south of northeast corner of field, 45 feet south of road, and 166.47 feet (slope) from station in azimuth 261°06′. No. 2 projects 6 inches, is in southwest corner of front yard, 42 feet north of center line of road, 13 feet north of west end of stone retaining wall, 3 feet east of southeast corner post of garden, and 121.26 feet (slope) from station in azimuth 169°28′. Azimuth mark projects 7 inches, is 20 feet north of center line of road, 10 feet east of maple tree, 2 feet south of north right-of-way fence, and approximately 0.25 mile from station in azimuth 93°33′06″. Azimuth from station to *Michigan State Sanitorium, water tank*, is 284°23′50″.

Plane coordinates: (E), $x=378{,}094.83$ feet; $y=406{,}143.09$ feet; grid azimuth to azimuth mark=93°51′30″.*

Clark (Ingham County, H. C. Warwick, 1932; 1934).—About 6 miles southwest of Perry, 14 miles east by north of center of Lansing, ½ mile south of Shiawassee-Ingham county line, on property owned by M. B. Clark, on highest part of ridge to south of road, 84 feet south of fence at edge of road excavation, and 45 feet west of break of slope on east side of ridge. To reach from Perry, go south 3.0 miles on Route M–47 to crossroads, proceed west 1.5 miles, south 0.5 mile, and west 1.0 mile to crossroads with school in southwest corner of intersection, proceed south 0.5 mile to narrow gravel road to west, and proceed west 0.9 mile on gravel road to crest of ridge and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is on east slope of ridge, 30 feet south of center line of road, 1 foot south of fence, 114 feet northwest of 16-inch hickory tree, and 150.30 feet (slope) from station in azimuth 237°13′. No. 2 projects 5 inches, is 20 feet south of center line of road, 1 foot south of fence, 146 feet east of east end of gate, and 140.06 feet from station in azimuth 126°10′. Azimuth mark projects 7 inches, is 31 feet south of the center line of the road, 1 foot south of fence, 65 feet west of north-and-south fence, 66 feet northeast of double tree in group of trees growing in pile of rocks, and approximately 0.2 mile from station in azimuth 265°04′26″.

Plane coordinates: (E), $x=330{,}661.07$ feet; $y=463{,}141.96$ feet; grid azimuth to azimuth mark=265°30′08″.*

Graham (Livingston County, H. C. Warwick, 1932; 1934).—About 9 miles south by west of Bancroft, 8 miles southeast of Perry, 1¾ miles south of Shiawassee-Livingston county line, 2¾ miles east of Livingston-Ingham county line, in hay field on property belonging to M. T. Graham, 47 feet north of center line of east-and-west road, about 50 yards east of center line of T-road to south, about 20 feet north of north right-of-way fence of road, and about 250 feet west of Graham's house. To reach from Bancroft, go south about 2¾ miles on County Route 467 to junction with Route 454, turn right (west) onto Route 467, go 0.3 mile, turn left (south), go 3.0 miles, turn right, go 1 mile, turn left (south), go 3.0 miles to road to west along single-wire pole line, turn right onto this road, and go west ¾ mile to station site on highest point of ridge. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 30 feet south of center line of road, in north edge of small woods, and 108.52 feet from station in azimuth 320°49′. No. 2 projects 5 inches, is 40 feet north of center line of road, 13 feet north of southwest corner of field, 8 feet east of projected center line of T-road to south, and 148.68 feet from station in azimuth 86°49′. Azimuth mark projects 6 inches, is 18 feet south of center line of road, 40 feet east of northwest corner of wood lot, 10 feet northeast of oak tree, 4 feet north of south right-of-way fence of road, and approximately 0.25 mile from station in azimuth 86°57′41″.

Plane coordinates: (E), $x=383{,}013.61$ feet; $y=456{,}105.93$ feet; grid azimuth to azimuth mark=87°15′25″.*

Laingsburg (Shiawassee County, H. C. Warwick, 1932).—About 9 miles southwest of Owosso, 3¼ miles east and ½ mile north of Laingsburg, on property known as the Fuller farm and owned by estate administered by Ward Smith, in lane leading from road to east barn of farm, 1.5 feet west of fence in line with west side of barn, 10 feet south of south side of barn, and 108 feet east of northeast corner of house. To reach from Owosso, follow Route M–47 south to junction with Route M–104 at Pittsburg, proceed west 1.1 miles on Route M–104 to point where Route M–104 deflects to left, continue straight west 2¼ miles to T–intersection, go east about 25 feet to lane leading north to barn, and follow

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is in lane, 38 feet north of center line of road, 24.5 feet east of 18-inch walnut tree, 97.5 feet southeast of southeast corner of house, and 97.88 feet from station in azimuth 14°21′. No. 2 projects 5 inches, is 1 foot south of fence, 76.5 feet north-northwest of northwest corner of barn, 87 feet northeast of northeast corner of house, and 104.44 feet from station in azimuth 132°28′. Azimuth mark projects 6 inches, is on right-of-way of county road, 26 feet west of center line of road, 28.5 feet north of north end of gate, about 200 yards north of large red barn, directly across road from most northerly of two 24-inch oak trees, and approximately 0.2 mile from station in azimuth 2°35′03″.

Plane coordinates: (E), x=333,810.95 feet; y=510,375.72 feet; grid azimuth to azimuth mark=3°00′23″.*

Teichman (Shiawassee County, H. C. Warwick, 1932).—About 8½ miles southeast of Owosso, 1.3 miles north and 1 mile west of Bancroft, on ridge in cultivated field belonging to Henry Teichman, opposite red barn on highest ground in vicinity, about 55 yards west of center line of north-and-south section-line gravel road, about 120 yards west of large red barn on east side of road, and about 8 yards north of center line of farm road which crosses field at its highest point. To reach from Bancroft, go north 0.6 mile on County Route 467 to point where Route 467 turns right and gravel road continues straight ahead, keep straight ahead 1 mile on gravel road to crossroads at Fremont School, and continue north ¼ mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 20 feet east of center line of road, about 70 yards northwest of northwest corner of red barn, and 217.3 feet (slope) from station in azimuth 239°56′. No. 2 projects 8 inches, is 2 feet north of telephone pole in northwest corner of Mr. Teichman's front yard, 18 feet east of center line of road, and 329.3 feet (slope) from station in azimuth 324°53′. Azimuth mark projects 7 inches, is 21 feet east of center line of road, 5 feet south of telephone pole, and approximately 0.35 mile from station in azimuth 185°20′44″.

Plane coordinates: (E), x=388,029.09 feet; y=509,045.18 feet; grid azimuth to azimuth mark=185°37′48″.*

Harryman (Shiawassee County, H. C. Warwick, 1932).—About 5 miles west-northwest of central part of Owosso, 5¼ miles east and 0.5 mile north of Ovid, 0.75 mile east and 0.5 mile north of Burton, in NE¼ sec. 18, T. 7 N., R. 2 E., about 0.25 mile west of northeast corner of section, just south of road along north side of section, on property of O. F. Harryman, at east edge of orchard just east of farm buildings, 15 feet west of north-and-south fence line, 23 feet southeast of northeast apple tree, 49.5 feet south of lone hickory tree in fence line, and 78 feet south of east-and-west fence line paralleling road. To reach from junction of Routes M–21 and M–47 in Owosso, go west 2.5 miles on Route M–21 to five-point intersection at white schoolhouse, turn right onto road leading north-northwest, continue 1.5 miles to junction with east-and-west road, turn left, and continue 1.25 miles to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in southeast fence corner of orchard, and 117.09 feet from station in azimuth 354°35′. No. 2 projects 2 inches, is 1 foot south of fence line paralleling road, 25 feet south of center line of road, and 164.92 feet from station in azimuth 118°38′. Azimuth mark projects 10 inches, is 26 feet north of center line of road, 5 feet west of telephone pole, and approximately 0.15 mile from station in azimuth 262°05′33″.

Plane coordinates: (E), x=338,678.94 feet; y=552,343.19 feet; grid azimuth to azimuth mark=262°30′14″.*

Lansing (Ingham County, H. C. Warwick, 1932; 1934).—In Lansing, on top of Capital National Bank Building (opposite Capitol grounds which are to northwest), on highest stone work of building, in angle at southeast corner of structure, 5.38 feet south of center of 1-inch bolt which is outside of south end of east face of railing around light mast, 3.78 feet east of 1-inch bolt at east end of south face of railing around mast, and directly on line between reference marks. Station is not marked but can quickly and easily be recovered by close reference marks.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Reference marks are standard reference disks in drill holes in stone coping around top of building. No. 1 is 3.05 feet north of south end of east coping, and 6.00 feet from station in azimuth 236°19′. No. 2 is 6.03 feet west of east end of south coping, and 6.00 feet from station in azimuth 56°12′. Azimuths from station are: *Lansing, Michigan State College Memorial, finial*, 270°49′55″; *Lansing, State Capitol, tip of dome*, 121°09′03″; and *Lansing, Capital National Bank Building, steel mast*, distant 12.04 feet, 140°35′.

Plane coordinates: (E), $x=261{,}707.53$ feet; $y=450{,}452.67$ feet; grid azimuth to *Michigan State College Memorial, finial*=271°26′01.9″. (C), $x=821{,}430.75$ feet; $y=451{,}463.44$ feet; grid azimuth to *Michigan State College Memorial, finial*=270°01′11.6″.

State (Ingham County, H. C. Warwick, 1932; 1934).—In Lansing, on Michigan State College grounds, just north of power plant, on lawn south of curved drive, 63.9 feet north-northeast of northeast corner of power plant, and 164.4 feet west-southwest of southwest corner of Agriculture Building. To reach from Capitol in Lansing, go east on Michigan Avenue to college grounds. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference mark No. 1 is standard reference disk in concrete, note 11a, flush with surface, 1 foot northeast of northeast curb of curved drive, 54.1 feet southwest of southwest corner of Agriculture Building, and 97.37 feet from station in azimuth 273°25′. Reference mark No. 2 is 2-inch copper plate stamped "Michigan State College Precise Level Bench Mark 0," in southwest corner of rectangular plot of ground in "Y" of two drives directly west of Agriculture Building, and 107.96 feet from station in azimuth 165°26′. Azimuth mark is standard reference disk in concrete, note 11a, flush with surface, 61.5 feet northeast of northeast entrance (center) to greenhouse, 91.5 feet north-northwest of northwest corner of hexagonal fountain, 30.25 feet west-northwest of fire hydrant, and 902.10 feet from station in azimuth 98°15′56″. Azimuth from station to *Lansing, Capital National Bank Building, steel mast*, is 92°12′28″; and to *Lansing, Michigan State College, memorial finial*, 129°44′04″.

Plane coordinates: (E), $x=281{,}407.79$ feet; $y=449{,}511.54$ feet; grid azimuth to azimuth mark=98°49′03″.* (C), $x=841{,}148.89$ feet; $y=451{,}008.70$ feet; grid azimuth to azimuth mark=97°24′14″.*

Corunna (Shiawassee County, H. C. Warwick, 1932).—About 1.75 miles south and 1½ miles east of Shiawassee County courthouse in Corunna, 0.2 mile west of Oak Grove School, on highest ground in north-and-south fence line between property of Mrs. Wrigley on east and R. D. Harryman on west, and about 100 yards north of gravel road which runs approximately east-and-west. To reach from courthouse in Corunna, go south 2.8 miles on Route M–17 to road to right (west), turn right onto this road, and go 0.3 mile to station site in fence line leading north. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 23 feet north of center line of road, 4 feet north of oak tree, about 40 feet east of southwest corner of field, and 293.35 feet (slope) from station in azimuth 354°13′. No. 2 projects 6 inches, is 1 foot north of north right-of-way fence of road, 27 feet north of center line of road, 2 feet east of southwest fence corner, about 40 yards southeast of southeast corner of barn, and approximately 587 feet from station in azimuth 58°26′39″. Azimuth mark projects 4 inches, is 24 feet northeast of center line of Route M–71, in range with row of telegraph poles, about 90 feet north of large oak tree, and approximately 0.25 mile from station in azimuth 252°04′10″.

Plane coordinates: (E), $x=386{,}796.92$ feet; $y=530{,}780.14$ feet; grid azimuth to azimuth mark=252°21′27″.*

Primary traverse station No. 8 (U. S. G. S.) eccentric (Shiawassee County, H. C. Warwick, 1932).—About 9 miles north-northwest of Owosso, 4½ miles southwest of Oakley, in northeast corner of property owned by Mrs. Margaret Hobart and Mrs. Gertrude Rosa, in southwest corner of road intersection, 45 feet west of center line of north-and-south road, 38 feet south of center line of east-and-west road, 20 feet west of fence, and 14 feet south of fence. To reach from intersection of Routes M–47 and M–21 in Owosso, go north 7.5 miles on Route M–47 to gravel road to west which is 1 mile south of the Saginaw-Shiawassee county line, and go west 4.0 miles on gravel road to crossroads and station site.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is in same pasture as station, 1 foot west of fence, 23 feet west of center line of road, and 179.00 feet from station in azimuth 352°48′. Azimuth mark projects 6 inches, is on right-of-way of county road, about 200 feet northeast of small white house on south side of road, 25 feet north of center line of road, 1 foot south of right-of-way fence, 1 foot east of fence line prolonged, and approximately 0.15 mile from station in azimuth 265°47′14″. *Primary traverse station No. 8* (*U. S. G. S.*) (see description thereof) is 11.528 meters (37.82 feet) from station in azimuth 241°53′48″.

Plane coordinates: (E), x=345,305.86 feet; y=589,171.16 feet; grid azimuth to azimuth mark=266°11′00″.*

Jenkinson (Shiawassee County, H. C. Warwick, 1932).—About 6½ miles south and 2½ miles east of Chesaning, 6 miles north and 5½ miles east of Owosso, 3½ miles south and 5½ miles east of Oakley, 120 feet south of center line of half-section-line road, near center of sec. 13, T. 8 N., R. 3 E., on property belonging to S. J. Jenkinson, 20 feet west of center line of concrete driveway leading to Mr. Jenkinson's house, 75 feet west of west side of house, and 73 feet east of east side of barn. To reach from Owosso, go north 6 miles on Route M–47 to junction with County Route 490 with Standard Oil filling station in southwest road corner, turn right (east) onto this road, continue 3.3 miles to point where Route 490 turns, and keep straight ahead (east) 2.4 miles to brown brick house on south side of road with large well-kept lawn and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 31 feet south of center line of road, 2 feet west of concrete post, in northeast corner of Mr. Jenkinson's front yard, and 150.43 feet from station in azimuth 234°28′. No. 2 projects 6 inches, is 29 feet south of center line of road, 3 feet east of concrete post, 11 feet southeast of southeast corner of concrete culvert, and 124.45 feet from station in azimuth 137°23′. Azimuth mark projects 7 inches, is 20 feet north of center line of east-and-west road, 12 feet southeast of hickory tree, 17 feet east of telephone pole, about 200 feet east of driveway into C. T. Jenkinson's house, and approximately 0.45 mile from station in azimuth 7°15′30″.

Plane coordinates: (E), x=394,655.63 feet; y=581,006.33 feet; grid azimuth to azimuth mark=7°31′40″.*

Micklos (Saginaw County, H. C. Warwick, 1932).—About 6 miles west and 2½ miles south of St. Charles, 7¼ miles west and 5 miles north of Chesaning, on land owned by John Micklos, on highest point of low sand ridge on north side of road, 140 feet north of center line of road, 92 feet east of fence at west edge of old apple orchard, and about 75 feet west of small house at base of east slope of sand ridge. To reach from St. Charles, go south 2.1 miles on paved county road to gravel road to west marked by sign "Brant 4.5 Miles," turn west onto this road keeping main-traveled gravel road, continue 4.5 miles to Brant, and continue west 1.75 miles on gravel road to point where section-line road cuts through sand ridge and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is on crest of ridge, and 107.09 feet from station in azimuth 197°06′. No. 2 projects 5 inches, is on west slope of sand ridge, 84 feet north of center line of road, and 84.29 feet (slope) from station in azimuth 43°25′. Azimuth mark projects 6 inches, is along north-and-south road, 12 feet east of center line of road, 1 foot west of fence, on east-and-west fence line prolonged, 8 feet west of 30-inch elm tree, about 0.15 mile south of east-and-west gravel road which passes station, and approximately 0.25 mile from station in azimuth 308°22′40″. Azimuth from station to Brant, white church steeple, distant 1¾ miles, is 266°18′58″.

Plane coordinates: (E), x=341,065.82 feet; y=641,626.24 feet; grid azimuth to azimuth mark=308°47′12″.*

Mair (Saginaw County, H. C. Warwick, 1932).—About 3¼ miles south and 3 miles east of St. Charles, 4½ miles north and 2 miles east of Chesaning, in farmyard of house in southeast road corner, 54 feet south of center line of half-section-line road, near center of sec. 23, T. 10 N., R. 3 E., 22 feet south of south right-of-

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

way fence of road, 39 feet southeast of east end of wooden gate into barnyard, and 50 feet north of northeast corner of barn. To reach from St. Charles post office, go about 3 miles in southerly direction on Route M–47 to crossroads, turn left (east), and continue 3 miles to crossroads at Indiantown school house and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 8 inches, is 29 feet north of center line of road, 4 feet east of fence corner, in east-and-west row of maple trees, about 200 feet west of schoolhouse, and 112.51 feet from station in azimuth 220°34′. No. 2 projects 8 inches, is 31 feet north of center line of road, 9 feet east of large elm tree, about 25 yards southwest of southwest corner of brown frame farmhouse, and 207.65 feet from station in azimuth 110°37′. Azimuth mark projects 6 inches, is in north right-of-way fence of road, 22 feet north of center line of road, 75 feet east of fence corner, 100 feet west of west side of J. Baker's house, and approximately 0.3 mile from station in azimuth 264°32′57″.

Plane coordinates: (E), x=389,643.52 feet; y=639,949.96 feet; grid azimuth to azimuth mark=264°49′59″.*

Supplementary points

Airway beacon No. 20 (Jackson County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 51-foot tower near Grass Lake.

Plane coordinates: (E), x=347,851.06 feet; y=274,685.88 feet.

Near N. Y. C. R. R., brick stack (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=306,489 feet; y=270,204 feet.

Jackson, Michigan State Prison, tank (Jackson County, H. C. Warwick, 1932).—Plane coordinates: (E), x=315,353.94 feet; y=263,528.05 feet.

Jackson, Lefere Co., tall concrete stack (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=303,251 feet; y=271,143 feet.

Jackson, City Bank and Trust Co., tip of flagpole (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=299,204 feet; y=273,167 feet.

Jackson, Reynolds Field, airport beacon (Jackson County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 75-foot tower at Reynolds Field, 1½ miles west of Jackson.

Plane coordinates: (E), x=285,321.15 feet; y=276,148.53 feet.

Jackson, old State prison, flagpole (Jackson County, H. C. Warwick, 1932).—Plane coordinates: (E), x=299,808.36 feet; y=276,676.84 feet.

Jackson, Hayes Wheel Co., stack (Jackson County, H. C. Warwick, 1932).—Plane coordinates: (E), x=308,333.70 feet; y=273,427.90 feet.

Jackson, southwest, Automotive Fan & Bearing Co., tank (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=293,115 feet; y=275,675 feet.

Jackson, Mackling Grinding Wheel Co., tank (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=290,692 feet; y=274,891 feet.

Grass Lake, tallest church steeple (Jackson County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=353,415 feet; y=274,292 feet.

Stockbridge, black water tank, finial (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), x=361,563.98 feet; y=346,538.57 feet.

Primary traverse station No. 17 (U. S. G. S.) (Ingham County, H. C. Warwick, 1932).—About 3 miles south of Dansville, near southwest corner of SE¼ sec. 3, T. 1 N., R. 1 E., about 700 feet north of east-west Ingham-Bunker Hill Township line, on east edge of north-and-south road, in fence corner. Marked by iron post stamped "Prim. Trav. Sta. No. 17, 1908." Station *Wemple* is 11.436 meters (37.52 feet) from station in azimuth 236°38′.

Plane coordinates: (E), x=327,493.26 feet; y=370,242.93 feet.

Dansville, Ingham Agricultural School, stack (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=327,497 feet; y=384,515 feet.

Mason, courthouse (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), x=291,086.85 feet; y=394,371.47 feet. (C), x=852,184.05 feet; y=396,121.03 feet.

Mason, S. M. A. Corporation, tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), x=289,018.02 feet; y=396,091.72 feet. (C), x=850,073.40 feet; y=397,789.95 feet.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Michigan State Sanitarium, water tank (Livingston County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=416,955.08$ feet; $y=395,945.71$ feet.

Fowlerville, water tank (Livingston County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=390,222.39$ feet; $y=423,474.80$ feet.

County farm, water tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=300,767.06$ feet; $y=436,002.20$ feet. (C), $x=860,836.57$ feet; $y=437,980.24$ feet.

Lansing, Reo Motor Co., old duplex plant, tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=261,140.06$ feet; $y=444,257.25$ feet. (C), $x=821,016.31$ feet; $y=445,255.79$ feet.

Lansing, city power plant, southeast stack (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=260,511.77$ feet; $y=445,272.87$ feet. (C), $x=820,363.15$ feet; $y=446,255.62$ feet.

Lansing, city power plant, northwest stack (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=260,420.79$ feet; $y=445,361.81$ feet. (C), $x=820,270.00$ feet; $y=446,342.29$ feet.

Lansing, Reo Motor Co., tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=263,740.46$ feet; $y=445,402.74$ feet. (C), $x=823,587.70$ feet; $y=446,465.10$ feet.

Lansing, Olds Motor Co., stack (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=259,450.18$ feet; $y=446,268.69$ feet. (C), $x=819,277.28$ feet; $y=447,224.97$ feet.

Lansing, Michigan State College, power plant stack (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=281,334.65$ feet; $y=449,302.67$ feet. (C), $x=841,080.92$ feet; $y=450,798.09$ feet.

Lansing, Michigan State College Memorial, finial (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=280,863.28$ feet; $y=449,973.19$ feet. (C), $x=840,593.11$ feet; $y=451,456.79$ feet.

Lansing, municipal standpipe (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=263,712$ feet; $y=450,423$ feet. (C), $x=823,435$ feet; $y=451,483$ feet.

Michigan State College south base no. 2 (Ingham County, H. C. Warwick, 1932).—On farm of Michigan State College, about ½ mile south of center of campus, on west side of college road known as Farm Lane, and south of bridge over Cedar River. Marked by 4-inch brass plate in 4-foot concrete monument. Distances and bearings to blazed trees are: 15-inch white ash, 26.74 feet, N. 6° W.; 8-inch elm, 51.91 feet, N. 60° E.; 12-inch walnut, 54.59 feet, S. 50° E.; and 10-inch maple, 32.75 feet, S. 6° W. College south base, marked by 4-inch brass plate in 4-foot concrete monument, is 7.686 feet south of station.

Plane coordinates: (E), $x=281,965.72$ feet; $y=446,908.11$ feet; grid azimuth to station *Lansing*$=99°55'28.3''$. (C), $x=841,770.90$ feet; $y=448,419.71$ feet; grid azimuth to station *Lansing*$=98°30'38.4''$.

Michigan State College bench mark (Ingham County, Michigan Geodetic Survey, 1934; 1937).—On the Michigan State College Campus, directly in front of the entrance to the R. E. Olds Hall. The station is the exact center of a bench mark disk set in a concrete monument. The geographic position of this mark is an average of the determinations made by the Michigan Geodetic Survey in 1934, and the Senior Engineering classes of Michigan State College in 1935; 1936; and 1937.

Plane coordinates: (E), $x=280,989.02$ feet; $y=449,475.79$ feet. (C), $x=840,731.08$ feet; $y=450,962.64$ feet.

Lansing, Capital National Bank Building, steel mast (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=261,700$ feet; $y=450,461$ feet. (C), $x=821,423$ feet; $y=451,472$ feet.

Lansing, Indian School, tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=277,148$ feet; $y=455,095$ feet. (C), $x=836,752$ feet; $y=456,485$ feet.

Lansing, Capital City Airport, beacon (Ingham County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 50-foot tower, at the Capital City Airport, 3½ miles northwest of Lansing.

Plane coordinates: (E), $x=249,019.65$ feet; $y=466,513.94$ feet. (C), $x=808,350.16$ feet; $y=467,206.79$ feet.

Lansing, State Capitol, tip of dome (Ingham County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=261,201.11$ feet; $y=450,765.17$ feet. (C), $x=820,916.76$ feet; $y=451,763.35$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

East Lansing, municipal tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=283,299$ feet; $y=451,641$ feet. (C), $x=842,987$ feet; $y=453,184$ feet.

Primary traverse station No. 3 (U. S. G. S.) (Ingham County, H. C. Warwick, 1932; 1934).—About 6 miles northeast of Williamston, 5 miles north of Weberville, ¾ mile north of Belle Oak crossroads, in southeast road corner formed by road to east, inside property-line fence, 23 feet south of center line of road to east, 29 feet east of center line of north-and-south section-line road, and 6 feet southeast of corner post in northwest corner of field. To reach from Perry, go south about 5¾ miles on Route M-47 to intersection with County Route 446 at Standard Oil filling station in northwest road corner, turn left (east) on Route 446, go 2.5 miles to junction with Route 487, turn right, and go about ¼ mile to T-road to east and station site. Marked by standard U. S. Geological Survey pipe, with brass cap marked "Prim. Sta. No. 3, 1908," projecting 12 inches.

Plane coordinates: (E), $x=363,696.22$ feet; $y=451,992.81$ feet.

Lansing, Burton Dixie Co., tank (Ingham County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=257,098$ feet; $y=453,944$ feet. (C), $x=816,736$ feet; $y=454,840$ feet.

Perry, water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=351,928.34$ feet; $y=483,021.42$ feet.

Bancroft, water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=393,503.13$ feet; $y=501,455.06$ feet.

Pittsburg, white church steeple (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=351,429$ feet; $y=507,927$ feet.

Laingsburg, St. Catherine Church, steeple (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=316,354$ feet; $y=508,933$ feet.

Primary traverse station No. 21 (U. S. G. S.) (Shiawassee County, H. C. Warwick, 1932).—Four miles northwest of Bancroft, in northeast corner of T-road intersection, at quarter corner between sections 20 and 21, T. 6 N., R. 3 E., directly north of house with ornamental iron grill work at peak of roof on south side of road, about 1 foot north of ditch along north side of east-and-west road, 24.5 feet north of center line of east-and-west road, about 15 feet east of edge of ditch east of north-and-south road, 36.5 feet east of center line of north-and-south road, and 16 feet southwest of 10-inch locust tree in fence line north of east-and-west road. To reach from flagpole at Bancroft, go west 1 block to County Route 467, turn right onto Route 467, proceed 0.6 mile to point where Route 467 turns right and gravel road continues straight ahead, and follow gravel road 3.25 miles to T-intersection and station site. Marked by standard U. S. Geological Survey iron post stamped "Prim. Trav. Sta. No. 21, R. S. 1920, Mich.," 4 inches in diameter, and projecting about 12 inches.

Plane coordinates: (E), $x=377,592.06$ feet; $y=511,100.79$ feet.

Durand, water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=414,610.77$ feet; $y=514,513.70$ feet.

Corunna, Corunna Weatherproof Body Corporation, water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=379,705.35$ feet; $y=537,867.22$ feet.

Owosso, Owosso Weatherproof Body Corporation, water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=364,558.43$ feet; $y=544,090.61$ feet.

Owosso, American Malleable Co., water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=364,501.19$ feet; $y=544,593.51$ feet.

Owosso, St. Pauls Catholic Church (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=362,688.19$ feet; $y=546,208.05$ feet.

Owosso, Owosso Manufacturing Co., water tank (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=361,125.96$ feet; $y=546,574.33$ feet.

Owosso, Owosso Manufacturing Co., stack (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=360,958.95$ feet; $y=546,748.17$ feet.

Owosso, Michigan Sugar Co., stack (Shiawassee County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=359,728.61$ feet; $y=547,796.27$ feet.

Flushing, municipal water tank (Genesee County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=455,581$ feet; $y=570,965$ feet.

Primary traverse station No. 8 (U. S. G. S.) (Shiawassee County, H. C. Warwick, 1932).—About 9 miles north-northwest of Owosso, 4½ miles southwest of Oakley, at intersection of 2 county roads which is common corner of secs. 4, 5, 8,

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

and 9, T. 8 N., R. 2 E., on right-of-way of county road, 12 feet west of center line of north-and-south road, 22 feet south of east-and-west road, and 1.5 feet east of south end of west headwall of concrete culvert under north-and-south road. Marked by bronze disk stamped "Prim. Trav. Sta. 8, 1915, Mich.," riveted to top of iron pipe which projects 12 inches. *Primary traverse station No. 8 (U. S. G. S.) eccentric* is 11.528 meters (37.82 feet) from station in azimuth 61°53′48″.

Plane coordinates: (E), $x=345,339.36$ feet; $y=589,188.75$ feet.

Chesaning, municipal water tank (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=380,668.92$ feet; $y=614,475.86$ feet.

Chesaning, G. M. P. Packing Co., water tank (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=380,453.43$ feet; $y=618,463.66$ feet.

St. Charles, municipal water tank (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=374,489.37$ feet; $y=655,964.64$ feet.

St. Charles, R. Gage Coal Co., No. 8 stack (Saginaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=367,073.16$ feet; $y=661,535.95$ feet.

Primary traverse station No. 16 (U. S. G. S.) (Saginaw County, H. C. Warwick, 1932).—About 7 miles north-northeast of St. Charles, 1 mile west of Swan Creek, in T. 11 N., R. 3 E., 37.9 meters (124 feet) northeast of northeast corner of concrete foundation under house, 7.6 meters (25 feet) north of center line of gravel road, and 7.0 meters (23 feet) west of center line of gravel road. To reach from St. Charles, go north 6.3 miles on Route M–47 to four-corner intersection at filling stations, turn right (east) onto gravel road, and proceed 1.0 mile to another four-corner intersection and station site. Marked by standard U. S. Geological Survey tablet stamped "Prim. Trav. Sta. No. 16, Mich. 1913", cemented in top of 4-inch iron pipe. Mark is on grade of gravel road and appears to have been removed and replaced during construction of road.

Plane coordinates: (E), $x=381,770.29$ feet; $y=685,349.08$ feet.

DETROIT TO JACKSON

Principal points

Grant (Essex District, Ontario, Canada, H. C. Warwick, 1932).—About 1½ miles northeast of village of Tecumseh, 1¾ miles east of point where electric line from Tecumseh to lake turns west at Lake Shore Drive, about 0.2 mile south of Lake St. Clair, about 135 feet south of south right-of-way fence of Lake Shore Drive, on property of Donald Grant who lives at station site, 124 feet southeast of green No. 8 of golf course, and 59 feet east of north-and-south fence line between golf course and field in which station is located. To reach from crossroads at large Catholic Church in Tecumseh, go north 1.4 miles on paved road along electric line to T-intersection at Lake Shore Drive, turn right into driveway, go 1.6 miles to cinder driveway to two-story brick farmhouse about 125 meters (410 feet) back from road, and continue to station site in field west of driveway. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, and is in north-and-south fence line, and 87.69 feet from station in azimuth 53°43′. No. 2 projects 3 inches, is in same north-and-south fence line as No. 1, 108 feet south of center line of Lake Shore Drive, and 112.77 feet from station in azimuth 145°06′. Azimuth mark projects 6 inches, and is 1 foot west of north-and-south fence line on west side of golf course, 18 feet east of center line of north-and-south gravel-dirt road, about 150 feet south of center line of Lake Shore Drive, and approximately 0.25 mile from station in azimuth 100°16′52″.

Plane coordinates: (E), $x=717,425.68$ feet; $y=301,276.48$ feet; grid azimuth to azimuth mark=99°44′23″.*

Whittier (Wayne County, H. C. Warwick, 1932).—About 3½ miles east-northeast of Penobscot Building, on west bank of Detroit River, about opposite center of Belle Isle, on top of highest building of New Whittier Hotel (old building), on elevated portion of roof which bears flagpole, 14.8 feet northeast of northeast side of flagpole, and on line between two reference marks. Station is not marked. Reference marks are standard reference disks in top of low coping wall around edge of roof. No. 1 is 8.9 feet south of northeast corner of coping wall, and 1.842 meters (6.04 feet) from station in azimuth 277°50′. No. 2 is 12.1 feet west of northeast corner of coping wall, and 2.467 meters (8.09 feet) from station in

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

azimuth 98°00′. Azimuth from station to *Detroit, WXYZ Radio Station, east mast* is 94°49′28″; and to U. S. Rubber Co., finial of silver-colored tank, 53°20′07″.

Plane coordinates: (E), $x=683,266.12$ feet; $y=311,467.28$ feet; grid azimuth to *Detroit, WXYZ Radio Station, east mast*=94°22′03.4″.

Penobscot (Wayne County, H. C. Warwick, 1932, 1934).—In Detroit, on highest part of roof of Penobscot Building at Griswold and Fort Streets, approximately under center of large steel mast on top of building, 12.8 feet south of inside of north wall around top of building, and 8.9 feet west of inside of east wall of building. Marked by standard station disk cemented in hole in tile roof. Reference marks are standard reference disks in drill holes in top of concrete wall. No. 1 is in center of top of north wall around top of building, 7.3 feet west of northeast corner of top of building, 11.5 feet east of northwest corner of building, and 13.29 feet from station in azimuth 158°29′. No. 2 is in center of top of east wall around top of building, 16.3 feet south of northeast corner of wall, 9.0 feet north of southeast corner of wall, and 9.52 feet from station in azimuth 257°35′. Azimuth from station to *Detroit, Fisher Building, east finial*, distant approximately 3 miles, is 150°50′29″.

Plane coordinates: (E), $x=667,384.32$ feet; $y=303,124.79$ feet; grid azimuth to *Detroit, Fisher Building, east finial*=150°25′28.1″.

Twelve Mile (Macomb County, H. C. Warwick, 1932; 1934).—Four miles north of Detroit, 29 feet south of center line of Twelve Mile Road, 38.5 feet east of fence to south, and 1 foot north of property-line fence. To reach from intersection of Van Dyke Street and Twelve Mile Road north of Detroit, go west about 0.4 mile on Twelve Mile Road to break of downgrade to west about 315 feet east of railroad crossing. Twelve Mile Road is 4 miles north of Eight Mile Road and city limits of Detroit. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is 35 feet north of center line of Twelve Mile Road, 37 feet west of small pear tree, and 68.25 feet from station in azimuth 245°32′. No. 2 projects 8 inches, is 93 feet north of center line of Twelve Mile Road, 12 feet west of center line of drive to house on north side of road, 1 foot west of fence line, and 125.08 feet from station in azimuth 163°09′. Azimuth mark projects 4 inches, is about 0.2 mile north of Twelve Mile Road, near schoolhouse, 20.4 feet east of east edge of east slab of double concrete pavement, 112 feet southwest of southwest corner of shoolhouse, 83.4 feet west of school well, 27 feet southwest of 24-inch tree, and 0.6 mile from station in azimuth 115°55′25″. Azimuth from station to *Detroit, Penobscot Building, red ball*, is 2°44′54″.

Plane coordinates: (E), $x=669,988.23$ feet; $y=367,307.10$ feet; grid azimuth to azimuth mark=115°29′52″.*

General (Wayne County, H. C. Warwick, 1932; 1934).—In Detroit, on northeast corner of roof of General Motors office building at intersection of Cass Avenue and Grand Boulevard, and on line between two reference marks in northeast corner of elevated portion of roof. Station is not marked because tile roof is unsuitable for setting mark. Reference marks are standard reference disks in cement-block coping of low parapet wall. No. 1 is 12 feet south of northeast corner, and 7.29 feet from station in azimuth 286°27′. No. 2 is 11.7 feet west of northeast corner, and 7.96 feet from station in azimuth 106°27′. Azimuth from station to *Detroit, WXYZ Radio Station, east mast*, is 326°16′04″; and to *Detroit, Hudson Building, flagpole*, 329°33′18″.

Plane coordinates: (E), $x=659,797.30$ feet; $y=317,162.10$ feet; grid azimuth to *Hudson Building, flagpole*=329°09′24.4″.

Rouge (Wayne County, H. C. Warwick, 1932; 1934).—In southwest corner of city of Detroit, in southwest corner of River Rouge Park, near south entrance to park, 207 feet west of center line of pavement of Outer Drive, 140 feet east of wire fence along west side of park, and 300 feet north of wire fence at south side of park (along Warren Road). To reach from downtown Detroit, go west about 10 miles on U. S. Route 12 to intersection with Outer Drive, proceed south about 3 miles on Outer Drive through River Rouge Park to south side of park at Warren Road. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is 21 feet west of center line of pavement of Outer Drive, 22 feet southeast of lamppost 3 feet from edge of pavement, and 197.78 feet from station in

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

azimuth 289°14′. Mark probably will be destroyed when improvements are made along drive. No. 2 projects 2 inches, is 1 foot east of fence along west side of park, 183 feet north of fence along south side of park, and 178.37 feet from station in azimuth 47°21′. Azimuth mark projects 1 inch, is 35 feet west of center line of pavement of Outer Drive, about 0.1 mile north (along drive) of concrete bridge over River Rouge, 190 feet north of 24-inch elm tree at west edge of pavement, 8 feet south of lamppost, and approximately 0.25 mile from station in azimuth 203°38′50″.

Plane coordinates: (E), x=611,790.08 feet; y=307,427.63 feet; grid azimuth to azimuth mark=203°22′07″.*

Purdy (Oakland County, H. C. Warwick, 1932).—Three miles west of Huntington Park, on land owned by John Purdy, just north of Ten Mile Road, 0.4 mile west of Greenfield Road, 0.6 mile east of Southfield Road, in open field about 75 yards northeast of Purdy's house, on small rise of ground, 185 feet north-northeast of northwest corner of concrete lower half of small building now used for garage, 41 feet southeast of largest one of cluster of plum trees, and 46 feet west-southwest of large plum tree partly dead on top. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 7 inches, is 1 foot east of fence east of yard, 26 feet south of northeast corner of yard, and 133.75 feet from station in azimuth 33°38′. No. 2 projects 8 inches, is 221 feet north of northwest corner of above-mentioned garage, and 211.15 feet from station in azimuth 127°28′. Azimuth mark projects 8 inches, is 22 feet west of west edge of concrete on Greenfield Road, 14.5 feet east of northeast corner of concrete sidewalk at unimproved street, about 100 yards north of Ten Mile Road, and approximately 0.35 mile from station in azimuth 265°49′38″. Azimuth from station to *Zoological Gardens, water tank,* is 268°26′47″.

Plane coordinates: (E), x=623,365.09 feet; y=355,649.74 feet; grid azimuth to azimuth mark=265°31′06″.*

Niemshack (Wayne County, H. C. Warwick, 1932; 1934).—About 5 miles southeast of Plymouth, 4 miles north of Wayne, 2 miles south of U. S. Route 12, in pasture to south and east of crossroads, on highest ground on land belonging to the Niemshack estate and occupied by Joseph Niemshack, 282 feet east of center line of pavement of Wayne Road, and 172 feet south of center line of gravel road. To reach from intersection of U. S. Route 12 and Wayne Road at Wayne, go north 2.75 miles on Wayne Road to Ford Road, and continue north 1.0 mile on Wayne Road to above-mentioned crossroads and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is 26 feet south of center line of gravel road, 1 foot south of fence, 275 feet east of center line of pavement of Wayne Road, and 145.48 feet from station in azimuth 174°47′. No. 2 projects 4 inches, is 36 feet east of center line of pavement of Wayne Road, 153 feet south of center line of gravel road, 0.5 foot east of fence, and 246.65 feet (slope) from station in azimuth 91°49′. Azimuth mark is on right-of-way of Wayne Road, 32 feet east of center line of pavement, 60 feet west of south end of old barn, 90 feet northeast of 36-inch elm tree on west side of road, and approximately 0.15 mile from station in azimuth 162°32′00″.

Plane coordinates: (E), x=576,433.70 feet; y=305,636.90 feet; grid azimuth to azimuth mark=162°20′35″.*

Sorson (Oakland County, H. C. Warwick, 1932; 1934).—About 5½ miles east-northeast of Northville, 1 mile northwest of Farmington, on highest point of locally prominent ridge on farm of C. E. Sorson of Detroit, and in north-and-south fence line between cultivated field and pasture. To reach from traffic light on U. S. Route 16 at Farmington, go west 0.9 mile to large white two-story house and group of white farm buildings on right, go through barnyard and out lane to north to end at gate into pasture, go through gate, and continue about 100 yards to station site on crest of ridge. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is in same fence as station, and 91.06 feet (slope) from station in azimuth 179°14′. No. 2 projects 8 inches, is in same fence as station, 20 yards northeast of thorn apple tree, and 138.24 feet (slope) from station in

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

azimuth 358°19′. Azimuth mark projects 3 inches, and is 1 foot south of north right-of-way fence of U. S. Route 16, 49 feet north of center line of concrete pavement, 21 feet north of telephone pole, about 50 yards east of gravel T-road to north, and approximately 0.35 mile from station in azimuth 9°39′32″.

Plane coordinates: (E), $x=573,464.69$ feet; $y=355,348.84$ feet; grid azimuth to azimuth mark=9°28′30″.*

Dix (Washtenaw County, H. C. Warwick, 1932; 1934).—About 9 miles northeast of Ann Arbor, 4 miles northeast of Dixboro, 7 miles southwest of Plymouth, on highest ground in pasture on land owned by William Greer, of Plymouth, 30 feet north of rail fence, 235 feet east of center line of gravel road, 210 feet east of wire fence, and 77 feet west of lone 24-inch oak tree in pasture. To reach from Ann Arbor, go east 5 miles on U. S. Route 12 to Dixboro, continue east 3.9 miles on U. S. Route 12 to old road to south which is about ¼ mile east of small cemetery on north side of highway, turn south onto dirt road, continue 0.3 mile to crossroads, proceed east 235 feet, and continue to station site in pasture. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is on rail fence line, 135 feet west of 24-inch oak tree in pasture, and 106.98 feet from station in azimuth 282°44′. No. 2 projects 5 inches, is on rail fence line, 150 feet east of wire fence, 10 feet northeast of group of small oak trees, and 94.59 feet from station in azimuth 72°27′. Azimuth mark projects 4 inches, is on right-of-way of U. S. Route 12, 1.5 feet south of right-of-way fence, 100 yards east of large brick house on north side of road, 58 feet north of center line of pavement, and approximately 0.3 mile from station in azimuth 186°49′33″.

Plane coordinates: (E), $x=520,680.26$ feet; $y=303,932.19$ feet; grid azimuth to azimuth mark=186°46′28″.*

Hamilton (Oakland County, H. C. Warwick, 1932).—About 16 miles north-northeast of Ann Arbor, 5½ miles east of South Lyon, on highest ground in orchard-covered hill on property of C. W. Hamilton, about 0.2 mile south of Mr. Hamilton's house, and about 90 yards east of center line of grassy lane between orchard to east and cultivated field to west. To reach from traffic light at South Lyon, go east 5.4 miles to two-story white house trimmed in brown on south side of road at large apple orchard, turn in at house, follow lane about 0.2 mile to end of fence on left, and go east about 90 yards to station site between rows of trees. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, and is 80.33 feet from station in azimuth 313°16′. No. 2 projects 3 inches, and is 10 feet east of granite bowlder, and 85.65 feet from station in azimuth 90°47′.

Plane coordinates: (E), $x=532,967.47$ feet; $y=350,121.56$ feet.

Naylor (Washtenaw County, H. C. Warwick, 1932; 1934).—About 7 miles northeast by north of Ann Arbor, 3⅓ miles north of Dixboro, near highest point of locally prominent ridge on land owned by John Naylor and leased by E. McCloy, 116 feet west of fence corner, 1 foot south of fence, and 48 feet east of 18-inch oak tree in fence line. To reach from Dixboro Methodist Episcopal Church sign at crossroads at western village limits of Dixboro, go north 3.25 miles on gravel road to two-story unpainted house with red barn and vitrified-tile silo on right-hand side of road, turn in at house, go through barnyard into field northeast of house, follow north side of fence to corner, continue north along fence to another corner, and continue west to top of ridge and station site. To reach from Ann Arbor, go 8 miles on Route 437 to intersection with Route 388, go southwest 0.2 mile on Route 437 to farm road turning into west edge of orchard of small peach and apple trees, turn into orchard, and follow west and south edges to top of ridge and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 7 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 1 inch, is at west edge of woods, in fence line between orchard and woods, and 130.45 feet from station in azimuth 221°58′. No. 2 projects 8 inches, is 1 foot west of fence between cultivated field on west and pasture on east, and 157.75 feet (slope) from station in azimuth 306°37′. Azimuth mark projects 7 inches, is 1 foot west of fence, 25 feet east of center line of gravel road, about 40 yards northwest of Naylor's house, 8 feet north of second post from corner of fence, and approximately 0.3 mile from station in azimuth

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

66°33′03″. Azimuth from station to *Dodge Bros. Estate, black tank, yellow top,* is 176°02′16″.

Plane coordinates: (E), x=502,057.55 feet; y=313,272.62 feet; grid azimuth to azimuth mark=66°32′45″.*

Barton (Washtenaw County, H. C. Warwick, 1932; 1934).—About 3 miles north-northwest of Ann Arbor, near highest part of prominent ridge known as Barton Hills, on line of row of small trees at south edge of Barton Hills Country Club golf course, about 0.3 mile northwest of clubhouse, straight south of first bunker on No. 2 fairway, 88 feet north of large pile of stones, and 55 feet northwest of angle in line of trees. To reach from courthouse at Ann Arbor, go west 1.0 mile on U. S. Route 12 to point where Route M–132 forks to right, proceed west 0.9 mile on Route M–132 to crossroads just west of fairgrounds, proceed north 1.9 miles on gravel road to point where road turns right, turn right with road, turn left across railroad and river, continue 1.0 mile on main-traveled road winding uphill from river bridge to water tank on left side of road, turn off road just to east of water tank, continue north about 200 feet to edge of golf course, and follow along edge of golf course northwest about 0.2 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is on line with row of small trees at south edge of golf course, and 50 feet south of tee No. 2 and 196.45 feet from station in azimuth 278°21′. No. 2 projects 2 inches, is 2 feet southwest of line of small trees, and 120.43 feet from station in azimuth 127°43′. Azimuth mark projects 6 inches, is about 100 yards north of north edge of Barton Hills golf course, 30 feet west of center line of gravel road, 46 feet south of center line of gravel road, 1 foot west of fence, 3 feet south of east end of gate, and approximately 0.4 mile from station in azimuth 201°46′21″. Azimuth from station to *Ann Arbor, University of Michigan, power plant stack,* distant approximately 0.3 mile, is 328°29′46″; and to Barton Hills Country Club, finial of tank, distant approximately 0.2 mile, 294°06′39″.

Plane coordinates: (E), x=472,046.36 feet; y=300,282.53 feet; grid azimuth to azimuth mark=201°50′32″.*

Hamburg (Livingston County, H. C. Warwick, 1932).—About 13 miles north by west of Ann Arbor, 1 mile north-northeast of Hamburg, on well-defined high point of brushy hill on property of Frank L. Downing, and about 50 yards north of old gravel pit. Sides and top of hill are covered with scrub trees and bushes. To reach from Hamburg post office, go north about 0.3 mile on main street to junction with Route M–36, turn left (north) onto Route M–36, proceed 0.3 mile to point where highway turns left, keep straight ahead 0.3 mile on County Route 441 to gray two-story house on right-hand side of road, go through barnyard, follow old road about ¼ mile to old gravel pit, follow around gravel pit to right, and continue to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, and is 36.42 feet (slope) from station in azimuth 2°15′. No. 2 projects 6 inches, and is 34.25 feet (slope) from station in azimuth 113°49′. Azimuth mark projects 2 inches, is 32 feet west of north-and-south gravel road (County Route 441), in small grass-covered island formed by T-road from west which branches in shape of Y to meet north-and-south road, 14 feet north of telephone pole, about 0.1 mile south of Downing's house, and approximately 0.35 mile from station in azimuth 67°39′28″. Azimuth from station to *Dodge Bros. Estate, black tank, yellow top,* distant about 8 miles, is 217°07′59″.

Plane coordinates: (E), x=466,346.57 feet; y=349,736.48 feet; grid azimuth to azimuth mark=67°44′31″.*

Dexter (Washtenaw County, H. C. Warwick, 1932; 1934).—About 10 miles west-northwest of Ann Arbor, 2 miles west of Dexter, 2½ miles east of Chelsea, on south slope of southeast rim near highest part of locally prominent hill, 26 feet southeast of southeast edge of gravel pit, 62 feet north of fence, and 20 feet west of group of small oak trees. Gravel has been dug from upper part of hill forming crater which is now abandoned. To reach from Chelsea, go east 2 miles on gravel road parallel to Michigan Central Railroad to railroad crossing at cement plant, continue east 2 miles along gravel road to T-intersection, proceed north 0.2 mile on gravel road, take right fork, continue 0.1 mile along old spur line of railroad to end of road, turn right, and go around gravel pit to station

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is on slope of hill, 1 foot north of fence, 8 feet southwest of group of small oak trees, and 80.99 feet (slope) from station in azimuth 315°55′. No. 2 projects 3 inches, is on slope of hill, 3 feet north of fence, 60 feet west of fence corner, 12 feet south of rim of gravel pit, and 127.77 feet (slope) from station in azimuth 59°27′. Azimuth mark is northwest corner of pasture, 1.5 feet south and 1.5 feet east of fence corner, about 0.1 mile east of gravel road, 8 feet south of center line of narrow dirt road, 75 feet south of center line of south track of Michigan Central Railroad, and approximately 0.2 mile from station in azimuth 107°59′08″. Azimuth from station to Dexter Catholic Church spire, distant approximately 4 miles, is 263°41′53″; and to *Chelsea, municipal water tank*, distant approximately 4.5 miles 75°56′32″.

Plane coordinates: (E), $x=428,193.57$ feet; $y=303,583.30$ feet; grid azimuth to azimuth mark=108°09′52″.*

Stofer (Washtenaw County, H. C. Warwick, 1932).—About 8 miles southeast of Stockbridge, 4½ miles north-northwest of Chelsea, and on highest point of Stofer Hill which is on land owned by Mr. Stofer. To reach from flagpole at main intersection in Chelsea, go north 5.4 miles on Route M–92 to two-story house on right-hand side of road, which is opposite small lake, mail box, and "Free Press" can. House is white, trimmed in brown, porch is vine covered, and there are shrubs in front of porch. Turn in at house, follow farm road east across fields to gate into pasture, go through gate, continue about ¼ mile to point where road comes out of woods into clearing around lake, and continues to station site on highest point of hill on right-hand side. Truck can be driven to station in dry weather. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 2 feet north of fence, 9 feet east of 20-inch oak tree, about 25 feet southwest of rock pile, and 304.2 feet (slope) from station in azimuth 326°32′. No. 2 projects 6 inches, is on shoulder of hill, 40 feet south of edge of precipitous slope to north, and 68.3 feet (slope) from station in azimuth 58°50′. Azimuth mark projects 4 inches, is at northeast corner of unpainted barn, 94 feet east of concrete foundation of red barn, and approximately 0.4 mile from station in azimuth 92°07′48″. Azimuth from station to *Chelsea, municipal water tank* is 329°30′34″.

Plane coordinates: (E), $x=392,773.94$ feet; $y=317,984.37$ feet; grid azimuth to azimuth mark=92°23′51″.*

Pinckney (Livingston County, H. C. Warwick, 1932).—About 17 miles north-northwest of Ann Arbor, 1 mile northwest of Pinckney, on highest part of locally prominent ridge on property belonging to Frank Mack of Milford and leased by Wayne Bennett, and about 75 feet south of road. To reach from public square in Pinckney, go east 3 blocks on Route M–36 to County Route 453 at Dixie filling station, turn north onto this road, continue 0.9 mile to two-story house on left-hand side of road, turn left onto road along west side of house, go through gate at windmill, continue 0.5 mile on road leading west along top of ridge to station site on highest point of hill. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 8 inches, and is 88.05 feet (slope) from station in azimuth 323°58′. No. 2 projects 6 inches, and is 72.13 feet from station in azimuth 61°02′. Azimuth mark is standard reference disk wedged in drill hole in granite bowlder, note 12c, projecting 8 inches, 48 feet east of broken-down fence line, 80 feet south of fence line along south edge of woods, and approximately 0.3 mile from station in azimuth 271°47′21″. Azimuth from station to *Pinckney, St. Marys Catholic Church, tip of cross* is 329°51′29″.

Plane coordinates: (E), $x=423,673.77$ feet; $y=353,680.55$ feet; grid azimuth to azimuth mark=271°58′49″.*

* This azimuth has been computed by the first formula (p. 171), neglecting the second term

For notes in regard to marking of stations see p. 167.

Supplementary points

Belle Island, William Livingstone Memorial Lighthouse (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=692,465 feet; y=309,450 feet.

Belle River, municipal water tank (Essex District, Canada, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=759,867 feet; y=291,837 feet.

Mount Clemens, Selfridge Field, beacon (Macomb County, H. C. Warwick, 1932).—Twenty-four-inch rotating beacon on No. 10 hangar roof, Selfridge Field, 3 miles east of Mount Clemens on Lake St. Clair and on north bank of the Clinton River.

Plane coordinates: (E), x=728,057.30 feet; y=405,960.42 feet.

Mount Clemens, Macomb County Building, highest point (Macomb County, H. C. Warwick, 1932).—Plane coordinates: (E), x=712,407.62 feet; y=400,697.36 feet.

Mount Clemens eccentric (Macomb County, H. C. Warwick, 1932).—About 4 miles east of Mount Clemens, 1.75 miles northeast by east of Lakeside, 32 feet northwest of northwest corner of house owned by Amiel Malece (numbered 438), 27 feet north of 36-inch oak tree, and 25 feet east of center line of road. To reach from post office at Mount Clemens, go south 0.45 mile on Market Street to overhead danger light at Fifth Street, turn left onto concrete road, continue 3.5 miles to point where road turns south at sign "Grosse Pointe 14 Miles," follow concrete road 1.1 miles to gravel road leading to left between two brick posts, turn onto this road, and go 0.4 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in fence line paralleling road, 27 feet east of center line of road, 50 feet south of green house which is east of road, and 129.55 feet from station in azimuth 183°05′. No. 2 projects 5 inches, is in grove of trees, 78 feet north of small white house, 10 feet north of 24-inch maple tree, 91 feet west of center line of road, and 115.95 feet from station in azimuth 72°12′. Azimuth mark projects 6 inches, is 20 feet south of center line of concrete road, 19 feet west of large tree, and approximately 0.3 mile from station in azimuth 148°30′28″. Station *Mount Clemens* (*U. S. L. S.*) is 16.552 meters (54.30 feet) from station in azimuth 300°10′00″.

Plane coordinates: [1] (E), x=806,613 feet; y=393,413 feet.

Mount Clemens, black water tank (Macomb County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=707,561 feet; y=399,952 feet.

Tecumseh, Catholic Church, cross (Essex District, Canada, H. C. Warwick, 1932).—Plane coordinates: (E), x=711,014.53 feet; y=296,585.96.

Grosse Pointe High School, finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=706,375.41 feet; y=325,486.17 feet.

Windsor, General Motors Co., stack (Essex District, Ontario, Canada, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=680,292 feet; y=295,137 feet.

Windsor, General Motors Co., water tank (Essex District, Ontario, Canada, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=680,146 feet; y=295,138 feet.

Windsor, Hotel Dieu, steeple (Essex District, Canada, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=672,965 feet; y=290,770 feet.

Sandwich, Assumption Church, spire (Essex District, Canada, H. C. Warwick, 1932).—Plane coordinates: (E), x=661,428.25 feet; y=294,810.54 feet.

Ojibway Steel Co., concrete stack (Essex District, Canada, H. C. Warwick, 1932).—Plane coordinates: (E), x=653,554.45 feet; y=280,250.91 feet.

Detroit, Penobscot Building, red ball (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), x=667,384 feet; y=303,126 feet.

Detroit, Union Guardian Building, flagpole (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=667,737.71 feet; y=302,954.26 feet.

Detroit, Hudson Building, flagpole (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=667,369.86 feet; y=304,480.77 feet.

Detroit, Fisher Building, west finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=659,322.10 feet; y=317,293.63 feet.

Detroit, Fisher Building, east finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=659,339.39 feet; y=317,300.53 feet.

Highland Park, Ford plant, southeast stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), x=653,354.31 feet; y=331,759.07 feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Bell Telephone building, flagpole (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=649,251.37$ feet; $y=329,364.73$ feet.

Detroit University, clock tower (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=642,713.38$ feet; $y=333,342.28$ feet.

Zoological Gardens, water tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=639,972.20$ feet; $y=356,189.78$ feet.

Marygrove College, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=637,449$ feet; $y=333,691$ feet.

Marygrove College, silver water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=637,331.55$ feet; $y=333,657.46$ feet.

Redford, St. Mary's Church, cross on belfry (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=624,535.21$ feet; $y=327,030.23$ feet.

Birmingham, municipal silver water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=622,457.14$ feet; $y=382,391.20$ feet.

Detroit, city water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=625,214.57$ feet; $y=343,077.07$ feet.

Detroit, Peach Island front range light (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=705,374$ feet; $y=314,487$ feet.

Detroit, municipal waterworks, spire (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=685,366$ feet; $y=313,958$ feet.

Detroit, Windmill Point Lighthouse (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=699,127$ feet; $y=313,633$ feet.

Detroit, U. S. Marine Hospital, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=699,090$ feet; $y=313,913$ feet.

Detroit, Edison Co., plant, north stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=690,980.53$ feet; $y=313,734.41$ feet.

Detroit, Chrysler Co., plant, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=690,319.68$ feet; $y=318,353.45$ feet.

Detroit, Briggs Body Co., stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=685,124.86$ feet; $y=323,827.06$ feet.

Detroit, Detroit City Gas Co., Lynch Road plant, gas tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=677,522.72$ feet; $y=331,597.26$ feet.

Detroit, Stem of "Y" in Chrysler sign (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=690,352$ feet; $y=318,078$ feet.

Detroit, City Airport, beacon (Wayne County, H. C. Warwick, 1932).—A 24-inch rotating beacon on main hangar roof of the Detroit City Airport, 5 miles northeast of center of Detroit and 4½ miles north of Belle Isle Bridge.

Plane coordinates: (E), $x=679,700.39$ feet; $y=330,884.63$ feet.

Detroit, WXYZ Radio Station, east mast (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=662,586.89$ feet; $y=313,046.70$ feet.

Detroit, City College, belfry (Wayne County, H. C. Warwick, 1932.)—Plane coordinates: [1] (E), $x=662,119$ feet; $y=312,174$ feet.

Detroit, Hupmobile Motor Co., water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=670,365$ feet; $y=322,275$ feet.

Detroit, Sweetest Heart of Mary Catholic Church, cross on north spire (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=667,158$ feet; $y=313,323$ feet.

Detroit, St. Josephat Catholic Church, cross on spire (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=671,139$ feet; $y=308,877$ feet.

Detroit, Lee Plaza Hotel, north finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=652,620.53$ feet; $y=313,588.87$ feet.

Detroit, Lincoln Motor Co., stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=644,492$ feet; $y=309,458$ feet.

Detroit, Detroit City Gas Co., Coolidge Station, gas tank finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=632,674.16$ feet; $y=325,610.23$ feet.

Kelvinator Building, finial (Wayne County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=630,357$ feet; $y=318,593$ feet.

Kelvinator Co., stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=630,346.88$ feet; $y=319,629.65$ feet.

Beverly Hills, Suburban Development Co., water tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=625,256.27$ feet; $y=374,206.22$ feet.

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[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Berkley, municipal water tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=626,411.25$ feet; $y=365,317.09$ feet.

Dearborn, Ford Airport, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=616,174$ feet; $y=294,004$ feet.

Dearborn, municipal water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=606,725$ feet; $y=290,760$ feet.

Dearborn, Ford Airport, beacon (Wayne County, H. C. Warwick, 1932).—A 24-inch rotating beacon on hangar roof of Ford Airport, 9 miles west of Detroit, in Dearborn. Plane coordinates: (E), $x=622,543.32$ feet; $y=291,877.49$ feet.

Dearborn, Ford Airport, checkered water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=617,062.12$ feet; $y=294,438.77$ feet.

Rouge Park, Detroit municipal water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=609,843.86$ feet; $y=318,041.48$ feet.

Redford, Detroit municipal water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=602,645.13$ feet; $y=335,273.32$ feet.

Detroit, Duns Scotus Church, belfry (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=613,937.84$ feet; $y=350,188.92$ feet.

Pontiac, Insane Asylum, stack (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=608,466.29$ feet; $y=406,368.00$ feet.

Bloomingfield Hills Country Club, tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=611,594$ feet; $y=394,579$ feet.

Oakland Hills Country Club, silver water tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=605,045.92$ feet; $y=381,150.82$ feet.

Knollwood Country Club, tank (Oakland County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=590,848$ feet; $y=380,605$ feet.

Airway beacon No. 27 (Oakland County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 62-foot tower, about 7 miles by road north of Redford, about 3 miles south-southwest of Birmingham in sec. 35, T. 2 N., R. 9 E. Plane coordinates: (E), $x=585,705.68$ feet; $y=379,642.70$ feet.

Farmington, Children's Hospital, water tank (Oakland County, H. C. Warwick 1932).—Plane coordinates:[1] (E), $x=584,318$ feet; $y=346,608$ feet.

Wayne, Graham Body Co., stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=573,731$ feet; $y=284,126$ feet.

Wayne County Airport, beacon (Wayne County, H. C. Warwick, 1932).—A 24-inch rotating beacon on hangar roof of Wayne County Airport, 16 miles southwest of Detroit, 8 miles southwest of Dearborn and 6 miles southeast of Wayne.

Plane coordinates: (E), $x=590,482.85$ feet; $y=268,693.00$ feet.

Wayne County Training School, water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=553,976.18$ feet; $y=327,794.53$ feet.

Wayne County Training School, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=551,734.02$ feet; $y=329,176.58$ feet.

Wayne, municipal water tank (Wayne County, A. C. Warwick, 1932).—Plane coordinates: (E), $x=576,316.25$ feet; $y=284,779.63$ feet.

Flat Rock, airway beacon No. 11 B (Wayne County, A. C. Warwick, 1932).—A 24-inch rotating beacon about 150 feet above ground and on top of Ford water tank, located about ¼ mile west of Flat Rock.

Plane coordinates: (E), $x=600,785.59$ feet; $y=219,012.03$ feet.

Eloise, hospital, large brick stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=587,560.27$ feet; $y=287,190.70$ feet.

Coventry Gardens, water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=578,933.34$ feet; $y=327,251.03$ feet.

Detroit, House of Correction, men's division, stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=539,593.81$ feet; $y=324,203.58$ feet.

Detroit, Home of Correction, women's division, water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=539,228$ feet; $y=327,572$ feet.

Detroit, Home of Correction, men's division, water tank (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=539,597.27$ feet; $y=324,112.38$ feet.

Newport, airway beacon No. 24 (Washtenaw County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 75-foot tower, about 4 miles east of Ypsilanti.

Plane coordinates: (E), $x=538,578.10$ feet; $y=270,071.09$ feet.

Maybury Sanitarium, tall red brick stack (Wayne County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=535,860.52$ feet; $y=338,167.77$ feet.

South Lyon, municipal water tank (Livingston County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=500,504$ feet; $y=350,539$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Ypsilanti, Hall-Doyle Co., tank (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=503,869$ feet; $y=271,369$ feet.

Ypsilanti, municipal water tower, dome (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=511,349$ feet; $y=271,648$ feet.

Ypsilanti, old normal school, spire (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=511,892.76$ feet; $y=271,999.16$ feet.

Ann Arbor, Municipal Airport, beacon (Washtenaw County, H. C. Warwick, 1932).—A 24-inch rotating beacon on 51-foot tower, at Ann Arbor Municipal Airport, 3 miles south and ½ mile east of Ann Arbor, on west side of South State Street County Road.

Plane coordinates: [1] (E), $x=499,779$ feet; $y=282,775$ feet.

Ann Arbor, University of Michigan, power plant stack (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=481,629.49$ feet; $y=284,604.10$ feet.

Ann Arbor, First Methodist Church, spire (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=479,859.24$ feet; $y=284,354.95$ feet.

North Ann Arbor, Barton Hills Golf Club, tank (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=473,210.77$ feet; $y=299,759.74$ feet.

Ann Arbor, college hospital, flagstaff (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=482,539$ feet; $y=285,282$ feet.

St. Patrick Catholic Church, spire (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=477,130$ feet; $y=312,598$ feet.

Dodge Bros. Estate, black tank, yellow top (Livingston County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=496,752.32$ feet; $y=389,769.46$ feet.

Chelsea, municipal water tank (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=404,564.56$ feet; $y=297,744.92$ feet.

Chelsea, Tower Building, finial (Washtenaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=404,329.73$ feet; $y=298,780.94$ feet.

Pinckney, St. Marys Catholic Church, tip of cross (Livingston County, H. C. Warwick, 1932).—Plane coordinates: [1] (E), $x=425,778$ feet; $y=350,028$ feet.

THUNDER BAY TO GRAND TRAVERSE BAY

Principal points

Pikes Peak (Alcona County, H. C. Warwick, 1932).—About 16 miles south of Hillman, 10 miles northwest of Curran, in quarter section of T. 28 N., R. 5 E., on prominent hill known as Pikes Peak, on land owned by Birmingham Hunting Club and leased to State for fire lookout tower, 22.6 feet northeast of north tower leg, 29.7 feet north of east tower leg, and 33.7 feet north of approximate center of base of fire tower. To reach from Fairview, go east 11.5 miles on Route M-72 to road leading north, follow main-traveled road north and west 9.9 miles to county line, continue west 0.8 mile to Birmingham Club gate just west of school, proceed south 0.75 mile to dim fork to left, and follow left fork 1.25 miles to station site near fire lookout tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 41.2 feet east of east tower leg, 53.5 feet east of south tower leg, and 56.59 feet from station in azimuth 313°47′. No. 2 projects 8 inches, is 20.6 feet southwest of west corner of fire tower, 31.0 feet west of south tower leg, and 61.62 feet from station in azimuth 44°41′. Center of *Pikes Peak, fire lookout tower* is 10.27 meters (33.7 feet) from station in azimuth 22°41′.

Plane coordinates: (E), $x=450,401.38$ feet; $y=1,213,913.84$ feet.

Atlanta (Montmorency County, H. C. Warwick, 1932).—About 5½ miles east of Atlanta, in SE¼ sec. 11, T. 30 N., R. 3 E., on land leased to State for East Atlanta fire lookout tower, 11.85 meters (38.9 feet) northeast of southeast tower leg, 6.90 meters (22.6 feet) northeast of northeast tower leg, and 11.80 meters (38.7 feet) northeast of northwest tower leg. To reach from Atlanta, go east 5 miles on Route M-32 to point where highway turns south, continue east on old dirt road, and follow east and south 0.7 mile to fire tower and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is 14.70 meters (48.2 feet) east of center line of road, 3.40 meters (11.2 feet) south of 12-inch maple tree, and 21.10 meters (69.2 feet) from station in azimuth 175°25′. No. 2 is 10.6 meters

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

(35 feet) west of center line of road, 8.2 meters (27 feet) south of southeast tower leg, 10.40 meters (34.1 feet) southeast of southwest tower leg, and 19.45 meters (63.8 feet) from station in azimuth 10°33′. Center of *East Atlanta, fire lookout tower* is 11.10 meters (36.4 feet) from station in azimuth 42°12′.

Plane coordinates: (E), x=404,947.01 feet; y=1,278,186.29 feet.

Comins (Oscoda County, H. C. Warwick, 1932).—About 12 miles southeast of Atlanta, 3 miles northwest of Comins, on land owned by State, 25 feet west of center of trail, and 12 feet south of 4-inch double oak tree with triangular blaze. To reach from Atlanta, go east 5.7 miles on Route M–32 to junction with M–33, continue 13.5 miles on Route M–33 to section-line road to west which is 0.6 mile north of Comins, proceed west 2¼ miles and northwest 0.6 mile on main-traveled road to fork at Boiling Spring sign, follow left fork on main road 0.35 mile to fork at blazed 6-inch maple on right, take right fork continue 0.1 mile to road fork, follow main forward trail 1.5 miles to point where main road bears to right, follow dim trail (which is almost straight ahead) north 0.1 mile to T-intersection which is just north of triangular blaze on 4-inch oak tree on left, turn left onto old dim trail bearing to right into woods near 4-inch poplar tree on right with triangular blaze, and follow 0.35 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 20 feet east of trail, and 16.722 meters (54.86 feet) (slope) from station in azimuth 250°55′. No. 2 projects 4 inches, is 6 feet west of trail, and 19.875 meters (65.20 feet) from station in azimuth 336°42′.

Plane coordinates: (E), x=389,720.42 feet; y=1,219,715.40 feet.

Bigelow (Montmorency County, H. C. Warwick, 1932).—About 7 miles west of Atlanta, in SE¼ sec. 10, T. 30 N., R. 1 E., on land owned by Bigelow lumber interests of Bay City, 32 feet southwest of northwest leg of West Atlanta fire lookout tower, and 20.5 feet west of southwest leg. To reach from Gaylord, follow Route M–32 east 13 miles to Johannesburg, continue south and east 11.0 miles on Route M–32 to old settlement of Kaybee, turn left (northwest) onto sand road at "State fire tower 2 miles" sign, go through farmyard, follow main left-hand forks of sand trail up valley 1.5 miles to sign reading "Fire tower ½ mile," take right-hand fork of trail, and follow 0.5 mile to tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 8 inches. No. 1 is 41.4 feet north of northwest tower leg, 47.4 feet northwest of northeast tower leg, and 68.4 feet (slope) from station in azimuth 192°14′. No. 2 is 76.1 feet southeast of southeast tower leg, 83.7 feet southeast of northeast tower leg, and 116.6 feet (slope) from station in azimuth 273°34′. Center of *West Atlanta fire lookout tower* is 10.30 meters (33.8 feet) from station in azimuth 242°29′.

Plane coordinates: (E), x=336,633.44 feet; y=1,276,009.93 feet.

Lewiston (Montmorency County, H. C. Warwick, 1932).—About 21 miles southeast of Gaylord, 2 miles south of Lewiston, in SE¼ sec. 33, T. 29 N., R. 1 E., near south section line and county line, on top of knoll about 50 yards northwest of old wood lookout, and 13 feet south of road to lookout. To reach from post office at Lewiston, go west 0.8 mile on macadam road to first left-hand road at end of old railroad spur, turn left (south), follow main road 1.1 miles to T-road and sign "Top of Comstock Hills," turn left (east), go 100 yards to ungraded road to south, go south 0.6 mile to fork, follow right-hand fork 0.55 mile, and take left fork 0.4 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 2 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 1 inch, is 10 feet north of lookout road, and 84.48 feet (slope) from station in azimuth 281°00′. No. 2 projects 1 inch, is 20 feet north of lookout road, and 82.13 feet from station in azimuth 170°35′. Azimuth mark projects 4 inches, is on knoll northwest of station, about 12 feet southeast of lookout road, and approximately 0.15 mile from station in azimuth 125°13′34″. Azimuth from station to *Mount Tom fire lookout tower* is 310°06′02″.

Plane coordinates: (E), x=331,219.32 feet; y=1,223,918.26 feet; grid azimuth to azimuth mark=125°41′07″.*

Johannes (Otsego County, H. C. Warwick, 1932).—About 12½ miles east of Gaylord, 3 miles northeast of Johannesburg, in NE¼ sec. 3, T. 30 N., R. 1 W., in brushy cut-over wilderness, 39 feet south of north leg of abandoned fire lookout

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

tower, and 37 feet southwest of east leg of tower. To reach from Johannesburg, go east 3.35 miles on gravel road to dirt road leading north just east of farmhouse, go north 1.0 mile to point where main-traveled road turns east and little-used road leads west, follow road west 1.25 miles to dim crossroads where triangle blazes were made on 4-inch maple to south and 5-inch twin elm tree to north of road, go north (right) 0.9 mile on wood road to fork to right where main trail bears to left down grade (triangle blaze cut on pine tree 20 feet east of this point), follow right-hand fork past blaze, keep all right-hand open trails 0.5 mile to fork (open grassy fork to left), keep right fork straight ahead which is somewhat brushy about 170 yards to very small triangle blaze on bush on left and newly cleared trial to right, and follow newly cleared trail southwest 180 yards to station site at abandoned fire lookout tower. Tower is bent at top, does not appear to be very well anchored, and probably is not very permanent landmark. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 7 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 9 inches, and is 51.58 feet from station in azimuth 194°18′. No. 2 projects 6 inches, and is 52.32 feet from station in azimuth 108°45′.

Plane coordinates: (E), x=307,156.01 feet; y=1,284,842.29 feet.

Chub Lake (Otsego County, H. C. Warwick, 1932).—About 9 miles south-southeast of Gaylord, about 3.5 miles east of Otsego Lake, on same ridge as Chub Lake fire lookout tower, 150.0 feet east-northeast of northeast corner of tower, and 10 feet south of road leading to tower. To reach from Otsego Lake post office, go north about 1¾ miles on U. S. Route 27 to sand road leading right (southwest) through woods, follow winding road 1.2 miles to road fork, follow left fork of road 2.1 miles to road intersection, continue straight ahead 100 yards to road to right (south), and proceed south 0.6 mile to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is 45 feet north-northwest of road leading to tower, and 64.89 feet from station in azimuth 183°57′. No. 2 projects 6 inches, is 12 feet north of road leading to tower, 62 feet northeast of northeast corner of tower, and 82.17 feet from station in azimuth 86°08′. Center of *Chub Lake fire lookout tower* is 162.0 feet from station in azimuth 73°26′.

Plane coordinates: (E), x=251,844.01 feet; y=1,244,699.49 feet. (C), x=791,575.49 feet; y=1,245,215.02. feet.

Hudson (Charlevoix County, H. C. Warwick, 1932).—About 4 miles northwest of Vanderbilt, on prominent ridge near site of Hudson fire lookout tower, on land owned by girls' camp which is located on nearby lake to north, 5.05 meters (16.6 feet) southwest of southeast tower leg, and 4.42 meters (14.5 feet) southeast of the southwest tower leg. To reach from main crossroads in Vanderbilt, go north 1.1 miles on U. S. Route 27 to four-corner intersection, turn left onto dirt road, continue 4.1 miles to "State fire tower" sign, turn right (north), and follow narrow trail 1.0 mile to its end at fire tower and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 6 inches. No. 1 is 15.27 meters (50.1 feet) northeast of southeast tower leg, 12.47 meters (40.9 feet) northeast of northeast tower leg, and 20.27 meters (66.5 feet) (slope) from station in azimuth 229°52′. No. 2 is at northwest corner of flower garden, 10.42 meters (34.2 feet) northwest of southwest tower leg, 7.24 meters (23.8 feet) west of northwest tower leg, and 14.77 meters (48.5 feet) (slope) from station in azimuth 139°24′. Azimuth from station to tip of east gable of northernmost of two large buildings on north slope of first ridge to south of station, distant approximately 5 miles, 341°10′13″. Center of *Hudson fire lookout tower* is 6.65 meters (21.8 feet) from station in azimuth 184°17′.

Plane coordinates: (C), x=757,418.79 feet; y=1,339,587.17 feet. (E), x=220,125.42 feet; y=1,339,921.90 feet.

Hayes (Otsego County, H. C. Warwick, 1932).—About 8 miles south-southwest of Gaylord, 9 miles east-southeast of Alba, on State property, 27.5 feet northeast of northwest corner of Hayes fire lookout tower, 27 feet northwest of northeast corner of tower, 35.0 feet north of center of tower, and 29.7 feet west of southwest corner of small house. To reach from courthouse at Gaylord, go west 4.5 miles on Route M–32 to gravel road to south just west of cemetery on south side of Route M–32, proceed south 0.7 mile, continue straight ahead 2 miles to four-corner intersection, continue straight ahead 2.0 miles to road fork, take right

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fork, and continue 1.8 miles on main-traveled road to Hayes fire lookout tower and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 5 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 5 inches, is at north edge of garden plot on State property, 105 feet north of northwest corner of house, 1 foot south of fence, and 124.59 feet from station in azimuth 193°14′. No. 2 projects 6 inches, is 10 feet south of drive to house and tower, 63 feet east of east side of tower, 38 feet southeast of southeast corner of house, and 80.99 feet from station in azimuth 297°21′. Center of Hayes fire lookout tower is 35.00 feet from station in azimuth 1°18′.

Plane coordinates: (E), $x=212,130.20$ feet; $y=1,256,147.22$ feet. (C), $x=751,582.07$ feet; $y=1,255,638.80$ feet.

Elmira (Antrim County, H. C. Warwick, 1932).—About 13 miles southwest of Gaylord, 5 miles northeast of Alba, 2½ miles south-southwest of Elmira, near highest point of timbered ridge owned by F. A. Manglos, inside of triangle formed by three blazed trees, 12 feet east of large triangular blaze on 18-inch maple tree, 24 feet northwest of large triangular blaze on 24-inch elm tree, and 14 feet south of large triangular blaze on 18-inch beech tree. To reach from Gaylord, go west about 4½ miles to point where Route M–32 swings right and country road 620 continues straight ahead, continue 4.5 miles on country road 620 to four-corner intersection, turn right (west), go 1.0 mile to point where road turns south at plank gate on right, go through gate, continue 0.5 mile on woods road, follow left-hand fork 0.2 mile, take left-hand fork, continue 0.3 mile on main-traveled wood road to log cabin on right-hand side of road, continue 0.1 mile to fork, follow right-hand fork about ¼ mile to its end at barbed-wire fence, turn right, and follow newly cleared roadway along fence 0.1 mile to point where road goes through fence and end of truck travel. Cross fence, and follow road north and east to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference marks are standard reference disks in concrete, note 11a, flush with surface. No. 1 is 83.15 feet from station in azimuth 52°05′. No. 2 is 68.90 feet from station in azimuth 116°46′.

Plane coordinates: (C), $x=723,705.46$ feet; $y=1,285,952.73$ feet. (E), $x=185,039.94$ feet; $y=1,287,169.96$ feet.

Jordan (Antrim County, H. C. Warwick, 1932).—About 8 miles north of Alba, on ridge near Jordan fire lookout tower, 34.2 meters (112 feet) southeast of southeast leg of tower, and 38.6 meters (127 feet) southeast of southwest leg. To reach from West Elmira Garage at junction of Michigan Routes M–32 and M–131, go west 1.0 mile on Route M–131 to point where highway turns left at schoolhouse, turn right onto winding gravel road to north, continue 3.5 miles, turn left with main road, continue 1.7 miles to T-intersection at rock house and barn, turn right, continue straight ahead 0.5 mile, turn left at mail box on left side of road, and follow narrow sand trail west and south to its end at Jordan fire lookout tower and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference mark No. 1 is standard reference disk in concrete, note 11a, projecting 6 inches, on break in slope, 17.94 meters (58.9 feet) (slope) from station in azimuth 268°12′. Reference mark No. 2 is standard reference disk in top of large outcropping boulder, 19.7 meters (65 feet) southeast of southeast leg of lookout tower, 22.8 meters (75 feet) southeast of northeast leg, and 17.24 meters (56.6 feet) from station in azimuth 159°36. Azimuth mark is standard reference disk in concrete, note 11a, projecting 5 inches, 25 feet north of center line of gravel road, 2 feet east of fence corner, approximately 200 yards west of yellow house, and approximately 0.3 mile from station in azimuth 25°35′36″. Azimuth from station to *Bear Creek fire lookout tower* is 198°39′20″. *Jordan fire lookout tower* is 38.4 meters (126 feet) from station in azimuth 136°13′44″.

Plane coordinates: (C), $x=697,224.24$ feet; $y=1,313,314.93$ feet; grid azimuth to azimuth mark=25°03′08″.* (E), $x=159,269.03$ feet; $y=1,315,207.72$ feet; grid azimuth to azimuth mark=26°31′41″.*

Mancelona (Antrim County, H. C. Warwick, 1932).—About 1 mile southeast of Mancelona, on property owned by George Lesher, on highest part of prominent ridge, 43.3 feet north of center of Mancelona fire lookout tower, 13 feet west of double elm tree, and 13 feet east-northeast of 12-inch elm tree. To reach from railroad station at Mancelona, go east 1.5 miles on County Road 618 to T-intersection, go south 0.25 mile to road to west along telephone line, follow west 0.2 mile

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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to road to south through woods, and follow this road south to station site near Mancelona fire lookout tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is 12 feet south of road to fire tower, 19.5 feet east of 18-inch maple tree, and 82.47 feet (slope) from station in azimuth 242°48′. No. 2 projects 2 inches, is at southeast corner of enclosure around fire tower, 42 feet south-southeast of northeast corner of fire tower, 41 feet east-southeast of southwest corner of fire tower, 10 feet south of 10-inch elm tree, and 73.37 feet from station in azimuth 340°44′. *Center of Mancelona tower* is 43.3 feet from station in azimuth 4°17′.

Plane coordinates: (C), $x=685,240.34$ feet; $y=1,237,390.97$ feet. (E), $x=145,335.37$ feet; $y=1,239,607.16$ feet.

Wildfong (Antrim County, H. C. Warwick, 1932).—About 5 miles due west of Alba, 4¾ miles north-northwest of Mancelona, on land owned and occupied by Sam G. Wildfong, in west edge of apple orchard, between second and third rows of trees from north side of orchard and outside of most westerly row, 67.5 feet south of 24-inch elm tree in northwest corner of orchard, 44 feet south of large boulder, 134 feet north of 12-inch maple tree in west edge of orchard, and on range between maple and elm mentioned above. To reach from center of Mancelona, go west 0.5 mile on Route M-88 to Route M-66, turn north (right) onto Route M-66, proceed 5.3 miles to road fork (main road bears right on level ground, and left fork keeps straight ahead up steep hill), continue straight ahead up hill about 0.5 mile to private lane leading to stone house and large barn, turn west into lane, go 0.2 mile to fence corner, keep right along west side of fence to south edge of woods, and proceed west along south edge of woods to high point of ridge and station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 12 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 4 inches. No. 1 is in south edge of woods, about 14 feet south of center line of lane, and 104.3 feet (slope) from station in azimuth 227°47′. No. 2 is in south edge of woods, and 104.7 feet (slope) from station in azimuth 133°04′. Azimuth mark is approximately 0.3 mile from station in azimuth 271°52′58″. Azimuth from station to *Mancelona fire lookout tower* is 339°25′43″.

Plane coordinates: (C), $x=673,845.72$ feet; $y=1,266,953.47$ feet; grid azimuth to azimuth mark=271°24′29″.* (E), $x=134,702.14$ feet; $y=1,269,456.91$ feet; grid azimuth to azimuth mark=272°52′50″.*

Supplementary points

Alpena, Huron Portland Cement Co., flashing white light (Alpena County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=562,843$ feet; $y=1,297,476$ feet.

Curran, fire lookout tower (Alcona County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=479,982.89$ feet; $y=1,171,916.34$ feet.

Pike's Peak, fire lookout tower (Alcona County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=450,388$ feet; $y=1,213,883$ feet.

Lake Emma, fire lookout tower (Presque Isle County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=420,099.75$ feet; $y=1,361,441.73$ feet.

Turtle Lake, fire lookout tower (Alpena County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=449,834.46$ feet; $y=1,234,247.77$ feet.

East Atlanta, fire lookout tower (Montmorency County, H. C. Warwick, 1932)—Plane coordinates:[1] (E), $x=404,923$ feet; $y=1,278,159$ feet.

West Atlanta, fire lookout tower (Montmorency County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=336,663$ feet; $y=1,276,026$ feet.

South Pigeon River, fire lookout tower (Otsego County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=315,431.41$ feet; $y=1,322,763.08$ feet.

Chub Lake, fire lookout tower (Otsego County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=251,688$ feet; $y=1,244,655$ feet. (C), $x=791,421$ feet; $y=1,245,167$ feet.

Gaylord, municipal water tank, finial (Otsego County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=239,690.22$ feet; $y=1,284,843.82$ feet. (C), $x=778,394.40$ feet; $y=1,285,033.17$ feet.

[1] No check on this position.
*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Gaylord, St. Mary's Church, spire (Otsego County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=238,696.81$ feet; $y=1,287,853.11$ feet. (C), $x=777,323.94$ feet; $y=1,288,015.86$ feet.

Hudson, fire lookout tower (Otsego County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=220,128$ feet; $y=1,339,944$ feet. (C), $x=757,420$ feet; $y=1,339,609$ feet.

Jordan, fire lookout tower (Antrim County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=697,136$ feet; $y=1,313,405$ feet. (E), $x=159,183$ feet; $y=1,315,300$ feet.

Bear Creek, fire lookout tower (Emmet County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=724,139$ feet; $y=1,395,596$ feet. (E), $x=188,301$ feet; $y=1,396,775$ feet.

Pickerel Lake, fire lookout tower (Kalkaska County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=698,330$ feet; $y=1,202,623$ feet. (E), $x=157,531$ feet; $y=1,204,511$ feet.

Mancelona, fire lookout tower (Antrim County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=685,237.41$ feet; $y=1,237,347.70$ feet; grid azimuth to station *Wildfong*$=158°57'15''.5$. (E), $x=145,331.33$ feet; $y=1,239,563.96$ feet; grid azimuth to station *Wildfong*$=160°25'33''.2$.

Kalkaska, Church of Christ, spire (Kalkaska County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=648,658$ feet; $y=1,179,712$ feet. (E), $x=107,280$ feet; $y=1,182,875$ feet.

GAYLORD TO MOUNT PLEASANT

Principal points

Bald Hill (Crawford County, H. C. Warwick, 1932).—About 12.5 miles northeast of Grayling, on northeasterly part of bald grassy hill dotted with a few dead scrub trees, and about 30 meters (98 feet) southeast of 4-inch twin scrub oak tree. To reach from main traffic light in Grayling, go northeast 10.5 miles on main street which becomes well-traveled road and is marked by signs "State Forest Headquarters" to four-corner intersection at schoolhouse on left side of road, turn left with main road, continue 3.4 miles to dirt trail turning left at sign "Nash Camp" and several other arrows and signs (do not follow arrow of Nash camp sign), turn left northwest onto dirt trail, and proceed about 1 mile to point where trail reaches crest of ridge in saddle. This point is as close as trail comes to station site which is on highest point of hill to right and east about ¼ mile. With due care motor vehicle can be driven to station site. About 7 meters (23 feet) north of station, slope of hill breaks off quite steeply; while to south for about 50 meters (164 feet), hilltop is flat and then turns into gentle slope to south. Marked by standard station disk cemented in top of 4-inch iron pipe projecting 5 inches. Pipe is 4 feet long and embedded in ball of concrete. Reference marks are similar to station mark except that standard reference disk is cemented in top of each pipe. No. 1 is 10.55 meters (34.6 feet) from station in azimuth 318°34'. No. 2 is 8.09 meters (26.5 feet) from station in azimuth 78°40'. Azimuth from station to *Mack Lake, fire lookout tower* is 290°15'21''.

Plane coordinates: (E), $x=286,447.81$ feet; $y=1,176,626.66$ feet; grid azimuth to *Mack Lake, fire lookout tower*$=290°50'01''.1$. (C), $x=827,913.02$ feet; $y=1,178,050.45$ feet; grid azimuth to *Mack Lake, fire lookout tower*$=289°22'08''$.**

Elk Hill (Oscoda County, H. C. Warwick, 1932).—About 18 miles east-northeast of Grayling, about 20 miles north-northeast of Roscommon, and 14.70 meters (48.2 feet) west of concrete foundation of steps at west center of Elk Hill fire lookout tower. To reach from intersection of main street and U. S. Route 27 in Grayling, go northeast ¾ mile on main street to T-intersection, turn right, follow road marked with State Forest Headquarters signs, turn left at 10.5 miles at schoolhouse on left, turn left at 12.2 miles, turn right at T-intersection at 17.7 miles, take extreme left fork at 18.1 miles, take right fork at 19.2 miles, continue to road intersection at 20.9 miles marked with sign "To fire tower," turn left onto this road, and continue about 1 mile to station site at fire tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 2 inches, is at center of tower, and 17.56 meters (57.6 feet) from station in azimuth 263°42'. No. 2 projects 5 inches, is in edge of

[1] No check on this position.

**This azimuth has been computed by the first formula (p. 171), using both terms.

For notes in regard to marking of stations see p. 167.

woods, 10 feet southeast of road to tower, 6 feet northwest of group of small oak trees, and 30.865 meters (101.26 feet) from station in azimuth 9°41′. *Elk Hill, fire lookout tower* is 17.56 meters (57.6 feet) from station in azimuth 263°42′.

Plane coordinates: (E), x=319,665.89 feet; y=1,177,327.89 feet. (C), x=861,104.21 feet; y=1,179,601.62 feet.

Down River (Crawford County, H. C. Warwick, 1932).—About 6¾ miles east-northeast of Grayling, at site of Down River fire lookout tower, on highest point of bare-topped hill, 17.6 feet north of southeast tower leg, 6.5 feet east of northeast tower leg, and approximately 17 feet north of center of base of tower. To reach from traffic light in Grayling, go northeast ¾ mile on main street to T-intersection with sign "State Forest Hdqrs.", turn right onto gravel road, go 4.1 miles to road to left at sign "State Fire Tower 4 Miles," turn left onto this road, go 1.8 miles to fork, take right fork with sign "Down River Fire Tower," go 1.4 miles, take right-hand fork, go 0.6 mile, take right-hand fork again, and continue 0.3 mile to crest of ridge in saddle just east of fire tower and end of truck travel. Turn west and follow wagon road up steep grade 200 yards to the station site. Marked by standard station disk in top of 4-inch galvanized-iron pipe, 4 feet long, embedded in concrete. Reference marks are standard reference disks in similar pipes. No. 1 is 73.95 feet from station in azimuth 246°14′. No. 2 is 84.00 feet (slope) from station in azimuth 146°08′. Azimuth mark is standard reference disk in concrete, note 11a, projecting 6 inches, about 15 feet south of center line of road through pasture, about ¼ mile east of fork in road, and approximately 0.3 mile from station in azimuth 136°56′41″. Azimuth from station to *Down River, fire lookout tower*, 5.18 meters (17.0 feet) distant is 58°58′; *Ogemaw, fire lookout tower* is 313°24′27″; to *Roscommon, fire lookout tower*, 337°14′05″; to *Portage Lake, fire lookout tower*, 48°12′58″; and to tall stack of Kerry, Hansen Flooring Co. at Grayling, 56°16′09″.

Plane coordinates: (E), x=258,940.26 feet; y=1,170,844.52 feet; grid azimuth to azimuth mark=137°35′49″.* (C), x=800,561.88 feet; y=1,171,566.29 feet; grid azimuth to azimuth mark=136°07′53″.*

Crawford (Crawford County, H. C. Warwick, 1932).—About 10 miles east of Roscommon, near section line between secs. 35 and 36, T. 25 N., R. 1 W., on flat-topped wooded hill, northeast of lone pine tree on flat place at top of hill, 2.8 meters (9 feet) southeast of triangular blaze on 8-inch scrub oak tree, and 2.4 meters (8 feet) south of blaze on 4-inch scrub oak tree. To reach from Roscommon follow Route M-76 east 7.2 miles, proceed south 1.0 mile to junction with county road 28 which is dirt and gravel road to east, follow east 1.0 mile to dirt road to north, proceed north 0.5 mile to fork near mail box, take right-hand road northeast 1.1 miles to crossroads at corner of sections 34, 35, 3, 2 which is indicated by stake at corner of fence on south side of road, follow sandy road east along fence 0.9 mile to galvanized iron building on south which is known as the Steam Heat Lodge, take dim road about 30 meters (98 feet) east of lodge, follow northeast 0.6 mile to blazes on trees at end of road, turn left, and follow blazed patch up hill northwest about 500 meters (1,640 feet) to station site. Hill can be identified by very tall pine tree on top which sticks up above surrounding trees. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 6 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is 2 meters (7 feet) south of 6-inch scrub oak tree, 1 meter (3 feet) north of 5-inch scrub oak tree, and is 11.53 meters (37.8 feet) from station in azimuth 279°02′. No. 2 projects 3 inches, is 1 meter (3 feet) north of 6-inch scrub oak tree, and 10.56 meters (34.6 feet) from station in azimuth 36°46′. Lone pine tree is approximately 50 meters (164 feet) from station in azimuth 32°01′. In 1934 it was reported by a hunter that disks were missing from reference marks.

Plane coordinates: (C), x=855,167.58 feet; y=1,102,365.92 feet. (E), x=311,759.18 feet; y=1,100,274.73 feet.

Cheney (Crawford County, H. C. Warwick, 1932).—About 6 miles south of Grayling, 7 miles north-northwest of Roscommon, 2¾ miles west of Pere Cheney, on highest part of westerly peak of prominent ridge with gravel pit on northeast slope, 20 feet southeast of 4-inch oak tree with triangular blaze, 28 feet southeast of center-line of road, and 26 feet northeast of 6-inch oak tree with triangular blaze on west side. To reach from Grayling, go south 6.4 miles on U. S. Route 27 to private road leading to left of small frame house and log barn inside fenced enclosure, go around left side of fenced plot to old road on east side, and follow

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

this road 1.2 miles to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is 12 feet south of center-line of road, 5 feet southwest of group of small oak trees, and 77.92 feet from station in azimuth 225°15′. No. 2 projects 4 inches, is 98 feet south of center-line of road, 6 feet west of 6-inch oak tree, and 80.65 feet from station in azimuth 295°39′. Azimuth mark projects 6 inches, is 35 feet west of center-line of U. S. Route 27, 185 feet north of intersection of U. S. Route 27 and an east-and-west gravel road, 150 feet west of tar-paper-covered house, and approximately 1.4 miles from station in azimuth 128°06′45″.

Plane coordinates: (E), x=233,448.65 feet; y=1,121,480.81 feet; grid azimuth to azimuth mark=128°49′49″.* (C), x=776,340.02 feet; y=1,121,567.98 feet; grid azimuth to azimuth mark=127°22′06″.*

Indian (Roscommon County, H. C. Warwick, 1932).—Sixteen miles southeast of Roscommon, 8 miles west of West Branch, 10.5 meters (34 feet) west of southwest leg of Indian Springs fire lookout tower, and 10.8 meters (35 feet) west of northwest leg. To reach from Roscommon, go south 14.3 miles on U. S. 27 to junction with Route M–55, go east 11.1 miles on Route M–55 to junction with Route M–76, follow combined routes southeast 0.9 mile to sign "State Fire Tower ½ mile" and dirt road to left, and follow this road northeast 0.6 mile to high prominent hill and tower. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference marks are standard reference disks in concrete, note 11a. No. 1 is flush with surface, 13.1 meters (43 feet) northeast of northwest tower leg, 9.5 meters (31 feet) north of northeast tower leg, and 23.45 meters (76.9 feet) from station in azimuth 236°49′. No. 2 projects 2 inches, is 26 meters (85 feet) south of southwest tower leg, 30.0 meters (98 feet) southwest of southeast tower leg, and 23.27 meters (76.3 feet) from station in azimuth 13°28′. Azimuths from station to fire lookout towers are: *Ogemaw*, 205°07′15″; *Rose City*, 227°21′29″; and *Houghton Lake*, 88°49′07″. Center of *Indian Springs fire lookout tower* is 13.23 meters (43.4 feet) from station in azimuth 265°24′.

Plane coordinates: (E), x=309,204.06 feet; y=1,021,139.89 feet; grid azimuth to *Houghton Lake, fire lookout tower*=89°19′39.6″. (C), x=854,626.70 feet; y=1,023,186.20 feet; grid azimuth to *Houghton Lake, fire lookout tower*= 87°52′20.9″.

Houghton (Roscommon County, H. C. Warwick, 1932).—About 16 miles south-southwest of Roscommon, 4 miles south of Houghton Lake, on flat area about 200 feet southwest of highest point of ridge, and in large grove of small oak trees. To reach from Roscommon, go south 15 miles on U. S. Route 27 to Prudenville, continue west 2.0 miles on Route 27 to dirt road to south, proceed south 0.5 mile to T-intersection, proceed 0.25 mile to sand road to south at northeast corner of cemetery, proceed south 1 mile to crossroads, continue south 0.1 mile on sand road to fork, take main-traveled left fork, go southeast 0.65 mile to log barn on left side of road, leave road and follow trail south through orchard and up ridge 0.3 mile to end of trail in grove of large Norway pines, go south through woods ¼ mile to firebreak in section line, and continue south 300 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is on same flat area as station, and 67.15 feet from station in azimuth 230°41′. No. 2 projects 6 inches, is in cleared lane running northeast from station, and 59.76 feet from station in azimuth 125°20′. Azimuth from station to *Houghton Lake, fire lookout tower*, distant about 4 miles, is 125°19′40″.

Plane coordinates: (E), x=232,586.06 feet; y=1,007,556.99 feet; grid azimuth to *Houghton Lake, fire lookout tower*=126°02′27.4″. (C), x=778,376.61 feet; y=1,007,662.21 feet; grid azimuth to *Houghton Lake, fire lookout tower*= 124°35′10.7″.

Berry (Roscommon County, H. C. Warwick, 1932).—About 8 miles south of Houghton Lake, 15 miles northwest of Gladwin, in SE¼ sec. 25, T. 21 N., R. 3 W., on high point of ridge, 121.55 feet south of center of Houghton southeast fire lookout tower, 40 feet southeast of road to fire tower, and 40 feet north of firebreak. To reach from Prudenville, go south 8.6 miles on Route M–18 to road leading east to tower at summit of hill, and follow this road east 0.1 mile to station site. Surface and underground marks are standard disk station marks in con-

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

crete, note 1a and 7a. Upper mark projects 8 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is at center of tower, and 121.55 feet from station in azimuth 176°56′. No. 2 projects 4 inches, is 36 feet north of firebreak, and 70.83 feet from station in azimuth 272°59′. Azimuth mark projects 3 inches, is 60 feet west of Route M–18, 25 feet north of east-and-west sand road, and approximately 0.8 mile from station in azimuth 174°00′19″. Azimuth from station to *Houghton Lake, fire lookout tower* is 139°52′45″.

Plane coordinates: (E), x=250,277.07 feet; y=977,702.22 feet; grid azimuth to azimuth mark=174°40′07″.* (C), x=796,818.68 feet; y=978,266.15 feet; grid azimuth to azimuth mark=173°13′00″.*

Greer (Gladwin County, H. C. Warwick, 1932).—About 2.5 miles north of intersection of Routes M–18 and M–61 in main part of Gladwin, on highest part of ridge, on property owned by Hazen S. Greer, 16.1 meters (53 feet) northeast of southeast corner of stone and concrete foundation under large barn with silo in connection, 17.4 meters (57 feet) southeast of northeast corner of barn, and 9.7 meters (32 feet) due east of concrete foundation under silo. To reach from junction of Routes M–18 and M–61 at Gladwin, go north 2.5 miles on Route M–18 to four-corner intersection which is ¼ mile north of farmhouse with large stone fence around it, turn right (east), go about 75 meters (246 feet) to wooden gate on north side of road, and proceed north 86.7 meters (284 feet) from center line of road to station site. (The road intersection above can be identified by the fact that ¼ mile south there is well-built-up farm, the farmhouse having a large stone fence around it.) Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 8 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 8 inches, is 0.2 meter (1 foot) east of fence line, 4 meters (13 feet) west of a driveway, 43.5 meters (143 feet) north of center line of east-and-west road, and 43.18 meters (141.7 feet) (slope) from station in azimuth 25°22′. No. 2 projects 8 inches, is 1.8 meters (6 feet) northwest of northeast corner of stone foundation under barn, about 100 meters (328 feet) east of center-line of Route M–18, and 18.94 meters (62.1 feet) from station in azimuth 119°21′. Azimuth mark projects 4 inches, is 8 meters (26 feet) west of center line of Route M–18, about 30 meters (98 feet) south of concrete culvert, 0.2 meter (1 foot) east of property line, and 0.35 mile from station in azimuth 15°44′10″. Azimuth from station to white steeple on open belfry on red roof of church or school, distant about 1 mile, is 223°58′29″.

Plane coordinates: (E), x=284,811.96 feet; y=918,293.52 feet; grid azimuth to azimuth mark=16°18′16″.* (C), x=832,846.30 feet; y=919,749.33 feet; grid azimuth to azimuth mark=14°51′24″.*

McGonigal (Clare County, H. C. Warwick, 1932; 1936).—About 8 miles northeast of Harrison, in SW¼ sec. 18, T. 20 N., R. 3 W., on land owned by State, in open area on top of ridge, 12.8 meters (42 feet) east of center line of section-line road at point where road goes over top of ridge, 17.2 meters (56 feet) west of 10-inch oak tree somewhat stunted in growth with branches all way down. Open area is further marked by three pine snags 4 to 7 feet high and some small wild-cherry bushes. To reach from Prudenville, go south 15 miles on Route M–18 to point where highway turns east, proceed west 1.0 mile on narrow gravel road to schoolhouse, proceed south 1.0 mile on narrow gravel road, proceed west 4 miles on gravel and dirt road to crossroads, proceed north 2 miles on dirt road to T-road, proceed west 1.0 mile on sand road to road leading north just west of house on right, turn north, and go 1.25 miles through brush on wheel tracks (dim road) to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 4 inches. Reference marks are standard reference disks in concrete, note 11a, projecting 4 inches. No. 1 was 4.4 meters (14 feet) east of center line of section-line road, and 23.35 meters (76.6 feet) from station in azimuth 18°57′. No. 2 was 5.9 meters (19 feet) west of center line of section-line road, 4.9 meters (16 feet) east of wire fence, and 25.20 meters (82.7 feet) from station in azimuth 132°35′. In 1936, because of road construction, the two reference marks were moved to new locations. No. 1 is 86.92 feet from station in azimuth 59°44′, and No. 2 is 103.59 feet from station in azimuth 132°35′. Azimuth from station to *Harrison, fire lookout tower* is 45°11′34″.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Plane coordinates: (C), $x=768,198.41$ feet; $y=957,141.06$ feet; grid azimuth to *Harrison, fire lookout tower*=44°28′56.0″. (E), $x=221,130.32$ feet; $y=957,308.36$ feet; grid azimuth to *Harrison, fire lookout tower*=45°55′53.8″.

Wilson (Clare County, H. C. Warwick, 1932).—About 12 miles north of west of Gladwin, 4 miles northeast of Harrison, in SE¼ sec. 13, T. 19 N., R. 4 W., on land owned by Lee and John Wilson, of Harrison, in open area on summit of wooded ridge, and 12 feet east of triangular blaze on 6-inch oak tree. To reach from Harrison, go east about 4 miles on Goodwin road to corner of F. Hall's garden, opposite old barns, turn north onto wheel tracks entering gap at southwest corner of pasture on north side of road, follow tracks northeast across pasture 0.35 mile to point where trail enters woods, and follow newly cleared trail northeast 475 yards to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects 3 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. Reference marks project 7 inches and azimuth mark projects 5 inches. No. 1 is 61.36 feet from station in azimuth 246°16′. No. 2 is 50.27 feet from station in azimuth 161°02′. Azimuth mark is in north right-of-way fence, 30 feet north of center line of Gladwin road, 50 feet east of southeast corner of F. Hall's garden, about 50 yards southeast of F. Hall's house, and approximately 0.5 mile from station in azimuth 36°24′10″.

Plane coordinates: (C), $x=765,320.26$ feet; $y=926,710.86$ feet; grid azimuth to azimuth mark=35°42′05″.* (E), $x=217,483.25$ feet; $y=926,959.41$ feet; grid azimuth to azimuth mark=37°08′59″.*

Williams (Gladwin County, H. C. Warwick, 1932).—About 7 miles north-northeast of Coleman, about 3 miles south-southwest of Beaverton, on high point of low ridge, on property of Jacob Williams, 5.9 meters (19 feet) north of old barn, and 40.3 meters (132 feet) northeast of northeast corner of concrete foundation under house. To reach from junction of Routes M-18 and M-80 in Beaverton, go south 2.5 miles on Route M-18 to four-corner intersection, and proceed west 1.75 miles on dirt section-line road to point where road turns right (north) to small house and barn and ends. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark projects about 6 inches. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is 1.8 meters (6 feet) west of 4-inch cherry tree, 2 meters (7 feet) north of little-used dirt trail which runs along top of ridge from house past barn and on out to northeast, and 23.98 meters (78.7 feet) from station in azimuth 264°58′. No. 2 projects 6 inches, is on gentle slope to north, and 22.49 meters (73.8 feet) (slope) from station in azimuth 173°13′. Azimuth mark projects 8 inches, is 6 meters (20 feet) north of center line of dirt road, 22.4 meters (73 feet) east of fence corner, and 0.1 mile from station in azimuth 321°47′16″.

Plane coordinates: (E), $x=274,645.34$ feet; $y=855,789.55$ feet; grid azimuth to azimuth mark=322°22′46″.* (C), $x=824,259.35$ feet; $y=857,006.61$ feet; grid azimuth to azimuth mark=320°56′11″.*

Dover (Clare County, H. C. Warwick, 1932).—About 14 miles southwest of Gladwin, 6 miles north of Clare, in SW¼ sec. 35, T. 18 N., R. 4 W., 1 foot west of east right-of-way fence of U. S. Route 27, 78 feet east of center line of highway, on top of 10-foot bank, 40 feet southeast of triangular blaze on 6-inch apple tree, and about 200 yards southeast of vacant house on west side of highway. Field east of station is stumpy cow pasture. To reach from Clare, follow U. S. Route 27 north 5.75 miles from junction with U. S. Route 10 direct to station site. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is flush with surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches, is 1 foot west of east right-of-way fence, and 77.28 feet from station in azimuth 179°07′. No. 2 projects 5 inches, is 74 feet west of center line of U. S. Route 27, 1 foot east of west right-of-way fence, 15 feet south of telegraph pole, and 158.75 feet from station in azimuth 66°45′. Azimuth mark projects 4 inches, is 33 feet west of center line of U. S. Route 27, 8 feet south of telegraph pole, 1 foot east of west right-of-way fence, 150 feet southeast of windmill, and approximately 0.25 mile from station in azimuth 175°54′17″.

Plane coordinates: (C), $x=758,882.16$ feet; $y=878,118.99$ feet; grid azimuth to azimuth mark=175°13′25″.* (E), $x=209,820.15$ feet; $y=878,543.21$ feet; grid azimuth to azimuth mark=176°40′06″.*

Coleman (Midland County, H. C. Warwick, 1932).—One mile due south of Coleman, 99.8 meters (327 feet) east of center line of north-and-south road, on

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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rise in ground, approximately 44 meters (144 feet) west of 8-inch elm tree on right-of-way, about 8.9 meters (29 feet) south of center line of right-of-way, 9.3 meters (31 feet) east of fence corner at gate on south side of road, and 0.2 meter (1 foot) north of property line fence of section 32. To reach from Coleman, go south across railroad tracks at first crossing west of railroad station, jog left, and continue south 1.0 mile to four-corner intersection. This intersection is common corner of secs. 29, 30, 31, and 32, T. 16 N., R. 2 W. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 4 inches, is in fence line, 27.6 meters (91 feet) east of fence corner of T-fence used to separate orchard from cattle driveway, and 25.49 meters (83.6 feet) (slope) from station in azimuth 226°50′. No. 2 projects 6 inches, is in fence line across road from station, 13.5 meters (44 feet) west of above-mentioned fence corner, and 28.50 meters (93.5 feet) (slope) from station in azimuth 128°14′. Azimuth mark projects 4 inches, is in fence line which forms southern boundary of section 30, 100 meters (328 feet) west of small stone house on south side of road, 10 meters (32 feet) north of center line of section-line road, 24 meters (79 feet) northeast of corner post just east of gate on south side of road, and 0.3 mile from station in azimuth 92°14′11″.

Plane coordinates: (E), x=257,160.11 feet; y=818,532.81 feet; grid azimuth to azimuth mark=92°52′18″.* (C), x=807,716.87 feet; y=819,320.97 feet; grid azimuth to azimuth mark=91°25′52″.*

Little (Isabella County, H. C. Warwick, 1932).—About 6 miles south of Clare, 9 miles north of Mount Pleasant, in NE¼ sec. 32, T. 16 N., R. 4 W., on land owned by Ernest Little, across road from and about 50 yards west of his house, 42 feet west of center line of road, 17 feet west of right-of-way fence, 14 feet southeast of southeast corner of east wing of old unoccupied log and frame house, and 18 feet northeast of southeast corner of south wing of log house. To reach from Mount Pleasant, go north 8.5 miles on U. S. Route 27 to crossroads at Catholic school 2 miles north of Rosebush, proceed west 2 miles on gravel road to crossroads with small white house and large barn on southwest corner, and proceed north 0.65 mile to station site at summit of first long grade. Surface and underground marks are standard disk station marks in concrete, notes 1a and 7a. Upper mark is 8 inches below surface. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 6 inches, is on right-of-way fence line on east side of road, 21 feet east of center line of road, and 67.21 feet from station in azimuth 256°27′. No. 2 projects 5 inches, is 30 feet west of center line of road, 1 foot west of right-of-way fence, 22 feet south of 24-inch apple tree, and 70.67 feet from station in azimuth 348°50′. Azimuth mark projects 6 inches, is 22 feet west of center line of road, 1 foot west of right-of-way fence, 250 feet east of large unpainted barn, and approximately 0.25 mile from station in azimuth 182°00′11″.

Plane coordinates: (C), x=749,023.38 feet; y=816,380.51 feet; grid azimuth to azimuth mark=181°21′06″.* (E), x=198,409.53 feet; y=817,068.83 feet; grid azimuth to azimuth mark=182°47′31″.*

Supplementary points

Mount Tom, fire lookout tower (Oscoda County, H. C. Warwick, 1932).—Plane coordinates: (E), x=378,614.00 feet; y=1,183,354.61 feet.

Elk Hill, fire lookout tower (Oscoda County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=319,723 feet; y=1,177,334 feet. (C), x=861,161 feet; y=1,179,609 feet.

Down River, fire lookout tower (Crawford County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), x=258,925 feet; y=1,170,836 feet. (C), x=800,547 feet; y=1,171,558 feet.

Mack Lake, fire lookout tower (Oscoda County, H. C. Warwick, 1932).—Plane coordinates: (E), x=392,759.01 feet; y=1,136,171.37 feet.

Portage Lake, fire lookout tower (Crawford County, H. C. Warwick, 1932).—Plane coordinates: (E), x=205,230.35 feet; y=1,123,937.19 feet; grid azimuth to station *Down River*=228°52′04″.1. (C), x=748,069.50 feet; y=1,123,303.30 feet; grid azimuth to station *Down River*=227°24′13″.3.

Grass Lake, fire lookout tower (Kalkaska County, H. C. Warwick, 1932).—Plane coordinates: (C), x=730,501.93 feet; y=1,101,091.00 feet. (E), x=187,100.60 feet; y=1,102,178.64 feet.

[1] No check on this position.

* This azimuth has been computed by the first formula (p. 171), neglecting the second term.

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Roscommon, fire lookout tower (Crawford County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=285,912.32$ feet; $y=1,104,467.07$ feet; grid azimuth to station *Down River*=157°53′09″.4. (C), $x=829,220.84$ feet; $y=1,105,898.03$ feet; grid azimuth to station *Down River*=156°25′21″.2.

Ogemaw, fire lookout tower (Ogemaw County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=343,220$ feet; $y=1,089,289$ feet.

Rose City, fire lookout tower (Ogemaw County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=363,184.19$ feet; $y=1,069,969.96$ feet; grid azimuth to station *Indian*=47°52′03″.8.

Indian Springs, fire lookout tower (Roscommon County, H. C. Warwick, 1932).—Plane coordinates:[1] (E), $x=309,247$ feet; $y=1,021,143$ feet. (C), $x=854,669$ feet; $y=1,023,190$ feet.

Houghton Lake, fire lookout tower (Roscommon County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=215,431.17$ feet; $y=1,020,039.49$ feet. (C), $x=760,911.06$ feet; $y=1,019,704.73$ feet.

Gladwin Game Refuge, fire lookout tower (Gladwin County, H. C. Warwick).—Plane coordinates: (E), $x=271,598.16$ feet; $y=967,473.12$ feet. (C), $x=818,392.26$ feet; $y=968,580.41$ feet.

Harrison, fire lookout tower (Clare County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=735,906.26$ feet; $y=924,259.93$ feet. (E), $x=188,014.84$ feet; $y=925,252.63$ feet.

Farwell, fire lookout tower (Clare County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=708,086.28$ feet; $y=859,348.29$ feet. (E), $x=158,562.96$ feet; $y=861,057.32$ feet.

Clare, municipal water tank (Clare County, H. C. Warwick, 1932).—Plane coordinates:[1] (C), $x=758,359$ feet; $y=846,681$ feet. (E), $x=208,505$ feet; $y=847,127$ feet.

Edenville, fire lookout tower (Midland County, H. C. Warwick, 1932).—Plane coordinates: (E), $x=310,855.92$ feet; $y=839,040.48$ feet. (C), $x=860,882.03$ feet; $y=841,173.80$ feet.

Mount Pleasant Sugar Co., stack (Isabella County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=757,421.88$ feet; $y=771,696.14$ feet. (E), $x=205,683.84$ feet; $y=772,184.88$ feet.

Mount Pleasant Indian School, stack (Isabella County, H. C. Warwick, 1932).—Plane coordinates: (C), $x=754,072.42$ feet; $y=771,683.62$ feet. (E), $x=202,334.95$ feet; $y=772,256.38$ feet.

VICINITY OF MENOMINEE

Principal points

Menominee R. M. No. 2 (Marinette County, Wis., C. A. Schanck, 1934).—In Menekaunee suburb of city of Marinette, in southeast angle of intersection of Alimeda and Bird Streets, 41 feet south of center line of Bird Street, 31 feet east of center line of Alimeda Street, in range with north side of old vacant house, and 27.5 feet west of northwest corner of house. Station is marked by standard reference disk in concrete, note 11b, flush with surface of ground. Station *Menominee* (see description and geographic position thereof) is 19.723 meters (64.71 feet) from station in azimuth 69°28′. Reference mark No. 1 and azimuth mark are standard reference disks in concrete, note 11b. No. 1 projects 2 inches above surface of ground, is in northwest angle of intersection of Alimeda and Bird Streets, directly in front of front door of house, 1 foot west of sidewalk, 115.38 feet north of station *Menominee* (*U. S. L. S.*), and 114.82 feet from station in azimuth 143°37′. Azimuth mark projects 3 inches above surface of ground, is on west edge of road leading southeast from main part of Menekaunee suburb and terminating on point known as Sea Gull Bar, midway between Green Bay on east and Lagoon on west, 0.35 mile south of last buildings, and 0.5 mile from station in azimuth 306°30′30″.

Plane coordinates: (W), $x=798,945.66$ feet; $y=1,309,418.93$ feet; grid azimuth to azimuth mark=305°41′18″.* (C), $x=24,117.53$ feet; $y=1,312,700.92$ feet; grid azimuth to azimuth mark=307°48′48″.*

Beach (Menominee County, C. A. Schanck, 1934).—In city of Menominee, in sec. 35, T. 32 N., R. 27 W. on land owned by city of Menominee, and known as Menominee Beach, 140 feet east of northeast corner of Lumberman's National Bank Building in southeast corner of park, 85 feet west of high-water line of shore

[1] *No check on this position.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.
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of Green Bay, 26 yards east of alleyway, and 25 yards north of alleyway. Surface and underground marks are standard station disks in concrete, notes 7b and 1a; upper mark is flush with surface of ground. Reference marks are standard reference disks in concrete, note 11b. No. 1 projects 6 inches above ground, is 1 foot east of northeast corner of bank building, and 138.04 feet from station in azimuth 75°10′. No. 2 is flush with surface of ground, 156 feet northeast of corner of bank building, 30 yards west of shore line, and 117.79 feet from station in azimuth 149°40′. Distance between reference marks is 155.72 feet. Azimuth mark is standard reference disk set flush in concrete pier which leads out to Front Range Light, 140 yards east of fog horn on same pier, 4 feet south of north edge of pier, and approximately 0.6 mile from station in azimuth 307°04′51″. Following azimuths are from station: *Menominee Lloyd's Department Store, tank,* 128°-07′26″. Menominee, Hotel Menominee, stack, 359°13′24″.

Plane coordinates: (W), x=796,513.89 feet y=1,315,855.47 feet; grid azimuth to azimuth mark=306°16′02″.* (C), x=21,925.74 feet; y=1,319,224.25 feet; grid azimuth to azimuth mark=308°23′34″.*

Sven (Door County, Wis., C. A. Schanck, 1934).—About 2 miles east-northeast of Fish Creek, about 1.2 miles south of Eagle Bluff Light House, in Peninsular State Park, at site of *Sven observation tower.* To reach from post office in Fish Creek, follow State Route 42 east 0.4 mile to junction with boulevard leading north into State Park, turn onto boulevard and go north 1.5 miles to junction with Skyline Boulevard, turn northeast onto this road and go 0.6 mile to *Sven observation tower* and station site. Station is 60 feet west of center line of Skyline Boulevard, 43.76 feet northwest of center of observation tower, 42 feet west-northwest of north leg, 35 feet northwest of west leg, and 4 feet east of fence along cliff. Surface and underground marks are standard station disks in concrete, notes 1a and 7a; upper mark projects 4 inches above ground. Reference and azimuth marks are standard reference disks in concrete, note 11a. No. 1 projects 3 inches above ground, is along northwest edge of observation tower, 4 feet southwest of north leg of tower, and 38.59 feet from station in azimuth 317°36′. No. 2 projects 6 inches above ground, is 54 feet south-southwest of center of observation tower, about 50 feet west of center line of boulevard, 20 feet east of fence along edge of cliff, and 62.24 feet from station in azimuth 18°44′. Distance between reference marks is 55.17 feet. Azimuth mark projects 8 inches above ground, is about 0.25 mile south of Eagle Bluff Light House, about 75 feet east of high-water mark, 17 feet east of center line of road, and approximately 0.5 mile from station in azimuth 195°30′05″.

Plane coordinates: (W), x=889,821.64 feet; y=1,335,428.11 feet; grid azimuth to azimuth mark=194°25′48″.* (C), x=115,902.77 feet; y=1,335,321.80 feet; grid azimuth to azimuth mark=196°33′26″.*

Feich (Menominee County, C. A. Schanck, 1934).—About 20 miles east-southeast of Wausaukee, Wis., about 13 miles north-northeast of Menominee, and about 3 miles east of Carbondale, in NE¼ sec. 6, T. 33 N., R. 26 W., on land owned by Paul Feich. To reach from junction of U. S. Route 41 and State Route 35 in downtown Menominee, follow U. S. Route 41 north 11.75 miles to County Route 338, which is side road to east, turn east onto Route 338 and go 3.7 miles to ridge and station site on south. Station is at crest of north-and-south ridge, 99 feet southwest of yellow "Turn" sign on side of road, 86 feet south of center line of County Route 338, 60 feet south of telephone pole, 57 feet south of south right-of-way fence, and 10 feet north of 12-inch white birch stump. Surface and underground marks are standard station disks in concrete, notes 1b and 7a; upper mark is 12 inches below surface of ground. Reference and azimuth marks are standard reference disks in concrete, note 11a, projecting 3 inches above ground. No. 1 is 27 feet north of center line of road, 13 feet west of 5-inch poplar tree, 1 foot south of north right-of-way fence, and 122.39 feet from station in azimuth 207°01′. No. 2 is 25 feet south of center line of road, 15 feet west of telephone pole, 1 foot south of south right-of-way fence, and 189.54 feet from station in azimuth 108°44′. Distance between reference marks is 239.99 feet. Azimuth mark is 150 feet west of St. Mark's Evangelical Lutheran Church, 21 feet north of center line of County Route 338, and approximately 0.2 mile from station in azimuth 96°19′30″.

Plane coordinates: (W), x=806,229.67 feet; y=1,383,107.04 feet; grid azimuth to azimuth mark=95°28′46″.* (C), x=34,134.88 feet; y=1,386,078.45 feet; grid azimuth to azimuth mark=97°36′42″.*

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Inlet (Marinette County, Wis., C. A. Schanck, 1934).—About 18 miles northwest of Marinette, about 9 miles northeast of Crivitz, and about 7 miles southeast of Wausaukee, in NE¼ of sec. 20, T. 33 N., R. 21 E., on land owned by Mr. Roose and occupied by *Middle Inlet lookout tower*. To reach from Marinette, follow County Route C north 16 miles to crossroad, turn left onto crossroad and go 5.8 miles to T-intersection, turn onto road to north and follow it 1.4 miles to dim trail leading north into woods, then follow trail 0.6 mile to Lookout Tower. Station is on high cleared flat-topped hill, about 80 feet south of highest point of hill, 20.48 feet south-southeast of center of *Middle Inlet lookout tower*, 19½ feet southwest of southeast leg, 11 feet south of southwest leg, and at end of trail up hill. Surface and underground marks are standard station disks in concrete, notes 1b and 7a; upper mark projects 6 inches above ground. Reference and azimuth marks are standard reference disks in concrete, note 11b, projecting 10 inches above ground. No. 1 is about 50 feet west of west slope of hill, and 69.85 feet from station in azimuth 253°01′. No. 2 is about 10 feet east of trail on south slope of hill, and 92.05 feet from station in azimuth 15°29′. Distance between reference marks is 140.28 feet. Azimuth mark is on south edge of cultivated field, 150 feet east of T-intersection, 100 feet east of southwest corner of field, 25½ feet north of center line of east-and-west road, and approximately 1.0 mile from station in azimuth 332°50′08″. To reach azimuth mark from station site, go 0.6 mile to county road, turn right onto road and go 1.4 mile to T-intersection and azimuth mark to east of this intersection.

Plane coordinates: (W), x=734,367.25 feet; y=1,386,335.74 feet; grid azimuth to azimuth mark=332°11′17″.*

Sundre (Marinette County, Wis., C. A. Schanck, 1934).—About 11 miles southeast of Crivitz, about 10 miles west by north of Marinette, and about 10 miles east by north of Pound, in NE¼ of sec. 25, T. 31 N., R. 21 E., on land owned and occupied by R. E. Sundre. To reach from intersection of U. S. Route 41 and State Route 64 in Marinette, follow Route 64 west 9.15 miles to side gravel road to north, turn north onto gravel road and go 1.6 miles to Mr. Sundre's house on left and station site. To reach from Pound, follow State Route 64 (also U. S. Route 141) north 1 mile to their junction, turn east onto Route 64 and go 10 miles to gravel road to north, then proceed to station as above. Station is in northeast corner of Mr. Sundre's yard, 75 yards east-northeast of house, 35 feet west of center line of road, 18 feet west of fence line, and 12 feet south of fence line. Surface and underground marks are standard station disks in concrete, notes 1b and 7a; upper mark is 3 inches below surface of ground. Reference and azimuth marks are standard reference disks in concrete, note 11b. No. 1 projects 7 inches above ground, is 18 feet east of center line of road, 1 foot west of fence line, and 73.86 feet from station in azimuth 239°29′. No. 2 projects 6 inches above ground, is 25 feet west of center line of road, 15 feet northwest of 12-inch birch tree, and 79.04 feet from station in azimuth 348°54′. Distance between reference marks is 124.85 feet. Azimuth mark projects 5 inches above ground, is on east edge of field, 200 yards south of farmhouse, 30 feet west of center line of gravel road, 1 foot east of fence line, and approximately 0.4 mile from station in azimuth 250°12′20″.

Plane coordinates: (W), x=739,375.55 feet; y=1,324,276.07 feet; grid azimuth to azimuth mark=249°32′53″.*

Supplementary points

Stephenson Lookout (Menominee County, C. A. Schanck, 1934).—About 1.3 miles east-northeast of Stephenson, 0.35 mile east of right-angle turn in Menominee County Route 352, and near north end of top of low hill. Point observed was center of fire lookout tower of Michigan Department of Conservation, standard, square, skeleton steel tower with enclosed cabin on top about 85 feet above ground.

Plane coordinates: (W), x=801,159.42 feet; y=1,430,863.09 feet. (C), x=30,846.51 feet; y=1,433,997.19 feet.

Menominee, pierhead front range light (Menominee County, C. A. Schanck, 1934).—On end of concrete breakwater extending into Green Bay from Ann Arbor Ferry slip, in southeast part of city of Menominee, on north side of mouth of Menominee River where it empties into Green Bay, and about 325 yards east of shore line of Bay. Point observed was center of fixed red harbor light on top of concrete tower.

*This azimuth has been computed by the first formula (p. 171), neglecting the second term.

For notes in regard to marking of stations see p. 167.

Plane coordinates: (W), $x=800,616.03$ feet; $y=1,313,223.92$ feet. (C), $x=25,928.12$ feet; $y=1,316,441.92$ feet.

Menominee, Epiphany Church, spire (Menominee County, C. A. Schanck, 1934).—In city of Menominee, on Ogden Avenue at intersection of Jenkins Avenue. Tall, slim, octagonal spire surmounted by ball and cross, on square red-brick belfry, roof of belfry merging into octagonal shape of spire; where square and octagonal roofs meet there are four dormers with gables and louvres, with small cross on each. Church was erected in 1892. This is most prominent spire in Menominee.

Plane coordinates: (W), $x=793,077.37$ feet; $y=1,317,012.61$ feet. (C), $x=18,533.98$ feet; $y=1,320,508.30$ feet.

Menominee, Menominee County Courthouse, tower (Menominee County, C. A. Schanck, 1934).—In city of Menominee, in park on Ogden Avenue directly opposite intersection of Jane Street. Square white tower rises from center of courthouse building, and has large louvered belfry with massive cornice and curving roof surmounted by ornamental iron weather vane on top of massive finial; curving roof has blind arch on each side. Courthouse erected in 1909. Point observed on was ornamental iron weather vane which marks center of tower.

Plane coordinates: (W), $x=793,487.25$ feet; $y=1,316,778.11$ feet. (C), $x=18,934.92$ feet; $y=1,320,258.72$ feet.

Menominee, Lloyd's Department Store, tank (Menominee County, C. A. Schanck, 1934).—In city of Menominee, on Sheridan Road, on top of southwest corner of four-story department store building. Point observed was finial on red wooden water tank with conical top; tall wooden finial is at center and is braced with ornamental wood moulding. At base of tank is platform with railing. Tank is supported above building by short four-legged girder structure. Large sign, "Lloyd's," is on top of building a short distance from tank.

Plane coordinates: (W), $x=795,589.56$ feet; $y=1,316,559.91$ feet. (C), $x=21,028.05$ feet; $y=1,319,962.63$ feet.

Menominee, M. & M. Paper Co., plant No. 2, tank (Menominee County, C. A. Schanck, 1934).—In southwestern part of city of Menominee, on Erdlitz Avenue at head of Ogden Avenue, and at plant No. 2 of M. & M. Paper Co. which is beside Menominee River. Point observed was center of high, black water tank having conical roof with ball on top marking center, and spherical bottom with platform and railing at base of tank; there is also platform and railing where feed pipe joins tank. Tank is lettered "M. & M. Paper Co. Plant No. 2," is about 100 feet high, and was built in 1923.

Plane coordinates: (W), $x=787,584.27$ feet; $y=1,316,807.07$ feet. (C), $x=13,036.05$ feet; $y=1,320,506.70$ feet.

Menominee, Hoskin-Morainville Paper Co., stack (Menominee County, C. A. Schanck, 1934).—In extreme southeasterly part of city of Menominee, short distance west of Green Bay, at Menominee River, at power house at rear of plant of Hoskin-Morainville Paper Co., which is large concrete building located on Sheridan Road at Menominee River. Point observed was center of tall concrete stack, about 125 feet high, with slight flaring top and series of vertical indentations about top. Stack erected in 1920.

Plane coordinates: (W), $x=798,141.47$ feet; $y=1,313,324.28$ feet. (C), $x=23,458.60$ feet; $y=1,316,634.02$ feet.

Menominee, Hoskin-Morainville Paper Co., tank (Menominee County, C. A. Schanck, 1934).—In extreme southeasterly part of city of Menominee, along north shore of Menominee River, at plant of Hoskin-Morainville Co., which is located between Sheridan Road and west shore line of Green Bay. Point observed was center of black water tank, about 80 feet high, with conical top having ball at center. Tank has platform and railing at base, is supported by four-legged girder structure on south side of long concrete building, and has prominent collar connection where feed pipe connects to tank. Tank erected in 1921.

Plane coordinates: (W), $x=797,981.01$ feet; $y=1,313,383.07$ feet. (C), $x=23,300.40$ feet; $y=1,316,698.73$ feet.

Menominee, Superior Sugar Refining Co., brick stack (Menominee County, C. A. Schanck, 1934).—In city of Menominee, on Sugar Island, near mouth of Menominee River, at plant of Superior Sugar Refining Co., and beside large red-brick factory building. Point observed was center of very large red-brick stack which is about 100 feet high and has very pronounced flare at top. Stack was erected in 1902.

Plane coordinates: (W), $x=794,579.22$ feet; $y=1,313,976.69$ feet. (C), $x=19,922.41$ feet; $y=1,317,418.24$ feet.

For notes in regard to marking of stations see p. 167.

Menominee, Superior Sugar Refining Co., concrete stack (Menominee County C. A. Schanck, 1934).—In city of Menominee, on Sugar Island, near mouth of Menominee River, at plant of Superior Sugar Refining Co., and short distance to east of two banks of low steel stacks. Point observed was center of tall, concrete stack about 100 feet high, and having wide collar near top. Stack was erected in 1908.

Plane coordinates: (W), $x=794,124.31$ feet; $y=1,314,108.23$ feet. (C), $x=19,472.61$ feet; $y=1,317,566.61$ feet.

Menominee, John Davis School, stack (Menominee County, C. A. Schanck 1934).—In city of Menominee, on Broadway Avenue near Holmes Avenue. Point observed was center of stack of heating plant of school.

Plane coordinates: (W), $x=792,451.70$ feet; $y=1,317,864.61$ feet. (C), $x=17,940.22$ feet; $y=1,321,383.08$ feet.

Menominee, Christ Evangelical Lutheran Church, spire (Menominee County C. A. Schanck, 1934).—In city of Menominee, on Dunlap Avenue near State Street. Point observed was center of tall, slim, octagonal, green-shingled spire with four principal sides and four minor ones, having at top series of ornamental copings surmounted by gilded wooden cross. At midsection an equilateral gable is on each of four principal sides, and at base of spire are four small dormers, each with horizontal louvres. Surmounting four corners of tower under spire are four conical finials with ball atop each. Inscription on church reads "Ev. Luth. Christus Kirche." Church and spire were built in 1905.

Plane coordinates: (W), $x=794,264.97$ feet; $y=1,317,338.25$ feet. (C), $x=19,733.00$ feet; $y=1,320,789.72$ feet.

Menominee, St. Adelbert's Church, spire (Menominee County, C. A. Schanck, 1934).—In city of Menominee, at southwest corner of Broadway and Holmes Avenue. Point observed was center of spire, which is painted black, has gold colored cross at apex, is on top of church, and is about 90 feet high.

Plane coordinates: (W), $x=792,126.03$ feet; $y=1,317,800.18$ feet. (C), $x=17,612.33$ feet; $y=1,321,330.77$ feet.

Menominee, Lloyd Manufacturing Co., tank (Menominee County, C. A. Schanck, 1934).—In extreme northern section of Menominee, near northern city limits, at plant of Lloyd Manufacturing Co., which is located to east of U. S. Route 41 and to west of Green Bay. Tank is at rear of plant, near two taller steel stacks, and on rear of long low brick building. Point observed was tall finial on center on top of wooden water tank, painted black, about 70 feet high, lettered "Lloyd Loom Products," and having conical, green top.

Plane coordinates: (W), $x=793,961.98$ feet; $y=1,323,733.67$ feet. (C), $x=19,667.47$ feet; $y=1,327,193.01$ feet.

Chambers Island Lighthouse (Door County, Wis., C. A. Schanck, 1934).—On west side of Chambers Island in Green Bay, about 13 miles northeast of city of Menominee, Mich., and about 7½ miles northwest of town of Fish Creek, Wis. Point observed was center of flashing white light on lighthouse.

Plane coordinates: (W), $x=857,060.74$ feet; $y=1,352,397.83$ feet. (C), $x=83,793.86$ feet; $y=1,353,497.09$ feet.

Marinette, M. & M. Paper Co., plant No. 1, tank (Marinette County, Wis., C. A. Schanck, 1934).—In northwestern section of city of Marinette, between Riverside Avenue and Menominee River, at plant No. 1 of M. & M. Paper Co. Point observed was center of high, black water tank having conical roof with ball on top marking center, and spherical bottom with platform and railing at base of tank; there is also platform and railing where feed pipe joins tank. Tank is lettered "M. & M. Paper Co. plant No. 1," is about 100 feet high, and was built in 1923.

Plane coordinates: (W), $x=784,012.93$ feet; $y=1,315,885.37$ feet. (C), $x=9,432.35$ feet; $y=1,319,717.98$ feet.

Marinette, M. & M. Paper Co., plant No. 1, stack (Marinette County, Wis., C. A. Schanck, 1934).—In northwestern section of city of Marinette, between Riverside Avenue and Menominee River, about center of plant No. 1 of M. & M. Paper Co. Point observed was center of very plain, buff-brick stack, rather thick at base, and about 100 feet high.

Plane coordinates: (W), $x=783,637.28$ feet; $y=1,316,020.24$ feet. (C), $x=9,061.91$ feet; $y=1,319,866.72$ feet.

Marinette, Evangelical Lutheran Church, steeple (Marinette County, Wis., C. A. Schanck, 1934.)—

Plane coordinates: (W), $x=790,099.46$ feet; $y=1,311,662.39$ feet. (C), $x=15,359.15$ feet; $y=1,315,271.34$ feet.

For notes in regard to marking of stations see p. 167.

Marinette, tall steel stack (Marinette County, Wis., C. A. Schanck, 1934).—In eastern section of city of Marinette, adjacent to Menominee River, at lumber yard on Main Street. Point observed was center of tall stack of light steel construction, about 100 feet high.

Plane coordinates: (W), $x=795,784.60$ feet; $y=1,311,763.39$ feet. (C), $x=21,045.08$ feet; $y=1,315,161.39$ feet.

Marinette, Pioneer Presbyterian Church, spire (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, at corner of Church and Newberry Streets. Point observed was center of tall, slim octagonal spire, covered with green asbestos shingles, and having ornamental iron finial at top; it surmounts square tower with open arched belfry which is above main wooden church structure.

Plane coordinates: (W), $x=790,667.38$ feet; $y=1,312,681.36$ feet. (C), $x=15,964.56$ feet; $y=1,316,268.72$ feet.

Marinette, Gram Methodist Episcopal Church, spire (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, on Main Street just east of business district. Point observed was finial about 75 feet high on top of square, pyramidal, slate-roofed spire with red metal edges, which surmounts red-brick tower with large open belfry having two large gothic-arched openings on each side.

Plane coordinates: (W), $x=789,989.14$ feet; $y=1,313,499.88$ feet. (C), $x=15,317.04$ feet; $y=1,317,111.97$ feet.

Marinette, Lauerman's Department Store, tank (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, at corner of Hall Avenue and Main Street, on short brick parapet on roof of three-story building housing Lauerman's Department Store. Tank is slim, gray, wooden tank lettered with large "L" and has conical, green top with very prominent, conically-shaped finial at center. Point observed was center of tank.

Plane coordinates:[1] (W), $x=789,078$ feet; $y=1,313,766$ feet. (C), $x=14,416$ feet; $y=1,317,411$ feet.

Marinette, French Church of St. Joseph, statue on dome (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, at intersection of Carney Boulevard and Stanton Street. Church was erected in 1881, and has stone tablet above doorway which is inscribed "Eglise Francais de St. Joseph." Point observed was center of statue of St. Joseph on top of silvered dome which rises from round tower having alternate wide silver panels and narrow dark panels—giving appearance of open-columned cupola from distance.

Plane coordinates:[1] (W), $x=791,355$ feet; $y=1,311,333$ feet. (C), $x=16,602$ feet; $y=1,314,895$ feet.

Marinette, Sacred Heart Church, spire (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, on Elizabeth Avenue near Ninth Street. Point observed was center of octagonal spire which is painted silver at top and bottom leaving center portion wide black band; has ornamental coping at top surmounted by gilded wooden cross; base is square red-brick tower with triangular gable and cornice on each side. Church was erected in 1893.

Plane coordinates:[1] (W), $x=792,723$ feet; $y=1,310,560$ feet. (C), $x=17,940$ feet; $y=1,314,072$ feet.

Marinette, Marinette County Courthouse, dome (Marinette County, Wis., C. A. Schanck, 1934).—In city of Marinette, on top of center of courthouse building which faces on Hall Street at Court Street. Dome is square, dome-shaped roof with gilded weather vane at center and small glass window in each side; it rises from square gray stone tower which has two columns on each face with horizontal louvres between columns. Point observed was center of gilded weather vane on top of dome.

Plane coordinates:[1] (W), $x=788,328$ feet; $y=1,314,077$ feet. (C), $x=13,678$ feet; $y=1,317,751$ feet.

Sven Observation Tower (Door County, Wis., C. A. Schanck, 1934).—North of town of Fish Creek, on Skyline Boulevard in Peninsular State Park. Tower is about 50 feet high, and overlooks Green Bay. Point observed was center of observation tower.

Plane coordinates:[1] (W), $x=889,849$ feet; $y=1,335,394$ feet. (C), $x=115,929$ feet; $y=1,335,287$ feet.

Middle Inlet lookout tower (Marinette County, Wis., C. A. Schanck, 1934).—About 9 miles northeast of Crivitz, 18 miles northwest of Marinette, in NE¼ sec. 20, T. 33 N., R. 21 E., on land owned by Mr. Roose. Center of the tower is 20.48 feet north-northwest of station *Inlet* (see description thereof).

Plane coordinates:[1] (W), $x=734,373$ feet; $y=1,386,355$ feet.

[1] No check on this position.

For notes in regard to marking of stations see p. 167.

Eagle Bluff Lighthouse (Door County, Wis., C. A. Schanck, 1934).—North of town of Fish Creek and about 50 feet southeast of shoreline of Green Bay. This lighthouse was constructed in 1868. Point observed on was center of light about 60 feet high. Triangulation station *Eagle Bluff* (*U. S. L.S.*) (see description and geographic position thereof) is 130.45 feet from center of lighthouse.

Plane coordinates:[1] (W), $x=890,325$ feet; $y=1,340,760$ feet. (C), $x=116,604$ feet; $y=1,340,631$ feet.

U. S. LAKE SURVEY STATIONS NOT RIGIDLY ADJUSTED

Keweenaw Point, middle base (U. S. L. S.) (Baraga County, U. S. Lake Survey 1871).—About midway between stations *Keweenaw Point, north base* (*U. S. L. S.*) and *Keweenaw Point, south base* (*U. S. L. S.*) (see descriptions thereof). Marked by single stone post. In 1929 it was reported that this station was destroyed in building the highway from L'anse to Houghton.[7]

Copper Harbor latitude mark (U. S. L. S.) (Keweenaw County, O. B. Wheeler, 1865).—About 1 mile east of Copper Harbor and just north of Fort Wilkin's Marked by pine post. Stone post marked "S" is just outside fort fence, 71.29 meters (233.9 feet) (2.31″ of latitude) south of the observatory post, and cross on rock near water's edge is 157.25 meters (515.9 feet) north. In 1934, cross on rock was reported recovered.[7]

St. Ignace (U. S. L. S.) (Thunder Bay District, Ontario, Canada, U. S. Lake Survey, 1867; 1872).—Near north shore of Lake Superior, on east end and highest part of Isle St. Ignace. Marked by cross cut in solid rock. Small piles of rock were placed at corners of station tower, and as rock in immediate vicinity is destitute of vegetation, site can be easily identified. Station is also called "Isle Saint Ignace" by U. S. Lake Survey.[7]

Tip Top (U. S. L. S.) (Thunder Bay District, Ontario, Canada, U. S. Lake Survey, 1867; 1871).—On northeast shore of Lake Superior, about 8 miles northeast of Simmons' Harbor (harbor is about 10 miles north of Otter Head). Marked by brass frustum leaded into solid rock. Over this frustum was placed tripod about 3 feet high, loaded with stones to keep it in position. Reference marks are boulders, at following distances and bearings from station: 94.6 feet, N. 46°24′ W.; 68.5 feet, N. 85° W.; and 274.0 feet, S. 71°28′ W. Southwest boulder is at highest point of hill, and there is some soil in its vicinity. Near station, rock is slightly lower and destitute of soil.[7]

Michipicoten (U. S. L. S.) (Thunder Bay District, Ontario, Canada, U. S. Lake Survey, 1869; 1871).—On northwest side and highest part of Michipicoten Island. Approached from mining company's landing on northwest coast. Marked by cross cut in solid rock. Reference mark is stone post, 120.25 feet from station and bearing S. 44°04′ W. In 1894 it was reported that mark could not be identified.[7]

Paugon (U. S. L. S.) (Thunder Bay district, Ontario, Canada, U. S. Lake Survey, 1869).—On northeast shore of Lake Superior, nearly due north of east end of Michipicoten Island. Marked by brass pin set into surface rock.[7]

Batchewana middle base (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On neck of land near east end of Batchewana Island, near line between *Batchewana east base* (*U. S. L. S.*) and *Batchewana west base* (*U. S. L. S.*) (see descriptions and geographic positions thereof). Marked by stone.[7]

Robbins (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1895).—On west shore of Whitefish Bay, about 3 miles south of Shelldrake River, and 20 feet from edge of bluff. Marked by ½-inch drill hole in flat field stone with letters "U. S." cut on it, 2 feet below surface of ground.[7]

Salt Point (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1896).—About 9 miles west of Iroquois Island, on extremity of point of land on south shore of Whitefish Bay, about 30 feet from shore. Marked by ⅜-inch drill hole between letters "U. S." in top of cut stone post, projecting 3 inches above ground.[7]

Phillips (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1893).—About 9 miles east of Ecoba (station on Canadian Pacific Ry.), about 1 mile north of lake on land owned by Hugh Phillips, and supposed to be on lot 4 of third concession, Coffin Addition, Aberdeen Township. Marked by ⅝-inch hole in cut stone, top of which is 3½ feet below surface of ground. Reference marks are 4 field boulders with crosses and letters "U. S." on them, approximately north, east, south, and west, each 25 feet from station, and 35.25 feet apart,

[1] No check on this position.
[7] For plane coordinates consult index.

For notes in regard to marking of stations see p. 167.

making an exact square. A 24-inch maple tree is 64 feet from station, bearing S. 85° 44′ E.[7]

South Gros Cap (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1893; 1894).—On rock bluff on west edge of Gros Cap Mountain. Marked by ½-inch drill hole in rock which projects slightly in hollow of ledge. Station also called Gros Cap by U. S. Lake Survey.[7]

Middle Pancake (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On edge of bluff at north side of Pancake Bay, about 200 feet from shore. Marked by stone.[7]

South Pancake (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—About 2 miles north of Corbeil Point Light, on small point on shore of Pancake Bay. Marked by ½-inch drill hole and letters "U. S." cut in top of large flat rock, set 12 inches below surface of ground in pile of broken rock.[7]

East Bay (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On west wide of small island at east end of Batchewana Bay. Marked by ½-inch drill hole and letters "U. S." cut in solid rock.[7]

Rock (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On top of solid rock point on west side of small bay at southeast end of Batchewana Bay. Marked by ½-inch drill hole and letters "U. S." in solid rock.[7]

Sand Point (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On long sandy point projecting from north shore of Batchewana Bay toward east end of Batchewana Island. Marked by cross cut in top of dressed stone post, projecting about 6 inches above ground.[7]

Steamboat Island (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On east side of Steamboat Island, near North Sandy Island. Marked by stone.[7]

North Sandy (1868) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1868; 1895).—In Whitefish Bay, on west side of North Sandy Island on top of bluff, near edge of timber. Marked by lead-filled hole in cut stone, with letters "U. S." cut in top surface which is 2 feet below surface of ground.[7]

South Sandy (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On south end of South Sandy Island. Marked by stone.[7]

South Shore (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On birch point on south shore of Batchewana Bay. Marked by stone post.[7]

Rudder Head (1895) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On shore at north end of Rudder Head Point. Marked by ½-inch drill hole and letters "U. S." in rock.[7]

Rudder Head (1868) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1868; 1895.—On point north of Maple Island. Marked by stone.[7]

Maple Island (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On west shore of Maple Island, about 40 feet from water's edge. Marked by drill hole between letters "U. S." in top of field stone, top of which is 6 inches below surface of ground. Reference mark is large boulder with cross and letters "U. S." cut in top, 104.2 feet from station bearing N. 6° W. Corbeil Point light bears N. 9°33′ W. from station.[7]

Goulais Point (1868) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1868; 1895).—On west side of point of land forming Goulais Bay, about midway between south end of Goulais Point and bay back of Maple Island, and on top of bank about 20 feet from beach. Marked by stone post.[7]

Goulais Point (1895) (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—Near end of point separating Goulais Bay from Whitefish Bay, about 30 feet from shore. Marked by ⅜-inch drill hole between letters "U. S." cut in top of 6- by 6- by 24-inch stone, top of which is about 6 inches below surface of ground.[7]

Crawford (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—About ¼ mile west of Crawford's Landing, about 1½ mile northeast of Corbeil Point Light, on edge of bluff near shore. Marked by cross on dressed stone, with letters "U. S." cut on side, top of stone projects 6 inches above ground.[7]

North Parisian (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On north end of Parisian Island. Marked by stone. U. S.

[7] For plane coordinates consult index.

For notes in regard to marking of stations see p. 167.

Lake Survey reports that this station is within 2 or 3 feet of station North Parisian (1868).[7]

South Parisian (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On south end of Parisian Island. Marked by 8-foot wooden post set 4½ feet in ground.[7]

North Gros Cap (U. S. L. S.) (Algoma District, Ontario, Canada, U. S. Lake Survey, 1895).—On rock point projecting into Whitefish Bay and forming southern limit of Goulais Bay. Marked by ½-inch drill hole surrounded by 6-inch triangle cut in solid rock. Reference marks are crosses cut in rock with letters "U. S." cut near them, and are at following distances and bearings from station: 43.22 feet, approximately east; and 70.75 feet, S. 60° E.[7]

Taquamenon Island (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1868; 1895).—On west side of Tequamenon Island. Marked by cross cut on large boulder. U. S. Lake Survey reports also call this station "Tequamenon." [7]

Emerson (U. S. L. S.) (Chippewa County, U. S. Lake Survey, 1895).—On sand bank at south side of mouth of Tequamenon River. Marked by stone.[7]

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED

Lake Superior

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	West Zone	Central Zone		West Zone	Central Zone
	Feet	*Feet*		*Feet*	*Feet*
Michigan Island Lighthouse (U. S. L. S.).	63, 128 1, 962, 755	---------- ----------	Delta County: SE. corner of sec. 12, T. 38 N., R. 23 W. (U. S. L. S.).	921, 481 1, 530, 374	154, 808 1, 528, 944
Franklin shaft house No. 2 (U. S. L. S.)	544, 957 2, 056, 935	---------- ----------	△⊙91. Gillman (U. S. L. S.), 1868.	54, 116 1, 859, 541	---------- ----------
Lamson's tree (U. S. L. S.)	522, 537 2, 080, 405	---------- ----------	Little Girls Point, stake 57, Gillman (U. S. L. S.).	101, 934 1, 866, 144	---------- ----------
Granite Island Lighthouse (U. S. L. S.).	835, 591 1, 905, 909	---------- ----------	△1871. Presque Isle River (U. S. L. S.).	193, 459 1, 901, 914	---------- ----------
Observatory post, Thones Hill (U. S. L. S.).	826, 930 1, 836, 750	---------- ----------	⊙22. Gillman (U. S. L. S.), 1868.	101, 939 2, 279, 825	---------- ----------
Marquette Catholic Church (U. S. L. S.).	840, 063 1, 840, 515	---------- ----------	△1. Lt. Rodgers, 1868, or Gillman (U. S. L. S.).	146, 152 2, 291, 365	---------- ----------
Marquette, dome of City Hall (U. S. L. S.).	840, 623 1, 840, 638	---------- ----------	⊙69. Lt. Rodgers (U. S. L. S.), 1868.	208, 531 2, 315, 601	---------- ----------
Marquette, M. E. Church (U. S. L. S.).	841, 710 1, 842, 013	---------- --------	⊙53½. Lt. Rodgers (U. S. L. S.), 1868.	220, 474 2, 322, 428	---------- ----------
Marquette, old schoolhouse (U. S. L. S.).	842, 557 1, 842, 086	---------- ----------	△X′ (U. S. L. S.)	539, 638 2, 407, 323	---------- ----------
Marquette Lighthouse (U. S. L. S.).	845, 683 1, 842, 539	---------- ----------	Isle Royal Lighthouse (U. S. L. S.).	541, 745 2, 402, 433	---------- ----------
Carp (U. S. L. S.)	844, 909 1, 831, 260	---------- ----------	△Point (U. S. L. S.)	543, 258 2, 396, 353	---------- ----------
Schoolcraft County, Mich.: NE. corner of sec. 27, T. 46 N., R. 19 W. (U. S. L. S.).	---------- ----------	270, 891 1, 773, 592	Keweenaw Point, middle base (U. S. L. S.), 1871, l. 1929 (d. m.).	570, 065 1, 971, 729	---------- ----------
Schoolcraft County, Mich.: SE. corner of sec. 4, T. 45 N., R. 20 W. (U. S. L. S.).	---------- ----------	233, 775 1, 758, 087	Mount Houghton (U. S. L. S.), 1867, l. 1934.	700, 218 2, 154, 428	---------- ----------
Delta County: NW. corner of NE. quarter of sec. 16, T. 42 N., R. 19 W. (U. S. L. S.).	---------- ----------	261, 820 1, 656, 923	East Bluff (U. S. L. S.), 1865	736, 572 2, 169, 011	---------- ----------
			Manitou Island Lighthouse (U. S. L. S.), 1865.	787, 908 2, 160, 103	---------- ----------

[7] For plane coordinates consult index.

For notes in regard to marking of stations see p. 167.

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Lake Superior—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	West Zone	Central Zone		West Zone	Central Zone
	Feet	*Feet*		*Feet*	*Feet*
West Bluff (U. S. L. S.), 1865, l. 1934.	706, 107 2, 175, 885	---------- ----------	Copper Harbor latitude mark (U. S. L. S.), 1865.	718, 673 2, 177, 201	---------- ----------
Montreal (U. S. L. S.), 1865	712, 539 2, 166, 418	---------- ----------	B (U. S. L. S.), 1865	719, 979 2, 176, 339	---------- ----------
Silver Creek (U. S. L. S.), 1865.	729, 497 2, 171, 125	---------- ----------	Copper Harbor Lighthouse (U. S. L. S.), 1865.	720, 003 2, 179, 163	---------- ----------
C (U. S. L. S.), 1865	720, 059 2, 179, 146	---------- ----------	Mount Bohemia (U. S. L. S.), 1865, l. 1934.	682, 393 2, 148, 630	---------- ----------
D (U. S. L. S.), 1865	719, 534 2, 174, 000	---------- ----------	Mount Lookout (U. S. L. S.), 1865 (Bald Pate, 1855), l. 1934.	660, 258 2, 168, 956	---------- ----------
⊙16. Gillman (U. S. L. S.)	715, 365 2, 179, 243	---------- ----------	⊙CXXI (U. S. L. S.)	656, 993 2, 176, 266	---------- ----------
A (U. S. L. S.), 1865	717, 531 2, 176, 934	---------- ----------	Eagle Harbor Lighthouse (U. S. L. S.).	646, 221 2, 173, 594	---------- ----------
Copper Harbor astronomic station (U. S. L. S.), 1865.	718, 678 2, 176, 683	---------- ----------			

Keweenaw Bay

Huron Island Lighthouse (U. S. L. S.).	687, 551 1, 992, 362	---------- ----------	Stannard Rock day beacon (U. S. L. S.), 1867.	879, 760 2, 073, 185	---------- ----------
Point Abbeye (U. S. L. S.), 1867.	651, 186 1, 993, 520	---------- ----------	Schultz (1865) (U. S. L. S.)	567, 730 1, 954, 050	---------- ----------
Huron Island (U. S. L. S.), 1867.	687, 515 1, 992, 331	---------- ----------	Au Village (U. S. L. S.), 1865	586, 694 1, 950, 899	---------- ----------
Tobacco River (U. S. L. S.), 1867.	662, 305 2, 101, 031	---------- ----------	Bendery (1865) (U. S. L. S.)	573, 792 1, 916, 898	---------- ----------
Bete Gris (U. S. L. S.), 1867	699, 344 2, 128, 008	---------- ----------	Portage Entry Lighthouse (U. S. L. S.).	583, 895 1, 997, 044	---------- ----------
Keweenaw (U. S. L. S.), 1867	756, 659 2, 152, 969	---------- ----------	Crebassa latitude post (U. S. L. S.).	583, 684 1, 997, 031	---------- ----------
Manitou Island (U. S. L. S.), 1867.	780, 200 2, 155, 695	---------- ----------			

Lake Superior

	Central Zone	East Zone		Central Zone	East Zone
Tip Top (U. S. L. S.) (Canada), 1867, r. 1871 (d. m.).	438, 295 2, 469, 447	---------- ----------	Whitefish Point latitude post (U. S. L. S.), 1867.	698, 628 1, 921, 386	176, 561 1, 923, 104
Michipicoten (U. S. L. S.) (Canada), 1869, p. l. 1894 (d. m.).	467, 322 2, 280, 597	---------- ----------	Robbins (U. S. L. S.), 1895 (d. m.).	679, 806 1, 872, 464	156, 447 1, 874, 692
Paugon (U. S. L. S.) (Canada), 1869 (d. m.).	542, 670 2, 353, 909	---------- ----------	Salt Point (U. S. L. S.), 1896 (d. m.).	---------- ----------	198, 932 1, 813, 947
Batchewana middle base (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	299, 021 1, 965, 014			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE		CENTRAL ZONE	EAST ZONE
	Feet	*Feet*		*Feet*	*Feet*
Lake George Lighthouse (U. S. L. S.), 1893.	---------- ----------	378,445 1,790,392	Sault Ste. Marie, Observatory, west pier (U. S. L. S.), 1893 (d. m.).	---------- ----------	328,167 1,823,835

Green Bay

Round Island (U. S. L. S.), 1864.	241,002 1,550,002	---------- ----------	Flat Rock (U. S. L. S.), 1863	166,655 1,566,943	---------- ----------
Garden Bluff (U. S. L. S.), 1864.	275,375 1,561,940	---------- ----------	E (south) (U. S. L. S.), 1863	180,314 1,581,190	---------- ----------
Chippewa Point (U. S. L. S.), 1864.	220,926 1,540,080	---------- ----------	Bluff (U. S. L. S.), 1863	170,352 1,582,114	---------- ----------
St. Vidal Point (U. S. L. S.), 1864.	236,318 1,567,078	---------- ----------	A east base (U. S. L. S.), 1863.	181,279 1,587,223	---------- ----------
Middle Bluff (U. S. L. S.), 1864.	265,980 1,541,170	---------- ----------	D (U. S. L. S.), 1863	186,275 1,587,290	---------- ----------
Indian Point (U. S. L. S.), 1864.	253,034 1,584,111	---------- ----------	C (U. S. L. S.), 1863	180,314 1,595,764	---------- ----------
Stony Point (U. S. L. S.), 1864.	271,079 1,581,697	---------- ----------	B west base (U. S. L. S.), 1863.	175,689 1,590,237	---------- ----------
Valentine Point (U. S. L. S.), 1864.	298,664 1,585,105	---------- ----------	E (north) (U. S. L. S.), 1863	190,705 1,593,149	---------- ----------
Porcupine Point (U. S. L. S.), 1864.	283,778 1,596,533	---------- ----------	F (north) (U. S. L. S.), 1863	185,784 1,603,701	---------- ----------
Fishdam (old) (U. S. L. S.), 1864.	298,431 1,601,487	---------- ----------	G (north) (U. S. L. S.), 1863	195,076 1,599,996	---------- ----------
St. Vidal Island (U. S. L. S.), 1864.	242,309 1,568,983	---------- ----------	H (U. S. L. S.), 1863	194,791 1,605,728	---------- ----------
Sand Point (U. S. L. S.), 1863	169,532 1,549,807	---------- ----------	I (mouth of Whitefish River) (U. S. L. S.), 1863.	191,363 1,608,935	---------- ----------
G (south) (U. S. L. S.), 1863	184,632 1,535,587	---------- ----------			

Lake Michigan, north end

Boyers Bluff (old) (U. S. L. S.) Wis., 1864.	195,386 1,431,038	---------- ----------	Cat Head (U. S. L. S.), 1860	534,008 1,342,265	---------- ----------
Peninsula Point (U. S. L. S.), 1864.	188,842 1,521,474	---------- ----------	Middle Village (U. S. L. S.), 1860.	665,480 1,487,146	---------- ----------
Ford River (old) (U. S. L. S.), 1864.	154,863 1,529,062	---------- ----------	Pine River (U. S. L. S.), 1860	629,282 1,397,096	---------- ----------
Burnt Bluff (old) (U. S. L. S.), 1864.	254,437 1,527,177	---------- ----------	Hat Island (U. S. L. S.), 1853	614,939 1,573,836	---------- ----------
South Fox (U. S. L. S.), 1860	471,682 1,427,317	---------- ----------	Pt. aux Chenes (U. S. L. S.), 1853.	712,848 1,614,935	---------- ----------
Northwest Manitou (U. S. L. S.), 1864.	423,616 1,332,748	---------- ----------	d (U. S. L. S.), 1853	707,306 1,553,526	---------- ----------

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Lake Michigan, north end—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
Grand Traverse Lighthouse (U. S. L. S.), 1860.	551, 555 1, 352, 305	---------- ----------	Garden Island (U. S. L. S.), 1854.	558, 515 1, 575, 375	---------- ----------
North Fox (U. S. L. S.), 1860.	493, 884 1, 446, 732	---------- ----------	Scott Point (U. S. L. S.)	513, 819 1, 625, 443	---------- ----------
Beaver Island Lighthouse (U. S. L. S.), 1860.	545, 203 1, 485, 515	---------- ----------	High Island (U. S. L. S.), 1854.	516, 929 1, 542, 369	---------- ----------
Waugoshance Lighthouse (U. S. L. S.), 1853.	667, 946 1, 563, 324	---------- ----------	Seul Choix (U. S. L. S.)	458, 024 1, 611, 305	---------- ----------
Biddle Point (U. S. L. S.), 1854.	594, 378 1, 667, 938	---------- ----------	Gull Island (U. S. L. S.), 1855.	478, 701 1, 531, 724	---------- ----------
Point Paterson (U. S. L. S.), 1854.	524, 361 1, 628, 458	---------- ----------			

Straits of Mackinac

Point St. Martin (new) (U. S. L. S.), 1851, r. 1896 (m.).	809, 676 1, 631, 435	279, 943 1, 630, 318	E′ of E. P. S. (U. S. L. S.), 1851.	919, 300 1, 632, 749	389, 555 1, 628, 766
Point Fuyard (new) (U. S. L. S.), 1896.	843, 074 1, 625, 005	313, 161 1, 623, 017	Point St. Vital (U. S. L. S.), 1851.	945, 821 1, 625, 952	415, 885 1, 621, 279
McGulpin Point Lighthouse (U. S. L. S.), 1896.	749, 243 1, 564, 096	217, 773 1, 564, 578	Mast (U. S. L. S.)	912, 122 1, 489, 225	378, 641 1, 485, 499
St. Ignace smokestack (U. S. L. S.), 1896.	---------- ----------	235, 630 1, 589, 133	Round Island astronomical station (U. S. L. S.), 1853.	789, 947 1, 582, 174	258, 935 1, 581, 590
Magnetic station (Mackinac), west base (U. S. L. S.), 1896.	---------- ----------	217, 867 1, 565, 342	P (U. S. L. S.), 1851	796, 707 1, 571, 579	265, 417 1, 570, 822
B. Mackinac, east base (old) (U. S. L. S.).	776, 023 1, 548, 109	244, 128 1, 547, 899	Q (U. S. L. S.), 1849	781, 547 1, 547, 996	249, 647 1, 547, 642
H. near Pine River (U. S. L. S.), 1851.	783, 417 1, 656, 919	---------- ----------	R (U. S. L. S.), 1853	813, 031 1, 555, 615	281, 319 1, 554, 438
I. Point St. Martin (U. S. L. S.), 1851, 1896 (d. m.).	809, 676 1, 631, 434	---------- ----------	S (U. S. L. S.), 1851	804, 516 1, 536, 453	272, 308 1, 535, 505
K. Goose Island (north end) (U. S. L. S.).	835, 097 1, 616, 055	304, 953 1, 614, 280	T (U. S. L. S.)	820, 504 1, 545, 880	288, 535 1, 544, 512
L. Point Fuyard (U. S. L. S.), 1849.	848, 504 1, 618, 682	318, 424 1, 616, 555	U (U. S. L. S.), 1851	819, 944 1, 523, 406	287, 391 1, 522, 061
Bois Blanc Lighthouse (U. S. L. S.), 1849.	838, 936 1, 573, 902	307, 691 1, 572, 043	V (U. S. L. S.), 1849	823, 599 1, 544, 519	291, 594 1, 543, 071
O. Bois Blanc Island (U. S. L. S.), 1851.	855, 702 1, 560, 156	324, 092 1, 557, 866	X (U. S. L. S.), 1851	839, 867 1, 541, 040	307, 766 1, 539, 170
N. Beaver Tail Point (U. S. L. S.), 1851.	901, 517 1, 631, 687	371, 753 1, 628, 170	W (U. S. L. S.), 1851	840, 152 1, 522, 534	307, 568 1, 520, 663
Spectacle Reef water station (U. S. L. S.), 1851.	911, 773 1, 559, 786	380, 128 1, 556, 035	Y (U. S. L. S.), 1851	863, 297 1, 520, 921	330, 663 1, 518, 450
M. water station (1851) (U. S. L. S.).	907, 662 1, 612, 567	377, 395 1, 608, 898	Cheboygan Lighthouse (U. S. L. S.), 1851.	840, 117 1, 522, 522	307, 533 1, 520, 653
			Z (U. S. L. S.), 1851	892, 529 1, 510, 788	359, 618 1, 507, 561

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Straits of Mackinac—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE		CENTRAL ZONE	EAST ZONE
	Feet	*Feet*		*Feet*	*Feet*
2 of E. P. S., 1849, northwest point of Isle Brule or Great St. Martin Island (U. S. L. S.).	783, 350 1, 635, 113	---------- ----------	3 on Isle Brule (U. S. L. S.)	782, 690 1, 626, 799	---------- ----------
G or 8 (on main shore) (U. S. L. S.).	770, 827 1, 632, 074	---------- ----------	W 1849 (Goose Island Reef) (U. S. L. S.).	837, 549 1, 610, 356	---------- ----------
V of E. P. S. (U. S. L. S.)	875, 810 1, 637, 578	346, 212 1, 634, 730	P of E. P. S., 1849 (U. S. L. S.).	838, 050 1, 632, 820	---------- ----------
P of E. P. S., 1851, Les Cheneaux (U. S. L. S.).	885, 504 1, 635, 471	355, 846 1, 632, 370	I of E. P. S. (U. S. L. S.)	835, 444 1, 640, 472	---------- ----------
Y of E. P. S. (U. S. L. S.)	890, 606 1, 638, 215	361, 017 1, 634, 980	Detour Lighthouse (1849) (U. S. L. S.).	---------- ----------	436, 723 1, 624, 235

St. Marys River

South Gros Cap (U. S. L. S.) (Canada), 1893 (d. m.).	---------- ----------	267, 913 1, 836, 148	△2 (U. S. L. S.) (Canada)	---------- ----------	317, 442 1, 826, 747
A (U. S. L. S.) (Canada)	---------- ----------	275, 191 1, 824, 765	7 (U. S. L. S.)	---------- ----------	322, 080 1, 823, 796
I (U. S. L. S.)	---------- ----------	267, 197 1, 803, 518	6 (U. S. L. S.) (Canada)	---------- ----------	325, 440 1, 826, 970
B (U. S. L. S.) (Canada)	---------- ----------	281, 999 1, 817, 457	9 (U. S. L. S.)	---------- ----------	326, 478 1, 821, 351
M (U. S. L. S.)	---------- ----------	283, 933 1, 799, 566	8 (U. S. L. S.) (Canada)	---------- ----------	333, 263 1, 825, 449
10 (U. S. L. S.) (Canada)	---------- ----------	286, 663 1, 812, 472	21 (U. S. L. S.)	---------- ----------	337, 434 1, 819, 210
15, Ripley (U. S. L. S.)	---------- ----------	290, 678 1, 804, 308	14. Ripley, Topsail Island (U. S. L. S.) (Canada).	---------- ----------	341, 132 1, 821, 525
12 (U. S. L. S.) (Canada)	---------- ----------	296, 512 1, 810, 509	L (U. S. L. S.)	---------- ----------	276, 610 1, 793, 965
17 (U. S. L. S.)	---------- ----------	298, 850 1, 801, 545	K (U. S. L. S.)	---------- ----------	264, 477 1, 796, 056
N (U. S. L. S.)	---------- ----------	301, 231 1, 812, 813	11 (U. S. L. S.)	---------- ----------	287, 476 1, 799, 378
C (U. S. L. S.) (Canada)	---------- ----------	299, 721 1, 815, 105	13 (U. S. L. S.)	---------- ----------	289, 377 1, 801, 859
O (U. S. L. S.)	---------- ----------	304, 670 1, 815, 044	5 (U. S. L. S.)	---------- ----------	322, 065 1, 821, 198
E (U. S. L. S.) (Canada)	---------- ----------	305, 028 1, 823, 636	□9 (U. S. L. S.)	---------- ----------	329, 052 1, 824, 763
D (U. S. L. S.) (Canada)	---------- ----------	297, 890 1, 822, 468	□11 (U. S. L. S.)	---------- ----------	330, 116 1, 823, 522
P (U. S. L. S.)	---------- ----------	309, 501 1, 818, 319	□4 (U. S. L.S.) (Canada)	---------- ----------	337, 797 1, 824, 572
□2 (U. S. L. S.) (Canada)	---------- ----------	315, 098 1, 825, 401	□15 (U. S. L. S.)	---------- ----------	334, 886 1, 821, 027
R (U. S. L. S.)	---------- ----------	311, 991 1, 819, 651	Magnetic station No. 1 (U. S. L. S.), 1894.	---------- ----------	329, 731 1, 822, 754
3 (U. S. L. S.)	---------- ----------	319, 901 1, 820, 707	Magnetic station No. 2 (U. S. L. S.), 1894.	---------- ----------	325, 625 1, 818, 144

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Lake Superior, Whitefish Bay

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
Middle Pancake (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	239,320 1,991,230	South Parisian (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	234,490 1,877,345
South Pancake (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	253,315 1,976,450	North Gros Cap (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	269,083 1,853,318
East Bay (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	321,591 1,954,632	Iroquois Lighthouse (U. S. L. S.), 1893.	---------- ----------	256,750 1,818,328
Rock (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	310,995 1,942,223	Iroquois Point observatory post (U. S. L. S.), 1867.	781,637 1,818,754	256,833 1,818,308
Sand Point (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	287,374 1,977,258	Iroquois Lighthouse (old) (U. S. L. S.).	---------- ----------	256,877 1,818,284
Corbay Lighthouse (U. S. L. S.) (Canada), 1895.	783,449 1,966,493	262,552 1,965,948	Iroquois (old station) (U. S. L. S.).	---------- ----------	247,093 1,814,025
Steamboat Island (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	250,526 1,949,154	Taquamenon Island (U. S. L. S.), 1868, r. 1895 (d. m.).	---------- ----------	177,309 1,836,805
North Sandy (1868) (U. S. L. S.) (Canada), 1868, r. 1895 (d. m.).	---------- ----------	250,348 1,943,633	Emerson (U. S. L. S.), 1895 (d. m.).	---------- ----------	157,722 1,845,262
South Sandy (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	253,814 1,934,571	Whitefish Point Lighthouse (U. S. L. S.), 1895.	698,608 1,922,393	176,567 1,924,112
South Shore (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	295,323 1,949,400	Emerson smokestack (U. S. L. S.), 1895.	681,443 1,838,268	157,181 1,840,460
Rudder Head (1895) (U. S. L. S.) (Canada) (d. m.).	---------- ----------	278,403 1,943,585	Shelldrake smokestack (U. S. L. S.), 1895.	680,753 1,887,632	157,795 1,889,832
Rudder Head (1868) (U. S. L. S.) (Canada), 1868, r. 1895 (d. m.).	---------- ----------	276,062 1,939,574	Dollar Settlement (U. S. L. S.), 1896.	---------- ----------	231,068 1,811,369
Maple Island (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	271,036 1,922,379	Iroquois Island (U. S. L. S.), 1896.	---------- ----------	244,503 1,821,665
Goulais Point (1868) (U. S. L. S.) (Canada), 1868 r. 1895 (d. m.).	---------- ----------	272,108 1,902,221	Luce County, Mich.: Sec. corner 11, 12, 13, 14, T. 50 N., R. 8 W. (U. S. L. S.).	622,846 1,909,608	100,481 1,913,337
Goulais Point (1895) (U. S. L. S.) (Canada), (d. m.).	---------- ----------	277,077 1,890,885	Chippewa County, Mich.: Sec. corner 5, 6, 31, 32, T. 51 N., R. 5 W. (U. S. L. S.).	696,460 1,921,053	174,384 1,922,829
Crawford (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	267,220 1,971,141	Foremast of wreck *Josephine* (U. S. L. S.) (Canada).	---------- ----------	247,969 1,946,951
North Parisian (U. S. L. S.) (Canada), 1895 (d. m.).	---------- ----------	232,234 1,903,362	Pancake Shoal water station (of 1868 survey) (U. S. L. S.) (Canada).	---------- ----------	215,816 1,976,708

St. Marys River

Waiska smokestack (U. S. L. S.), 1893.	---------- ----------	269,371 1,799,426	Canal Park flagstaff (U. S. L. S.), 1893.	---------- ----------	327,846 1,824,004
Round Island Lighthouse (Upper St. Marys River) (U. S. L. S.), 1893.	---------- ----------	285,970 1,802,955	Sault Ste. Marie, courthouse flagstaff (U. S. L. S.), 1893.	---------- ----------	329,117 1,822,634
Point aux Pins Lighthouse (U. S. L. S.) (Canada), 1893.	---------- ----------	296,836 1,810,557	Sault Ste. Marie, St. Marys Catholic Church spire (U. S. L. S.), 1893.	---------- ----------	330,126 1,822,699
Sault Ste. Marie, Fort Brady flagstaff (U. S. L. S.), 1893.	---------- ----------	325,509 1,820,846	Sault Ste. Marie, Ontario, International Hotel (U. S. L. S.), 1893.	---------- ----------	331,477 1,828,119

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River—Continued

Station	x coordinate; y coordinate	
	Central Zone	East Zone
	Feet	*Feet*
Sault Ste. Marie, Ontario, Catholic Church spire (U. S. L. S.), 1893.	----------	334,013
	----------	1,825,961
Sault Ste. Marie, Ontario, Indian Home flagstaff (U. S. L. S.), 1893.	----------	343,629
	----------	1,823,356
Crib light post (Ross) (U. S. L. S.) (Canada), 1894.	----------	389,789
	----------	1,731,518
Smokestack (tallest of three at Sailors' Encampment) (U. S. L. S.), 1894.	----------	388,074
	----------	1,731,329
Iron tower (Winter Point, back range) (U. S. L. S.), 1894.	----------	377,300
	----------	1,720,035
Lightkeeper's house, chimney, Winter Point (U. S. L. S.), 1894.	----------	377,391
	----------	1,719,957
Pilot Island, front range light (U. S. L. S.), 1894.	----------	381,745
	----------	1,704,802
Round Island Lighthouse (lower St. Marys River) (U. S. L. S.), 1894.	----------	410,409
	----------	1,680,188
Sweets Point light (post) (U. S. L. S.), 1894.	960,772	431,684
	1,658,679	1,653,597
Pipe Island Lighthouse (U. S. L. S.), 1894.	970,112	440,832
	1,651,577	1,646,255
Frying Pan Lighthouse (U. S. L. S.), 1894.	971,283	441,722
	1,640,846	1,635,499
200 (U. S. L. S.), 1894 (m.)	----------	393,504
		1,715,777
201. Twin Island (U. S. L. S.), 1894 (m.).	----------	393,757
	----------	1,697,901
202 (U. S. L. S.) (Canada), 1894 (m.).	----------	397,428
	----------	1,710,184
202 A (U. S. L. S.), (Canada), 1894 (m.).	----------	401,684
	----------	1,705,886
203 (U. S. L. S.), 1894 (m.)	----------	400,200
	----------	1,693,806
204 (U. S. L. S.) (Canada), 1894 (m.).	----------	412,286
	----------	1,699,295
208 (U. S. L. S.) (Canada), 1894 (m.).	----------	421,680
	----------	1,680,010
205 (U. S. L. S.), 1894 (m.)	----------	401,780
	----------	1,681,946
206 (U. S. L. S.), (Canada), 1894 (m.).	943,511	415,272
	1,690,742	1,686,095
207 (U. S. L. S.), 1894 (m.)	941,219	412,647
	1,677,969	1,673,389
209 (U. S. L. S.), 1894 (m.)	945,235	416,702
	1,679,578	1,674,892
211 (U. S. L. S.), 1894 (m.)	950,148	421,429
	1,672,554	1,667,743
210 (U. S. L. S.) (Canada), 1894 (m.).	954,279	425,732
	1,679,199	1,674,277
212 (U. S. L. S.) (Canada), 1894 (m.).	955,832	427,097
	1,672,059	1,667,099
213 (U. S. L. S.), 1894 (m.)	950,594	421,784
	1,669,129	1,664,308
214 (U. S. L. S.) (Canada), 1894 (m.).	962,066	433,262
	1,669,586	1,664,464
215 (U. S. L. S.), 1894 (m.)	943,921	414,912
	1,661,366	1,656,724
216 (U. S. L. S.) (Canada), 1894 (m.).	969,801	441,054
	1,671,909	1,666,584
217 (U. S. L. S.), 1894 (m.)	949,219	420,074
	1,656,289	1,651,511
218 (U. S. L. S.) (Canada), 1894 (m.).	971,611	442,979
	1,676,354	1,670,979
219 (U. S. L. S.), 1894 (m.)	955,257	426,105
	1,656,116	1,651,180
221 (U. S. L. S.), 1894 (m.)	961,255	432,123
	1,657,023	1,651,929
222 (U. S. L. S.) (Canada), 1894 (m.).	----------	446,240
	----------	1,688,471
223 (U. S. L. S.), 1894 (m.)	----------	439,682
	----------	1,654,539
225 (U. S. L. S.), 1894 (m.)	----------	442,860
	----------	1,649,734
231 (U. S. L. S.), 1894 (m.)	----------	449,282
	----------	1,643,643
227 (U. S. L. S.), 1894 (m.)	----------	438,328
	----------	1,644,626
229 (U. S. L. S.), 1894 (m.)	----------	454,773
	----------	1,649,794
232 (U. S. L. S.) (Canada), 1894 (m.).	----------	466,926
	----------	1,686,117
235 (U. S. L. S.), 1894 (m.)	----------	446,219
	----------	1,635,956
245 (U. S. L. S.), 1894 (m.)	----------	442,042
	----------	1,662,241
247 (U. S. L. S.), 1894 (m.)	----------	445,972
	----------	1,666,402
253 (U. S. L. S.), 1894 (m.)	----------	453,442
	----------	1,669,289

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE		CENTRAL ZONE	EAST ZONE
	Feet	*Feet*		*Feet*	*Feet*
228 (U. S. L. S.) (Canada), 1894 (m.).	----------	456, 832	283 (U. S. L. S.), 1894 (m.)	----------	468, 374
	----------	1, 689, 955		----------	1, 654, 242
261 (U. S. L. S.), 1894 (m.)	----------	452, 466	285 (U. S. L. S.), 1894 (m.)	----------	468, 093
	----------	1, 661, 953		----------	1, 663, 450
263 (U. S. L. S.), 1894 (m.)	----------	454, 234	287 (U. S. L. S.), 1894 (m.)	----------	463, 111
	----------	1, 659, 533		----------	1, 667, 396
267 (U. S. L. S.), 1894 (m.)	----------	459, 092	291 (U. S. L. S.), 1894 (m.)	----------	459, 555
	----------	1, 654, 575		----------	1, 677, 567
277 (U. S. L. S.), 1894 (m.)	----------	471, 209	Detour smokestack (U. S. L. S.), 1894.	970, 314	440, 821
	----------	1, 644, 999		1, 643, 434	1, 638, 111
273 (U. S. L. S.), 1894 (m.)	----------	461, 811	Detour church (U. S. L. S.), 1894.	969, 133	439, 692
	----------	1, 641, 281		1, 645, 368	1, 640, 075

St. Marys River, Hay Lake

23 (U. S. L. S.)	----------	341, 638	16 (U. S. L. S.)	----------	357, 152
	----------	1, 817, 387		----------	1, 790, 739
25 (U. S. L. S.)	----------	345, 512	15 (U. S. L. S.)	----------	351, 075
	----------	1, 819, 889		----------	1, 788, 633
16 (U. S. L. S.) (Canada)	----------	346, 106	18 (U. S. L. S.)	----------	358, 715
	----------	1, 821, 646		----------	1, 784, 382
4U (U. S. L. S.)	----------	344, 248	17 (U. S. L. S.)	----------	352, 375
	----------	1, 818, 698		----------	1, 783, 353
1 (U. S. L. S.)	----------	339, 849	20 (U. S. L. S.)	----------	364, 335
	----------	1, 816, 914		----------	1, 779, 136
6 (U. S. L. S.)	----------	343, 555	75 (U. S. L. S.)	----------	368, 651
	----------	1, 814, 048		----------	1, 773, 254
3 (U. S. L. S.)	----------	340, 970	21 (U. S. L. S.)	----------	359, 586
	----------	1, 811, 857		----------	1, 768, 588
8 (U. S. L. S.)	----------	345, 943	73 (U. S. L. S.)	----------	371, 370
	----------	1, 810, 938		----------	1, 764, 875
5 (U. S. L. S.)	----------	343, 200	76 (U. S. L. S.)	----------	358, 903
	----------	1, 809, 225		----------	1, 764, 699
7 (U. S. L. S.)	----------	345, 323	69 (U. S. L. S.)	----------	369, 320
	----------	1, 806, 882		----------	1, 759, 224
10 (U. S. L. S.)	----------	348, 642	67 (U. S. L. S.)	----------	373, 915
	----------	1, 807, 587		----------	1, 758, 379
9 (U. S. L. S.)	----------	346, 890	71 (U. S. L. S.)	----------	373, 589
	----------	1, 803, 127		----------	1, 761, 677
12 (U. S. L. S.)	----------	354, 248	□55 (U. S. L. S.)	----------	375, 949
	----------	1, 802, 293		----------	1, 760, 155
11 (U. S. L. S.)	----------	348, 721	57 (U. S. L. S.)	----------	378, 819
	----------	1, 800, 858		----------	1, 757, 430
14 (U. S. L. S.)	----------	354, 978	□53 (U. S. L. S.)	----------	382, 126
	----------	1, 798, 928		----------	1, 758, 555
13 (U. S. L. S.)	----------	350, 663			
	----------	1, 793, 437			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River, West Neebish

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
77 (U. S. L. S.)		367,312 1,758,168	89 R (U. S. L. S.)		367,395 1,740,031
78 (U. S. L. S.)		359,663 1,756,746	114 (U. S. L. S.)		367,487 1,736,123
79 (U. S. L. S.)		363,016 1,754,105	107 (U. S. L. S.)		369,718 1,736,477
80 (U. S. L. S.)		359,550 1,748,265	112 (U. S. L. S.)		368,466 1,733,503
81 (U. S. L. S.)		362,195 1,747,449	105 (U. S. L. S.)		371,040 1,733,371
82 (U. S. L. S.)		361,166 1,744,711	110 (U. S. L. S.)		369,329 1,731,242
83 (U. S. L. S.)		362,493 1,745,961	103 (U. S. L. S.)		371,316 1,730,725
85 (U. S. L. S.)		363,461 1,744,125	108 (U. S. L. S.)		369,792 1,728,401
84 (U. S. L. S.)		362,413 1,743,861	101 (U. S. L. S.)		372,972 1,727,633
86 (U. S. L. S.)		363,584 1,742,251	106 (U. S. L. S.)		368,855 1,726,553
87 (U. S. L. S.)		365,071 1,742,631	99 (U. S. L. S.)		376,095 1,724,471
88 (U. S. L. S.)		365,511 1,739,059	102 (U. S. L. S.)		370,165 1,708,384

St. Marys River, Little Mud Lake

62 (U. S. L. S.) (Canada)		387,817 1,740,209	66 (U. S. L. S.) (Canada)		390,604 1,736,612
60 (U. S. L. S.) (Canada)		387,776 1,747,032	70 (U. S. L. S.) (Canada)		393,949 1,733,180
59 (U. S. L. S.)		383,813 1,747,014	65 (U. S. L. S.)		389,866 1,733,502
98 (U. S. L. S.) (Canada)	919,425 1,728,057	392,176 1,724,023	63½ (U. S. L. S.)		388,808 1,734,850
97 (U. S. L. S.)		382,467 1,727,004	63 (U. S. L. S.)		387,573 1,736,378
95 (U. S. L. S.)		386,291 1,733,475	64 (U. S. L. S.) (Canada)		388,633 1,738,803
72 (U. S. L. S.) (Canada)		390,020 1,728,711	61 (U. S. L. S.)		385,139 1,739,625
			104 (U. S. L. S.)		355,989 1,720,422

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Lake George

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
18 (U. S. L. S.) (Canada)		348, 458 1, 822, 130	49 (U. S. L. S.)		377, 504 1, 811, 243
27 (U. S. L. S.)		350, 113 1, 820, 359	48 (U. S. L. S.) (Canada)		382, 917 1, 785, 451
20 (U. S. L. S.) (Canada)		350, 849 1, 824, 376	51 (U. S. L. S.)		368, 225 1, 794, 319
29 (U. S. L. S.)		353, 258 1, 823, 633	53 (U. S. L. S.)		377, 613 1, 778, 427
22 (U. S. L. S.) (Canada)		352, 657 1, 827, 275	50 (U. S. L. S.) (Canada)		385, 730 1, 777, 479
31 (U. S. L. S.)		354, 011 1, 825, 188	54 (U. S. L. S.) (Canada)		385, 369 1, 767, 808
33 (U. S. L. S.)		355, 249 1, 827, 998	52 (U. S. L. S.) (Canada)		389, 619 1, 772, 151
24 (U. S. L. S.) (Canada)		355, 758 1, 831, 222	56 (U. S. L. S.) (Canada)		392, 568 1, 761, 832
35 (U. S. L. S.)		356, 960 1, 829, 771	55 (U. S. L. S.)		386, 738 1, 758, 049
37 (U. S. L. S.)		359, 763 1, 833, 634	58 (U. S. L. S.) (Canada)		389, 183 1, 753, 062
26 (U. S. L. S.) (Canada)		357, 068 1, 834, 726	□51 (U. S. L. S.)		383, 779 1, 757, 346
28 (U. S. L. S.) (Canada)		360, 059 1, 837, 822	□6 (U. S. L. S.) (Canada)		375, 951 1, 843, 428
39 (U. S. L. S.)		361, 318 1, 835, 147	□19 (U. S. L. S.)		367, 615 1, 832, 477
30 (U. S. L. S.) (Canada)		364, 712 1, 840, 080	□21 (U. S. L. S.)		371, 177 1, 831, 367
41 (U. S. L. S.)		364, 663 1, 836, 129	34 R (U. S. L. S.) (Canada)		371, 644 1, 835, 158
32 (U. S. L. S.) (Canada)		368, 631 1, 841, 101	□23 (U. S. L. S.)		374, 990 1, 831, 323
34 (U. S. L. S.) (Canada)		371, 624 1, 834, 832	□8 (U. S. L. S.) (Canada)		376, 188 1, 833, 915
43 (U. S. L. S.)		369, 050 1, 830, 157	□25 (U. S. L. S.)		378, 462 1, 833, 519
45 (U. S. L. S.)		377, 918 1, 831, 675	□10 (U. S. L. S.) (Canada)		378, 813 1, 834, 460
40 (U. S. L. S.) (Canada)		384, 191 1, 839, 960	10 R (U. S. L. S.) (Canada)		378, 918 1, 834, 551
42 (U. S. L. S.)(Canada)		392, 062 1, 833, 511	□12 (U. S. L. S.) (Canada)		381, 062 1, 835, 145
47 (U. S. L. S.)		379, 609 1, 826, 919	12 R (U. S. L. S.) (Canada)		381, 529 1, 835, 230
44 (U. S. L. S.) (Canada)		396, 261 1, 821, 574	□14 (U. S. L. S.) (Canada)		383, 199 1, 834, 719
46 (U. S. L. S.) (Canada)		391, 667 1, 808, 607	38 (U. S. L. S.) (Canada)		386, 424 1, 833, 743

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Lake George—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
36 (U. S. L. S.) (Canada)		377,819 1,836,755	Crib light (foot of flats) (U. S. L. S.).		379,817 1,786,434
Manchester Shoal crib (U. S. L. S.).		383,953 1,833,221	□37 (U. S. L. S.)		379,177 1,781,512
□27 (U. S. L. S.)		383,720 1,832,277	□24 (U. S. L. S.) (Canada)		383,379 1,782,982
□16 (U. S. L. S.) (Canada)		385,363 1,832,226	□17 (U. S. L. S.)		349,069 1,821,267
□18 (U. S. L. S.) (Canada)		385,360 1,830,684	□39 (U. S. L. S.)		379,560 1,778,494
□20 (U. S. L. S.) (Canada)		386,577 1,829,858	□26 (U. S. L. S.) (Canada)		382,238 1,775,035
□29 (U. S. L. S.)		386,133 1,828,933	□43 (U. S. L. S.)		383,026 1,768,748
□22 (U. S. L. S.) (Canada)		387,779 1,828,028	□28 (U. S. L. S.) (Canada)		384,528 1,770,739
□31 (U. S. L. S.)		380,804 1,825,257	□41 (U. S. L. S.)		381,556 1,771,316
Church Point crib light (U. S. L. S.)		387,658 1,824,395	□45 (U. S. L. S.)		383,522 1,766,215
42½ (U.L.L.S.) (Canada)		404,025 1,823,841	□B (1881) (U. S. L. S.) (Canada).		385,017 1,766,870
46 R (U. S. L. S.) (Canada)		391,709 1,808,615	□A (1881) (U. S. L. S.) (Canada).		384,743 1,768,140
49 R (U. S. L. S.)		377,488 1,811,254	□47 (U. S. L. S.)		385,190 1,763,564
Crib light (head of flats) (U. S. L. S.).		376,537 1,799,062	□34 (U. S. L. S.) (Canada)		389,626 1,756,138
□33 (U. S. L. S.)		371,470 1,798,373	□32 (U. S. L. S.) (Canada)		387,026 1,761,967
□31½ (U. S. L. S.)		369,296 1,800,880	C (1883) (U. S. L. S.)		379,005 1,759,992
Crib W (1879) (U. S. L. S.)		375,690 1,791,163	Shoal Island Lighthouse (U. S. L. S.) (Canada).		396,638 1,754,767
Crib E (1879) (U. S. L. S.) (Canada).		381,446 1,791,652	□36 (U. S. L. S.) (Canada)		387,180 1,754,566
Crib W (1881) (U. S. L. S.)		375,685 1,791,165	68 (U. S. L. S.) (Canada)		390,976 1,732,199
Crib E (1881) (U. S. L. S.) (Canada).		381,442 1,791,644	91 (U. S. L. S.)		388,507 1,731,711
Crib W (1882) (U. S. L. S.)		375,682 1,791,153	93 (U. S. L. S.)		385,850 1,727,934
□35 (U. S. L. S.)		369,769 1,788,955	74 (U. S. L. S.) (Canada)		389,444 1,727,361

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Green Bay

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	West Zone	Central Zone		West Zone	Central Zone
	Feet	*Feet*		*Feet*	*Feet*
W. Whaleback water station (U. S. L. S.), 1864.	900, 918 1, 410, 928	---------- ----------	North Egg (U. S. L. S.), 1865.	879, 645 1, 306, 407	---------- ----------
Washington Island (U. S. L. S.), 1864.	961, 351 1, 405, 523	---------- ----------	Chambers Island south base (U. S. L. S.), 1864.	866, 307 1, 336, 795	---------- ----------
Sable (U. S. L. S.), 1864	946, 260 1, 389, 449	---------- ----------	Chambers Island north base (U. S. L. S.), 1864.	857, 061 1, 352, 378	---------- ----------
North Chambers (U. S. L. S.), 1864.	864, 531 1, 355, 788	---------- ----------	⊙3 Penny (U. S. L. S.), 1862	889, 906 1, 340, 036	---------- ----------
Sister Bluff (U. S. L. S.), 1864.	920, 783 1, 367, 765	---------- ----------	Abbott (U. S. L. S.)	818, 975 1, 358, 486	---------- ----------
Horseshoe Island (U. S. L. S.), 1864.	896, 819 1, 345, 017	---------- ----------	Eagle (old) (U. S. L. S.)	891, 617 1, 341, 600	---------- ----------
Sister Island (U. S. L. S.), 1864.	912, 470 1, 361, 523	---------- ----------	Fish Creek (U. S. L. S.)	887, 234 1, 327, 177	---------- ----------
North Strawberry (U. S. L. S.), 1864.	882, 692 1, 342, 319	---------- ----------	Hat Island (U. S. L. S.), 1864	870, 082 1, 315, 829	---------- ----------
Rochereau (old) (U. S. L. S.), 1864.	837, 980 1, 385, 807	---------- ----------	Middle Strawberry (U. S. L. S.), 1864.	882, 688 1, 340, 011	---------- ----------
Green Island (U. S. L. S.), 1865.	822, 548 1, 300, 173	---------- ----------	South Strawberry Island (U. S. L. S.), 1864.	883, 411 1, 336, 504	---------- ----------
South Egg (old) (U. S. L. S.) (Wis.), 1865.	859, 535 1, 273, 957	---------- ----------	Menominee (old) (1865) (U. S. L. S.) (Wis.).	798, 619 1, 310, 069	---------- ----------
North Sturgeon (old) (U. S. L. S.), 1865.	848, 599 1, 243, 874	---------- ----------			

St. Marys River, Potagannissing Bay

	Central Zone	East Zone		Central Zone	East Zone
Burnt Island (U. S. L. S.), 1896 (m.).	---------- ----------	462, 407 1, 675, 486	345 (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	505, 432 1, 678, 149
Kocruish (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	470, 022 1, 691, 632	343 (U. S. L. S.), 1896 (m.)	---------- ----------	492, 299 1, 677, 956
Chippewa Point (U. S. L. S.), 1896 (m.).	---------- ----------	486, 538 1, 676, 971	262. Gull Island (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	511, 769 1, 699, 475
Serpent (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	494, 897 1, 703, 742	299. Cedar Island (U. S. L. S.), 1896 (m.).	---------- ----------	474, 719 1, 671, 725
Sulphur Island Lighthouse (U. S. L. S.) (Canada), 1896.	---------- ----------	514, 880 1, 693, 001	341. Drummond Island (U. S. L. S.), 1896 (m.).	---------- ----------	486, 196 1, 669, 624
252 (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	469, 331 1, 707, 535	337. Peck Island (U. S. L. S.), 1896 (m.).	---------- ----------	490, 787 1, 662, 670
Grande Point (U. S. L. S.) (Canada), 1896 (m.).	---------- ----------	471, 762 1, 716, 822	311. Drummond Island (U. S. L. S.), 1896 (m.).	---------- ----------	481, 776 1, 648, 807

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Potagannissing Bay—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
267 (U. S. L. S.), 1896 (m.)	----------	459,092	297. Wilson Island (U. S. L. S.), 1896 (m.).	----------	471,669
	----------	1,654,577		----------	1,673,085
327. Drummond Island (U. S. L. S.), 1896 (m.).	----------	488,671	291½. Burnt Island Reef (U. S. L. S.), 1896 (m.).	----------	458,678
	----------	1,654,741		----------	1,679,472
339. Drummond Island (U. S. L. S.), 1896 (m.).	----------	497,362	260. Thessalon Island (U. S. L. S.), 1896 (m.).	----------	510,859
	----------	1,663,584		----------	1,712,118
238½. Perrique Island (U. S. L. S.) (Canada), 1896 (m.).	----------	475,569	313. Boulanger Island (U. S. L. S.), 1896 (m.).	----------	476,343
	----------	1,691,825		----------	1,654,338
254. Fox Island (U. S. L. S.) (Canada), 1896 (m.).	----------	473,596	309. Harbor Island Reef (U. S. L. S.), 1896 (m.).	----------	469,347
	----------	1,704,887		----------	1,656,524
232 (U. S. L. S.) (Canada), 1896 (m.).	----------	466,925	269. Surveyors Island (U. S. L. S.), 1896 (m.).	----------	460,321
	----------	1,686,117		----------	1,651,457
238. North Seine Island (U. S. L. S.) (Canada), 1896 (m.).	----------	472,171	279. Sam Island (U. S. L. S.), 1896 (m.).	----------	474,820
	----------	1,686,599		----------	1,649,785
236. Maple Island (U. S. L. S.) (Canada), 1896 (m.).	----------	476,345	281. Wreck Island (U. S. L. S.), 1896 (m.).	----------	474,978
	----------	1,682,501		----------	1,651,835
295. Burnt Island (U. S. L. S.), 1896 (m.).	----------	468,086	315. Rogg Island (U. S. L. S.), 1896 (m.).	----------	480,169
	----------	1,679,397		----------	1,654,450
301. Choke Cherry Island (U. S. L. S.), 1896 (m.).	----------	477,323	317. Fire Island (U. S. L. S.), 1896 (m.).	----------	481,873
	----------	1,673,487		----------	1,654,960
303. Propeller Island (U. S. L. S.), 1896 (m.).	----------	479,215	319. La Pointe Island (U. S. L. S.), 1896 (m.).	----------	484,321
	----------	1,668,650		----------	1,655,118
305. Standerson Island (U. S. L. S.), 1896 (m.).	----------	473,627	321. Grape Island (U. S. L. S.), 1896 (m.).	----------	486,222
	----------	1,665,455		----------	1,658,735
250. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.).	----------	466,883	323. Bald Island (U. S. L. S.), 1896 (m.).	----------	482,319
	----------	1,702,121		----------	1,659,860
240. Colville Island (U. S. L. S.) (Canada), 1896 (m.).	----------	471,257	331. James Island (U. S. L. S.), 1896 (m.).	----------	493,478
	----------	1,694,142		----------	1,656,831
246. Hog Island (U. S. L. S.) (Canada), 1896 (m.).	----------	468,797	329. Bay Island (U. S. L. S.), 1896 (m.).	----------	490,086
	----------	1,694,866		----------	1,656,360
293. Burnt Island (U. S. L. S.), 1896 (m.).	----------	462,471	333. Ashman Island (U. S. L. S.), 1896 (m.).	----------	489,085
	----------	1,679,996		----------	1,659,530
230 (U. S. L. S.) (Canada), 1894 (m.).	----------	462,670	335. Rutland Island (U. S. L. S.), 1896 (m.).	----------	492,437
	----------	1,687,401		----------	1,661,173
307. Saltonstall Island (U. S. L. S.), 1896 (m.).	----------	466,799	271. Fairbanks Island (U. S. L. S.), 1896 (m.).	----------	465,028
	----------	1,662,489		----------	1,642,473
248. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.).	----------	463,048	275. Picnic Island (U. S. L. S.), 1896 (m.).	----------	468,542
	----------	1,698,024		----------	1,643,565
244. St. Joseph Island (U. S. L. S.) (Canada), 1896 (m.).	----------	463,462	265 (U. S. L. S.), 1896 (m.)	----------	458,726
	----------	1,691,148		----------	1,651,493
242. Beef Island (U. S. L. S.) (Canada), 1896 (m.).	----------	467,134			
	----------	1,691,790			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

St. Marys River, Detour Passage

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
237. Drummond Island (U. S. L. S.), 1896 (m.).	974,577 1,635,925	444,885 1,630,495	239 (U. S. L. S.), 1896 (m.)	975,244 1,632,742	445,469 1,627,296
264. Upper Peninsula (U. S. L. S.), 1896 (m.).	968,945 1,633,551	439,195 1,628,269	241 (U. S. L. S.), 1896 (m.)	979,350 1,631,011	449,528 1,625,458
266. Upper Peninsula (U. S. L. S.), 1896 (m.).	967,787 1,630,211	437,950 1,624,962	268. Island (U. S. L. S.), 1896 (m.).	963,080 1,633,195	433,324 1,628,067

St. Marys River, shore-line points (old)

Scammons, M., Drummond Island (U. S. L. S.).	--------- ---------	447,715 1,629,820	V. Mainland (west of Lime Island) (U. S. L. S.).	--------- ---------	403,843 1,666,593
1. SE. end Scammons, 1853 (south coast Drummond Island) (U. S. L. S.).	--------- ---------	480,734 1,617,555	R″. South point St. Joseph Island (U. S. L. S.).	--------- ---------	429,040 1,662,736
19. Drummond Island (U. S. L. S.).	--------- ---------	448,019 1,640,488	1. N (end of small island 2 miles south of R″ Scammons, 1854) (U. S. L. S.).	--------- ---------	429,754 1,651,935
W. West side St. Marys River (opposite 19) (U. S. L. S.).	--------- ---------	440,367 1,640,343	a′ (U. S. L. S.)	--------- ---------	454,039 1,659,587
d. SW. point of Harbor Island (U. S. L. S.).	--------- ---------	473,392 1,656,347	2b (U. S. L. S.)	--------- ---------	465,864 1,635,753

Lake Michigan, north end

Cross Village (U. S. L. S.)	674,799 1,507,145	--------- ---------	West Cape Garden Island (U. S. L. S.).	555,259 1,567,446	--------- ---------
Simmons Reef (U. S. L. S.)	638,636 1,610,384	--------- ---------	Mount Pisgah (U. S. L. S.)	549,434 1,544,845	--------- ---------
Grays Reef (U. S. L. S.)	633,917 1,564,773	--------- ---------	NW. corner Big Beaver Island (U. S. L. S.).	546,933 1,552,841	--------- ---------
White Shoal (U. S. L. S.)	650,589 1,581,197	--------- ---------	Squaw Island (U. S. L. S.)	540,995 1,579,567	--------- ---------
Hog Island Reef (U. S. L. S.)	603,075 1,540,488	--------- ---------	L (U. S. L. S.)	546,933 1,552,841	--------- ---------
SW. side Garden Island (U. S. L. S.).	575,464 1,563,764	--------- ---------	R. 1854 (west coast of Beaver Island) (U. S. L. S.).	545,400 1,540,784	--------- ---------
Triangle Island (U. S. L. S.)	577,903 1,555,872	--------- ---------	Whiskey Island (U. S. L. S.)	536,690 1,571,557	--------- ---------
Mille Coquins (U. S. L. S.)	576,544 1,671,436	--------- ---------	Trout Island (U. S. L. S.)	516,161 1,557,249	--------- ---------
NW. point Hog Island (U. S. L. S.).	594,768 1,572,352	--------- ---------	Hughes (old) (U. S. L. S.)	476,831 1,627,143	--------- ---------
South Cape Garden Island (U. S. L. S.).	564,568 1,558,459	--------- ---------	⊙ 80 Hearding (U. S. L. S.)	401,876 1,625,341	--------- ---------
NE. corner Big Beaver Island (U. S. L. S.).	563,033 1,550,554	--------- ---------			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Toledo to Chicago

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE		CENTRAL ZONE	EAST ZONE
	Feet	*Feet*		*Feet*	*Feet*
St. Mary's Church, Toledo (U. S. L. S.) (Ohio), 1879.	---------- ----------	536,201 58,526	Reading First Baptist Church (U. S. L. S.).	773,532 124,916	205,834 125,170
Monroe Lighthouse (U. S. L. S.), 1877.	---------- ----------	591,320 142,652	Sturgis Presbyterian Church (U. S. L. S.).	590,281 109,821	---------- ----------
Monroe Courthouse (U. S. L. S.), 1877.	---------- ----------	573,405 151,186	Sturgis M. E. Church (U. S. L. S.).	590,262 109,585	---------- ----------
Monroe Presbyterian Church (U. S. L. S.).	---------- ----------	573,279 151,265	Sturgis schoolhouse (U. S. L. S.).	590,078 110,033	---------- ----------
Monroe German Lutheran Church (U. S. L. S.).	---------- ----------	573,453 150,251	Lima School (U. S. L. S.)	590,002 82,207	---------- ----------
Monroe M. E. Church (U. S. L. S.).	---------- ----------	572,885 151,166	Three Rivers, tall steeple (U. S. L. S.).	531,443 163,383	---------- ----------
Tecumseh Presbyterian Church (U. S. L. S.).	---------- ----------	423,444 183,826	Three Rivers, church (U. S. L. S.).	531,305 163,864	---------- ----------
Adrian engine house No. 2 (U. S. L. S.).	---------- ----------	401,976 144,468	White Pigeon Woolen Mill (U. S. L. S.).	529,672 107,477	---------- ----------
Hudson Congregational Church (U. S. L. S.).	---------- ----------	311,929 129,554	White Pigeon Baptist Church (U. S. L. S.).	529,173 108,038	---------- ----------
Prattville Church (U. S. L. S.).	---------- ----------	300,027 103,078	Constantine schoolhouse (U. (U. S. L. S.).	522,673 122,162	---------- ----------
Jackson, Mich. State prison (U. S. L. S.).	---------- ----------	298,722 271,591	South Bend, standpipe (U. S. L. S.) (Ind.).	364,022 64,279	---------- ----------
Jackson, chimney (U. S. L. S.).	---------- ----------	299,735 278,749	New Carlisle, Ind., M. E. Church, steeple (U. S. L. S.).	292,166 76,369	---------- ----------
Jackson First M. E. Church (U. S. L. S.).	---------- ----------	298,508 273,143	New Carlisle, Ind., spire of Christian Church (U. S. L. S.).	292,085 76,033	---------- ----------
Hillsdale Courthouse (U. S. L. S.).	804,341 155,346	237,373 154,844	St. Joseph, Congregational Church (U. S. L. S.).	301,044 221,379	---------- ----------
Hillsdale College clock tower (U. S. L. S.).	803,734 159,556	236,869 159,067	Michigan City High School (U. S. L. S.) (Ind.).	187,020 80,180	---------- ----------
Reading, SE. corner of Colby Wringer Factory (U. S. L. S.).	774,572 123,768	206,846 123,997	Michigan City Deutsche Evangelical Church (U. S. L. S.) (Ind.).	186,103 79,542	---------- ----------
Reading, cupola of schoolhouse (E. side of Chestnut St.) (U. S. L. S.).	773,639 124,676	205,935 124,928			

Lake Michigan, south end

Michigan City Lighhouse (U. S. L. S.) (Ind.).	184,463 83,186	---------- ----------	△Azimuth V (U. S. L. S.)	281,011 183,331	---------- ----------
△Azimuth VII, New Buffalo (U. S. L. S.).	227,506 110,920	---------- ----------	△Azimuth IV, or St. Josephs Station (U. S. L. S.).	299,961 224,258	---------- ----------
△16 (U. S. L. S.)	248,583 129,705	---------- ----------	△Azimuth III (U. S. L. S.)	331,743 267,441	---------- ----------
△Azimuth VI (U. S. L. S.)	266,384 148,601	---------- ----------			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Section corners, southern Michigan

Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE
	Feet	*Feet*
Monroe County, Mich.: SW. corner of private claim No. 432 (U. S. L. S.).	----------	552, 225
	----------	150, 119
Monroe County, Mich.: NE. corner of sec. 5, T. 8 S., R. 7 E. (U. S. L. S.).	----------	515, 763
	----------	117, 394
Monroe County, Mich.: Corner of secs. 25, 26, 35, 36, T. 6 S., R. 6 E. (U. S. L. S.).	----------	498, 633
	----------	154, 677
Lenawee County: Corner of secs. 22, 23, 26, 27, T. 7 S., R. 5 E. (U. S. L. S.).	----------	461, 683
	----------	127, 252
Lenawee County: Corner of secs. 14, 15, 22, 23, T. 6 S., R. 4 E. (U. S. L. S.).	----------	429, 450
	----------	163, 773
Lenawee County: NE. corner of sec. 3, T. 8 S., R. 3 E. (U. S. L. S.).	----------	397, 817
	----------	115, 620
Lenawee County: NE. corner of sec. 1, T. 6 S., R. 1 E. (U. S. L. S.).	----------	342, 472
	----------	177, 844
Hillsdale County, Mich.: Corner of secs. 22, 23, 26, 27, T. 7 S., R. 4 W. (U. S. L. S.).	773, 045	205, 357
	125, 331	125, 597
Hillsdale County, Mich.: NE. corner of sec. 26, T. 7 S., R. 4 W. (U. S. L. S.).	778, 384	210, 695
	125, 364	125, 500
Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.).	799, 014	232, 038
	154, 923	154, 551
Hillsdale County, Mich.: NW. corner of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.).	798, 990	232, 078
	157, 582	157, 210
Hillsdale County, Mich.: SE. corner of sec. 8, T. 5 S., R. 1 W. (U. S. L. S.).	----------	278, 257
	----------	207, 024
Hillsdale County, Mich.: SE. corner of sec. 36, T. 7 S., R. 2 W. (U. S. L. S.).	847, 256	279, 320
	116, 016	114, 485
Hillsdale County, Mich.: Corner of secs. 19, 20, 29, 30, T. 6 S., R. 1 W. (U. S. L. S.).	----------	284, 293
	----------	156, 719
Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 29, T. 6 S., R. 1 W. (U. S. L. S.).	----------	284, 274
	----------	154, 095
Branch County: SW. corner of SE. quarter of sec. 7, T. 6 S., R. 5 W. (U. S. L. S.).	722, 493	155, 835
	167, 304	168, 789
Branch County: SW. corner of SE. quarter of sec. 16, T. 7 S., R. 8 W. (U. S. L. S.)	638, 070	----------
	129, 545	----------
St. Joseph County: SW. corner of SE. quarter of sec. 22, T. 7 S., R. 10 W. (U. S. L. S.).	579, 610	----------
	123, 735	----------
Cass County: SW. corner of NW. quarter of sec. 36, T. 7 S., R. 13 W. (U. S. L. S.).	491, 911	----------
	115, 306	----------
Cass County: SW. corner of NW. quarter of sec. 27, T. 7 S., R. 14 W. (U. S. L. S.).	449, 534	----------
	121, 261	----------
Cass County: Corner of secs. 4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.).	381, 112	----------
	108, 563	----------
Van Buren County: SW. corner of sec. 36, T. 1 N., R. 17 W. (U. S. L. S.).	360, 683	----------
	334, 893	----------
Berrien County: Corner of secs. 14, 15, 22, 23, T. 8 S., R. 18 W. (U. S. L. S.).	328, 844	----------
	101, 305	----------
Berrien County: SE. corner of sec. 35, T. 6 S., R. 20 W. (U. S. L. S.).	271, 376	----------
	146, 702	----------
Steuben County, Ind.: NW. corner of sec. 31, T. 38 N., R. 14 E. (U. S. L. S.).	712, 689	143, 903
	79, 483	81, 221
La Grange County, Corner of secs. 4, 5, 8, 9, T. 37 N., R. 11 E. (U. S. L. S.) (Ind.).	630, 294	----------
	68, 000	----------
La Grange County: SW. corner of NW. quarter of sec. 33, T. 38 N., R. 8 E. (U. S. L. S.) (Ind.).	535, 420	----------
	74, 510	----------
Elkhart County: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 6 E. (U. S. L. S.) (Ind.).	483, 085	----------
	66, 268	----------
St. Joseph County, Ind.: Corner of secs. 17, 18, 19, 20, T. 37 N., R. 3 E. (U. S. L. S.).	372, 721	----------
	55, 425	----------
St. Joseph County, Ind.: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.).	293, 384	----------
	66, 314	----------
La Porte County: SW. corner of SE. quarter of SW. quarter of sec. 32, T. 38 N., R. 2 W. (U. S. L. S.) (Ind.).	247, 167	----------
	72, 089	----------
La Porte County: SE. corner of sec. 10, T. 37 N., R. 3 W. (U. S. L. S.) (Ind.).	229, 876	----------
	55, 401	----------
La Porte County: NW. corner of sec. 10, T. 36 N., R. 4 W. (U. S. L. S.) (Ind.).	191, 641	----------
	35, 680	----------

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—*Continued*

Lake Erie

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
Kingsville (U. S. L. S.) (Canada), 1877 (d. m.).	----------	752,020	East Sister Island (U. S. L. S.), 1877 (m.).	----------	722,401
	----------	193,276		----------	115,521
Kingsville M. E. Church (U. S. L. S.)(Canada), 1877.	----------	752,015	Little Point (U. S. L. S.), 1877.	----------	702,747
	----------	197,392		----------	177,306
Kingsville schoolhouse (U. S. L. S.) (Canada), 1877.	----------	751,284	Turtle Island Lighthouse (U. S. L. S.), 1877.	----------	575,178
	----------	197,854		----------	92,091
Old Hen Island (U. S. L. S.), 1877 (m.).	----------	737,245	Toledo stone longitude post (U. S. L. S.) (Ohio), 1881.	----------	534,072
	----------	106,474		----------	55,134
Azimuth △Chicken Island (U. S. L. S.), 1877.	----------	731,449			
	----------	99,660			

Detroit River

Bar Point (1878) (U. S. L. S.), 1877 (m.).	----------	650,617	River Rouge (U. S. L. S.)	----------	646,280
	----------	200,686		----------	281,374
Point Mouillee (U. S. L. S.), 1873 (m.).	----------	631,872	Petite Cote (U. S. L. S.)	----------	653,750
	----------	187,582		----------	283,247
Sugar Island (U. S. L. S.), 1873 (m.).	----------	642,143	Field (U. S. L. S.), 1873 (m.)	----------	651,627
	----------	215,554		----------	289,386
Bar Point (1874) (U. S. L. S.), 1873 (m.).	----------	649,462	Sandwich (U. S. L. S.), 1873 (m.).	----------	655,789
	----------	203,370		----------	288,551
Hackett (U. S. L. S.), 1873 (m.).	----------	647,993	Swayne (U. S. L. S.), 1873	----------	657,065
	----------	214,585		----------	296,899
Bois Blanc (U. S. L. S.), 1873 (m.).	----------	647,169	Sandwich Courthouse (U. S. L. S.), 1873.	----------	659,644
	----------	220,071		----------	292,154
Barker (U. S. L. S.), 1873 (m.).	----------	642,747	Michigan Central Elevator (U. S. L. S.), 1873.	----------	664,041
	----------	229,132		----------	300,530
Clark (U. S. L. S.), 1873 (m.)	----------	649,414	Windsor (U. S. L. S.), 1873	----------	669,642
	----------	233,174		----------	299,204
Biddle (U. S. L. S.), 1873 (m.).	----------	643,371	Engine house center (U. S. L. S.), 1873.	----------	669,644
	----------	231,501		----------	308,415
Brodhead (U. S. L. S.), 1873 (m.).	----------	643,454	Azimuth post, Belle Isle (U. S. L. S.), 1873.	----------	680,715
	----------	240,374		----------	305,048
Turkey Island (U. S. L. S.), 1873 (m.).	----------	649,807	St. Paul's Church (U. S. L. S.), 1873.	----------	667,273
	----------	250,420		----------	302,820
North Wyandotte (U. S. L. S.), 1873 (m.).	----------	640,880	△Engine house (U. S. L. S.), 1873.	----------	669,645
	----------	260,468		----------	308,407
Grosse Isle (U. S. L. S.)	----------	641,641	Office, SE. corner building, Grand River and Park Pl. (U. S. L. S.), 1873.	----------	666,211
	----------	247,668		----------	304,306
Wyandotte (U. S. L. S.)	----------	639,824	Detroit City Hall flagstaff (U. S. L. S.), 1873.	----------	667,428
	----------	253,803		----------	303,483
Wyandotte south base (U. S. L. S.).	----------	635,066	Observatory post, east pier (U. S. L. S.), 1871.	----------	666,223
	----------	248,680		----------	304,323
Wyandotte north base (U. S. L. S.).	----------	636,394	Westminster or St. Aloysius Church, SW. corner (U. S. L. S.), 1873.	----------	666,549
	----------	254,501		----------	304,031
Fighting Island (U. S. L. S.), 1873 (m.).	----------	649,082	Fort and Griswold Sts., intersection (U. S. L. S.), 1873.	----------	667,428
	----------	271,577		----------	303,226
Ecorse (U. S. L. S.), 1873 (m.).	----------	643,713	Detroit old observatory (U. S. L. S.), 1857; 1870.	----------	666,368
	----------	275,896		----------	304,207

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Lake St. Clair

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	CENTRAL ZONE	EAST ZONE		CENTRAL ZONE	EAST ZONE
	Feet	*Feet*		*Feet*	*Feet*
Happy (U. S. L. S.), 1873	----------	685, 749	Mitchel (U. S. L. S.), (Canada) 1871.	----------	833, 157
	----------	300, 336		----------	341, 528
Windmill Point Lighthouse (U. S. L. S.), 1873.	----------	699, 027	Thames River Lighthouse (U. S. L. S.), 1871.	----------	828, 146
	----------	313, 633		----------	300, 197
Lake St. Clair west base (U. S. L. S.).	----------	701, 287	Huron Point (U. S. L. S.), 1871.	----------	737, 579
	----------	298, 188		----------	389, 743
Grosse Point Church (U. S. L. S.), 1871.	----------	709, 381	North Channel (34 O. N. Chaffee, 1867) (U. S. L. S.), 1871.	----------	780, 826
	----------	326, 813		----------	412, 795
La Puce (1869) (U. S. L. S.)	----------	740, 466	St. Clair Flats Rear Range Lighthouse (U. S. L. S.), 1871.	----------	763, 208
	----------	293, 989		----------	380, 260
Grosse Point (U. S. L. S.), 1871.	----------	709, 591	Beacon (U. S. L. S.), 1871	----------	762, 344
	----------	326, 993		----------	379, 688
Lake St. Clair east base (U. S. L. S.), 1871.	----------	722, 300	Congregational Church at New Baltimore (U. S. L. S.), 1871.	----------	749, 721
	----------	295, 620		----------	431, 070
Milk River (U. S. L. S.), 1871.	----------	715, 426	Lutheran Church at New Baltimore (U. S. L. S.), 1871.	----------	749, 729
	----------	348, 834		----------	431, 430
Post on base line Michigan Land Survey (U. S. L. S.), 1871.	----------	715, 000	Camp Post (U. S. L. S.) (Canada).	----------	830, 860
	----------	347, 882		----------	304, 231
A (U. S. L. S.), 1871	----------	704, 932	1, O. N. Chaffee (1867) (U. S. L. S.).	----------	811, 295
	----------	310, 834		----------	410, 309
Bassett (U. S. L. S.), 1871	----------	788, 749	9, Macomb (O. N. C. 1867) (U. S. L. S.).	----------	764, 506
	----------	363, 893		----------	386, 892
La Puce (1871) (U. S. L. S.), 1871.	----------	740, 093	⊙43, O. N. C. (1867) (U. S. L. S.).	----------	772, 066
	----------	293, 185		----------	414, 268
Stony Point (U. S. L. S.), 1871.	----------	797, 625			
	----------	298, 907			

Lake Michigan, east shore

Frankfort (astronomic latitude) (U. S. L. S.), 1871.	369, 570	----------	Big Point Sable (astronomic latitude) (U. S. L. S.), 1866 (m.).	298, 680	----------
	1, 147, 640	----------		932, 893	----------
⊙28 (U. S. L. S.)	374, 605	----------	Big Point Sable (O. N. C.) (U. S. L. S.).	305, 327	----------
	1, 105, 197	----------		932, 672	----------
⊙53 (U. S. L. S.)	366, 204	----------	⊙99 (U. S. L. S.)	298, 287	----------
	1, 044, 877	----------		931, 642	----------
Manistee (astronomic latitude) (U. S. L. S.), 1871 (d.).	351, 231	----------	⊙123 (U. S. L. S.)	315, 909	----------
	1, 013, 329	----------		881, 581	----------
Rush Lake (U. S. L. S.), 1866.	351, 651	----------	⊙150 (U. S. L. S.)	309, 419	----------
	1, 011, 826	----------		816, 222	----------
⊙76 (U. S. L. S.)	338, 578	----------	⊙160 (U. S. L. S.)	293, 534	----------
	986, 353	----------		795, 007	----------
⊙95 (U. S. L. S.)	304, 057	----------	Observatory post, O. B. Wheeler, Little Point Sable (1866) (U. S. L. S.).	292, 961	----------
	941, 111	----------		792, 788	----------
Observatory post, O. B. Wheeler, Big Point Sable (1866) (U. S. L. S.).	298, 708	----------	Little Point Sable (astronomic latitude) (U. S. L. S.).	300, 907	----------
	933, 209	----------		782, 261	----------

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Lake Michigan, east shore—Continued

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
⊙7 (marked N1) (U. S. L. S.)	290,544 777,433	--------- ---------	△140 (U. S. L. S.)	376,304 488,365	--------- ---------
Claybanks (astronomic latitude) (U. S. L. S.), 1871 (m.).	308,395 731,917	--------- ---------	△194 (U. S. L. S.)	403,028 472,918	--------- ---------
△Z (U. S. L. S.)	308,879 728,596	--------- ---------	Observatory post 4 (U. S. L. S.).	376,634 464,016	--------- ---------
△35, reference stone (U. S. L. S.).	309,515 726,539	--------- ---------	△39 (U. S. L. S.)	376,165 431,030	--------- ---------
Duck Lake (astronomic latitude) (U. S. L. S.), 1871 (m.).	325,929 669,005	--------- ---------	△22 (U. S. L. S.)	374,494 424,730	--------- ---------
△53 (U. S. L. S.)	335,978 645,732	--------- ---------	Douglas (astronomic latitude) (U. S. L. S.), 1873 (m.).	371,155 414,446	--------- ---------
△84 (U. S. L. S.)	359,149 594,406	--------- ---------	Az. I (U. S. L. S.)	367,562 377,452	--------- ---------
⊙85 (U. S. L. S.)	391,138 591,973	--------- ---------	Az. II (U. S. L. S.)	356,672 330,041	--------- ---------
⊙77 (U. S. L. S.)	389,352 589,507	--------- ---------	△68 (U. S. L. S.)	346,773 299,250	--------- ---------
Observatory post 3 (U. S. L. S.).	366,978 568,227	--------- ---------	South Haven Lighthouse (geodetic) (U. S. L. S.), 1873 (m.).	355,261 328,457	--------- ---------
South Twin Sister (astronomic latitude) (U. S. L. S.). 1871 (m.).	373,337 538,268	--------- ---------	South Haven (geodetic) (U. S. L. S.), 1873 (d. m.).	338,871 280,802	--------- ---------
△127 (U. S. L. S.)	375,342 514,444	--------- ---------	Station 20 (geodetic) (U. S. L. S.).	310,026 237,121	--------- ---------

Lake Michigan, northeast end

North Manitou (U. S. L. S.), 1860.	436,571 1,299,135	--------- ---------	Sleeping Bear (U. S. L. S.), 1860.	417,371 1,229,448	--------- ---------
Pyramid Point (U. S. L. S.), 1860.	454,880 1,263,938	--------- ---------	Point aux Becs Scies (U. S. L. S.), 1860.	370,080 1,165,475	--------- ---------
Carp River (U. S. L. S.), 1860.	497,815 1,286,087	--------- ---------	Point Betsie Lighthouse (U. S. L. S.), 1858, r. 1872.	368,625 1,163,447	--------- ---------
South Manitou Lighthouse (U. S. L. S.), 1860.	411,052 1,278,579	--------- ---------	⊙ Penny, No. 1 (U. S. L. S.)	369,859 1,165,599	--------- ---------
South Manitou (U. S. L. S.), 1860.	396,469 1,279,418	--------- ---------			

PLANE COORDINATES, UNITED STATES LAKE SURVEY STATIONS, NOT RIGIDLY ADJUSTED—Continued

Grand Traverse Bay

Station	x coordinate; y coordinate		Station	x coordinate; y coordinate	
	Central Zone	East Zone		Central Zone	East Zone
	Feet	*Feet*		*Feet*	*Feet*
Traverse Point (Lake Michigan) (U. S. L. S.).	593, 264 1, 361, 570	--------- ---------	3 (U. S. L. S.), 1860	549, 410 1, 197, 935	--------- ---------
15 (U. S. L. S.), 1861	593, 694 1, 345, 064	--------- ---------	2 (U. S. L. S.), 1860	552, 430 1, 183, 445	--------- ---------
16 (U. S. L. S.), 1861	556, 264 1, 340, 233	--------- ---------	1 (U. S. L. S.), 1860	545, 076 1, 186, 320	--------- ---------
12 (New Mission Point) (U. S. L. S.), 1861.	547, 534 1, 293, 059	--------- ---------	Suttons Point (U. S. L. S.), 1860.	538, 964 1, 271, 804	--------- ---------
14 (U. S. L. S.), 1861	596, 428 1, 327, 878	--------- ---------	P (Merrels Point) (U. S. L. S.), 1860.	559, 584 1, 266, 237	--------- ---------
C (U. S. L. S.), 1861	549, 426 1, 324, 496	--------- ---------	R (U. S. L. S.), 1860	547, 986 1, 237, 162	--------- ---------
10 (U. S. L. S.), 1861	595, 392 1, 286, 927	--------- ---------	Lees Point (U. S. L. S.), 1860	538, 628 1, 248, 199	--------- ---------
11 (Old Mission) (U. S. L. S.), 1860.	570, 107 1, 272, 635	--------- ---------	U (U. S. L. S.), 1860	526, 444 1, 227, 356	--------- ---------
8 (U. S. L. S.), 1860	591, 836 1, 251, 311	--------- ---------	T (Blacks Point) (U. S. L. S.), 1860.	544, 598 1, 209, 533	--------- ---------
9 (U. S. L. S.), 1860	573, 544 1, 261, 056	--------- ---------	V (Norris Point) (U. S. L. S.), 1860.	530, 239 1, 202, 999	--------- ---------
7 (U. S. L. S.), 1860	567, 601 1, 240, 103	--------- ---------	W (U. S. L. S.), 1860	537, 349 1, 189, 990	--------- ---------
6 (U. S. L. S.), 1860	576, 953 1, 222, 575	--------- ---------	S (Hog Island) (U. S. L. S.), 1860.	543, 900 1, 228, 122	--------- ---------
5 (U. S. L. S.), 1860	564, 735 1, 223, 394	--------- ---------	Little Hog Island (U. S. L. S.), 1860.	543, 670 1, 224, 728	--------- ---------
4 (U. S. L. S.), 1860	565, 053 1, 204, 336	--------- ---------	Penny ⊙ 203 (U. S. L. S.), 1860.	529, 211 1, 197, 104	--------- ---------

Green Bay Islands

St. Martins Island (U. S. L. S.).	237, 742 1, 463, 588	--------- ---------	Gull Island (U. S. L. S.)	251, 102 1, 463, 555	--------- ---------
Poverty Island (U. S. L. S.)	264, 728 1, 470, 772	--------- ---------	Rock Island Lighthouse (U. S. L. S.).	223, 289 1, 433, 321	--------- ---------
Rocky Island (△Heardings R 1863) (U. S. L. S.).	254, 101 1, 499, 260	--------- ---------	Transit Post (Boyers Bluff, old) (U. S. L. S.).	195, 473 1, 430, 999	--------- ---------
Summer Island (U. S. L. S.)	269, 648 1, 475, 590	--------- ---------	Transit Post (Burnt Bluff, old) (U. S. L. S.).	252, 763 1, 524, 121	--------- ---------
Little Summer Island (U. S. L. S.).	259, 426 1, 494, 723	--------- ---------	Pilot Id. Lighthouse (U. S. L. S.).	198, 996 1, 381, 371	--------- ---------
Gravelly Island (U. S. L. S.)	249, 806 1, 467, 350	--------- ---------	Baileys Harbor Lighthouse (U. S. L. S.).	152, 150 1, 298, 670	--------- ---------

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN

Table I, east zone

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	Feet	Feet	°	′	Feet	Feet
41	30	0.00	101.20983	42	31	370,460.73	101.22800
	31	6,072.59	101.21017		32	376,534.41	101.22833
	32	12,145.20	101.21033		33	382,608.11	101.22867
	33	18,217.82	101.21083		34	388,681.83	101.22900
	34	24,290.47	101.21100		35	394,755.57	101.22917
	35	30,363.13	101.21133				
41	36	36,435.81	101.21167	42	36	400,829.32	101.22950
	37	42,508.51	101.21183		37	406,903.09	101.22983
	38	48,581.22	101.21217		38	412,976.88	101.23017
	39	54,653.95	101.21267		39	419,050.69	101.23053
	40	60,726.71	101.21283		40	425,124.51	101.23083
41	41	66,799.48	101.21317	42	41	431,198.36	101.23100
	42	72,872.27	101.21333		42	437,272.22	101.23133
	43	78,945.07	101.21367		43	443,346.10	101.23150
	44	85,017.89	101.21400		44	449,419.99	101.23200
	45	91,090.73	101.21433		45	455,493.91	101.23217
41	46	97,163.59	101.21450	42	46	461,567.84	101.23250
	47	103,236.46	101.21500		47	467,641.79	101.23283
	48	109,309.36	101.21517		48	473,715.76	101.23317
	49	115,382.27	101.21550		49	479,789.75	101.23333
	50	121,455.20	101.21583		50	485,863.75	101.23367
41	51	127,528.15	101.21600	42	51	491,937.77	101.23400
	52	133,601.11	101.21650		52	498,011.81	101.23433
	53	139,674.10	101.21667		53	504,085.87	101.23467
	54	145,747.10	101.21700		54	510,159.95	101.23483
	55	151,820.12	101.21717		55	516,234.04	101.23517
41	56	157,893.15	101.21767	42	56	522,308.15	101.23550
	57	163,966.21	101.21783		57	528,382.28	101.23583
	58	170,039.28	101.21817		58	534,456.43	101.23617
41	59	176,112.37	101.21850	42	59	540,530.60	101.23633
42	00	182,185.48	101.21883	43	00	546,604.78	101.23667
42	01	188,258.61	101.21900	43	01	552,678.98	101.23700
	02	194,331.75	101.21933		02	558,753.20	101.23733
	03	200,404.91	101.21967		03	564,827.44	101.23767
	04	206,478.09	101.22000		04	570,901.70	101.23783
	05	212,551.29	101.22033		05	576,975.97	101.23817
42	06	218,624.51	101.22050	43	06	583,050.26	101.23850
	07	224,697.74	101.22083		07	589,124.57	101.23883
	08	230,770.99	101.22117		08	595,198.90	101.23917
	09	236,844.26	101.22150		09	601,273.25	101.23933
	10	242,917.55	101.22183		10	607,347.61	101.23967
42	11	248,990.86	101.22200	43	11	613,421.99	101.24000
	12	255,064.18	101.22233		12	619,496.39	101.24033
	13	261,137.52	101.22267		13	625,570.81	101.24067
	14	267,210.88	101.22300		14	631,645.25	101.24083
	15	273,284.26	101.22333		15	637,719.70	101.24117
42	16	279,357.66	101.22350	43	16	643,794.17	101.24150
	17	285,431.07	101.22383		17	649,868.66	101.24183
	18	291,504.50	101.22417		18	655,943.17	101.24200
	19	297,577.95	101.22433		19	662,017.69	101.24250
	20	303,651.41	101.22483		20	668,092.24	101.24267
42	21	309,724.90	101.22500	43	21	674,166.80	101.24300
	22	315,798.40	101.22533		22	680,241.38	101.24333
	23	321,871.92	101.22567		23	686,315.98	101.24350
	24	327,945.46	101.22600		24	692,390.59	101.24383
	25	334,019.02	101.22617		25	698,465.22	101.24417
42	26	340,092.59	101.22650	43	26	704,539.87	101.24450
	27	346,166.18	101.22683		27	710,614.54	101.24483
	28	352,239.79	101.22717		28	716,689.23	101.24517
	29	358,313.42	101.22750		29	722,763.94	101.24533
	30	364,387.07	101.22767		30	728,838.66	101.24567

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, east zone—continued

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
43	31	734, 913. 40	101. 24600	44	31	1, 099, 430. 77	101. 26400
	32	740, 988. 16	101. 24617		32	1, 105, 506. 61	101. 26417
	33	747, 062. 93	101. 24667		33	1, 111, 582. 46	101. 26467
	34	753, 137. 73	101. 24683		34	1, 117, 658. 34	101. 26483
	35	759, 212. 54	101. 24717		35	1, 123, 734. 23	101. 26517
43	36	765, 287. 37	101. 24750	44	36	1, 129, 810. 14	101. 26550
	37	771, 362. 22	101. 24783		37	1, 135, 886. 07	101. 26567
	38	777, 437. 09	101. 24800		38	1, 141, 962. 01	101. 26617
	39	783, 511. 97	101. 24833		39	1, 148, 037. 98	101. 26633
	40	789, 586. 87	101. 24883		40	1, 154, 113. 96	101. 26667
43	41	795, 661. 80	101. 24900	44	41	1, 160, 189. 96	101. 26700
	42	801, 736. 74	101. 24917		42	1, 166, 265. 98	101. 26733
	43	807, 811. 69	101. 24967		43	1, 172, 342. 02	101. 26750
	44	813, 886. 67	101. 24983		44	1, 178, 418. 07	101. 26783
	45	819, 961. 66	101. 25017		45	1, 184, 494. 14	101. 26817
43	46	826, 036. 67	101. 25050	44	46	1, 190, 570. 23	101. 26850
	47	832, 111. 70	101. 25083		47	1, 196, 646. 34	101. 26883
	48	838, 186. 75	101. 25100		48	1, 202, 722. 47	101. 26900
	49	844, 261. 81	101. 25133		49	1, 208, 798. 61	101. 26933
	50	850, 336. 89	101. 25167		50	1, 214, 874. 77	101, 26967
43	51	856, 411. 99	101. 25200	44	51	1, 220, 950. 95	101. 27000
	52	862, 487. 11	101. 25233		52	1, 227, 027. 15	101. 27033
	53	868, 562. 25	101. 25250		53	1, 233, 103. 37	101. 27050
	54	874, 637. 40	101. 25283		54	1, 239, 179. 60	101. 27083
	55	880, 712. 57	101. 25317		55	1, 245, 255. 85	101. 27117
43	56	886, 787. 76	101. 25350	44	56	1, 251, 332. 12	101. 27150
	57	892, 862. 97	101. 25383		57	1, 257, 408. 41	101. 27183
	58	898, 938. 20	101. 25400		58	1, 263, 484. 72	101. 27217
43	59	905, 013. 44	101. 25433	44	59	1, 269, 561. 05	101. 27233
44	00	911, 088. 70	101. 25467	45	00	1, 275, 637. 39	101. 27267
44	01	917, 163. 98	101. 25500	45	01	1, 281, 713. 75	101. 27283
	02	923, 239. 28	101. 25533		02	1, 287, 790. 12	101. 27333
	03	929, 314. 60	101. 25567		03	1, 293, 866. 52	101. 27367
	04	935, 389. 94	101. 25583		04	1, 299, 942. 94	101. 27383
	05	941, 465. 29	101. 25617		05	1, 306, 019. 37	101. 27417
44	06	947, 540. 66	101. 25650	45	06	1, 312, 095. 82	101. 27450
	07	953, 616. 05	101. 25667		07	1, 318, 172. 29	101. 27483
	08	959, 691. 45	101. 25717		08	1, 324, 248. 78	101. 27500
	09	965, 766. 88	101. 25733		09	1, 330, 325. 28	101. 27533
	10	971, 842. 32	101. 25767		10	1, 336, 401. 80	101. 27567
44	11	977, 917. 78	101. 25800	45	11	1, 342, 478. 34	101. 27600
	12	983, 993. 26	101. 25833		12	1, 348, 554. 90	101. 27633
	13	990, 068. 76	101. 25850		13	1, 354, 631. 48	101. 27650
	14	996, 144. 27	101. 25883		14	1, 360, 708. 07	101. 27683
	15	1, 002, 219. 80	101. 25917		15	1, 366, 784. 68	101. 27717
44	16	1, 008, 295. 35	101. 25950	45	16	1, 372, 861. 31	101. 27750
	17	1, 014, 370. 92	101. 25983		17	1, 378, 937. 96	101. 27783
	18	1, 020, 446. 51	101. 26000		18	1, 385, 014. 63	101. 27817
	19	1, 026, 522. 11	101. 26033		19	1, 391, 091. 32	101. 27833
	20	1, 032, 597. 73	101. 26067		20	1, 397, 168. 02	101. 27867
44	21	1, 038, 673. 37	101. 26100	45	21	1, 403, 244. 74	101. 27900
	22	1, 044, 749. 03	101. 26133		22	1, 409, 321. 48	101. 27933
	23	1, 050, 824. 71	101. 26150		23	1, 415, 398. 24	101. 27950
	24	1, 056, 900. 40	101. 26183		24	1, 421, 475. 01	101. 27983
	25	1, 062, 976. 11	101. 26217		25	1, 427, 551. 80	101. 28017
44	26	1, 069, 051. 84	101. 26250	45	26	1, 433, 628. 61	101. 28050
	27	1, 075, 127. 59	101. 26283		27	1, 439, 705. 44	101. 28083
	28	1, 081, 203. 36	101. 26300		28	1, 445, 782. 29	101. 28100
	29	1, 087, 279. 14	101. 26350		29	1, 451, 859. 15	101. 28133
	30	1, 093, 354. 95	101. 26367		30	1, 457, 936. 03	101. 28167

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, east zone—continued

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
45	31	1,464,012.93	101.28200	46	16	1,737,492.10	101.29550
	32	1,470,089.85	101.28233		17	1,743,569.83	101.29583
	33	1,476,166.79	101.28267		18	1,749,647.58	101.29600
	34	1,482,243.75	101.28283		19	1,755,725.34	101.29633
	35	1,488,320.72	101.28317		20	1,761,803.12	101.29667
45	36	1,494,397.71	101.28350	46	21	1,767,880.92	101.29700
	37	1,500,474.72	101.28367		22	1,773,958.74	101.29733
	38	1,506,551.74	101.28417		23	1,780,036.58	101.29767
	39	1,512,628.79	101.28433		24	1,786,114.44	101.29783
	40	1,518,705.85	101.28467		25	1,792,192.31	101.29817
45	41	1,524,782.93	101.28500	46	26	1,798,270.20	101.29850
	42	1,530,860.03	101.28533		27	1,804,348.11	101.29883
	43	1,536,937.15	101.28550		28	1,810,426.04	101.29900
	44	1,543,014.28	101.28583		29	1,816,503.98	101.29933
	45	1,549,091.43	101.28617		30	1,822,581.94	101.29967
45	46	1,555,168.60	101.28650	46	31	1,828,659.92	101.30000
	47	1,561,245.79	101.28683		32	1,834,737.92	101.30033
	48	1,567,323.00	101.28717		33	1,840,815.94	101.30050
	49	1,573,400.23	101.28733		34	1,846,893.97	101.30083
	50	1,579,477.47	101.28767		35	1,852,972.02	101.30117
45	51	1,585,554.73	101.28800	46	36	1,859,050.09	101.30150
	52	1,591,632.01	101.28833		37	1,865,128.18	101.30183
	53	1,597,709.31	101.28850		38	1,871,206.29	101.30217
	54	1,603,786.62	101.28883		39	1,877,284.42	101.30233
	55	1,609,863.95	101.28917		40	1,883,362.56	101.30267
45	56	1,615,941.30	101.28950	46	41	1,889,440.72	101.30300
	57	1,622,018.67	101.28983		42	1,895,518.90	101.30317
	58	1,628,096.06	101.29017		43	1,901,597.09	101.30367
45	59	1,634,173.47	101.29033		44	1,907,675.31	101.30383
46	00	1,640,250.89	101.29067		45	1,913,753.54	101.30417
46	01	1,646,328.33	101.29100	46	46	1,919,831.79	101.30450
	02	1,652,405.79	101.29133		47	1,925,910.06	101.30483
	03	1,658,483.27	101.29150		48	1,931,988.35	101.30500
	04	1,664,560.76	101.29183		49	1,938,066.65	101.30533
	05	1,670,638.27	101.29217		50	1,944,144.97	101.30567
46	06	1,676,715.80	101.29250	46	51	1,950,223.31	101.30600
	07	1,682,793.35	101.29283		52	1,956,301.67	101.30633
	08	1,688,870.92	101.29300		53	1,962,380.05	101.30650
	09	1,694,948.50	101.29333		54	1,968,458.44	101.30683
	10	1,701,026.10	101.29367		55	1,974,536.85	101.30717
46	11	1,707,103.72	101.29400	46	56	1,980,615.28	101.30750
	12	1,713,181.36	101.29433		57	1,986,693.73	101.30783
	13	1,719,259.02	101.29467		58	1,992,772.20	101.30800
	14	1,725,336.70	101.29483	46	59	1,998,850.68	101.30833
	15	1,731,414.39	101.29517	47	00	2,004,929.18	

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table II, east zone

x'	Scale in units of seventh place of logarithms	Scale expressed as a ratio	x'	Scale in units of seventh place of logarithms	Scale expressed as a ratio
Feet			*Feet*		
0	−248.2	0.9999428	225,000	+2.9	1.0000007
5,000	−248.1	.9999429	230,000	+14.2	1.0000033
10,000	−247.7	.9999430	235,000	+25.7	1.0000059
15,000	−247.1	.9999431	240,000	+37.5	1.0000086
20,000	−246.2	.9999433	245,000	+49.5	1.0000114
25,000	−245.1	.9999436	250,000	+61.8	1.0000142
30,000	−243.7	.9999439	255,000	+74.3	1.0000171
35,000	−242.1	.9999443	260,000	+87.1	1.0000201
40,000	−240.3	.9999447	265,000	+100.1	1.0000230
45,000	−238.2	.9999452	270,000	+113.3	1.0000261
50,000	−235.8	.9999457	275,000	+126.8	1.0000292
55,000	−233.2	.9999463	280,000	+140.6	1.0000324
60,000	−230.3	.9999470	285,000	+154.6	1.0000356
65,000	−227.2	.9999477	290,000	+168.9	1.0000389
70,000	−223.9	.9999484	295,000	+183.5	1.0000423
75,000	−220.3	.9999493	300,000	+198.2	1.0000456
80,000	−216.5	.9999501	305,000	+213.2	1.0000491
85,000	−212.4	.9999511	310,000	+228.5	1.0000526
90,000	−208.0	.9999521	315,000	+244.0	1.0000562
95,000	−203.4	.9999532	320,000	+259.7	1.0000598
100,000	−198.6	.9999543	325,000	+275.7	1.0000635
105,000	−193.5	.9999554	330,000	+292.0	1.0000672
110,000	−188.2	.9999567	335,000	+308.5	1.0000710
115,000	−182.6	.9999580	340,000	+325.2	1.0000749
120,000	−176.8	.9999593	345,000	+342.0	1.0000787
125,000	−170.7	.9999607	350,000	+359.4	1.0000828
130,000	−164.4	.9999621	355,000	+376.9	1.0000868
135,000	−157.8	.9999637	360,000	+394.6	1.0000909
140,000	−151.0	.9999652	365,000	+412.6	1.0000950
145,000	−143.9	.9999669	370,000	+430.8	1.0000992
150,000	−136.6	.9999685	375,000	+449.3	1.0001035
155,000	−129.0	.9999703	380,000	+468.0	1.0001078
160,000	−121.2	.9999721	385,000	+487.0	1.0001121
165,000	−113.2	.9999739	390,000	+506.2	1.0001166
170,000	−104.9	.9999758	395,000	+525.7	1.0001210
175,000	−96.3	.9999778	400,000	+545.4	1.0001256
180,000	−87.5	.9999799	405,000	+565.3	1.0001302
185,000	−78.5	.9999819	410,000	+585.5	1.0001348
190,000	−69.2	.9999841	415,000	+606.0	1.0001395
195,000	−59.6	.9999863	420,000	+626.7	1.0001443
200,000	−49.8	.9999885	425,000	+647.7	1.0001491
205,000	−39.8	.9999908	430,000	+668.9	1.0001540
210,000	−29.5	.9999932	435,000	+690.4	1.0001590
215,000	−19.0	.9999956	440,000	+712.1	1.0001640
220,000	−8.2	0.9999981	445,000	+734.0	1.0001690
			450,000	+756.2	1.0001741

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, central and west zones

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
41	30	0.00	101.20650	42	31	370,448.22	101.22467
	31	6,072.39	101.20667		32	376,521.70	101.22483
	32	12,144.79	101.20700		33	382,595.19	101.22517
	33	18,217.21	101.20733		34	388,668.70	101.22550
	34	24,289.65	101.20767		35	394,742.23	101.22583
	35	30,362.11	101.20783	42	36	400,815.78	101.22617
41	36	36,434.58	101.20817		37	406,889.35	101.22633
	37	42,507.07	101.20850		38	412,962.93	101.22667
	38	48,579.58	101.20883		39	419,036.53	101.22700
	39	54,652.11	101.20917		40	425,110.15	101.22733
	40	60,724.66	101.20933	42	41	431,183.79	101.22767
41	41	66,797.22	101.20967		42	437,257.45	101.22783
	42	72,869.80	101.21000		43	443,331.12	101.22817
	43	78,942.40	101.21033		44	449,404.81	101.22850
	44	85,015.02	101.21067		45	455,478.52	101.22883
	45	91,087.66	101.21083	42	46	461,552.25	101.22917
41	46	97,160.31	101.21117		47	467,626.00	101.22933
	47	103,232.98	101.21150		48	473,699.76	101.22967
	48	109,305.67	101.21183		49	479,773.54	101.23000
	49	115,378.38	101.21200		50	485,847.34	101.23033
	50	121,451.10	101.21233	42	51	491,921.16	101.23067
41	51	127,523.84	101.21267		52	497,995.00	101.23083
	52	133,596.60	101.21300		53	504,068.85	101.23117
	53	139,669.38	101.21333		54	510,142.72	101.23150
	54	145,742.18	101.21350		55	516,216.61	101.23183
	55	151,814.99	101.21383	42	56	522,290.52	101.23200
41	56	157,887.82	101.21417		57	528,364.44	101.23233
	57	163,960.67	101.21450		58	534,438.38	101.23267
	58	170,033.54	101.21483	42	59	540,512.34	101.23300
41	59	176,106.43	101.21500	43	00	546,586.32	101.23333
42	00	182,179.33	101.21533	43	01	552,660.32	101.23367
42	01	188,252.25	101.21567		02	558,734.34	101.23383
	02	194,325.19	101.21600		03	564,808.37	101.23417
	03	200,398.15	101.21617		04	570,882.42	101.23450
	04	206,471.12	101.21650		05	576,956.49	101.23483
	05	212,544.11	101.21683	43	06	583,030.58	101.23500
42	06	218,617.12	101.21717		07	589,104.68	101.23533
	07	224,690.15	101.21750		08	595,178.80	101.23567
	08	230,763.20	101.21783		09	601,252.94	101.23600
	09	236,836.27	101.21800		10	607,327.10	101.23633
	10	242,909.35	101.21833	43	11	613,401.28	101.23650
42	11	248,982.45	101.21867		12	619,475.47	101.23683
	12	255,055.57	101.21900		13	625,549.68	101.23717
	13	261,128.71	101.21917		14	631,623.91	101.23750
	14	267,201.86	101.21950		15	637,698.16	101.23783
	15	273,275.03	101.21983	43	16	643,772.43	101.23817
42	16	279,348.22	101.22017		17	649,846.72	101.23833
	17	285,421.43	101.22050		18	655,921.02	101.23867
	18	291,494.66	101.22067		19	661,995.34	101.23900
	19	297,567.90	101.22100		20	668,069.68	101.23917
	20	303,641.16	101.22133	43	21	674,144.03	101.23950
42	21	309,714.44	101.22167		22	680,218.40	101.24000
	22	315,787.74	101.22183		23	686,292.80	101.24017
	23	321,861.05	101.22233		24	692,367.21	101.24050
	24	327,934.39	101.22250		25	698,441.64	101.24067
	25	334,007.74	101.22283	43	26	704,516.08	101.24117
42	26	340,081.11	101.22300		27	710,590.55	101.24133
	27	346,154.49	101.22350		28	716,665.03	101.24167
	28	352,227.90	101.22367		29	722,739.53	101.24200
	29	358,301.32	101.22400		30	728,814.05	101.24217
	30	364,374.76	101.22433				

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, central and west zones—Continued

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
43	31	734, 888. 58	101. 24250	44	31	1, 099, 393. 64	101. 26050
	32	740, 963. 13	101. 24300		32	1, 105, 469. 27	101. 26083
	33	747, 037. 71	101. 24317		33	1, 111, 544. 92	101. 26117
	34	753, 112. 30	101. 24350		34	1, 117, 620. 59	101. 26150
	35	759, 186. 91	101. 24367		35	1, 123, 696. 28	101. 26183
43	36	765, 261. 53	101. 24400	44	36	1, 129, 771. 99	101. 26200
	37	771, 336. 17	101. 24433		37	1, 135, 847. 71	101. 26233
	38	777, 410. 83	101. 24467		38	1, 141, 923. 45	101. 26267
	39	783, 485. 51	101. 24500		39	1, 147, 999. 21	101. 26300
	40	789, 560. 21	101. 24533		40	1, 154, 074. 99	101. 26317
43	41	795, 634. 93	101. 24550	44	41	1, 160, 150. 78	101. 26367
	42	801, 709. 66	101. 24583		42	1, 166, 226. 60	101. 26383
	43	807, 784. 41	101. 24617		43	1, 172, 302. 43	101. 26417
	44	813, 859. 18	101. 24650		44	1, 178, 378. 28	101. 26433
	45	819, 933. 97	101. 24683		45	1, 184, 454. 14	101. 26483
43	46	826, 008. 78	101. 24700	44	46	1, 190, 530. 03	101. 26500
	47	832, 083. 60	101. 24733		47	1, 196, 605. 93	101. 26533
	48	838, 158. 44	101. 24767		48	1, 202, 681. 85	101. 26567
	49	844, 233. 30	101. 24800		49	1, 208, 757. 79	101. 26600
	50	850, 308. 18	101. 24817		50	1, 214, 833. 75	101. 26633
43	51	856, 383. 07	101. 24850	44	51	1, 220, 909. 73	101. 26650
	52	862, 457. 98	101. 24883		52	1, 226, 985. 72	101. 26683
	53	868, 532. 91	101. 24917		53	1, 233, 061. 73	101. 26717
	54	874, 607. 86	101. 24950		54	1, 239, 137. 76	101. 26750
	55	880, 682. 83	101. 24983		55	1, 245, 213. 81	101. 26767
43	56	886, 757. 82	101. 25000	44	56	1, 251, 289. 87	101. 26800
	57	892, 832. 82	101. 25033		57	1, 257, 365. 95	101, 26833
	58	898, 907. 84	101. 25067		58	1, 263, 442. 05	101. 26867
43	59	904, 982. 88	101. 25100	44	59	1, 269, 518. 17	101. 26900
44	00	911, 057. 94	101: 25133	45	00	1, 275, 594. 31	101. 26933
44	01	917, 133. 02	101. 25150	45	01	1, 281, 670. 47	101. 26950
	02	923, 208. 11	101. 25183		02	1, 287, 746. 64	101. 26983
	03	929, 283. 22	101. 25217		03	1, 293, 822. 83	101. 27017
	04	935, 358. 35	101. 25250		04	1, 299, 899. 04	101. 27050
	05	941, 433. 50	101. 25267		05	1, 305, 975. 27	101. 27083
44	06	947, 508. 66	101. 25317	45	06	1, 312, 051. 52	101. 27100
	07	953, 583. 85	101. 25333		07	1, 318, 127. 78	101. 27133
	08	959, 659. 05	101. 25367		08	1, 324, 204. 06	101. 27167
	09	965, 734. 27	101. 25383		09	1, 330, 280. 36	101. 27200
	10	971, 809. 50	101. 25433		10	1, 336, 356. 68	101. 27217
44	11	977, 884. 76	101. 25450	45	11	1, 342, 433. 01	101. 27250
	12	983, 960. 03	101. 25483		12	1, 348, 509. 36	101. 27283
	13	990, 035. 32	101. 25517		13	1, 354, 585. 73	101. 27317
	14	996, 110. 63	101. 25550		14	1, 360, 662. 12	101. 27350
	15	1, 002, 185. 96	101. 25567		15	1, 366, 738. 53	101. 27383
44	16	1, 008, 261. 30	101. 25617	45	16	1, 372, 814. 96	101. 27400
	17	1, 014, 336. 67	101. 25633		17	1, 378, 891. 40	101. 27433
	18	1, 020, 412. 05	101. 25667		18	1, 384, 967. 86	101. 27467
	19	1, 026, 487. 45	101. 25683		19	1, 391, 044. 34	101. 27500
	20.	1, 032, 562. 86	101. 25733		20	1, 397, 120. 84	101. 27517
44	21	1, 038, 638. 30	101. 25750	45	21	1, 403, 197. 35	101. 27567
	22	1, 044, 713. 75	101. 25783		22	1, 409, 273. 89	101. 27583
	23	1, 050, 789. 22	101. 25817		23	1, 415, 350. 44	101. 27617
	24	1, 056, 864. 71	101. 25850		24	1, 421, 427. 01	101. 27650
	25	1, 062, 940. 22	101. 25867		25	1, 427, 503. 60	101. 27667
44	26	1, 069, 015. 74	101. 25900	45	26	1, 433, 580. 20	101. 27700
	27	1, 075, 091. 28	101. 25950		27	1, 439, 656. 82	101. 27750
	28	1, 081, 166. 85	101. 25967		28	1, 445, 733. 47	101. 27767
	29	1, 087, 242. 43	101. 26000		29	1, 451, 810. 13	101. 27783
	30	1, 093, 318. 03	101. 26017		30	1, 457, 886. 80	101. 27833

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, central and west zones—Continued

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
45	31	1,463,963.50	101.27850	46	31	1,828,598.17	101.29650
	32	1,470,040.21	101.27883		32	1,834,675.96	101.29683
	33	1,476,116.94	101.27917		33	1,840,753.77	101.29717
	34	1,482,193.69	101.27950		34	1,846,831.60	101.29750
	35	1,488,270.46	101.27983		35	1,852,909.45	101.29783
45	36	1,494,347.25	101.28000	46	36	1,858,987.32	101.29800
	37	1,500,424.05	101.28033		37	1,865,065.20	101.29833
	38	1,506,500.87	101.28067		38	1,871,143.10	101.29867
	39	1,512,577.71	101.28100		39	1,877,221.02	101.29900
	40	1,518,654.57	101.28117		40	1,883,298.96	101.29933
45	41	1,524,731.44	101.28167	46	41	1,889,376.92	101.29950
	42	1,530,808.34	101.28183		42	1,895,454.89	101.29983
	43	1,536,885.25	101.28217		43	1,901,532.88	101.30017
	44	1,542,962.18	101.28250		44	1,907,610.89	101.30050
	45	1,549,039.13	101.28267		45	1,913,688.92	101.30067
45	46	1,555,116.09	101.28300	46	46	1,919,766.96	101.30100
	47	1,561,193.07	101.28333		47	1,925,845.02	101.30133
	48	1,567,270.07	101.28367		48	1,931,923.10	101.30167
	49	1,573,347.09	101.28400		49	1,938,001.20	101.30200
	50	1,579,424.13	101.28433		50	1,944,079.32	101.30233
45	51	1,585,501.19	101.28450	46	51	1,950,157.46	101.30250
	52	1,591,578.26	101.28483		52	1,956,235.61	101.30283
	53	1,597,655.35	101.28517		53	1,962,313.78	101.30317
	54	1,603,732.46	101.28550		54	1,968,391.97	101.30350
	55	1,609,809.59	101.28583		55	1,974,470.18	101.30367
45	56	1,615,886.74	101.28600	46	56	1,980,548.40	101.30400
	57	1,621,963.90	101.28633		57	1,986,626.64	101.30433
	58	1,628,041.08	101.28667		58	1,992,704.90	101.30467
45	59	1,634,118.28	101.28700	46	59	1,998,783.18	101.30500
46	00	1,640,195.50	101.28733	47	00	2,004,861.48	101.30533
46	01	1,646,272.74	101.28750	47	01	2,010,939.80	101.30550
	02	1,652,349.99	101.28783		02	2,017,018.13	101.30583
	03	1,658,427.26	101.28817		03	2,023,096.48	101.30617
	04	1,664,504.55	101.28850		04	2,029,174.85	101.30650
	05	1,670,581.86	101.28867		05	2,035,253.24	101.30667
46	06	1,676,659.18	101.28917	47	06	2,041,331.64	101.30700
	07	1,682,736.53	101.28933		07	2,047,410.06	101.30733
	08	1,688,813.89	101.28967		08	2,053,488.50	101.30767
	09	1,694,891.27	101.29000		09	2,059,566.96	101.30800
	10	1,700,968.67	101.29017		10	2,065,645.44	101.30833
46	11	1,707,046.08	101.29050	47	11	2,071,723.94	101.30850
	12	1,713,123.51	101.29083		12	2,077,802.45	101.30883
	13	1,719,200.96	101.29117		13	2,083,880.98	101.30917
	14	1,725,278.43	101.29150		14	2,089,959.53	101.30933
	15	1,731,355.92	101.29183		15	2,096,038.09	101.30983
46	16	1,737,433.43	101.29200	47	16	2,102,116.68	101.31000
	17	1,743,510.95	101.29233		17	2,108,195.28	101.31033
	18	1,749,588.49	101.29267		18	2,114,273.90	101.31067
	19	1,755,666.05	101.29300		19	2,120,352.54	101.31083
	20	1,761,743.63	101.29333		20	2,126,431.19	101.31133
46	21	1,767,821.23	101.29350	47	21	2,132,509.87	101.31150
	22	1,773,898.84	101.29383		22	2,138,588.56	101.31183
	23	1,779,976.47	101.29417		23	2,144,667.27	101.31217
	24	1,786,054.12	101.29450		24	2,150,746.00	101.31233
	25	1,792,131.79	101.29467		25	2,156,824.74	101.31283
46	26	1,798,209.47	101.29517	47	26	2,162,903.51	101.31300
	27	1,804,287.18	101.29533		27	2,168,982.29	101.31333
	28	1,810,364.90	101.29567		28	2,175,061.09	101.31367
	29	1,816,442.64	101.29600		29	2,181,139.91	101.31383
	30	1,822,520.40	101.29617		30	2,187,218.74	101.31433

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table I, central and west zones—Continued

Latitude		y	Tabular difference for one second of latitude	Latitude		y	Tabular difference for one second of latitude
°	′	*Feet*	*Feet*	°	′	*Feet*	*Feet*
47	31	2, 193, 297. 60	101. 31450	47	56	2, 345, 274. 77	101. 32200
	32	2, 199, 376. 47	101. 31483		57	2, 351, 354. 09	101. 32233
	33	2, 205, 455. 36	101. 31517		58	2, 357, 433. 43	101. 32267
	34	2, 211, 534. 27	101. 31533	47	59	2, 363, 512. 79	101. 32283
	35	2, 217, 613. 19	101. 31567	48	00	2, 369, 592. 16	101. 32317
47	36	2, 223, 692. 13	101. 31600	48	01	2, 375, 671. 55	101. 32350
	37	2, 229, 771. 09	101. 31633		02	2, 381, 750. 96	101. 32383
	38	2, 235, 850. 07	101. 31667		03	2, 387, 830. 39	101. 32417
	39	2, 241, 929. 07	101. 31700		04	2, 393, 909. 84	101. 32433
	40	2, 248, 008. 09	101. 31717		05	2, 399, 989. 30	101. 32467
47	41	2, 254, 087. 12	101. 31750	48	06	2, 406, 068. 78	101. 32500
	42	2, 260, 166. 17	101. 31783		07	2, 412, 148. 28	101. 32533
	43	2, 266, 245. 24	101. 31817		08	2, 418, 227. 80	101. 32550
	44	2, 272, 324. 33	101. 31833		09	2, 424, 307. 33	101. 32583
	45	2, 278, 403. 43	101. 31883		10	2, 430, 386. 88	101. 32617
47	46	2, 284, 482. 56	101. 31900	48	11	2, 436, 466. 45	101. 32650
	47	2, 290, 561. 70	101. 31933		12	2, 442, 546. 04	101. 32683
	48	2, 296, 640. 86	101. 31950		13	2, 448, 625. 65	101. 32717
	49	2, 302, 720. 03	101. 32000		14	2, 454, 705. 28	101. 32733
	50	2, 308, 799. 23	101. 32017		15	2, 460, 784. 92	101. 32767
47	51	2, 314, 878. 44	101. 32050	48	16	2, 466. 864. 58	101. 32800
	52	2, 320, 957. 67	101. 32083		17	2, 472, 944. 26	101. 32833
	53	2, 327, 036. 92	101. 32117		18	2, 479, 023. 96	101. 32850
	54	2, 333, 116. 19	101. 32133		19	2, 485, 103. 67	101. 32883
	55	2, 339, 195. 47	101. 32167		20	2, 491, 183. 40	

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table II, central and west zones

x'	Scale in units of seventh place of logarithms	Scale expressed as a ratio	x'	Scale in units of seventh place of logarithms	Scale expressed as a ratio
Feet			*Feet*		
0	−394.8	0.9999091	250,000	−84.8	0.9999805
5,000	−394.7	.9999091	255,000	−72.3	.9999834
10,000	−394.3	.9999092	260,000	−59.5	.9999863
15,000	−393.7	.9999093	265,000	−46.5	.9999893
20,000	−392.8	.9999096	270,000	−33.3	.9999923
25,000	−391.7	.9999098	275,000	−19.8	.9999954
30,000	−390.3	.9999101	280,000	−6.0	0.9999986
35,000	−388.7	.9999105	285,000	+8.0	1.0000018
40,000	−386.9	.9999109	290,000	+22.3	1.0000051
45,000	−384.8	.9999114	295,000	+36.8	1.0000085
50,000	−382.4	.9999119	300,000	+51.5	1.0000119
55,000	−379.8	.9999125	305,000	+66.5	1.0000153
60,000	−376.9	.9999132	310,000	+81.8	1.0000188
65,000	−373.8	.9999139	315,000	+97.3	1.0000224
70,000	−370.5	.9999147	320,000	+113.0	1.0000260
75,000	−366.9	.9999155	325,000	+129.0	1.0000297
80,000	−363.1	.9999164	330,000	+145.3	1.0000335
85,000	−359.0	.9999173	335,000	+161.8	1.0000373
90,000	−354.6	.9999184	340,000	+178.5	1.0000411
95,000	−350.0	.9999194	345,000	+195.5	1.0000450
100,000	−345.2	.9999205	350,000	+212.7	1.0000489
105,000	−340.1	.9999217	355,000	+230.2	1.0000530
110,000	−334.8	.9999229	360,000	+247.9	1.0000571
115,000	−329.2	.9999242	365,000	+265.9	1.0000612
120,000	−323.4	.9999255	370,000	+284.1	1.0000654
125,000	−317.3	.9999269	375,000	+302.6	1.0000697
130,000	−311.0	.9999284	380,000	+321.3	1.0000740
135,000	−304.4	.9999299	385,000	+340.3	1.0000784
140,000	−297.6	.9999315	390,000	+359.5	1.0000828
145,000	−290.5	.9999331	395,000	+379.0	1.0000873
150,000	−283.2	.9999348	400,000	+398.7	1.0000918
155,000	−275.6	.9999365	405,000	+418.6	1.0000964
160,000	−267.8	.9999383	410,000	+438.8	1.0001010
165,000	−259.8	.9999402	415,000	+459.3	1.0001058
170,000	−251.5	.9999421	420,000	+480.0	1.0001105
175,000	−242.9	.9999441	425,000	+501.0	1.0001154
180,000	−234.1	.9999461	430,000	+522.2	1.0001202
185,000	−225.1	.9999482	435,000	+543.6	1.0001252
190,000	−215.8	.9999503	440,000	+565.3	1.0001302
195,000	−206.2	.9999525	445,000	+587.2	1.0001352
200,000	−196.4	.9999548	450,000	+609.4	1.0001403
205,000	−186.4	.9999571	455,000	+631.9	1.0001455
210,000	−176.1	.9999595	460,000	+654.6	1.0001508
215,000	−165.6	.9999619	465,000	+677.5	1.0001560
220,000	−154.8	.9999644	470,000	+700.7	1.0001613
			475,000	+724.1	1.0001667
225,000	−143.7	.9999669			
230,000	−132.4	.9999695			
235,000	−120.9	.9999722			
240,000	−109.1	.9999749			
245,000	−97.1	0.9999776			

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table III

Latitude	Colog *A*	Log *C*	Latitude	Colog *A*	Log *C*
° ′			° ′		
41 30	1.49091973	1.351168	42 36	1.49094789	1.367821
31	2016	1423	37	4831	8074
32	2058	1675	38	4874	8325
33	2101	1927	39	4917	8577
34	2144	2179	40	4959	8829
35	2186	2433			
			42 41	1.49095002	1.369081
41 36	2229	2686	42	5045	9332
37	2271	2938	43	5088	9584
38	2314	3191	44	5130	1.369836
39	2357	3445	45	5173	1.370088
40	2399	3698			
			42 46	5216	0339
41 41	1.49092442	1.353952	47	5259	0591
42	2484	4204	48	5301	0843
43	2527	4456	49	5344	1094
44	2569	4709	50	5387	1346
45	2612	4962			
			42 51	1.49095430	1.371598
41 46	2655	5214	52	5473	1849
47	2697	5466	53	5515	2101
48	2740	5719	54	5558	2353
49	2782	5972	55	5601	2604
50	2825	6224			
			42 56	5644	2856
41 51	1.49092868	1.356475	57	5686	3108
52	2910	6727	58	5729	3359
53	2953	6980	42 59	5772	3611
54	2996	7233	43 00	5815	3863
55	3038	7485			
			43 01	1.49095858	1.374114
41 56	3081	7737	02	5900	4365
57	3124	7990	03	5943	4617
58	3166	8242	04	5986	4869
41 59	3209	8494	05	6029	5120
42 00	3252	8746			
			43 06	6072	5371
42 01	1.49093294	1.359000	07	6114	5624
02	3337	9252	08	6157	5875
03	3379	9504	09	6200	6125
04	3422	1.359757	10	6243	6377
05	3465	1.360009			
			43 11	1.49096286	1.376629
42 06	3507	0261	12	6328	6880
07	3550	0513	13	6371	7132
08	3593	0765	14	6414	7384
09	3635	1017	15	6457	7635
10	3678	1269			
			43 16	6500	7886
42 11	1.49093721	1.361522	17	6542	8138
12	3763	1774	18	6585	8389
13	3806	2026	19	6628	8640
14	3849	2279	20	6671	8892
15	3892	2530			
			43 21	1.49096714	1.379144
42 16	3934	2782	22	6756	9395
17	3977	3035	23	6799	9646
18	4020	3287	24	6842	1.379898
19	4062	3539	25	6885	1.380149
20	4105	3792			
			43 26	6928	0400
42 21	1.49094148	1.364043	27	6971	0652
22	4190	4294	28	7013	0903
23	4233	4546	29	7056	1154
24	4276	4798	30	7099	1405
25	4319	5050			
			43 31	1.49097142	1.381657
42 26	4361	5302	32	7185	1908
27	4404	5555	33	7228	2159
28	4447	5807	34	7270	2411
29	4489	6060	35	7313	2662
30	4532	6310			
			43 36	7356	2913
42 31	1.49094575	1.366562	37	7399	3165
32	4618	6815	38	7442	3416
33	4660	7065	39	7485	3667
34	4703	7318	40	7527	3918
35	4746	7569			

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table III—Continued

Latitude		Colog *A*	Log *C*	Latitude		Colog *A*	Log *C*
°	′			°	′		
43	41	1.49097570	1.384170	44	46	1.49100357	1.400488
	42	7613	4421		47	0400	0738
	43	7656	4671		48	0443	0990
	44	7699	4923		49	0486	1241
	45	7742	5174		50	0529	1491
43	46	7785	5425	44	51	1.49100572	1.401743
	47	7827	5677		52	0615	1995
	48	7870	5927		53	0658	2244
	49	7913	6178		54	0701	2495
	50	7956	6429		55	0743	2747
43	51	1.49097999	1.386681	44	56	0786	2997
	52	8042	6931		57	0829	3248
	53	8085	7182		58	0872	3500
	54	8127	7434	44	59	0915	3750
	55	8170	7685	45	00	0958	4001
43	56	8213	7936	45	01	1.49101001	1.404253
	57	8256	8188		02	1044	4503
	58	8299	8439		03	1087	4754
43	59	8342	8689		04	1130	5005
44	00	8385	8940		05	1172	5256
44	01	1.49098428	1.389192	45	06	1215	5507
	02	8470	9443		07	1258	5758
	03	8513	9694		08	1301	6009
	04	8556	1.389944		09	1344	6260
	05	8599	1.390196		10	1387	6511
44	06	8642	0447	45	11	1.49101430	1.406761
	07	8685	0699		12	1473	7013
	08	8728	0950		13	1516	7263
	09	8771	1200		14	1559	7513
	10	8813	1451		15	1601	7765
44	11	1.49098856	1.391703	45	16	1644	8016
	12	8899	1954		17	1687	8266
	13	8942	2204		18	1730	8517
	14	8985	2456		19	1773	8769
	15	9028	2707		20	1816	9019
44	16	9071	2958	45	21	1.49101859	1.409270
	17	9114	3209		22	1902	9522
	18	9156	3460		23	1945	1.409772
	19	9199	3711		24	1988	1.410023
	20	9242	3962		25	2030	0275
44	21	1.49099285	1.394213	45	26	2073	0526
	22	9328	4464		27	2116	0776
	23	9371	4715		28	2159	1027
	24	9414	4967		29	2202	1279
	25	9457	5217		30	2245	1529
44	26	9500	5468	45	31	1.49102288	1.411780
	27	9542	5719		32	2331	2032
	28	9585	5970		33	2374	2282
	29	9628	6221		34	2416	2533
	30	9671	6472		35	2459	2785
44	31	1.49099714	1.396723	45	36	2502	3035
	32	9757	6974		37	2545	3286
	33	9800	7225		38	2588	3537
	34	9843	7476		39	2631	3789
	35	9886	7727		40	2674	4039
44	36	9928	7978	45	41	1.49102717	1.414290
	37	1.49099971	8229		42	2760	4542
	38	1.49100014	8480		43	2803	4793
	39	0057	8731		44	2845	5043
	40	0100	8982		45	2888	5295
44	41	1.49100143	1.399233	45	46	2931	5546
	42	0186	9484		47	2974	5797
	43	0229	9735		48	3017	6047
	44	0272	1.399985		49	3060	6299
	45	0314	1.400237		50	3103	6550

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table III—Continued

Latitude		Colog *A*	Log *C*	Latitude		Colog *A*	Log *C*
°	′			°	′		
45	51	1.49103146	1.416801	47	06	1.49106359	1.435649
	52	3189	7052		07	6402	5900
	53	3231	7303		08	6445	6152
	54	3274	7554		09	6488	6404
	55	3317	7805		10	6530	6656
45	56	3360	8057	47	11	1.49106573	1.436907
	57	3403	8307		12	6616	7158
	58	3446	8558		13	6659	7411
45	59	3489	8809		14	6702	7662
46	00	3532	9061		15	6744	7913
46	01	1.49103574	1.419312	47	16	6787	8166
	02	3617	9563		17	6830	8417
	03	3660	1.419815		18	6873	8669
	04	3703	1.420065		19	6915	8921
	05	3746	0317		20	6958	9173
46	06	3789	0568	47	21	1.49107001	1.439424
	07	3832	0819		22	7044	9676
	08	3875	1070		23	7086	1.439928
	09	3918	1321		24	7129	1.440180
	10	3960	1572		25	7172	0432
46	11	1.49104003	1.421823	47	26	7215	0684
	12	4046	2075		27	7257	0936
	13	4089	2326		28	7300	1187
	14	4132	2577		29	7343	1440
	15	4175	2828		30	7386	1692
46	16	4218	3080	47	31	1.49107428	1.441943
	17	4260	3331		32	7471	2196
	18	4303	3581		33	7514	2447
	19	4346	3833		34	7557	2699
	20	4389	4084		35	7599	2951
46	21	1.49104432	1.424335	47	36	7642	3204
	22	4475	4587		37	7685	3455
	23	4518	4838		38	7728	3707
	24	4560	5089		39	7770	3960
	25	4603	5340		40	7813	4211
46	26	4646	5592	47	41	1.49107856	1.444463
	27	4689	5843		42	7899	4716
	28	4732	6094		43	7941	4968
	29	4775	6346		44	7984	5220
	30	4818	6597		45	8027	5472
46	31	1.49104860	1.426848	47	46	8069	5724
	32	4903	7100		47	8112	5976
	33	4946	7351		48	8155	6228
	34	4989	7602		49	8198	6481
	35	5032	7853		50	8240	6733
46	36	5075	8105	47	51	1.49108283	1.446985
	37	5117	8356		52	8326	7238
	38	5160	8607		53	8368	7490
	39	5203	8858		54	8411	7741
	40	5246	9109		55	8454	7993
46	41	1.49105289	1.429361	47	56	8496	8246
	42	5332	9613		57	8539	8498
	43	5374	1.429864		58	8582	8750
	44	5417	1.430115	47	59	8625	9003
	45	5460	0366	48	00	8667	9256
46	46	5503	0618	48	01	1.49108710	1.449508
	47	5546	0869		02	8753	1.449761
	48	5589	1121		03	8795	1.450013
	49	5631	1373		04	8838	0264
	50	5674	1624		05	8881	0517
46	51	1.49105717	1.431875	48	06	8923	0769
	52	5760	2126		07	8966	1021
	53	5803	2378		08	9009	1274
	54	5846	2630		09	9051	1527
	55	5888	2881		10	9094	1779
46	56	5931	3133	48	11	1.49109137	1.452031
	57	5974	3384		12	9179	2284
	58	6017	3636		13	9222	2537
46	59	6060	3888		14	9264	2789
47	00	6102	4139		15	9307	3042
47	01	1.49106145	1.434390	48	16	9350	3295
	02	6188	4642		17	9392	3547
	03	6231	4894		18	9435	3799
	04	6274	5145		19	9478	4052
	05	6316	5397		20	9520	4305

PLANE-COORDINATE PROJECTION TABLES FOR MICHIGAN—Continued

Table of constants

Constant	Zone		
	West	Central	East
λ, central meridian	88°45′00″.000	85°45′00″.000	83°40′00″.00
log R	−0.00003948	−0.00003948	−0.00002482
log $(1/6\rho_0^2)_g$	4.5803959—20	4.5806446—20	4.5806152—2
log $\left(\frac{1}{6\rho_0^2 \sin 1''}\right)_g$	9.8948210—20	9.8950697—20	9.8950403—2

$$\text{Geodetic azimuth—grid azimuth} = \Delta\alpha + \frac{(y_2 - y_1)\ (2x_1' + x_2')}{(6\rho_0^2 \sin 1'')_g}$$

Table for computing $\Delta\alpha$

[$\Delta\alpha$ *has same sign as* $\Delta\lambda$]

Latitude	$\Delta\lambda$=(Central meridian−λ)								Tabular differenc	
	0°05′	0°10′	0°15′	0°20′	0°25′	0°30′	0°35′	0°40′	$\Delta\lambda$=1′	$\Delta\lambda$=1″
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″		
41 30	3 18.8	6 37.6	9 56.4	13 15.1	16 33.9	19 52.7	23 11.5	26 30.3	+39.76	+0.6
40	19.4	38.9	9 58.3	17.8	37.2	19 56.6	16.1	35.6	+39.89	+0.6
50	20.1	40.2	10 00.3	20.4	40.5	20 00.5	20.7	40.8	+40.02	+0.6
42 00	3 20.7	6 41.5	10 02.2	13 23.0	16 43.7	20 04.4	23 25.2	26 45.9	+40.15	+0.6
10	21.4	42.8	04.2	25.6	46.9	08.3	29.7	51.1	+40.28	+0.6
20	22.0	44.1	06.1	28.1	50.2	12.2	34.3	26 56.3	+40.41	+0.6
30	22.7	45.4	08.1	30.7	53.4	16.1	38.8	27 01.4	+40.54	+0.6
40	23.3	46.6	10.0	33.3	56.6	19.9	43.3	06.6	+40.67	+0.6
50	24.0	47.9	11.9	35.8	16 59.8	23.7	47.7	11.7	+40.80	+0.6
43 00	3 24.6	6 49.2	10 13.8	13 38.4	17 03.0	20 27.6	23 52.2	27 16.8	+40.92	+0.6
10	25.2	50.5	15.7	41.0	06.2	31.4	23 56.7	21.9	+41.05	+0.6
20	25.9	51.7	17.6	43.5	09.4	35.3	24 01.1	27.0	+41.18	+0.6
30	26.5	53.0	19.5	46.0	12.5	39.1	05.6	32.1	+41.30	+0.6
40	27.1	54.3	21.4	48.6	15.7	42.8	10.0	37.1	+41.43	+0.6
50	27.8	55.5	23.3	51.1	18.9	46.6	14.4	42.2	+41.56	+0.6
44 00	3 28.4	6 56.8	10 25.2	13 53.6	17 22.0	20 50.4	24 18.8	27 47.2	+41.68	+0.6
10	29.0	58.0	27.1	56.1	25.1	54.2	23.2	52.2	+41.81	+0.6
20	29.6	6 59.3	29.0	13 58.6	28.3	20 57.9	27.6	27 57.2	+41.93	+0.6
30	30.3	7 00.5	30.8	14 01.1	31.4	21 01.6	31.9	28 02.2	+42.06	+0.7
40	30.9	01.8	32.7	03.6	34.5	05.4	36.3	07.2	+42.18	+0.7
50	31.5	03.0	34.5	06.1	37.6	09.1	40.6	12.2	+42.31	+0.7
45 00	3 32.1	7 04.3	10 36.4	14 08.5	17 40.7	21 12.8	24 44.9	28 17.1	+42.43	+0.7
10	32.7	05.5	38.2	11.0	43.7	16.5	49.3	22.0	+42.55	+0.7
20	33.4	06.7	40.1	13.5	46.8	20.2	53.6	26.9	+42.68	+0.7
30	34.0	08.0	41.9	15.9	49.9	23.9	24 57.8	31.8	+42.80	+0.7
40	34.6	09.2	43.8	18.4	52.9	27.5	25 02.1	36.7	+42.92	+0.7
50	35.2	10.4	45.6	20.8	56.0	31.2	06.4	41.6	+43.04	+0.7
46 00	3 35.8	7 11.6	10 47.4	14 23.2	17 59.0	21 34.8	25 10.6	28 46.4	+43.16	+0.7
10	36.4	12.8	49.2	25.6	18 02.0	38.5	14.9	51.3	+43.28	+0.7
20	37.0	14.0	51.0	28.1	05.1	42.1	19.1	28 56.1	+43.40	+0.7
30	37.6	15.2	52.8	30.5	08.1	45.7	23.3	29 00.9	+43.52	+0.7
40	38.2	16.4	54.6	32.9	11.1	49.3	27.5	05.7	+43.64	+0.7
50	38.8	17.6	56.4	35.2	14.1	52.9	31.7	10.5	+43.76	+0.7
47 00	3 39.4	7 18.8	10 58.2	14 37.6	18 17.0	21 56.5	25 35.9	29 15.3	+43.88	+0.7
10	39.9	20.0	11 00.0	40.0	20.0	22 00.0	40.0	20.0	+44.00	+0.7
20	40.6	21.2	01.8	42.4	23.0	03.6	44.2	24.8	+44.12	+0.7
30	41.2	22.4	03.6	44.7	25.9	07.1	48.3	29.5	+44.24	+0.7
40	41.8	23.5	05.3	47.1	28.9	10.6	52.4	34.2	+44.36	+0.7
50	42.4	24.7	07.1	49.4	31.8	14.2	25 56.5	38.9	+44.47	+0.7
48 00	3 42.9	7 25.9	11 08.8	14 51.8	18 34.7	22 17.7	26 00.6	29 43.6	+44.59	+0.7
10	43.5	27.1	10.6	54.1	37.6	21.2	04.7	48.2	+44.71	+0.7
20	44.1	28.2	12.3	56.4	40.5	24.7	08.8	52.9	+44.82	+0.7
30	44.7	29.4	14.1	58.8	43.4	28.1	12.8	57.5	+44.94	+0.7

Table for computing $\Delta\alpha$—Continued

[$\Delta\alpha$ *has same sign as* $\Delta\lambda$]

Latitude	$\Delta\lambda$=(Central meridian−λ)								Tabular differences	
	0°45′	0°50′	0°55′	1°00′	1°05′	1°10′	1°15′	1°20′	$\Delta\lambda$=1′	$\Delta\lambda$=1″
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″		
41 30	29 49.1	33 07.9	36 26.8	39 45.6	43 04.4	46 23.2	49 42.1	53 00.9	+39.76	+0.663
40	29 55.0	14.5	33.9	39 53.4	12.9	32.4	49 51.9	11.3	+39.89	+0.665
50	30 00.9	21.0	41.1	40 01.2	21.3	41.5	50 01.6	21.8	+40.02	+0.667
42 00	30 06.7	33 27.5	36 48.2	40 09.0	43 29.8	46 50.6	50 11.4	53 32.2	+40.15	+0.669
10	12.5	33.9	36 55.4	16.8	38.2	46 59.6	21.1	42.5	+40.28	+0.671
20	18.4	40.4	37 02.5	24.5	46.6	47 08.7	30.8	53 52.8	+40.41	+0.674
30	24.2	46.8	09.6	32.3	43 55.0	17.7	40.4	54 03.2	+40.54	+0.676
40	29.9	53.3	16.6	40.0	44 03.3	26.7	50.1	13.4	+40.67	+0.678
50	35.7	33 59.7	23.7	47.7	11.7	35.7	50 59.7	23.7	+40.80	+0.680
43 00	30 41.5	34 06.1	37 30.7	40 55.3	44 20.0	47 44.6	51 09.3	54 33.9	+40.92	+0.682
10	47.2	12.4	37.7	41 03.0	28.2	47 53.5	18.8	44.1	+41.05	+0.684
20	52.9	18.8	44.7	10.6	36.5	48 02.4	28.3	54 54.3	+41.18	+0.686
30	30 58.6	25.1	51.7	18.2	44.8	11.3	37.8	55 04.4	+41.30	+0.688
40	31 04.3	31.4	37 58.6	25.8	44 53.0	20.1	47.3	14.5	+41.43	+0.691
50	10.0	37.8	38 05.6	33.4	45 01.2	29.0	51 56.8	24.6	+41.56	+0.693
44 00	31 15.7	34 44.1	38 12.5	41 40.9	45 09.3	48 37.8	52 06.2	55 34.7	+41.68	+0.695
10	21.3	50.3	19.4	48.4	17.5	46.5	15.6	44.7	+41.81	+0.697
20	26.9	34 56.6	26.2	41 55.9	25.6	48 55.3	25.0	55 54.7	+41.93	+0.699
30	32.5	35 02.8	33.1	42 03.4	33.7	49 04.0	34.4	56 04.7	+42.06	+0.701
40	38.1	09.0	39.9	10.9	41.8	12.7	43.7	14.6	+42.18	+0.703
50	43.7	15.2	46.8	18.3	49.8	21.4	52 53.0	24.5	+42.31	+0.705
45 00	31 49.2	35 21.4	38 53.6	42 25.7	45 57.9	49 30.1	53 02.2	56 34.4	+42.43	+0.707
10	31 54.8	27.6	39 00.3	33.1	46 05.9	38.7	11.5	44.3	+42.55	+0.709
20	32 00.3	33.7	07.1	40.5	13.9	47.3	20.7	56 54.1	+42.68	+0.711
30	05.8	39.8	13.8	47.8	21.8	49 55.9	29.9	57 03.9	+42.80	+0.713
40	11.3	45.9	20.5	42 55.2	29.8	50 04.4	39.1	13.7	+42.92	+0.715
50	16.8	52.0	27.2	43 02.5	37.7	12.9	48.2	23.4	+43.04	+0.717
46 00	32 22.3	35 58.1	39 33.9	43 09.8	46 45.6	50 21.4	53 57.2	57 33.1	+43.16	+0.719
10	27.7	36 04.1	40.6	17.0	46 53.4	29.9	54 06.3	42.8	+43.28	+0.721
20	33.2	10.2	47.2	24.3	47 01.3	38.4	15.4	57 52.5	+43.40	+0.723
30	38.6	16.2	39 53.8	31.5	09.1	46.8	24.4	58 02.1	+43.52	+0.725
40	44.0	22.2	40 00.4	38.7	16.9	50 55.2	33.4	11.7	+43.64	+0.727
50	49.3	28.2	07.0	45.8	24.7	51 03.5	42.4	21.2	+43.76	+0.729
47 00	32 54.7	36 34.1	40 13.6	43 53.0	47 32.4	51 11.9	54 51.3	58 30.8	+43.88	+0.731
10	33 00.1	40.1	20.1	44 00.1	40.1	20.2	55 00.2	40.3	+44.00	+0.733
20	05.4	46.0	26.6	07.2	47.9	28.5	09.1	49.8	+44.12	+0.735
30	10.7	51.9	33.1	14.3	47 55.6	36.8	18.0	58 59.2	+44.24	+0.737
40	16.0	36 57.8	39.6	21.4	48 03.2	45.0	26.8	59 08.6	+44.36	+0.739
50	21.3	37 03.7	46.0	28.4	10.8	51 53.2	35.6	18.0	+44.47	+0.741
48 00	33 26.5	37 09.5	40 52.5	44 35.4	48 18.4	52 01.4	55 44.4	59 27.4	+44.59	+0.743
10	31.8	15.3	40 58.9	42.4	26.0	09.6	55 53.1	36.7	+44.71	+0.745
20	37.0	21.1	41 05.3	49.4	33.5	17.7	56 01.9	46.0	+44.82	+0.747
30	42.2	26.9	11.7	56.3	41.1	25.8	10.6	55.3	+44.94	+0.749

Table for computing $\Delta\alpha$—Continued

[$\Delta\alpha$ *has same sign as* $\Delta\lambda$]

Latitude	$\Delta\lambda$=(Central meridian $-\lambda$)						Tabular differences	
	1° 25′	1° 30′	1° 35′	1° 40′	1° 45′	1° 50′	$\Delta\lambda$=1′	$\Delta\lambda$=1″
° ′	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″	° ′ ″		
41 30	0 56 19.7	0 59 38.6	1 02 57.5	1 06 16.4	1 09 35.2	1 12 54.1	+39.76	+0.663
40	30.8	0 59 50.4	03 09.9	29.4	09 48.9	13 08.5	+39.89	+0.665
50	41.9	1 00 02.1	22.3	42.4	10 02.6	22.8	+40.02	+0.667
42 00	0 56 53.0	1 00 13.8	1 03 34.6	1 06 55.4	1 10 16.2	1 13 37.1	+40.15	+0.669
10	57 04.0	25.4	46.9	07 08.4	29.8	13 51.4	+40.28	+0.671
20	14.9	37.0	03 59.2	21.3	43.4	14 05.6	+40.41	+0.674
30	25.9	00 48.6	04 11.4	34.2	10 56.9	19.7	+40.54	+0.676
40	36.8	01 00.2	23.6	47.0	11 10.4	33.9	+40.67	+0.678
50	47.7	11.7	35.8	07 59.8	23.9	14 48.0	+40.80	+0.680
43 00	0 57 58.6	1 01 23.2	1 04 47.9	1 08 12.6	1 11 37.3	1 15 02.0	+40.92	+0.682
10	58 09.4	34.7	05 00.0	25.4	11 50.7	16.0	+41.05	+0.684
20	20.2	46.2	12.1	38.1	12 04.0	30.0	+41.18	+0.686
30	31.0	01 57.6	24.2	08 50.7	17.3	44.0	+41.30	+0.688
40	41.7	02 08.9	36.2	09 03.4	30.6	15 57.9	+41.43	+0.691
50	58 52.4	20.3	05 48.1	16.0	43.9	16 11.7	+41.56	+0.693
44 00	0 59 03.1	1 02 31.6	1 06 00.1	1 09 28.6	1 12 57.1	1 16 25.5	+41.68	+0.695
10	13.8	42.9	12.0	41.1	13 10.2	39.3	+41.81	+0.697
20	24.4	02 54.1	23.9	09 53.6	23.3	16 53.1	+41.93	+0.699
30	35.0	03 05.3	35.7	10 06.1	36.4	17 06.8	+42.06	+0.701
40	45.6	16.5	47.5	18.5	13 49.5	20.5	+42.18	+0.703
50	0 59 56.1	27.7	06 59.3	30.9	14 02.5	34.1	+42.31	+0.705
45 00	1 00 06.6	1 03 38.8	1 07 11.0	1 10 43.2	1 14 15.5	1 17 47.7	+42.43	+0.707
10	17.1	03 49.9	22.7	10 55.6	28.4	18 01.3	+42.55	+0.709
20	27.5	04 01.0	34.4	11 07.9	41.3	14.8	+42.68	+0.711
30	37.9	12.0	46.0	20.1	14 54.2	28.3	+42.80	+0.713
40	48.3	23.0	07 57.6	32.3	15 07.0	41.7	+42.92	+0.715
50	00 58.7	33.9	08 09.2	44.5	19.8	18 55.1	+43.04	+0.717
46 00	1 01 09.0	1 04 44.9	1 08 20.7	1 11 56.6	1 15 32.5	1 19 08.4	+43.16	+0.719
10	19.3	04 55.8	32.2	12 08.7	45.2	21.7	+43.28	+0.721
20	29.5	05 06.6	43.7	20.8	15 57.9	35.0	+43.40	+0.723
30	39.8	17.4	08 55.1	32.8	16 10.5	19 48.2	+43.52	+0.725
40	01 50.0	28.2	09 06.5	44.8	23.1	20 01.4	+43.64	+0.727
50	02 00.1	39.0	17.9	12 56.8	35.7	14.6	+43.76	+0.729
47 00	1 02 10.3	1 05 49.7	1 09 29.2	1 13 08.7	1 16 48.2	1 20 27.7	+43.88	+0.731
10	20.4	06 00.4	40.5	20.6	17 00.7	40.8	+44.00	+0.733
20	30.4	11.1	09 51.8	32.4	13.1	20 53.8	+44.12	+0.735
30	40.5	21.7	10 03.0	44.2	25.5	21 06.8	+44.24	+0.737
40	02 50.5	32.3	14.2	13 56.0	37.9	19.7	+44.36	+0.739
50	03 00.4	42.9	25.3	14 07.7	17 50.2	32.6	+44.47	+0.741
48 00	1 03 10.4	1 06 53.4	1 10 36.4	1 14 19.4	1 18 02.5	1 21 45.5	+44.59	+0.743
10	20.3	07 03.9	47.5	31.1	14.7	21 58.3	+44.71	+0.745
20	30.2	14.3	10 58.5	42.7	26.9	22 11.1	+44.82	+0.747
30	40.0	24.8	11 09.5	54.3	39.1	23.9	+44.94	+0.749

FIGURE 6.—Arcs included in the eastern adjustment and loop closures.

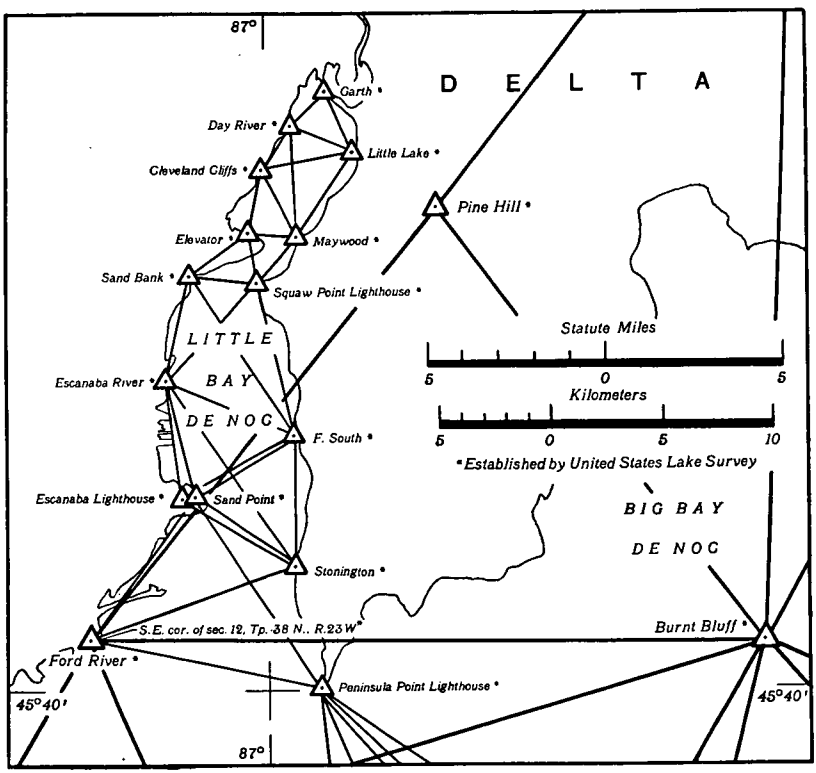

FIGURE 10.—Triangulation of Little Bay de Noc.

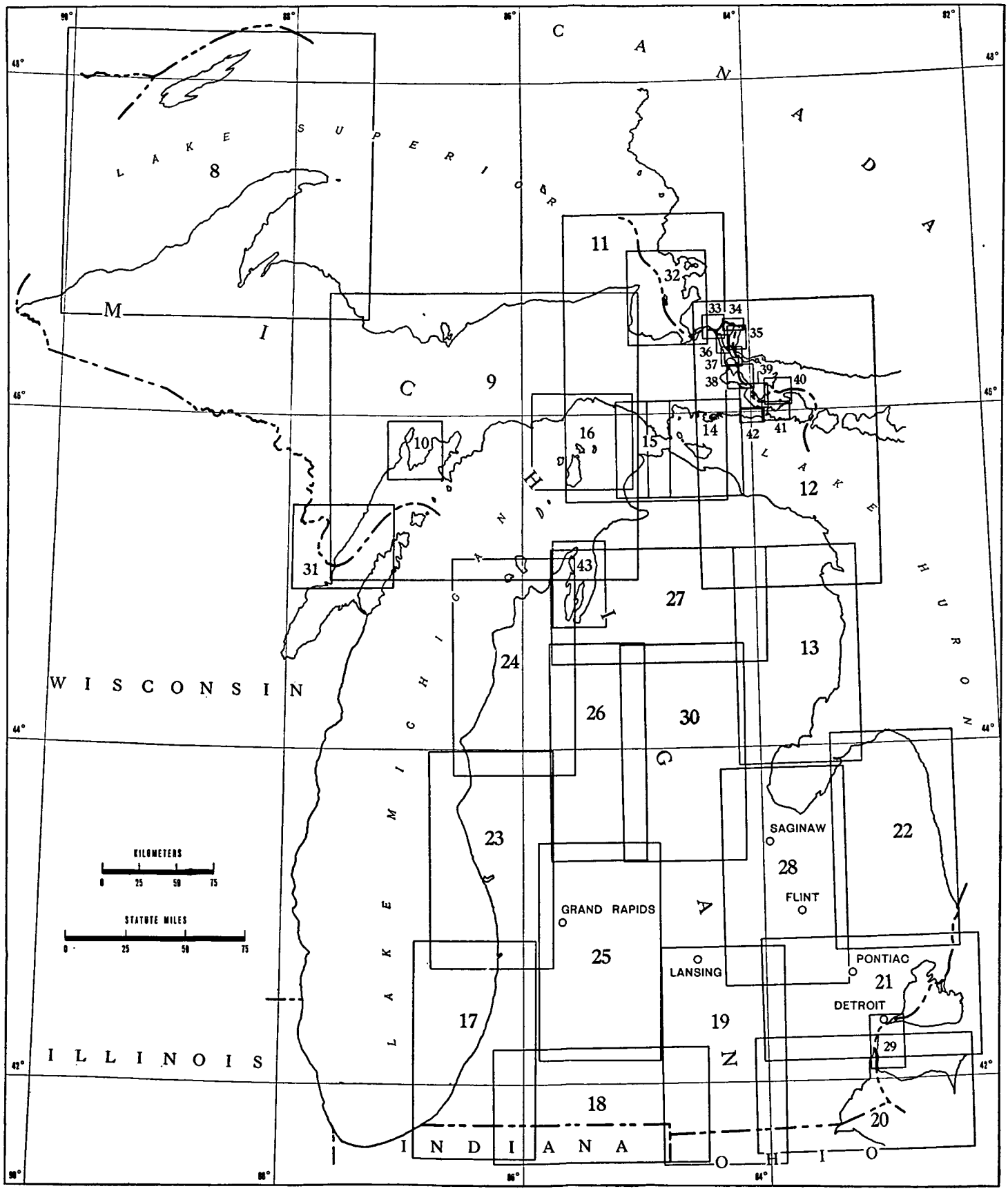

FIGURE 7.—Index map of Michigan showing areas covered by each of the following sketches, figures 8 to 43.

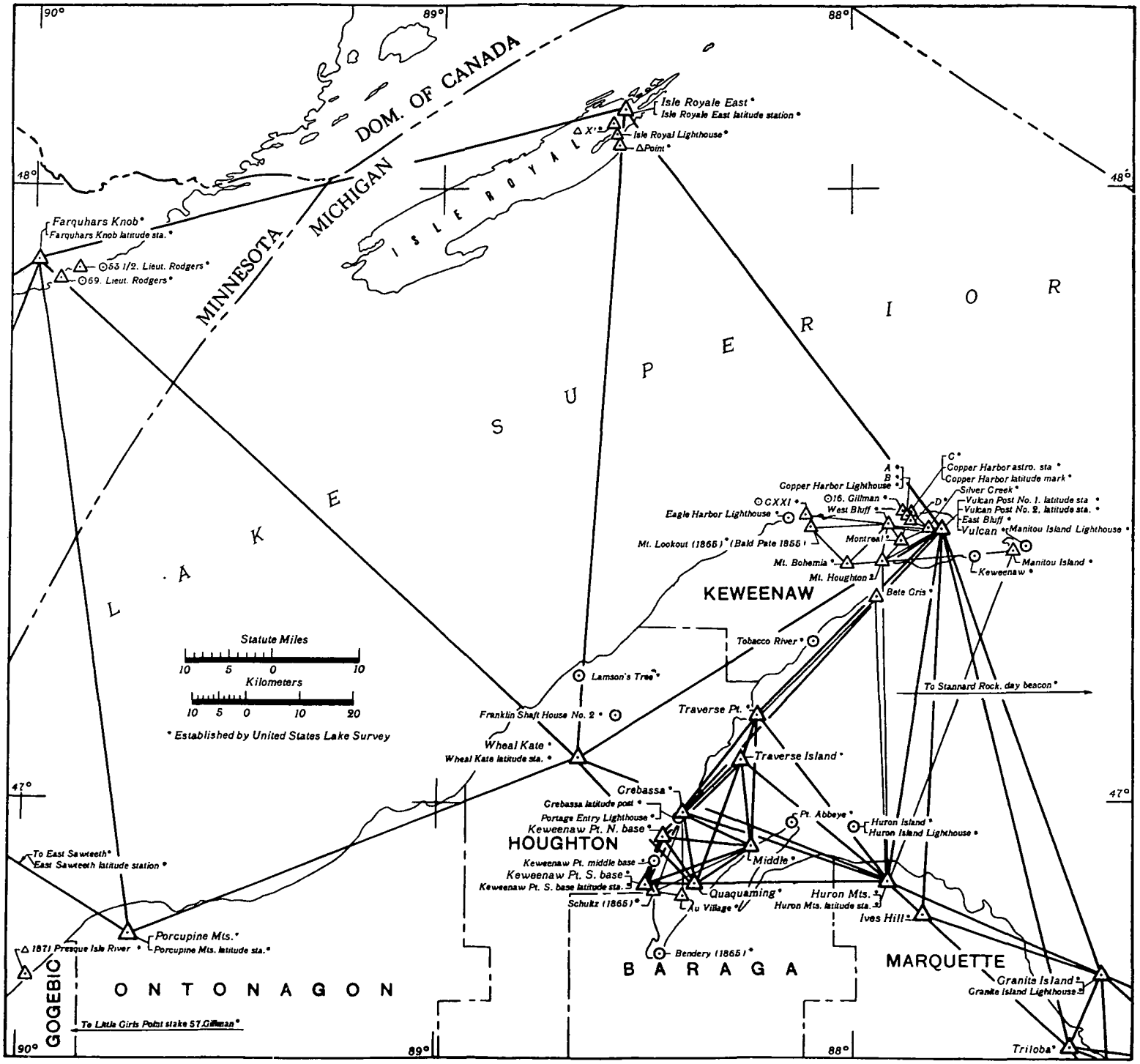

FIGURE 8.—Triangulation of Lake Superior and Keweenaw Bay.

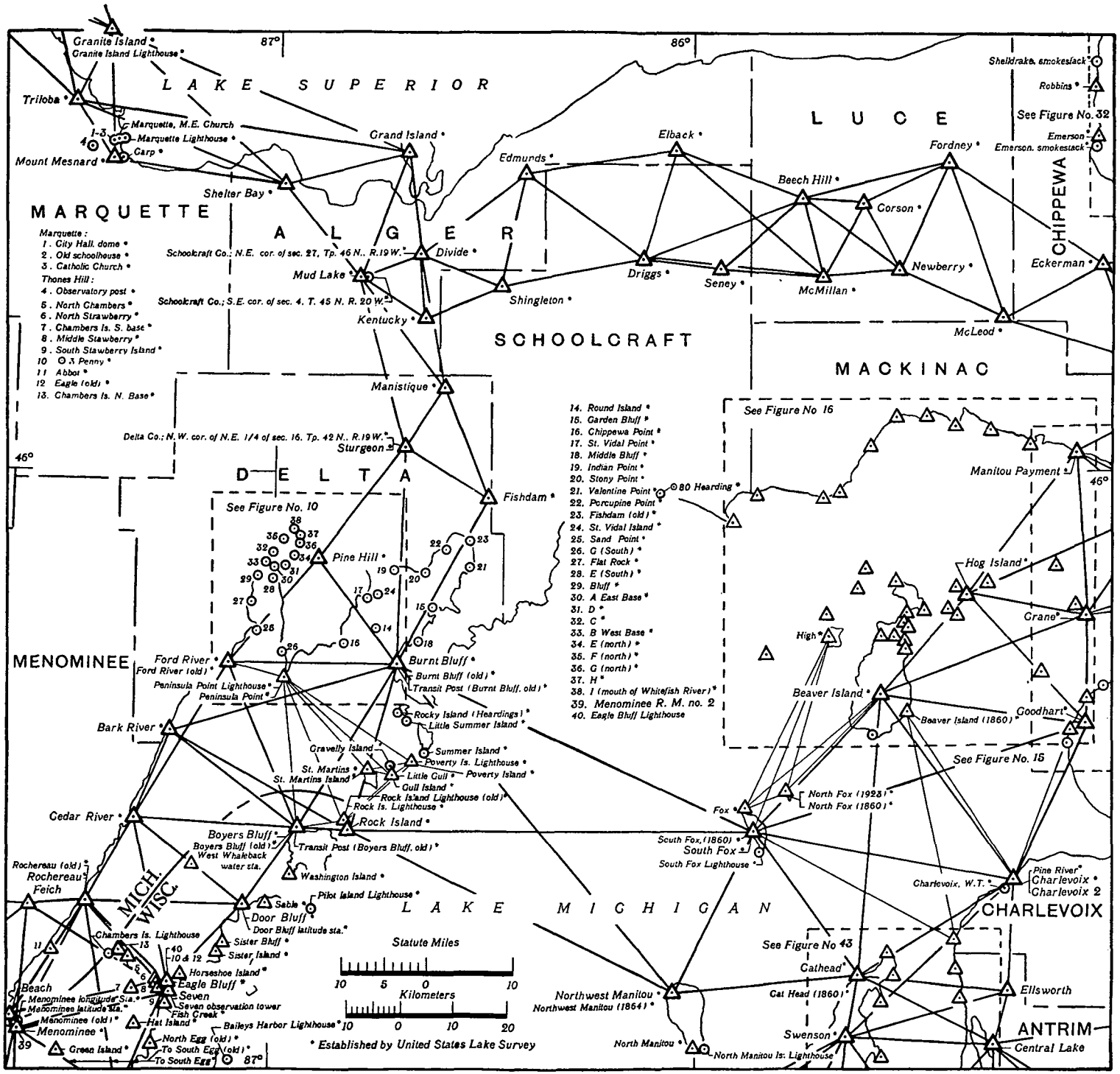

FIGURE 9.—Triangulation of Northern Michigan, Green Bay, and Northern Lake Michigan.

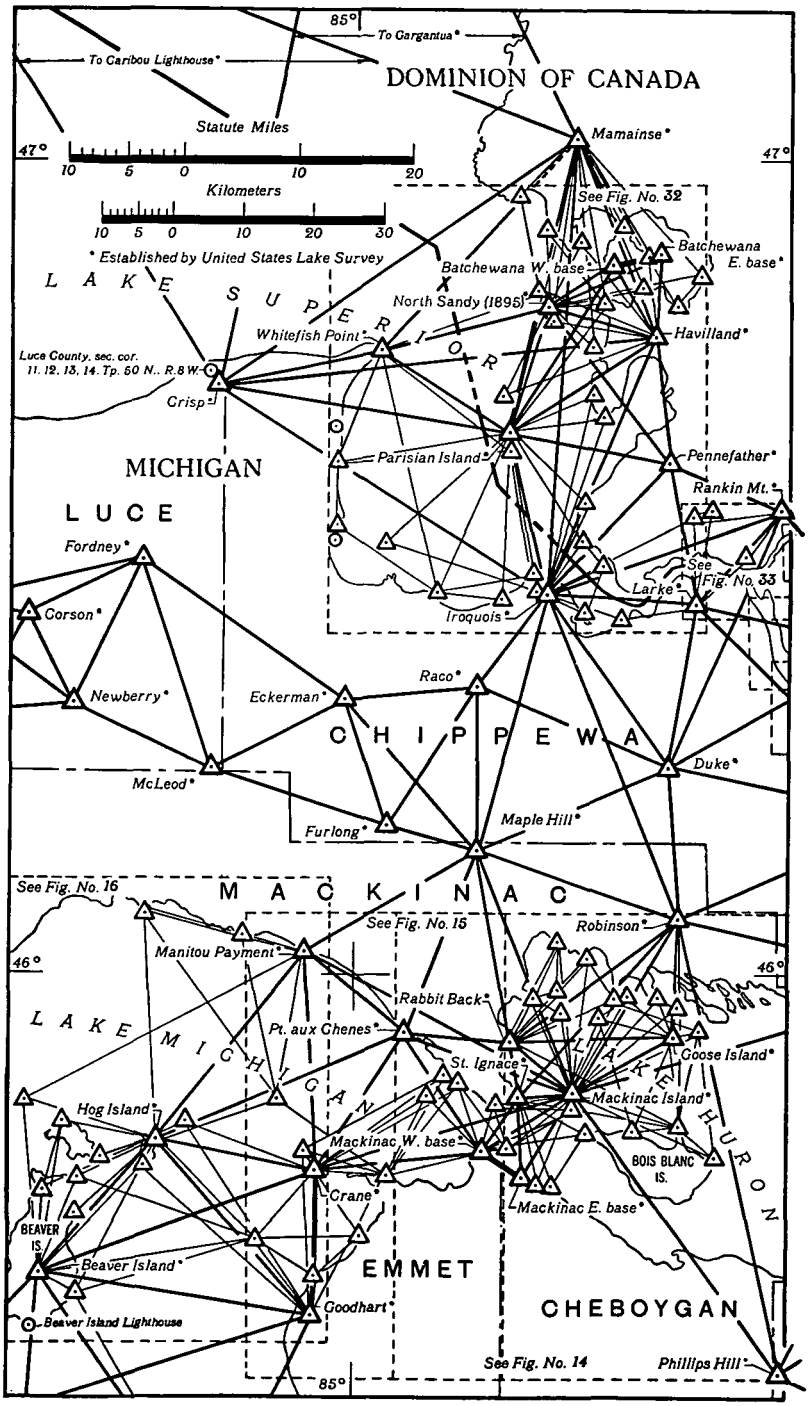

FIGURE 11.—Triangulation of Straits of Mackinac, Northern Michigan, and St. Marys River.

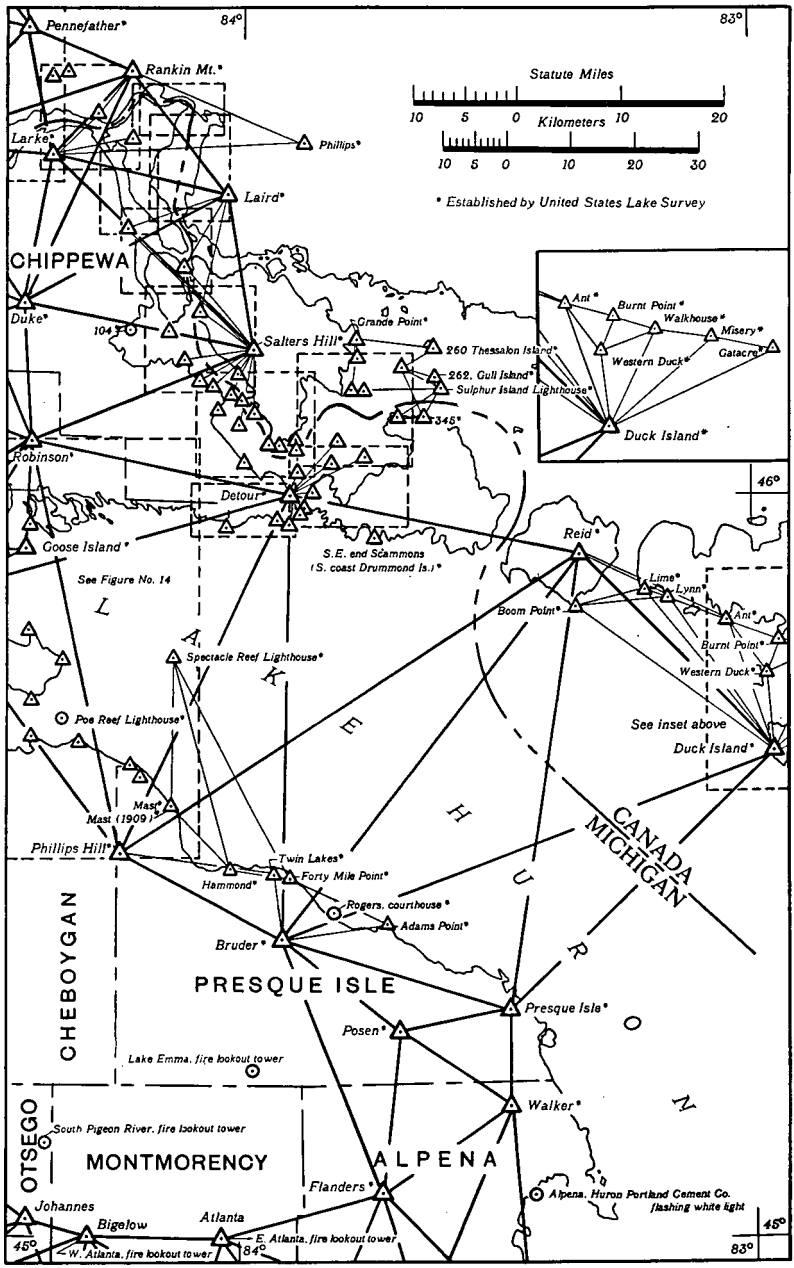

FIGURE 12.—Triangulation of upper Lake Huron and St. Marys River.

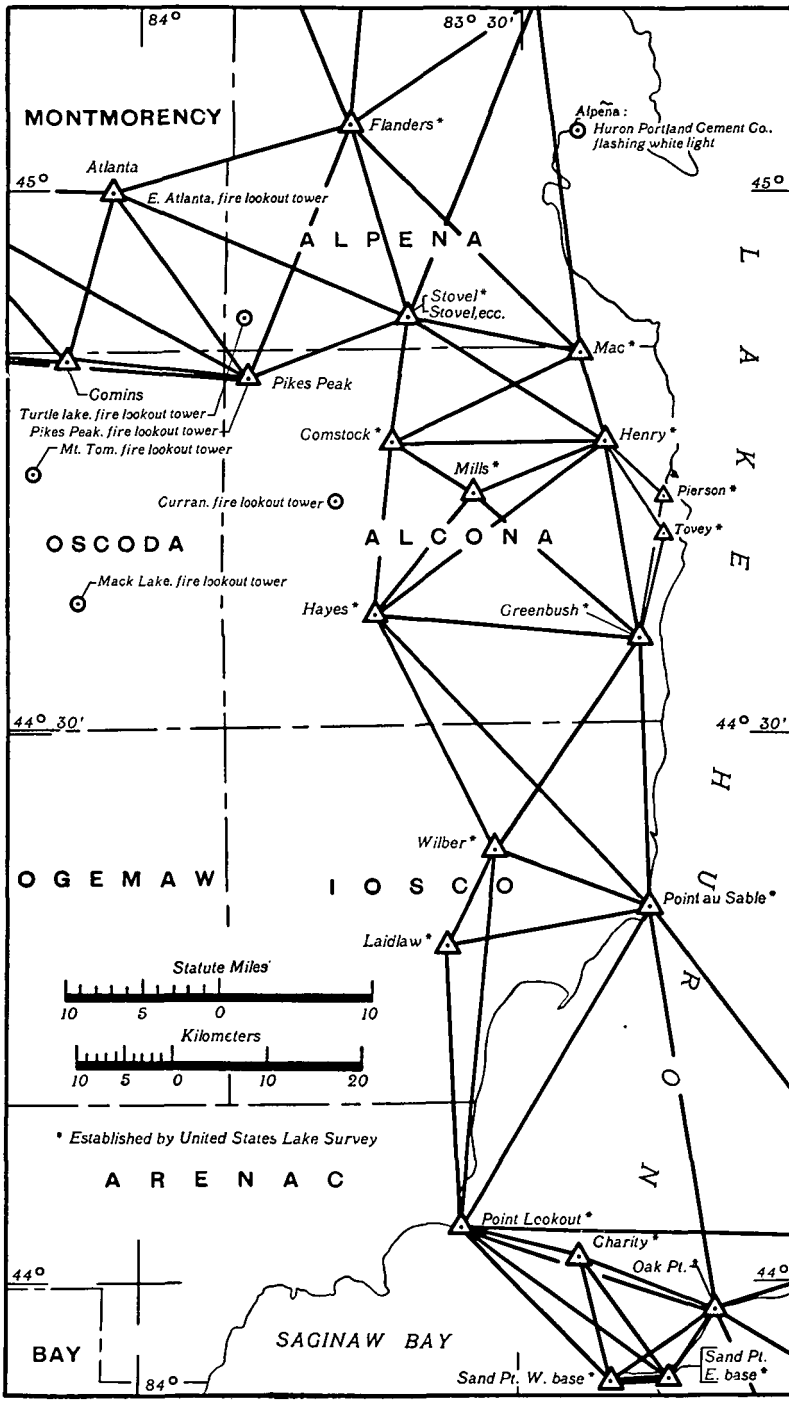

FIGURE 13.—Triangulation along Lake St. Clair to Thunder Bay arc and junction with Thunder Bay to Grand Traverse Bay arc.

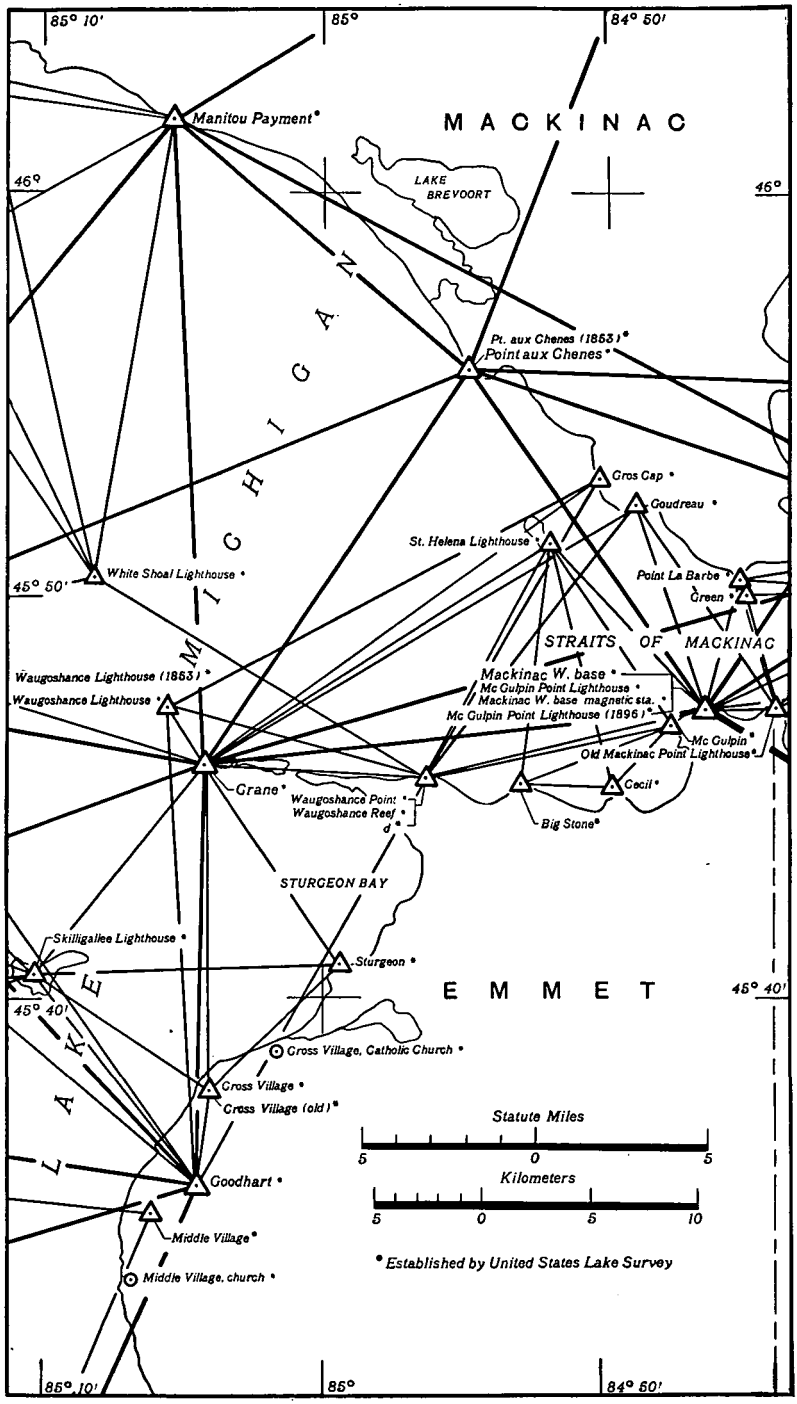

FIGURE 15.—Triangulation of upper Lake Michigan and Straits of Mackinac.

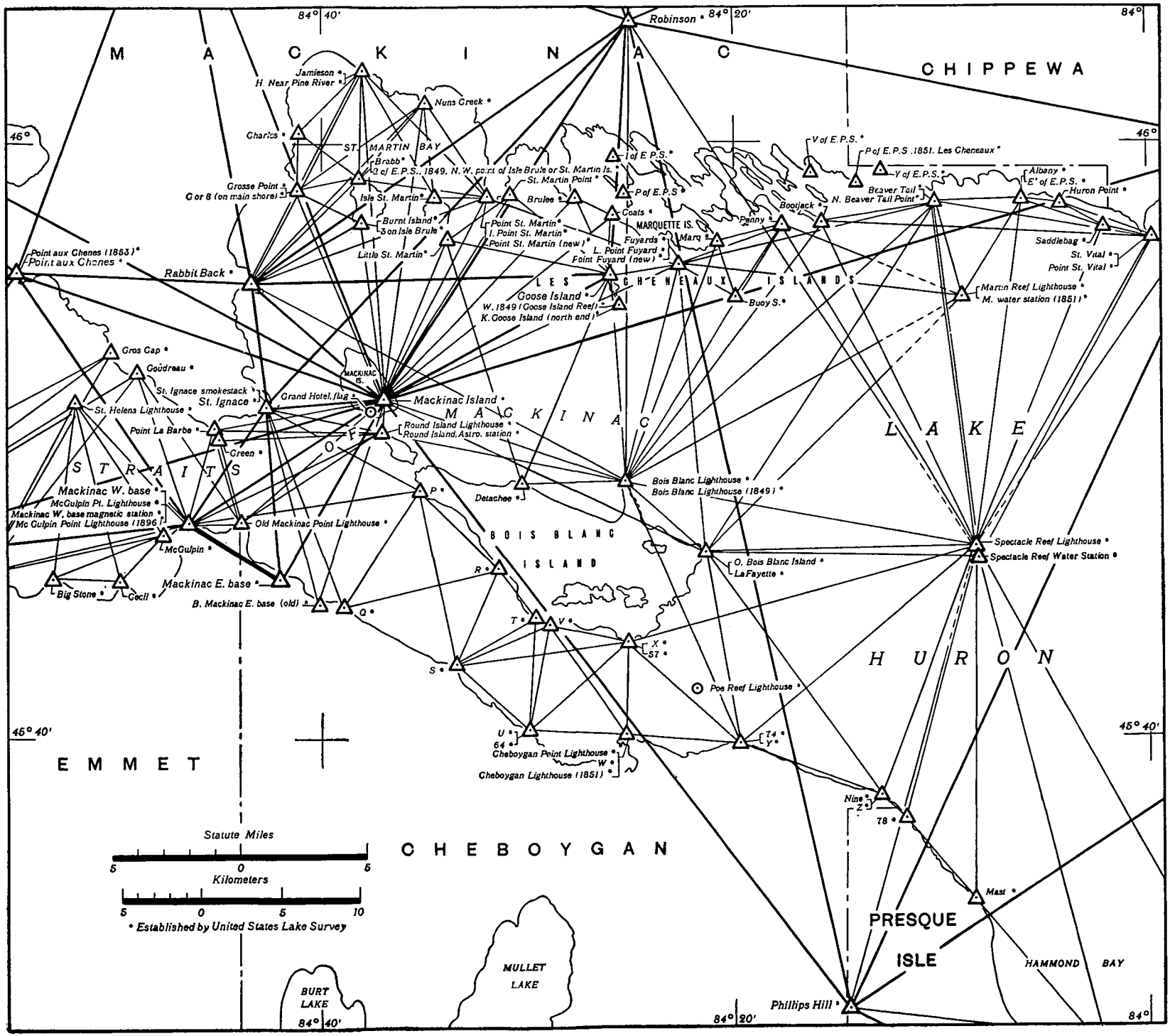

FIGURE 14.—Triangulation of upper Lake Huron and Straits of Mackinac.

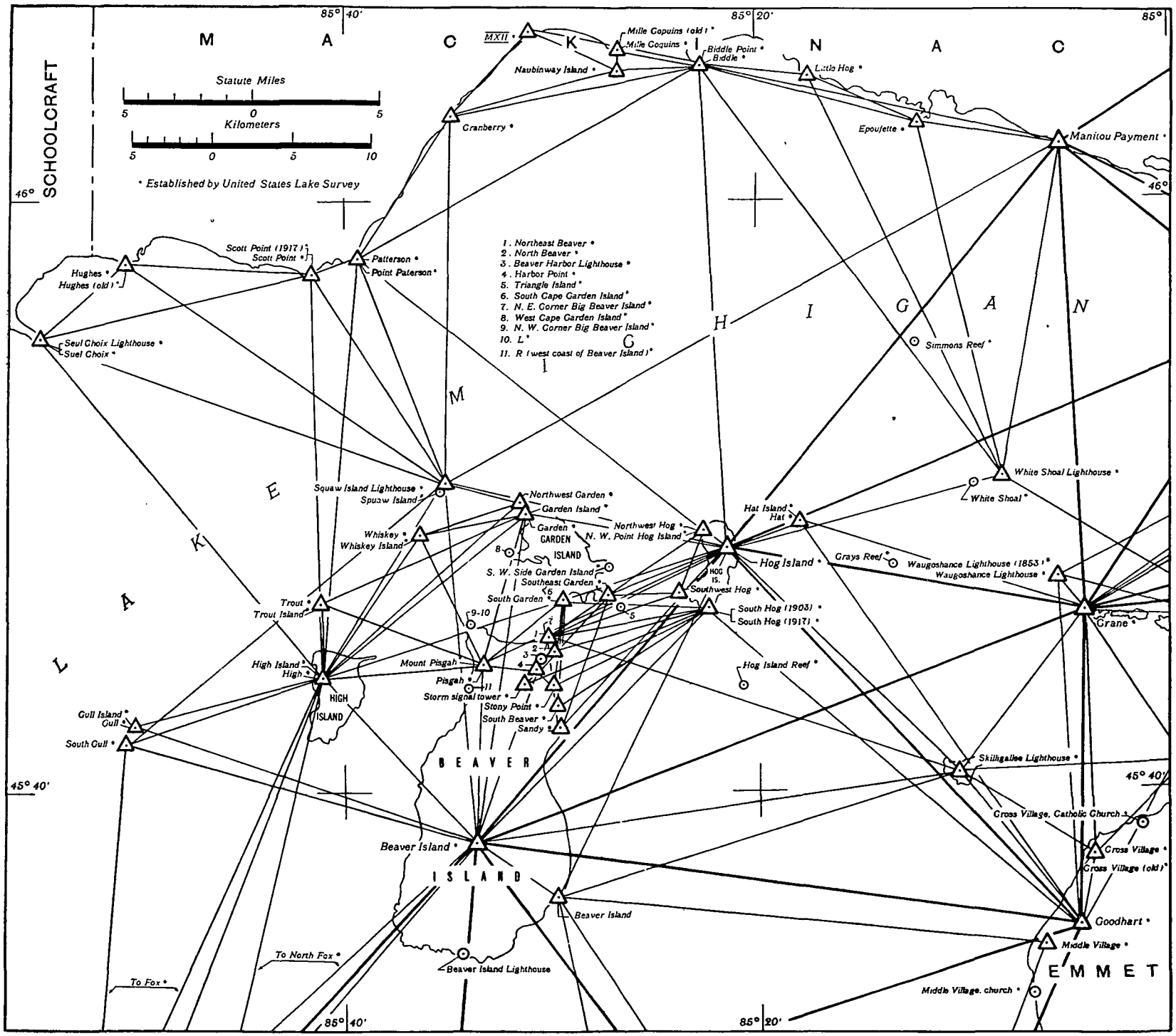

FIGURE 16.—Triangulation of upper Lake Michigan.

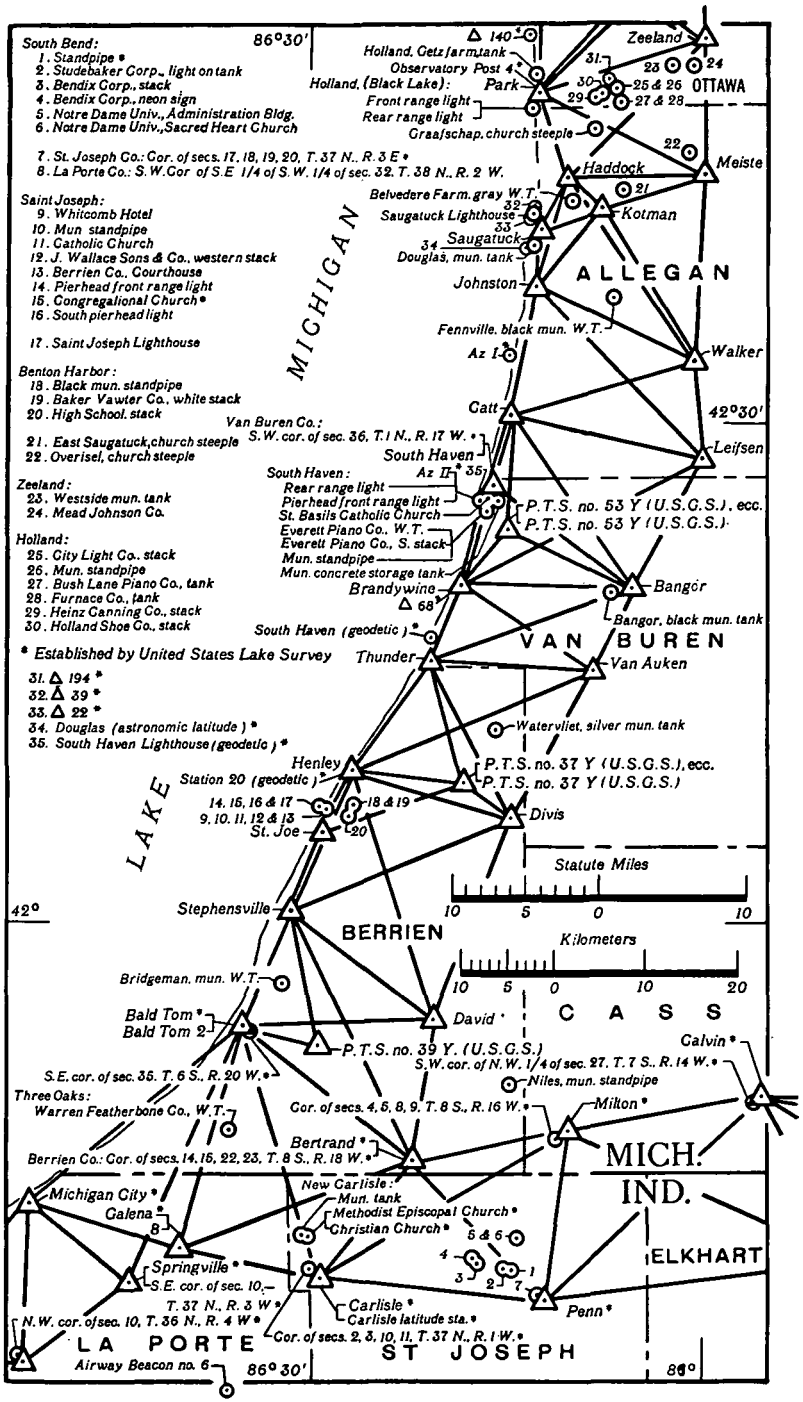

FIGURE 17.—Triangulation along east shore of Lake Michigan arc and junction with Chicago to Toledo arc.

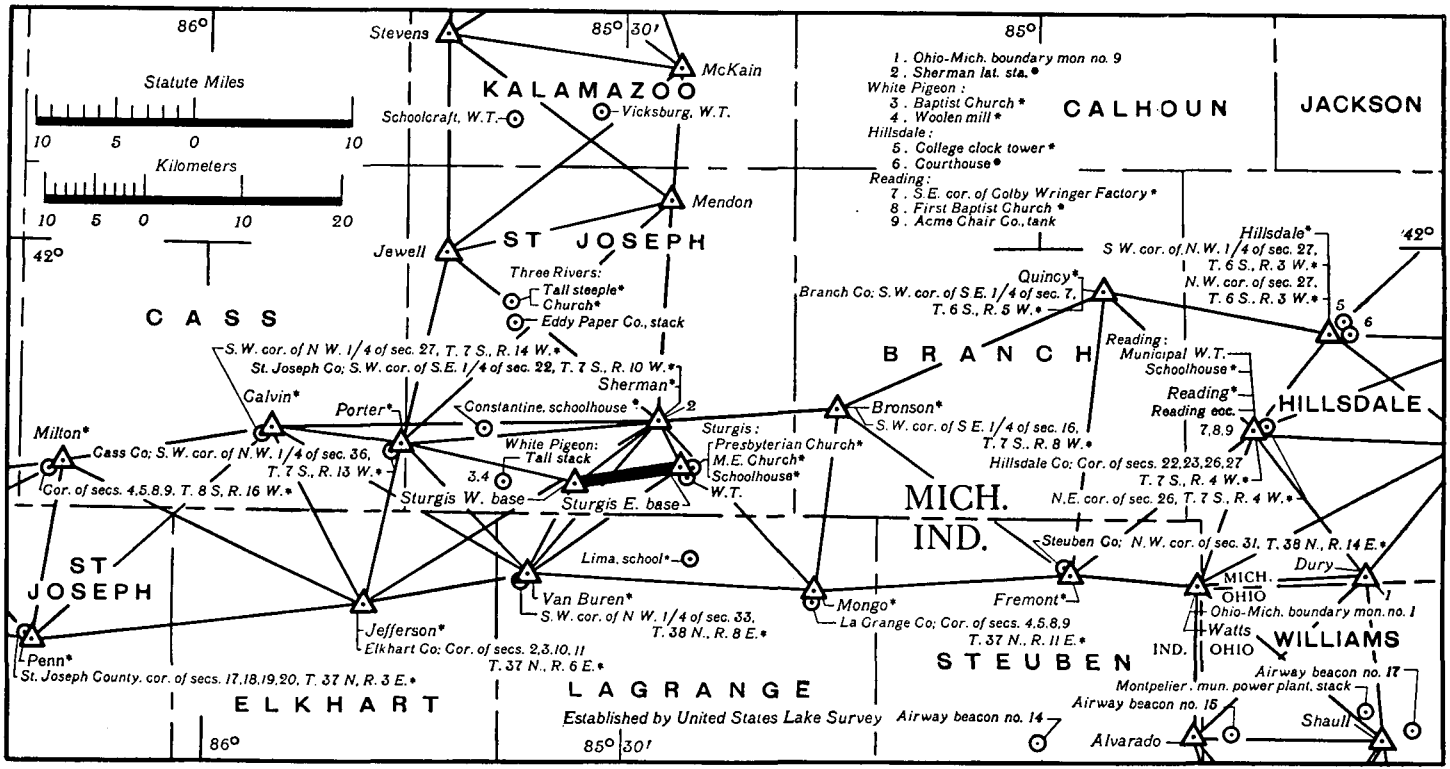

FIGURE 18.—Triangulation along Chicago to Toledo arc, junctions with Sturgis to Big Rapids and Indiana-Ohio boundary arcs.

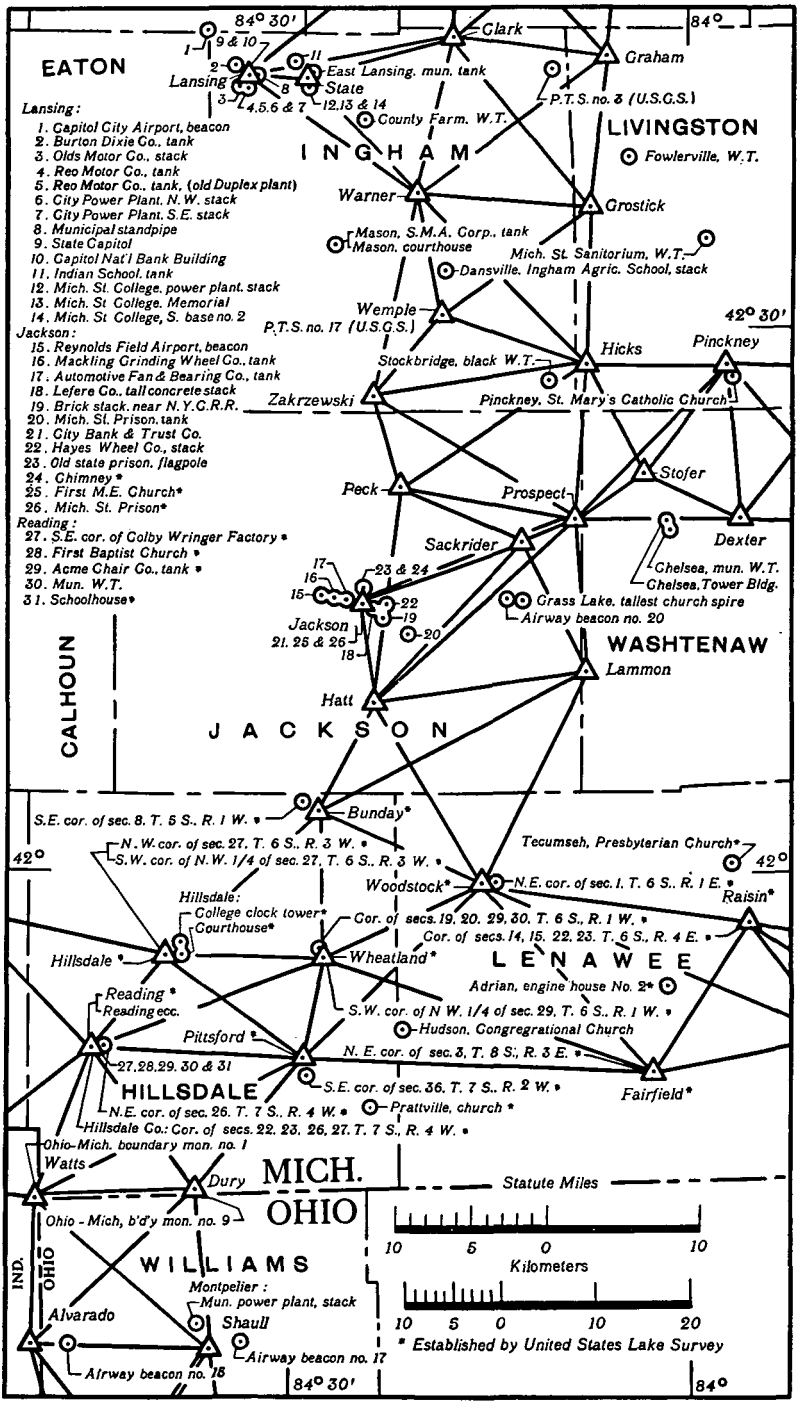

FIGURE 19.—Triangulation along Hillsdale to Saginaw arc, junctions with Chicago to Toledo and Detroit to Jackson arcs, and triangulation along Indiana-Ohio boundary arc.

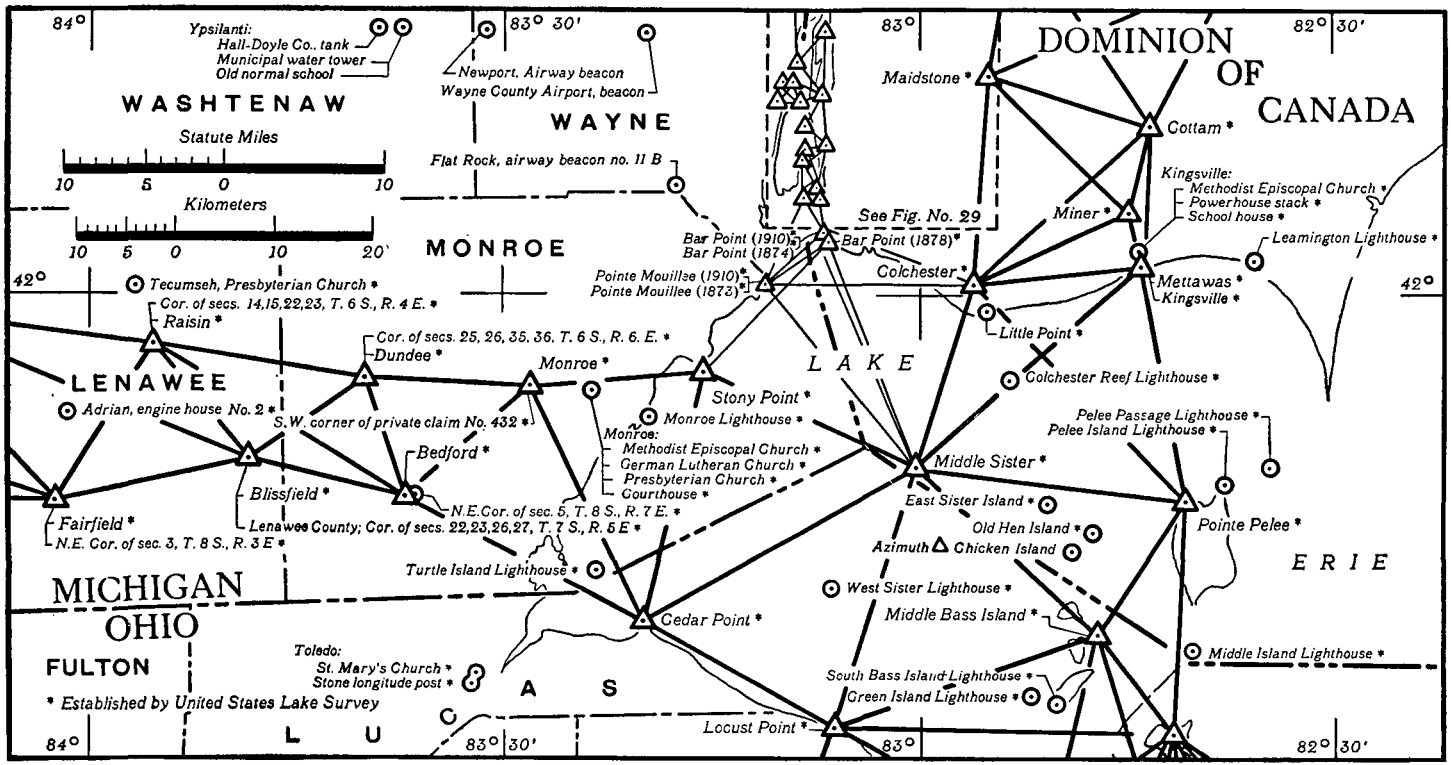

FIGURE 20.—Triangulation along Chicago to Toledo arc and Lake Erie to Lake St. Clair arc.

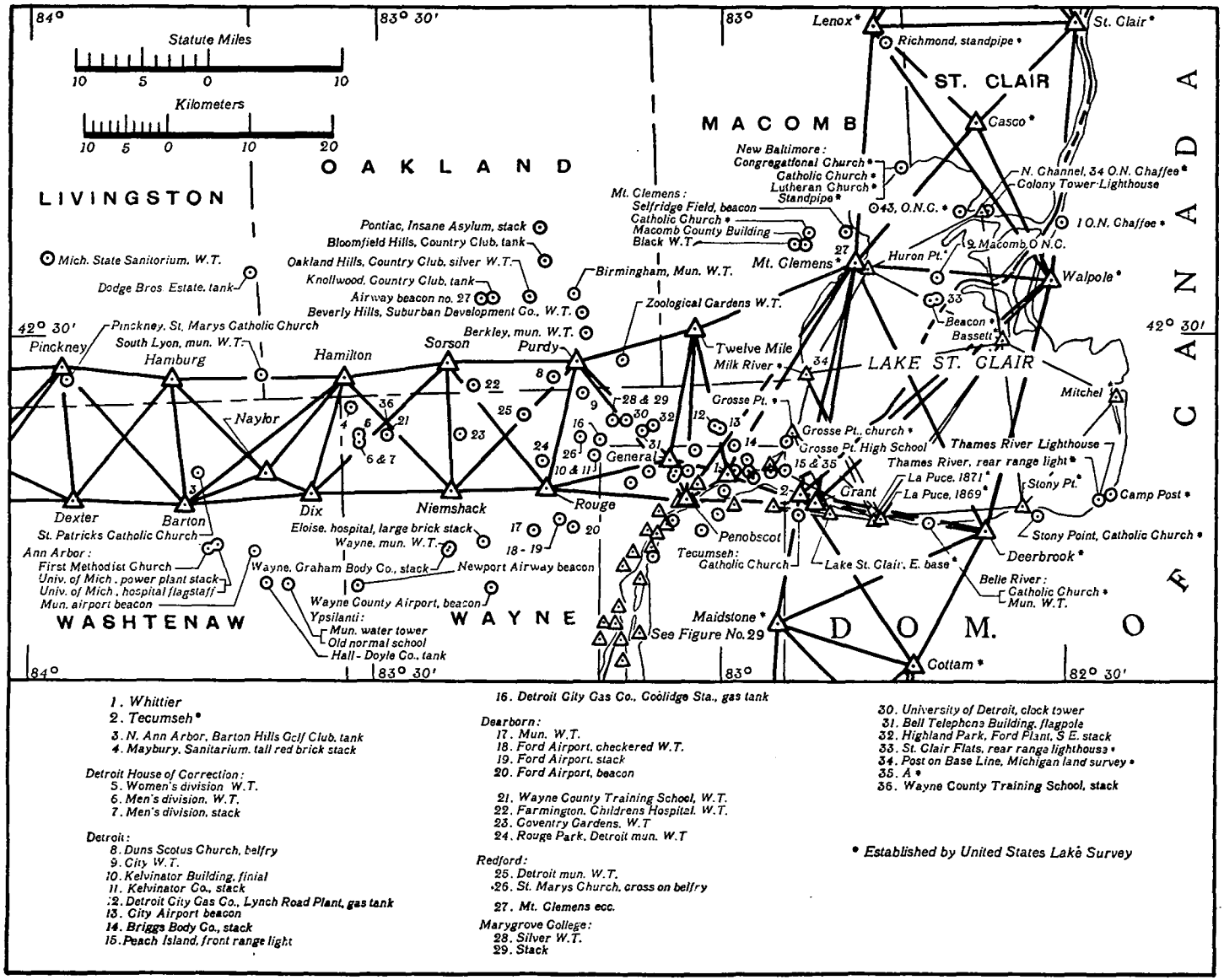

FIGURE 21.—Triangulation along Detroit to Jackson arc, junctions with Lake Erie to Lake St. Clair and Lake St. Clair to Thunder Bay arcs.

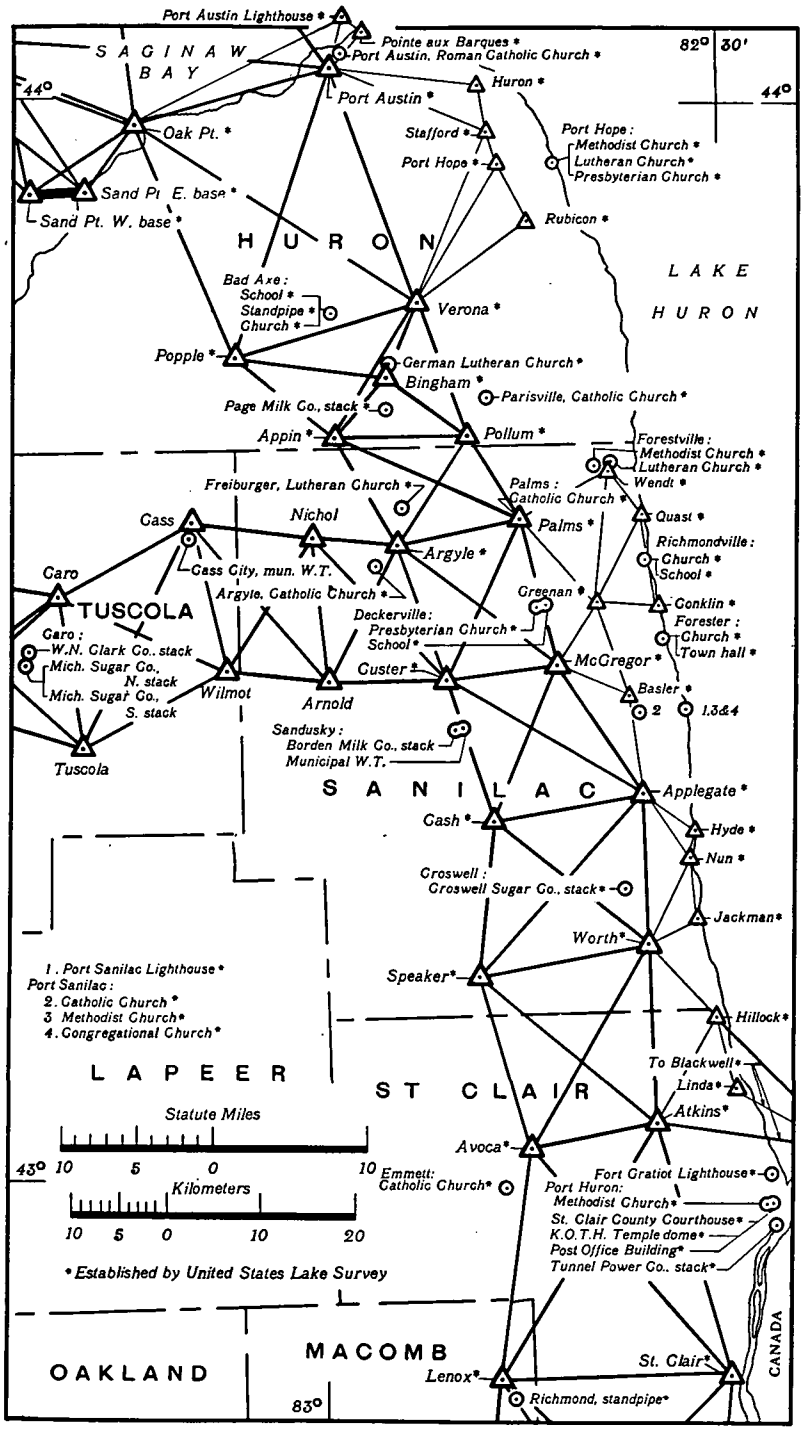

FIGURE 22.—Triangulation along Lake St. Clair to Thunder Bay arc and junction with Lake Huron to Big Rapids arc.

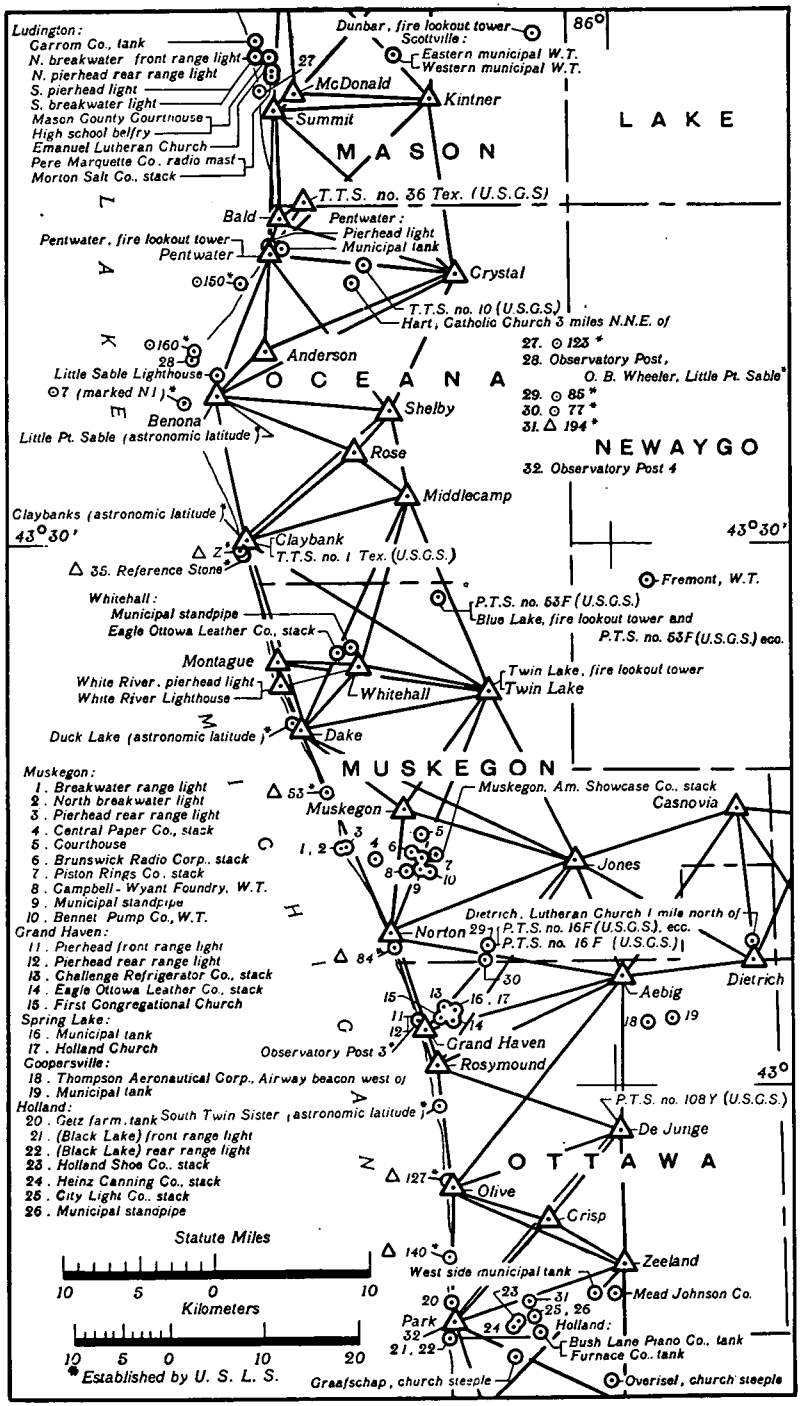

FIGURE 23.—Triangulation along east shore of Lake Michigan arc.

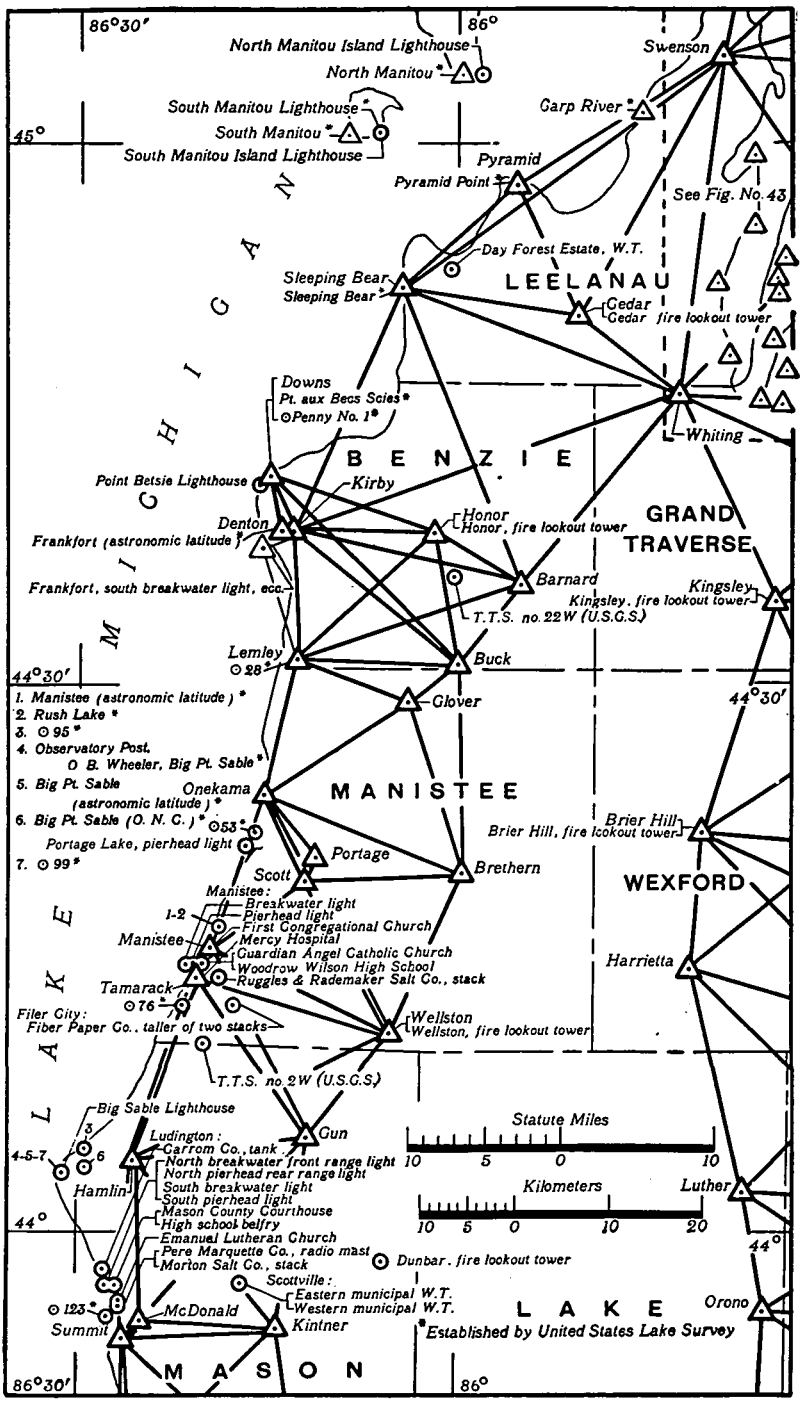

FIGURE 24.—Triangulation along east shore of Lake Michigan arc and Grand Traverse Bay to Big Rapids arc.

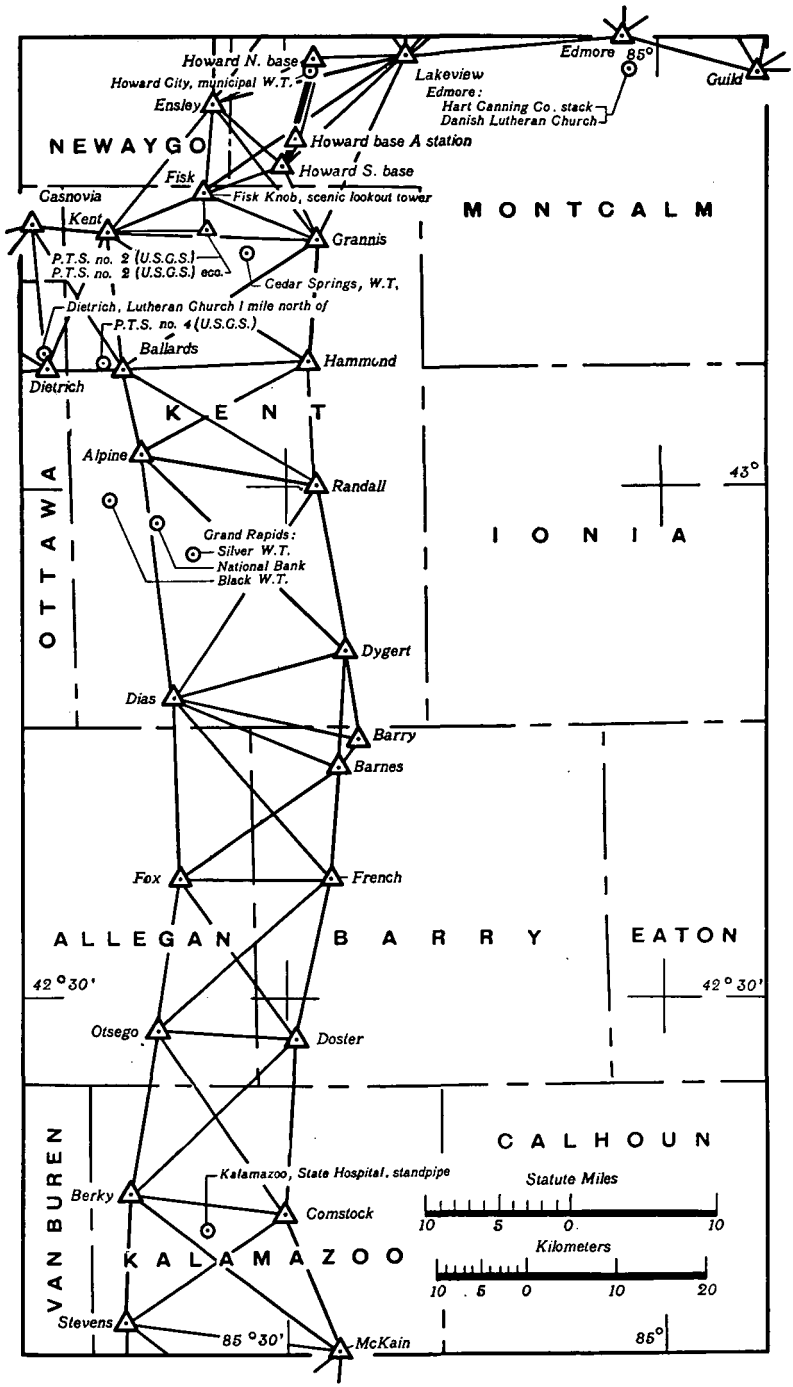

FIGURE 25.—Triangulation along Sturgis to Big Rapids arc and junction with east shore of Lake Michigan arc.

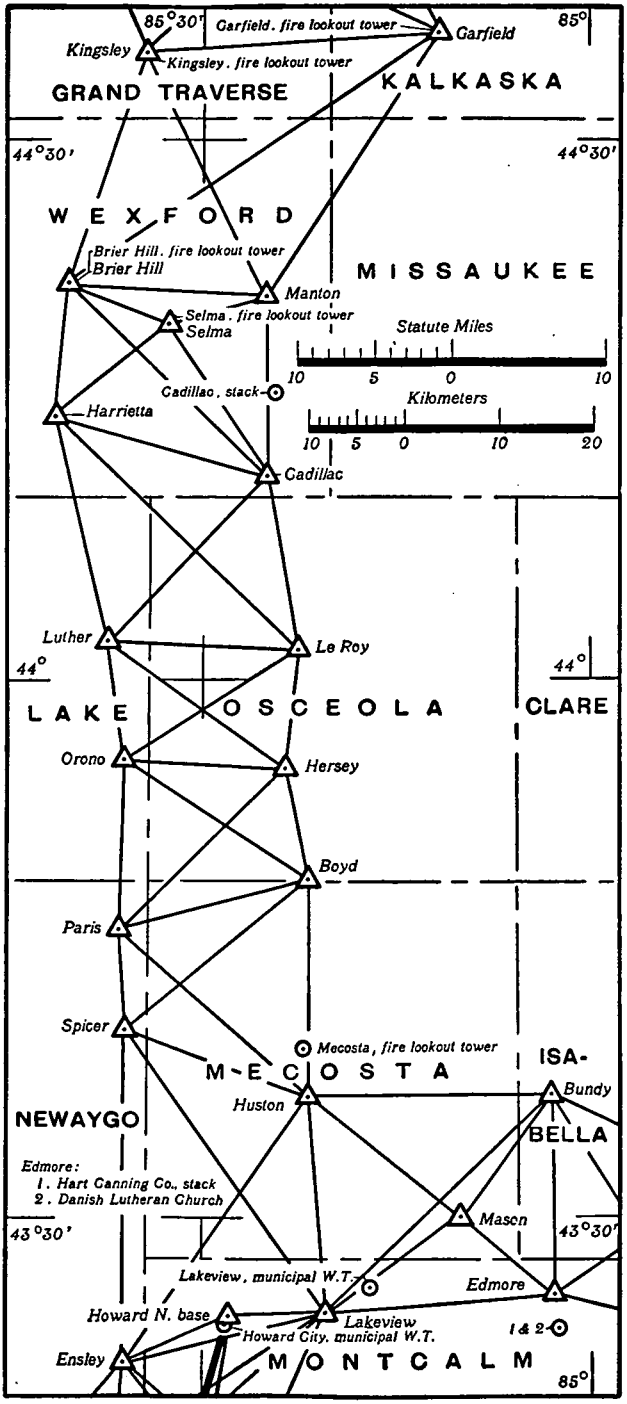

FIGURE 26.—Triangulation along Grand Traverse Bay to Big Rapids arc, junctions with Lake Huron to Big Rapids and Sturgis to Big Rapids arc.

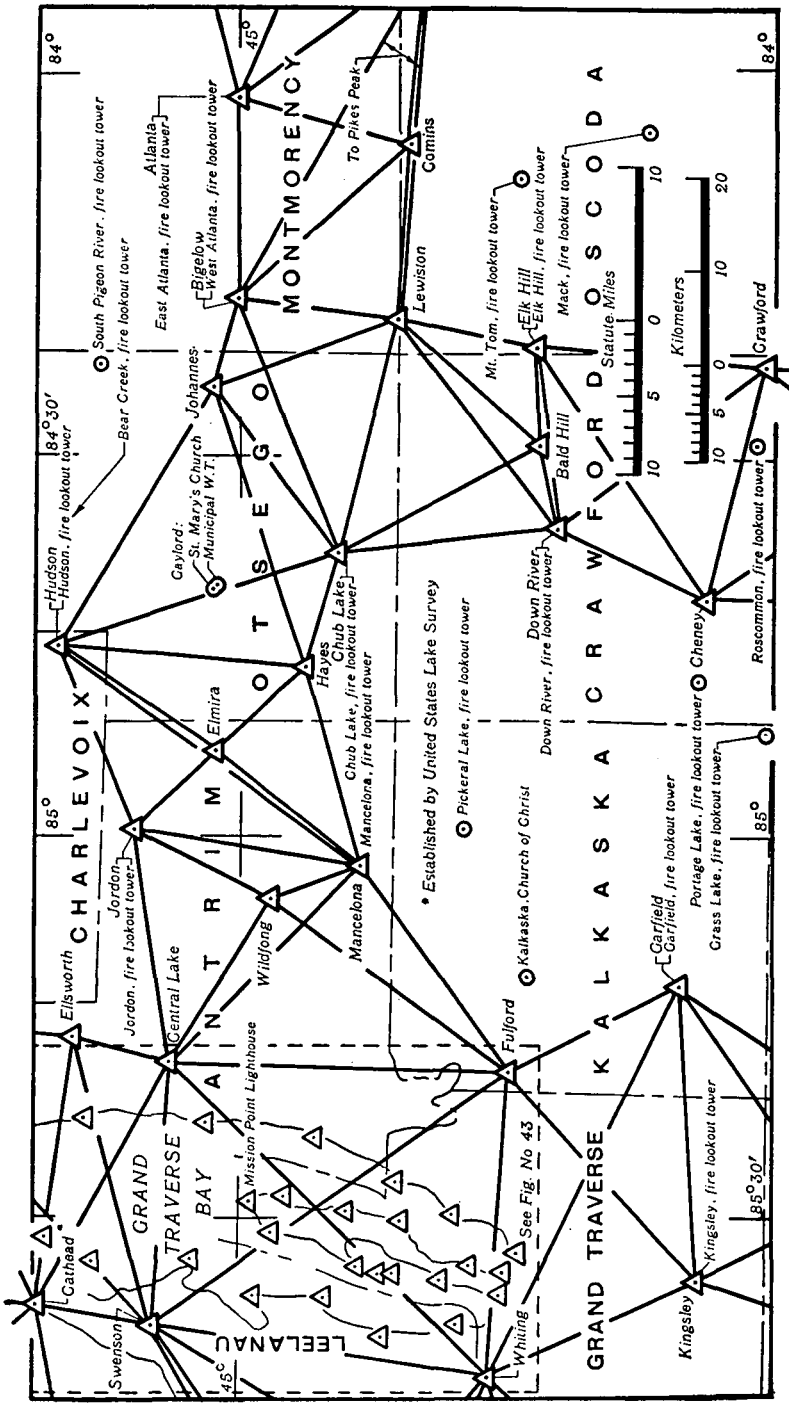

FIGURE 27.—Triangulation along Thunder Bay to Grand Traverse Bay arc, junctions with Gaylord to Mt. Pleasant and Grand Traverse Bay to Big Rapids arcs.

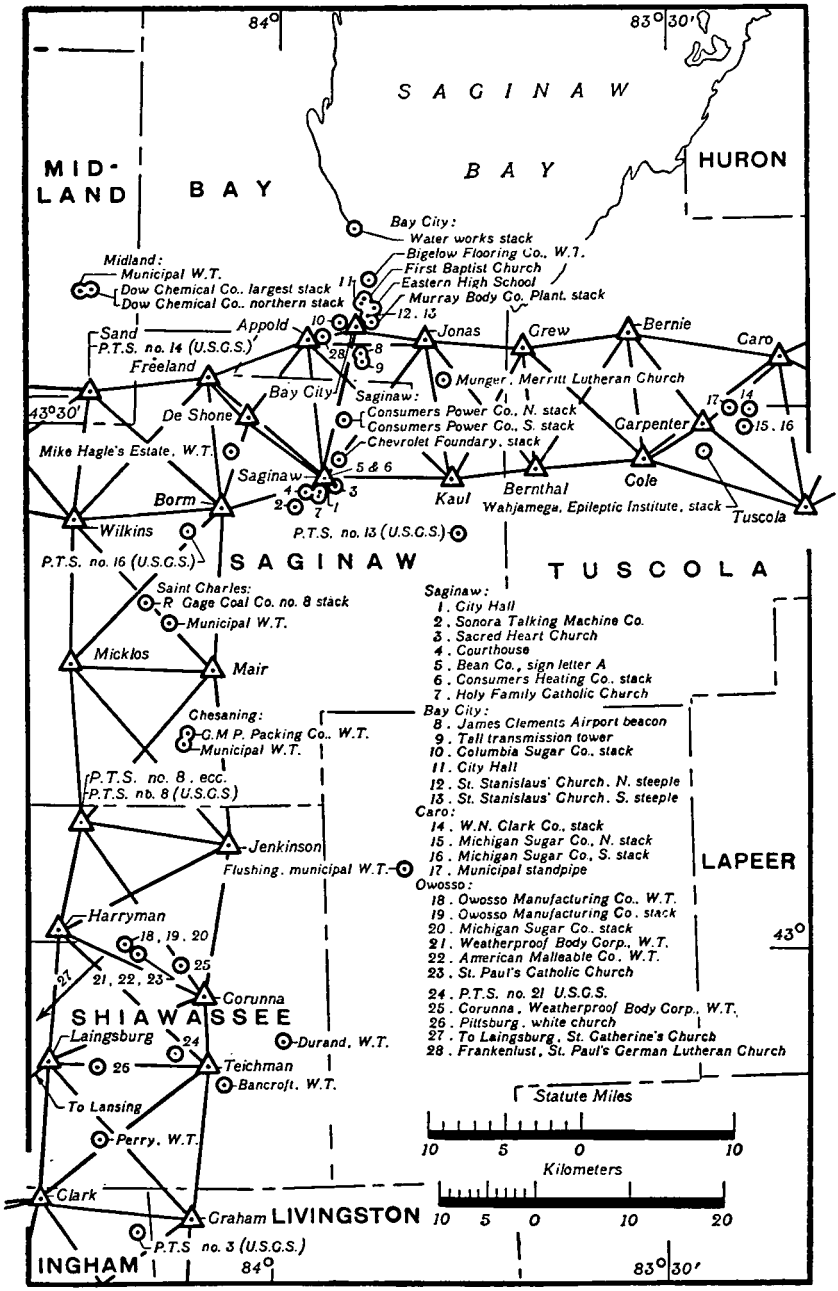

FIGURE 28.—Triangulation along Lake Huron to Big Rapids arc and Hillsdale to Saginaw arc.

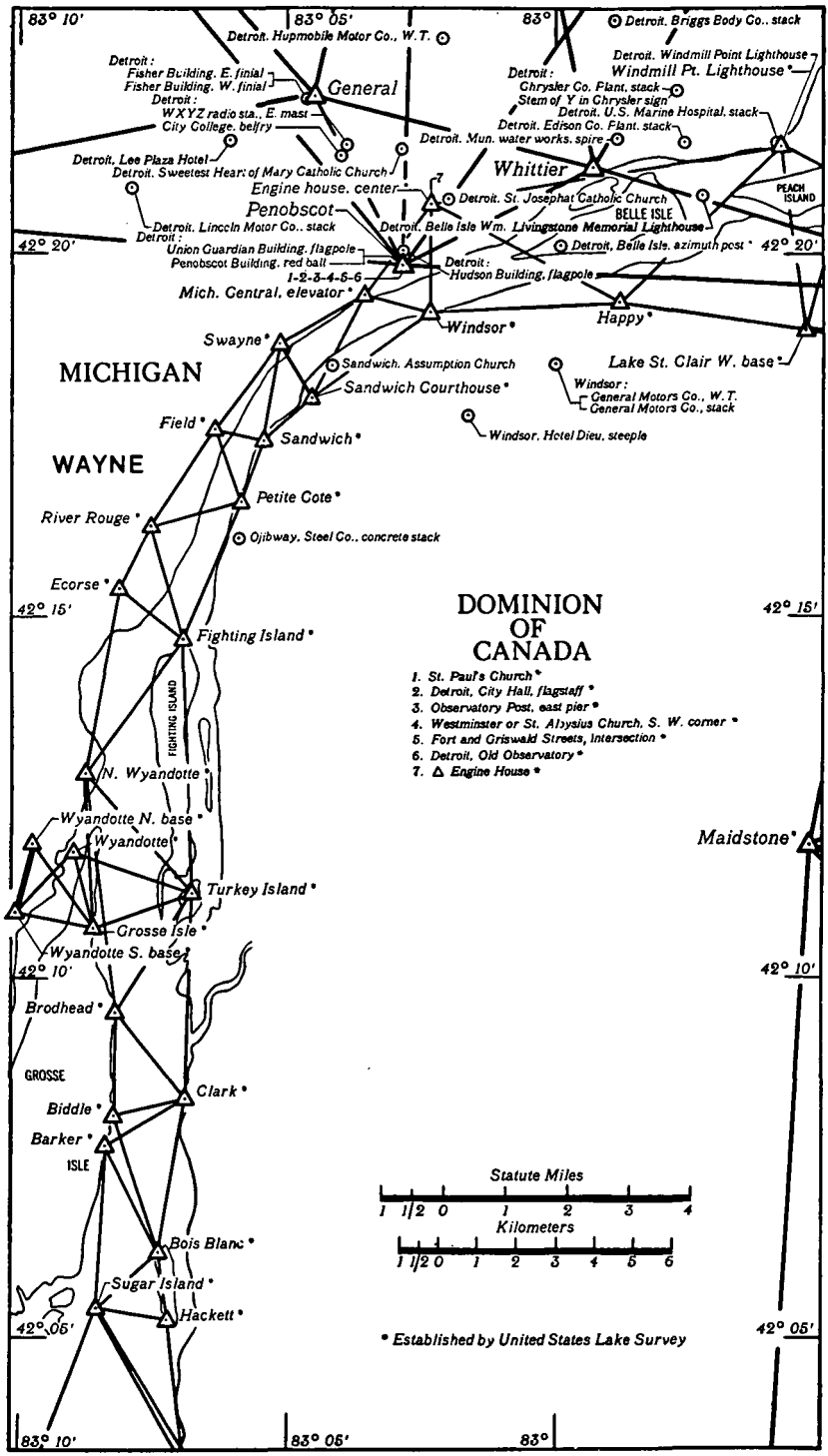

FIGURE 29.—Triangulation of Detroit River.

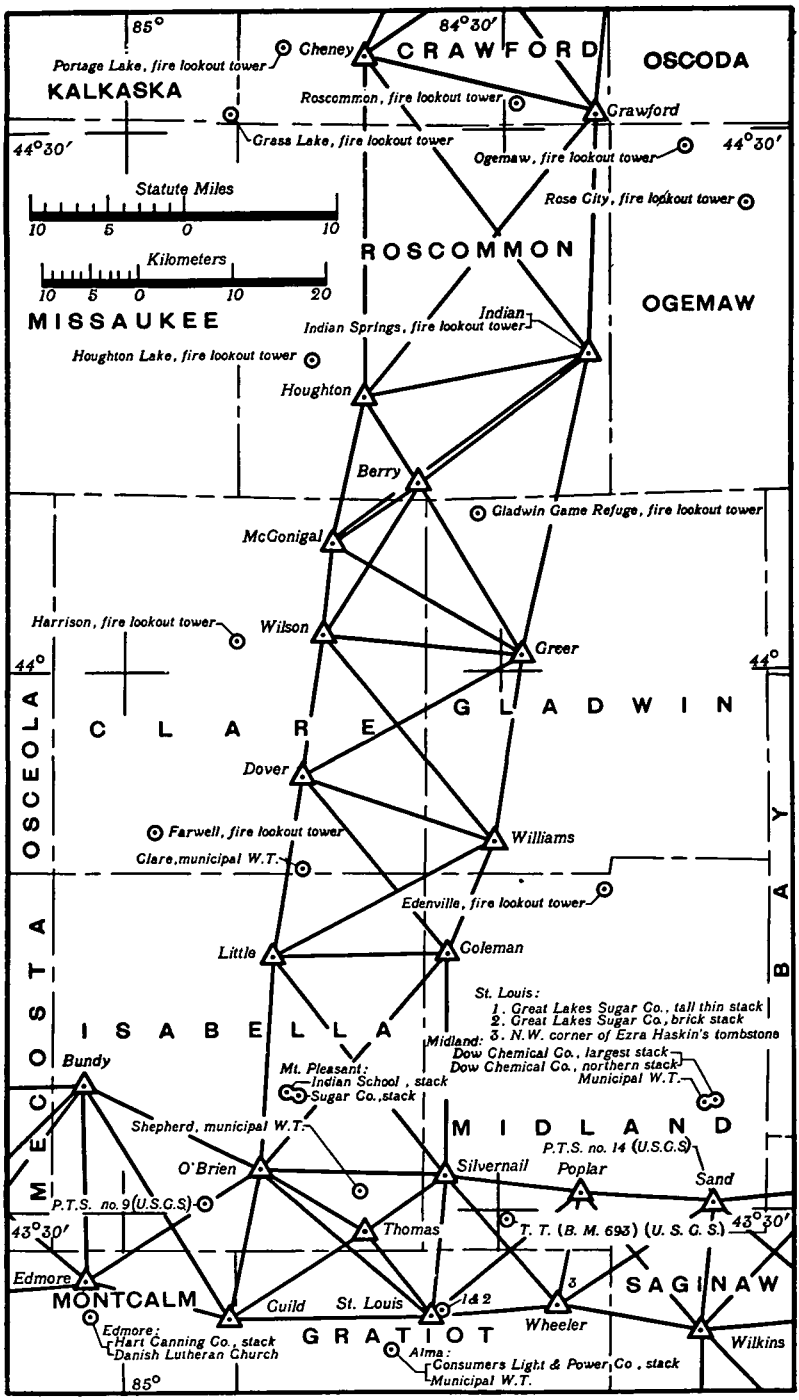

FIGURE 30.—Triangulation along Lake Huron to Big Rapids arc and Gaylord to Mt. Pleasant arc.

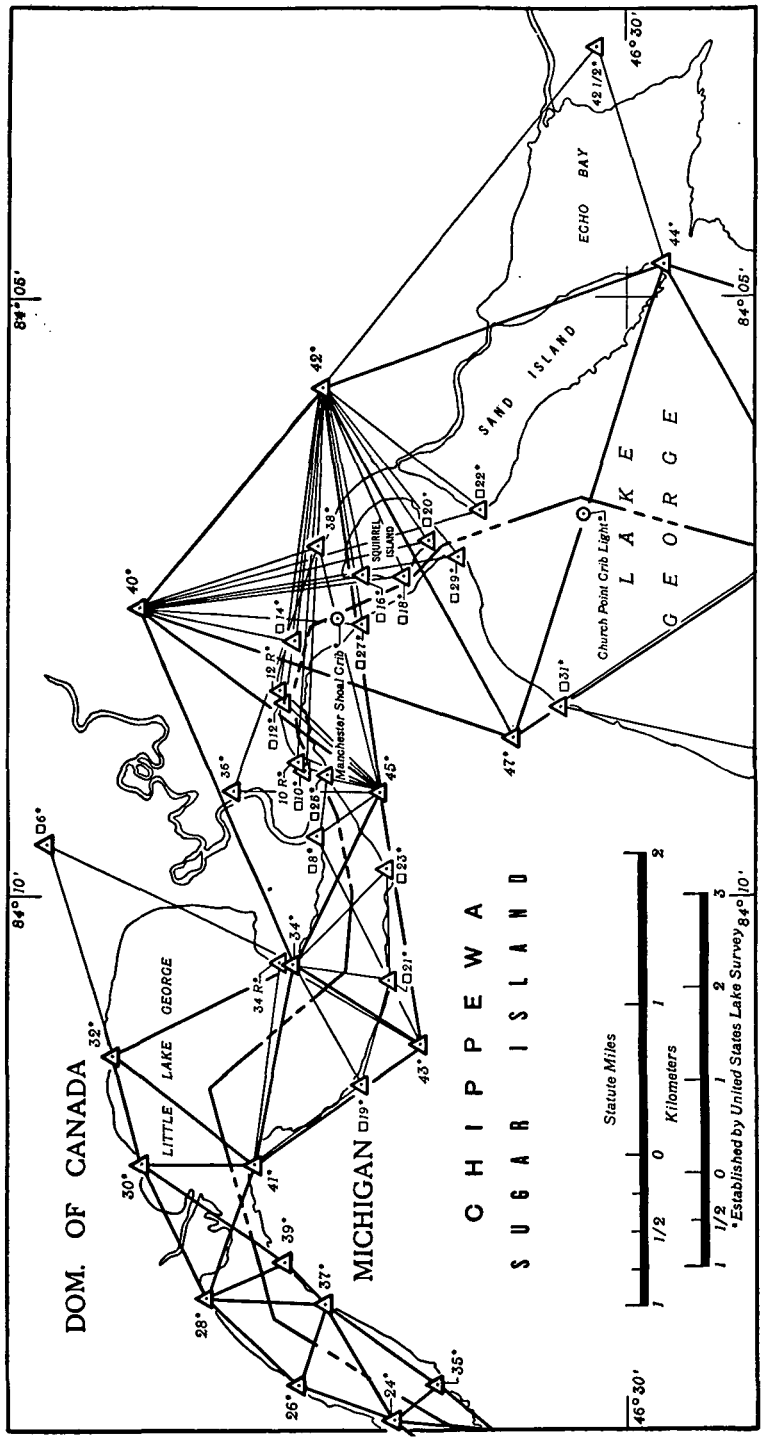

FIGURE 34.—Triangulation of St. Marys River north of Sugar Island.

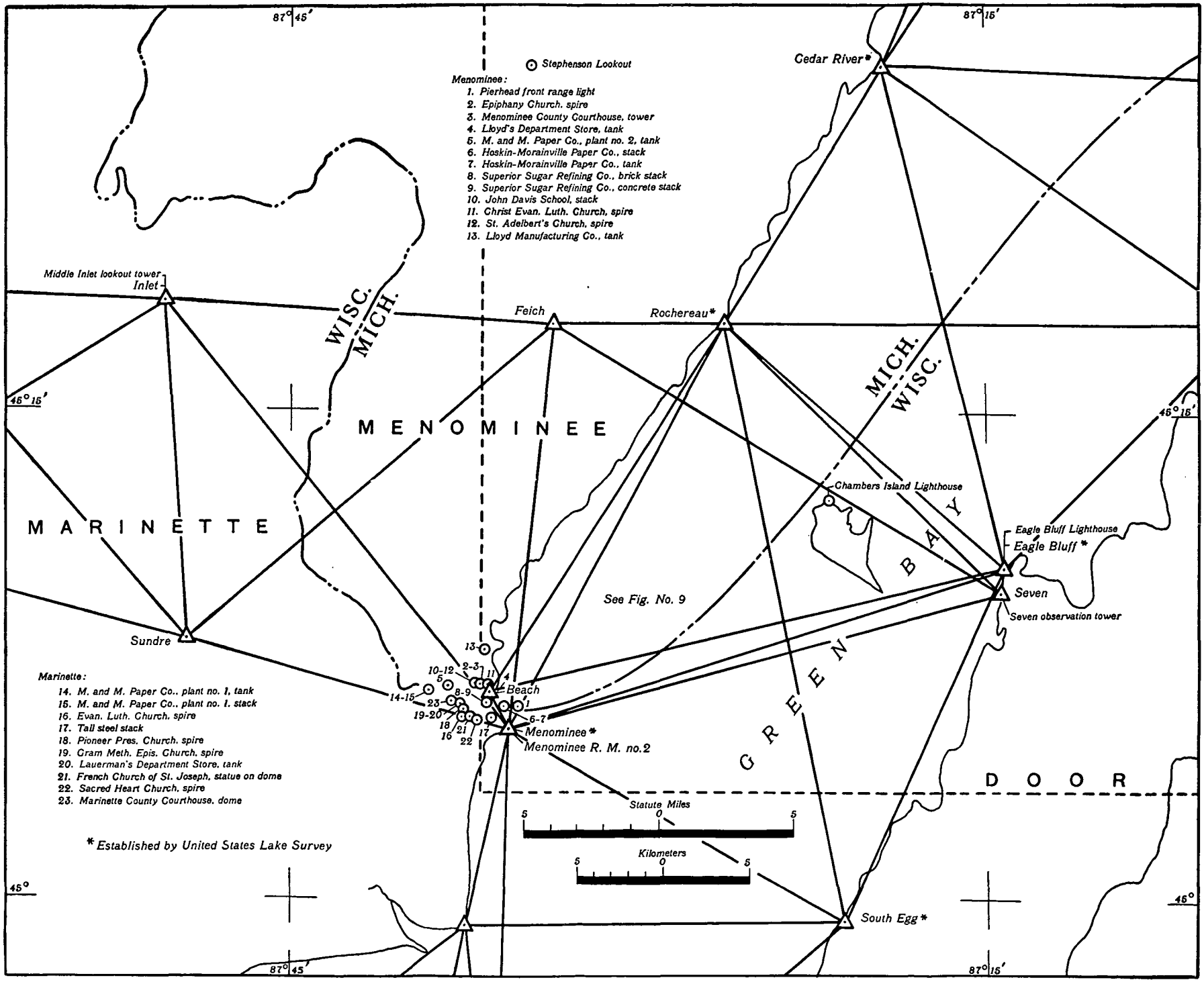

FIGURE 31.—Triangulation of vicinity of Menominee.

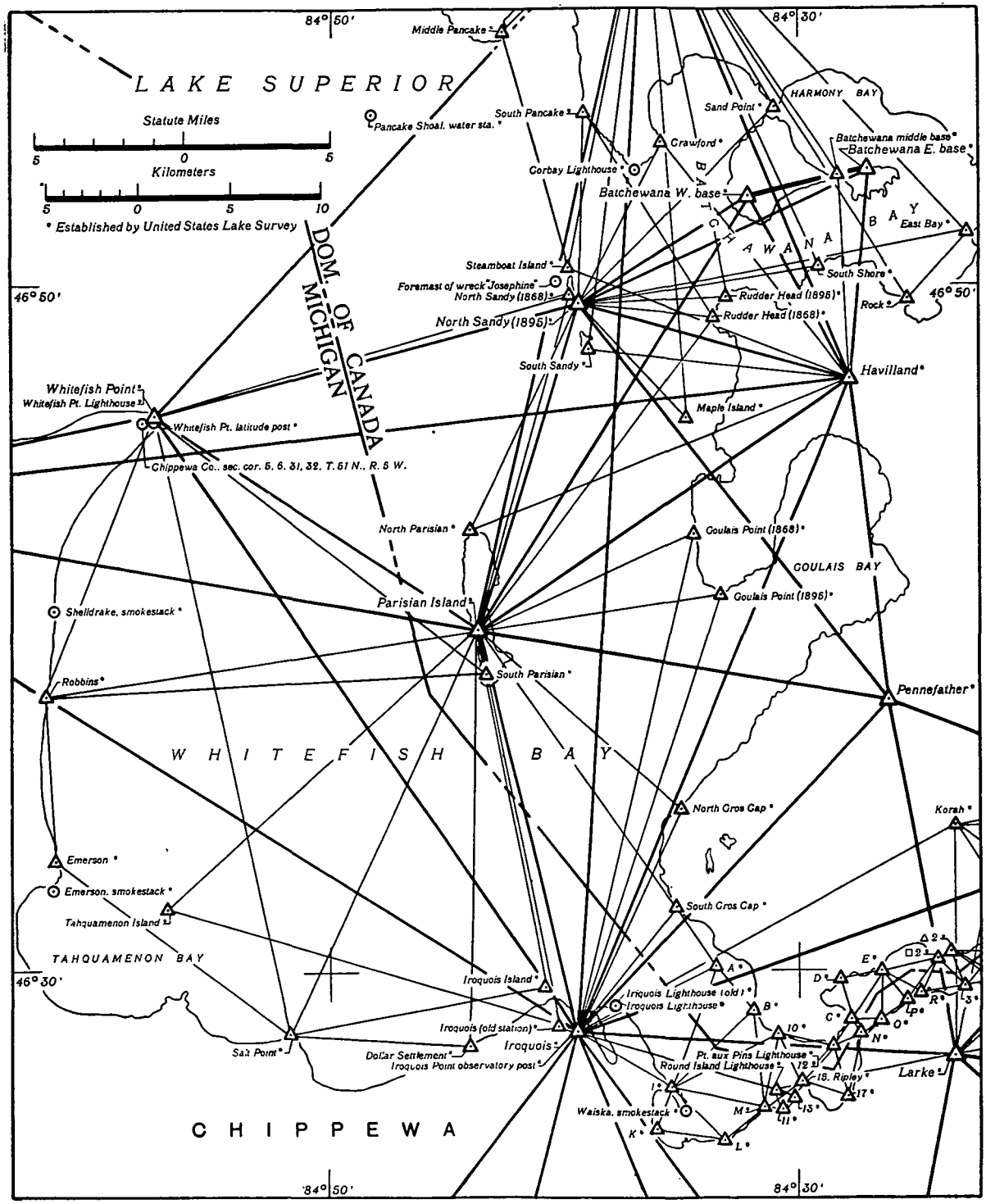

FIGURE 32.—Triangulation of Whitefish Bay and St. Marys River.

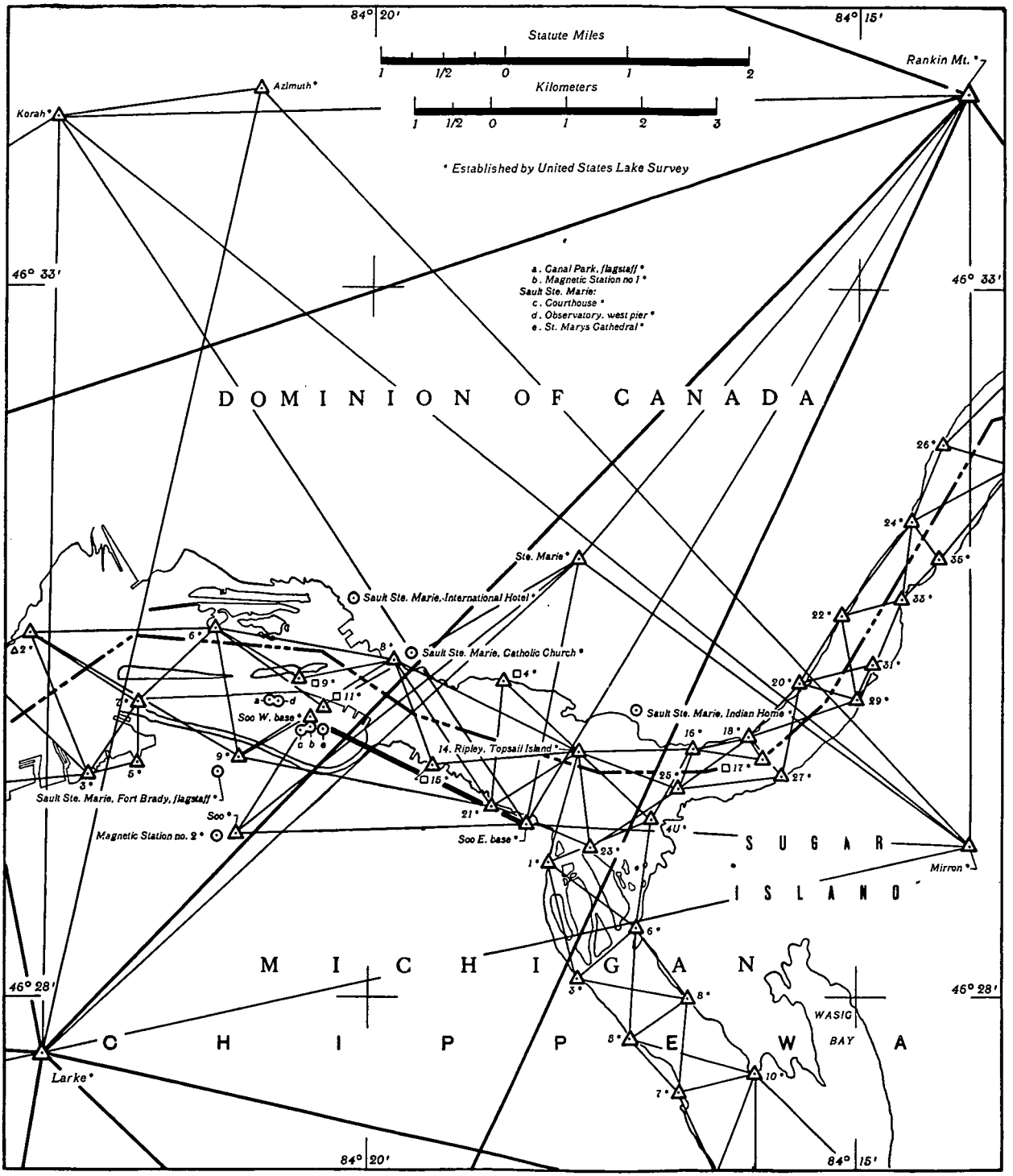

FIGURE 33.—Triangulation of St. Marys River in vicinity of Sault Ste. Marie.

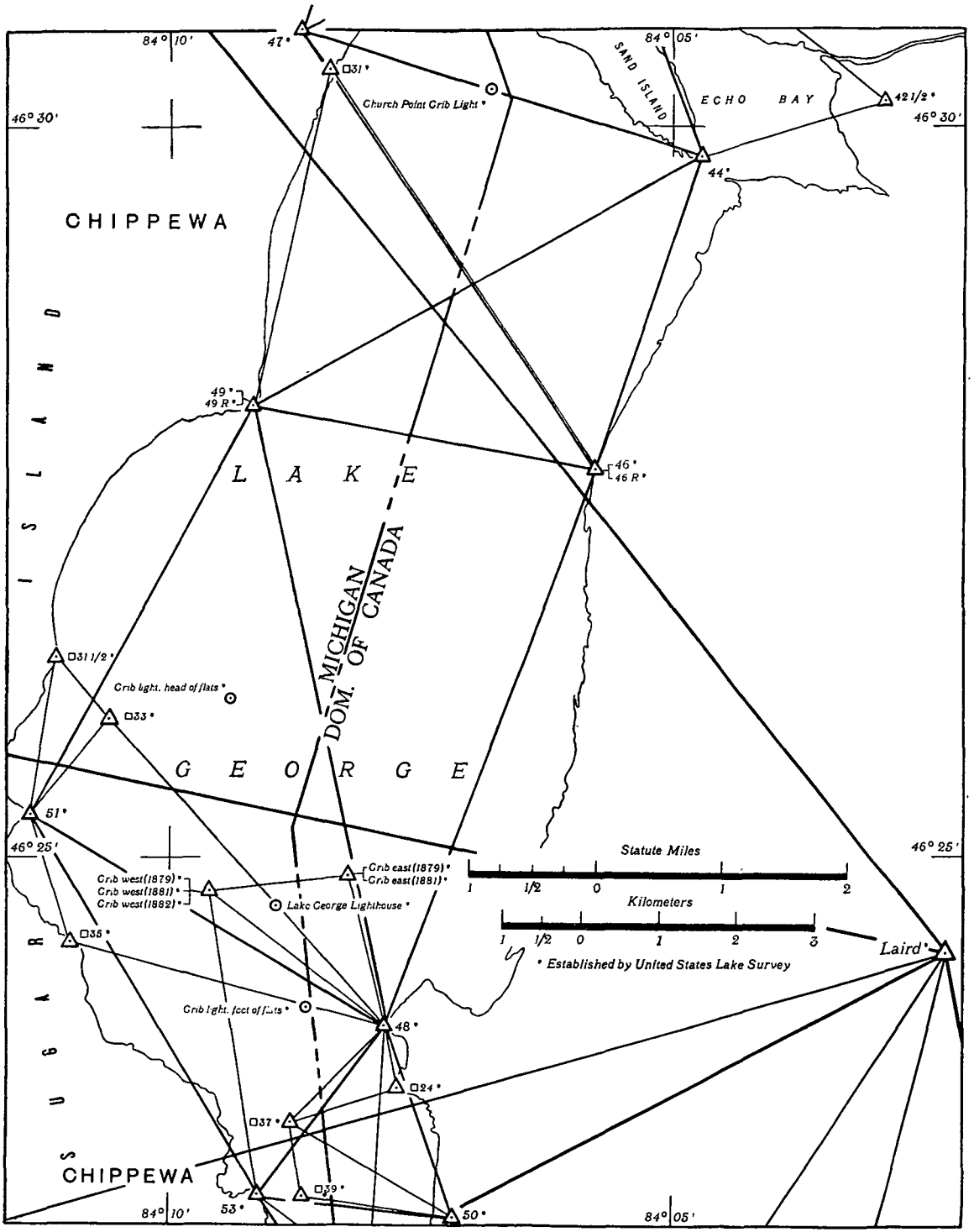

FIGURE 35.—Triangulation of St. Marys River, Lake George.

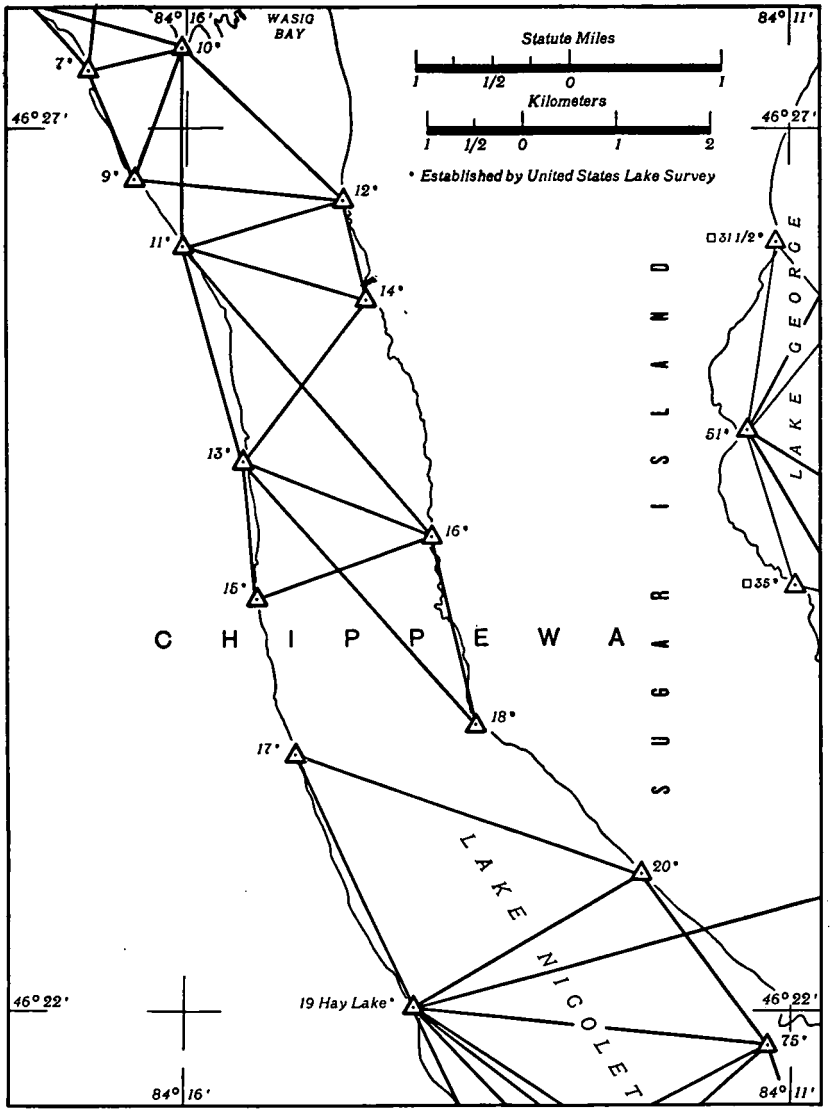

FIGURE 36.—Triangulation of St. Marys River in vicinity of northern part of Lake Nicolet.

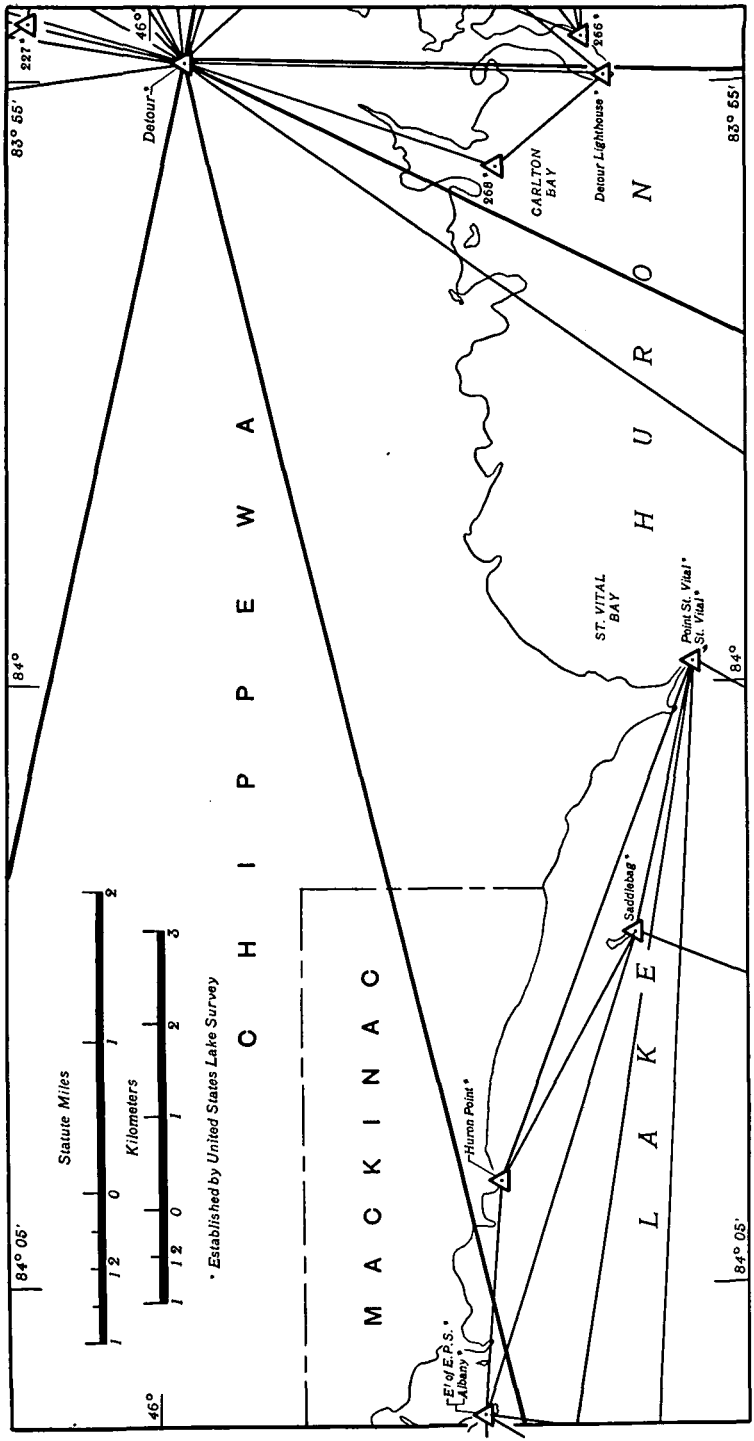

FIGURE 42.—Triangulation in vicinity of St. Vital Point.

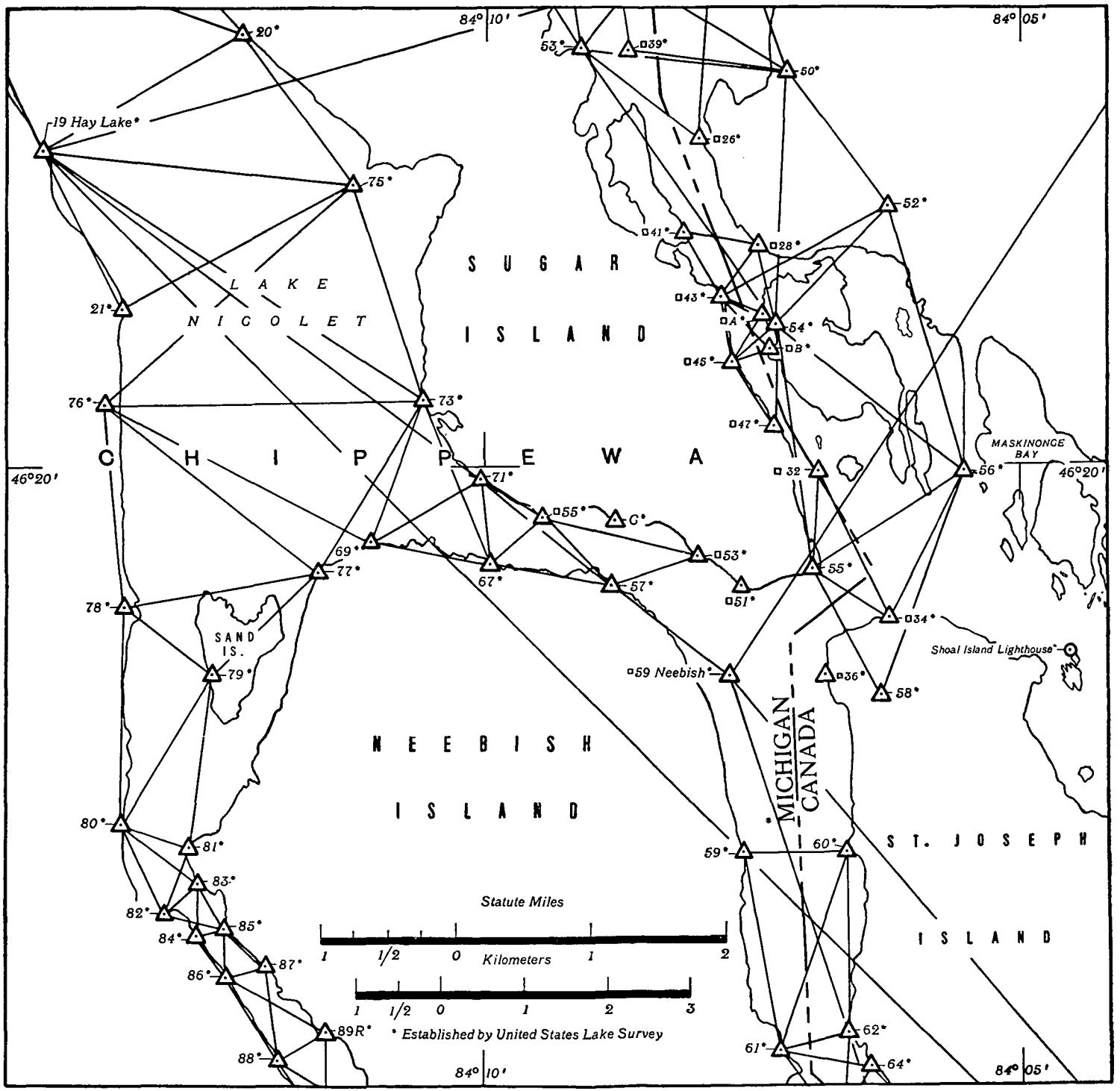

FIGURE 37.—Triangulation of St. Marys River in vicinity of Neebish Channel.

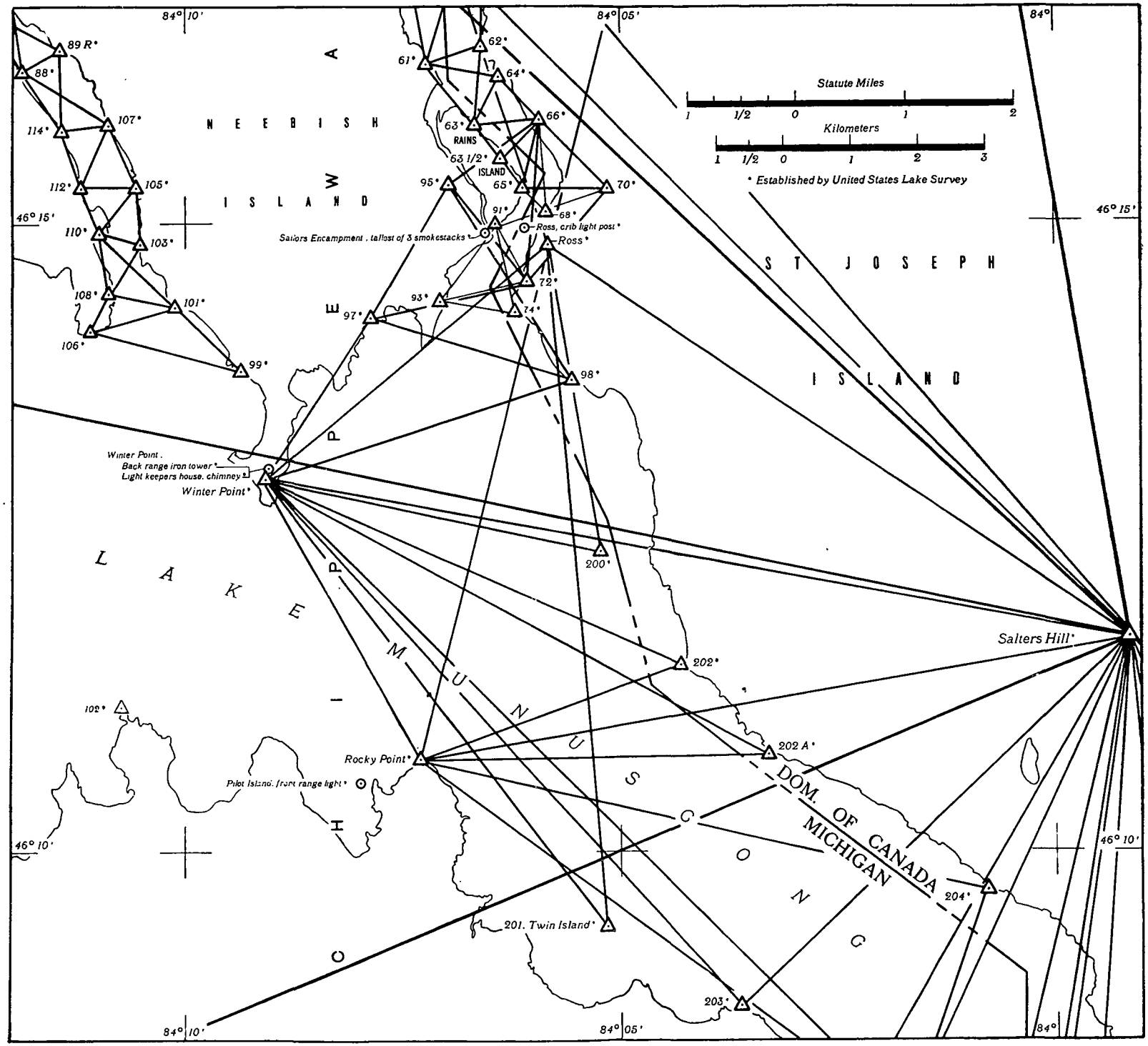

FIGURE 38.—Triangulation of St. Marys River in vicinity of Lake Munuscong.

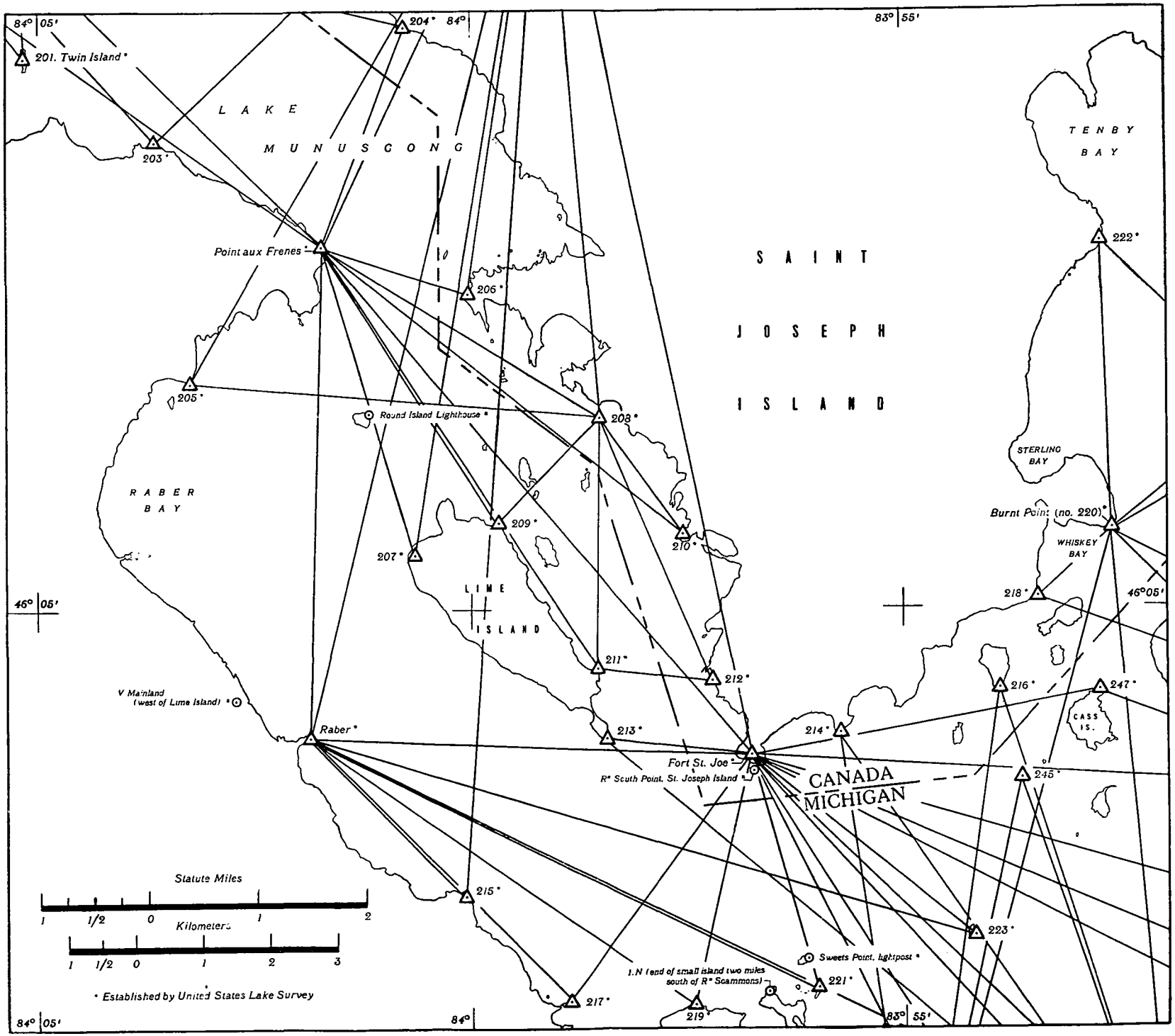

FIGURE 39.—Triangulation of St. Marys River south of St. Joseph Island.

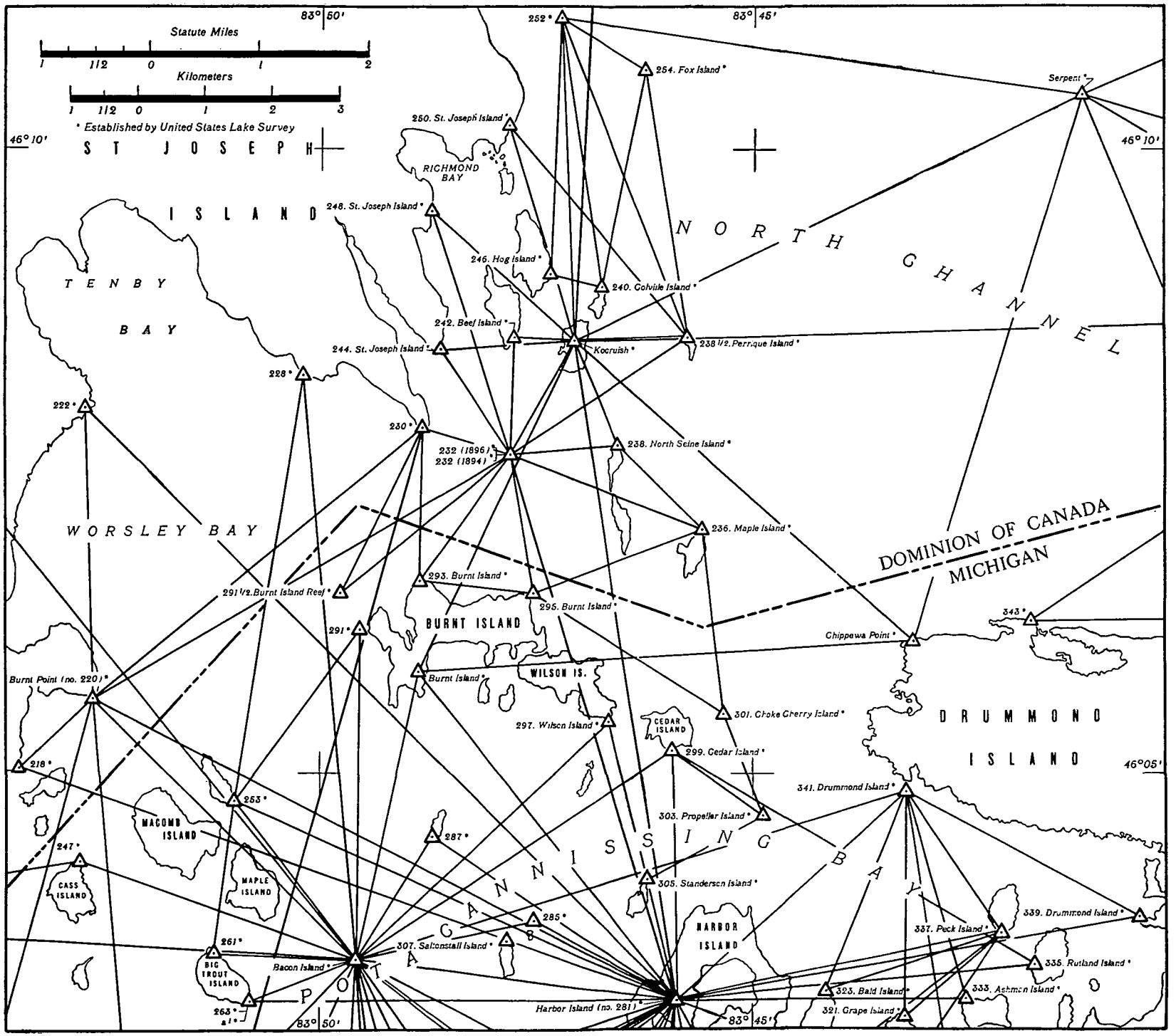

FIGURE 40.—Triangulation of Potagannissing Bay and southeast shore of St. Joseph Island.

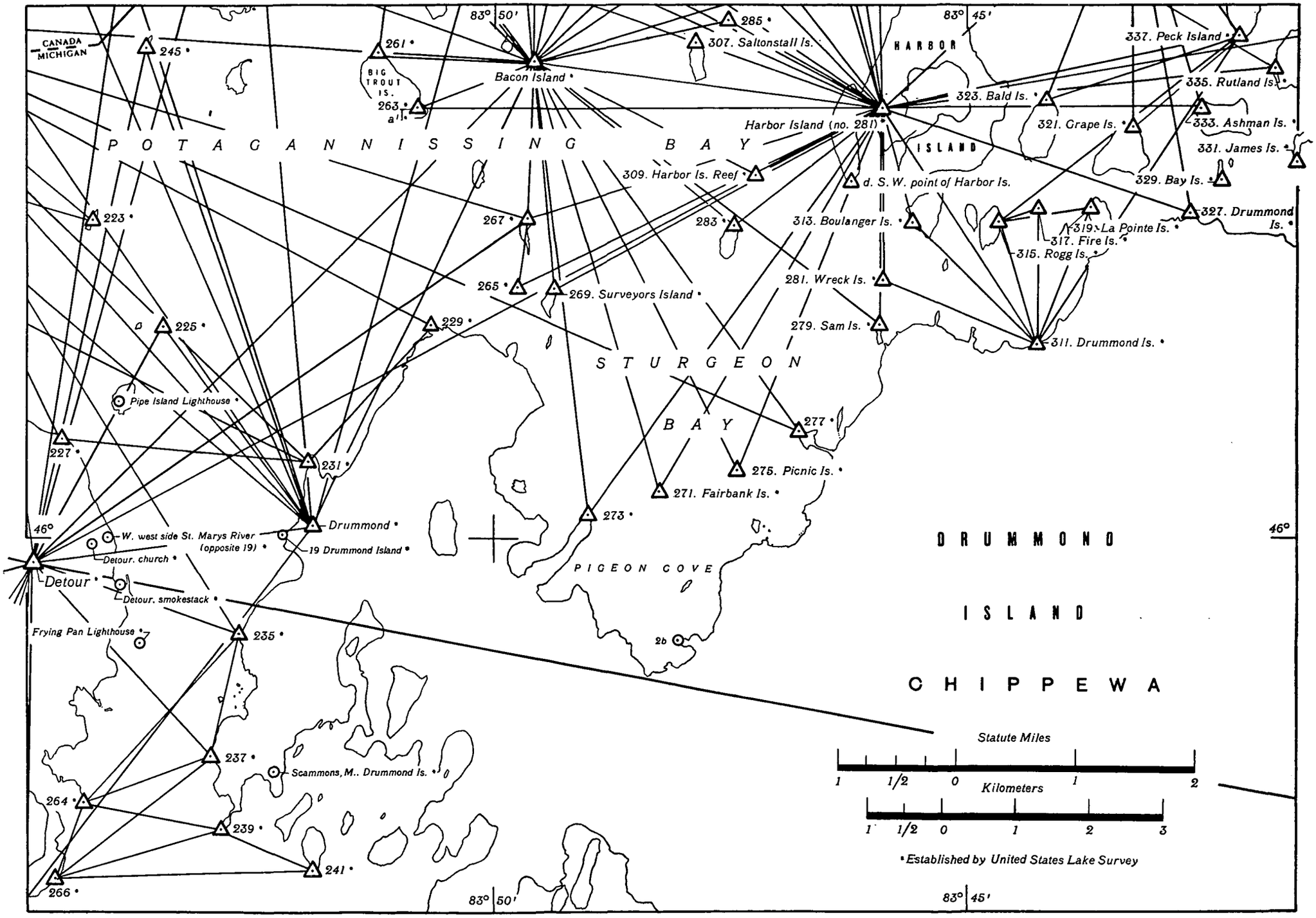

FIGURE 41.—Triangulation of Potagannissing Bay and northwest shore of Drummond Island.

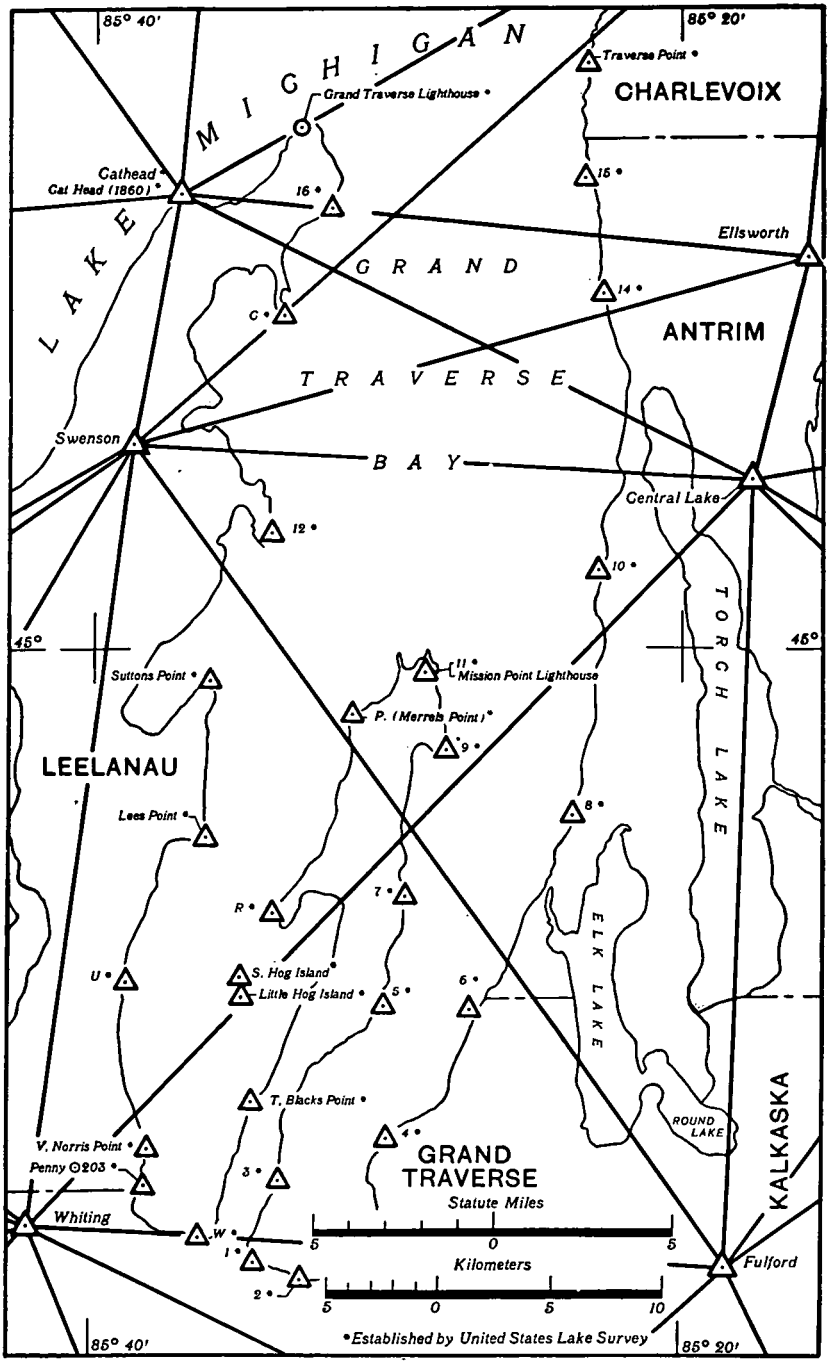

FIGURE 43.—Triangulation of Grand Traverse Bay.

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INDEX TO GEOGRAPHIC POSITIONS, DESCRIPTIONS, PLANE COORDINATES AND SKETCHES

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
a′ (U. S. L. S.)	150	345	40, 41
A (U. S. L. S.), 1865	116	333	8
A (U. S. L. S.), 1871	160	349	21
A (U. S. L. S.) (Canada)	124	336	32
A east base (U. S. L. S.)	119	334	9
A. Mackinac west base (U. S. L. S.)	24	185	11, 14, 15
Abbott (U. S. L. S.)	145	343	9
Acme Chair Co., red tank, Reading	45	219	18, 19
Adams Point (U. S. L. S.)	36	201	12
Adrian engine house No. 2 (U. S. L. S.)	152	346	19, 20
Aebig	57	242	23
Airport beacon; Reynolds Field, Jackson	90	301	19
Airway beacon:			
No. 6 (Ind.)	43	216	17
No. 11B, Flat Rock	102	312	20
No. 14 (Ind.)	44	218	18
No. 15 (Ohio)	44	218	18, 19
No. 17 (Ohio)	44	218	18, 19
No. 20	90	301	19
No. 24, Newport	103	312	20, 21
No. 27	102	312	21
Thompson Aeronautical Corporation, west of Coopersville	63	248	23
Albany (U. S. L. S.)	37	201	14, 42
Alma:			
Consumers Light and Power Co., stack	87	292	30
Municipal water tank	87	292	30
Alpena, Huron Portland Cement Co., flashing white light	105	317	12, 13
Alpine	74	269	25
Alvarado (Ind.)	44	217	18, 19
American Malleable Co., water tank, Owosso	93	303	28
American Showcase Co., stack, Muskegon	63	249	23
Anderson	68	261	23
Ann Arbor:			
College hospital, flagstaff	103	313	21
First Methodist Church, spire	103	313	21
Municipal airport, beacon	103	313	21
University of Michigan, power plant stack	103	313	21
Ant (U. S. L. S.) (Canada)	40	205	12
Appin (U. S. L. S.)	49	226	22
Applegate (U. S. L. S.)	48	224	22
Appold	81	284	28
Argyle (U. S. L. S.)	49	225	22
Argyle, Catholic Church (U. S. L. S.)	52	231	22
Arnold	80	280	22
Assumption Church, spire, Sandwich (Canada)	97	310	29
Astronomic latitude:			
Big Point Sable (U. S. L. S.)	161	349	24
Claybanks (U. S. L. S.)	161	350	23
Douglas (U. S. L. S.)	162	350	17
Duck Lake (U. S. L. S.)	162	350	23
Frankfort (U. S. L. S.)	161	349	24
Little Point Sable (U. S. L. S.)	161	349	23
Manistee (U. S. L. S.)	161	349	24
South Twin Sister (U. S. L. S.)	162	350	23
Astronomic station, Copper Harbor (U. S. L. S.)	116	333	8
Astronomical station, Menominee (U. S. L. S.) (Wis.)	23	183	9
Astronomical station, Round Island (U. S. L. S.)	123	335	14
Atkins (U. S. L. S.)	48	223	22
Atlanta	104	313	12, 13, 27
Au Village (U. S. L. S.)	117	333	8
Automotive Fan and Bearing Co., tank, southwest Jackson	91	301	19
Avoca (U. S. L. S.)	48	223	22
Azimuth (U. S. L. S.) (Canada)	39	204	33
Az. I. (U. S. L .S.)	162	350	17
Az. II (U. S. L. S.)	162	350	17
Azimuth △ Chicken Island (U. S. L. S.)	156	348	20
Azimuth post, Belle Isle (U. S. L. S.)	158	348	29

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
B (U. S. L. S.)	116	333	8
B (U. S. L. S.) (Canada)	124	336	32
B. Mackinac, east base (old) (U. S. L. S.)	121	335	14
B′ Mackinac east base (U. S. L. S.)	25	186	11, 14
B west base (U. S. L. S.)	119	334	9
Back range iron tower, Winter Point (U. S. L. S.)	130	338	38
Bacon Island (U. S. L. S.)	38	202	40, 41
Bad Axe:			
Church (U. S. L. S.)	53	231	22
School (U. S. L. S.)	53	231	22
Standpipe (U. S. L. S)	53	231	22
Baileys Harbor Lighthouse (U. S. L. S.)	165	351	9
Baker Vawter Co., white stack, Benton Harbor	59	247	17
Bald	67	258	23
Bald Hill	107	318	27
Bald Pate, 1855 (Mt. Lookout, 1865) (U. S. L. S.)	117	333	8
Bald Tom (U. S. L. S.)	41	207	17
Bald Tom 2	54	232	17
Ballards	58	245	25
Bancroft, water tank	93	303	28
Bangor	55	235	17
Bangor, black municipal tank, finial	60	247	17
Baptist Church, White Pigeon (U. S. L. S.)	153	346	18
Bar Point (1874) (U. S. L. S.)	157	348	20
Bar Point (1878) (U. S. L. S.)	156	348	20
Bar Point (1910) (U. S. L. S.) (Canada)	47	222	20
Bark River (U. S. L. S.)	21	179	9
Barker (U. S. L. S.)	157	348	29
Barnard	65	251	24
Barnes	74	268	25
Barry	74	269	25
Barton	96	308	21
Barton Hills Golf Club, tank North Ann Arbor	103	313	21
Basler (U. S. L. S.)	52	230	22
Bassett (U. S. L. S.)	160	349	21
Batchewana east base (U. S. L. S.) (Canada)	39	203	11, 32
Batchewana middle base (U. S. L. S.) (Canada)	118	330, 333	32
Batchewana west base (U. S. L. S.) (Canada)	39	203	11, 32
Bay City	81	285	28
Bay City:			
Bigelow Flooring Co., water tank finial	84	291	28
City Hall	84	291	28
Columbia Sugar Co., stack	84	291	28
Eastern High School, tip of dome	84	291	28
First Baptist Church, clock tower, spire	84	291	28
James Clements Airport, beacon	85	291	28
Murray Body Co. plant, stack	84	291	28
Red light, tip of tall transmission tower	84	291	28
St. Stanislaus Church, north steeple	85	291	28
St. Stanislaus Church, south steeple	85	291	28
Water works stack	84	291	28
Bayfield (U. S. L. S.) (Wis.)	114		
Beach	110	324	9, 31
Beacon (U. S. L. S.)	160	349	21
Beacon:			
Capital City Airport, Lansing	92	302	19
City Airport, Detroit	100	311	21
Ford Airport, Dearborn	101	312	21
James Clements Airport, Bay City	85	291	28
Municipal Airport, Ann Arbor	103	313	21
Selfridge Field, Mount Clemens	97	310	21
Wayne County Airport	102	312	20, 21
Bean Co., sign, letter A, Saginaw	85	291	28
Bear Creek, fire lookout tower	106	318	27
Beaver Harbor Lighthouse (U. S. L. S.)	29	191	16
Beaver Island (1860) (U. S. L. S.)	31	194	9, 16
Beaver Island (1903) (U. S. L. S.)	24	184	9, 11, 16
Beaver Island Lighthouse (U. S. L. S.)	121	335	11, 16
Beaver Island Lighthouse	79	279	11, 16
Beaver Tail (U. S. L. S.)	37	201	14
Bedford (U. S. L. S.)	43	215	20
Beech Hill (U. S. L. S.)	27	190	9
Belfry:			
City College, Detroit	100	311	29
Duns Scotus Church, Detroit	101	312	21
Bell Telephone Building, flagpole	98	311	21
Belle Isle, Azimuth Post (U. S. L. S.)	158	348	29
Belle Isle, William Livingstone Memorial Lighthouse	97	310	29
Belle River:			
Catholic Church (U. S. L. S.) (Canada)	47	222	21
Municipal water tank, (Canada)	97	310	21
Belvedere Farm, gray water tank	61	248	17
B. M. 693 (U. S. G. S.), transit traverse	86	292	30

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Bendery (1865) (U. S. L. S.)	117	333	8
Bendix Corporation:			
Center of neon sign, South Bend (Ind.)	43	216	17
Stack, South Bend (Ind.)	43	216	17
Bennet Pump Co., water tank finial, Muskegon	64	249	23
Benona	68	259	23
Benton Harbor:			
Baker Vawter Co., white stack	59	247	17
Black municipal standpipe, finial	59	247	17
High School, stack	59	247	17
Berkley, municipal water tank	101	312	21
Berky	73	266	25
Bernie	80	282	28
Bernthal	81	283	28
Berrien County:			
Corner of secs. 14, 15, 22, 23, T. 8 S., R. 18 W. (U. S. L. S.)	155	347	17
Courthouse, dome, Saint Joseph	59	247	17
SE. corner of sec. 35, T. 6 S., R. 20 W. (U. S. L. S.)	155	347	17
Berry	107	320	30
Bertrand (U. S. L. S.)	41	208	17
Bete Gris (U. S. L. S.)	117	333	8
Beverly Hills, Suburban Development Co., water tank	101	311	21
Biddle (U. S. L. S.), 1873	157	348	29
Biddle (U. S. L. S.), 1917	29	192	16
Biddle Point (U. S. L. S.)	121	335	16
Big Point Sable (astronomic latitude) (U. S. L. S.)	161	349	24
Big Point Sable (O. N. C.) (U. S. L. S.)	161	349	24
Big Point Sable, Observatory Post, O. B. Wheeler (1866)	161	349	24
Big Sable Lighthouse	70	263	24
Big Stone (U. S. L. S.)	34	198	14, 15
Bigelow	104	314	12, 27
Bigelow Flooring Co., water tank finial, Bay City	84	291	28
Bingham (U. S. L. S.)	49	226	22
Birmingham, silver municipal water tank	99	311	21
Black Lake:			
Front range light, Holland	62	248	17, 23
Rear range light, Holland	62	248	17, 23
Blackwell (U. S. L. S.)	51	229	22
Blissfield (U. S. L. S.)	43	215	20
Bloomingfield Hills Country Club, tank	101	312	21
Blue Lake, fire lookout tower and primary traverse station no. 53 F (U. S. G. S.) eccentric	72	264	23
Bluff (U. S. L. S.)	119	334	9
Bois Blanc (U. S. L. S.)	157	348	29
Bois Blanc Lighthouse (1849) (U. S. L. S.)	122	335	14
Bois Blanc Lighthouse (1896) (U. S. L. S.)	28	191	14
Boom Point (U. S. L. S.) (Canada)	40	205	12
Bootjack (U. S. L. S.)	37	201	14
Borden Milk Co., stack, Sandusky	83	290	22
Borm	81	286	28
Boundary Monument:			
No. 1, Ohio-Michigan	44	218	18, 19
No. 9, Ohio-Michigan	44	218	18, 19
Boyd	79	278	26
Boyers Bluff (U. S. L. S.) (Wis.)	21	179	9
Boyers Bluff (old) (U. S. L. S.) (Wis.)	120	334	9
Boyers Bluff, old, Transit Post (U. S. L. S.) (Wis.)	165	351	9
Brabb (U. S. L. S.)	35	198	14
Branch County:			
SW. corner of SE. quarter of sec. 7, T. 6 S., R. 5 W. (U. S. L. S.)	155	347	18
SW. corner of SE. quarter of sec. 16, T. 7 S., R. 8 W. (U. S. L. S.)	155	347	18
Brandywine	55	235	17
Breakwater:			
Front range light, Muskegon	64	249	23
Light, Manistee	69	262	24
Brethren	66	253	24
Bridgeman, municipal water tank, finial	59	247	17
Brier Hill	78	276	24, 26
Brier Hill, fire lookout tower	79	279	24, 26
Briggs Body Co., stack, Detroit	99	311	21, 29
Brodhead (U. S. L. S.)	157	348	29
Bronson (U. S. L. S.)	42	211	18
Bruder (U. S. L. S.)	26	188	12
Brulee (U. S. L. S.)	35	199	14
Brunswick Radio Corp., brick stack, Muskegon	64	249	23
Buck	66	252	24
Bunday (U. S. L. S.)	42	213	19
Bundy	83	289	26, 30
Buoy S (U. S. L. S.)	34	198	14
Burnt Bluff (U. S. L. S.)	21	178	9, 10
Burnt Bluff (old) (U. S. L. S.)	120	334	9
Burnt Bluff, old, Transit Post (U. S. L. S.)	165	351	9
Burnt Island (1896) (U. S. L. S.)	146	343	40

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Burnt Island (1918) (U. S. L. S.)	29	191	14
Burnt Point (U. S. L. S.) (Canada)	40	206	12
Burnt Point (No. 220) (U. S. L. S.) (Canada)	38	202	39, 40
Burton Dixie Co., tank, Lansing	93	303	19
Bush Lane Piano Co., tank, Holland	61	248	17, 23
C (U. S. L. S.), 1861	164	351	43
C (U. S. L. S.), 1863	119	334	9
C (U. S. L. S.), 1865	116	333	8
C (1883) (U. S. L. S.)	144	342	37
C (U. S. L. S.) (Canada)	125	336	32
C. Mackinac Island (U. S. L. S.)	25	186	11, 14
Cadillac	78	277	26
Cadillac, white stack	79	279	26
Calvin (U. S. L. S.)	41	209	17, 18
Camp Post (U. S. L. S.) (Canada)	161	349	21
Campbell-Wyant Foundry, water tank, finial, Muskegon	64	249	23
Canal Park flagstaff (U. S. L. S.)	129	337	33
Capital City Airport, beacon, Lansing	92	302	19
Capital National Bank Building, steel mast, Lansing	92	302	19
Caribou Island Lighthouse (U. S. L. S.) (Canada)	39	203	11
Carlisle (U. S. L. S.) (Ind.)	41	207	17
Carlisle (U. S. L. S.) latitude station (Ind.)	43	216	17
Caro	80	281	22, 28
Caro:			
Michigan Sugar Co., north stack	83	290	22, 28
Michigan Sugar Co., south stack	83	290	22, 28
Municipal standpipe	83	290	28
W. N. Clark Co., stack	83	290	22, 28
Carp (U. S. L. S.)	114	332	9
Carp River (U. S. L. S.)	163	350	24
Carpenter	80	282	28
Carrom Co., tank, Ludington	71	263	23, 24
Casco (U. S. L. S.)	48	223	21
Cash (U. S. L. S.)	48	224	22
Casnovia	57	244	23, 25
Cass	80	280	22
Cass City, municipal water tank	83	290	22
Cass County:			
Corner of secs. 4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.)	155	347	17, 18
SW. corner of NW. quarter of sec. 27, T. 7 S., R. 14 W. (U. S. L. S.)	155	347	17, 18
SW. corner of NW. quarter of sec. 36, T. 7 S., R. 13 W. (U. S. L. S.)	155	347	18
Cat Head (1860) (U. S. L. S.)	120	334	9, 43
Cathead (U. S. L. S.)	23	184	9, 27, 43
Catholic Church:			
Argyle (U. S. L. S.)	52	231	22
Belle River (U. S. L. S.) (Canada)	47	222	21
Cross Village (U. S. L. S.)	32	196	15, 16
Emmett (U. S. L. S.)	51	229	22
Marquette (U. S. L. S.)	114	332	9
Mount Clemens (U. S. L. S.)	47	222	21
New Baltimore (U. S. L. S.)	47	222	21
Palms (U. S. L. S.)	53	231	22
Parisville (U. S. L. S.)	53	231	22
Port Sanilac (U. S. L. S.)	51	230	22
Saint Joseph, steeple	59	247	17
Stony Point (U. S. L. S.) (Canada)	47	222	21
Tecumseh, cross (Canada)	97	310	21
Catholic Church spire:			
Sault Ste. Marie, Ontario (U. S. L. S.)	130	338	33
Three miles NNE. of Hart	72	264	23
Catt	55	236	17
Cecil (U. S. L. S.)	34	198	14, 15
Cedar	65	250	24
Cedar, fire lookout tower	69	262	24
Cedar Point (U. S. L. S.) (Ohio)	43	215	20
Cedar River (U. S. L. S.)	21	179	9, 31
Cedar Springs, water tank	76	273	25
Central Lake	77	274	9, 27, 43
Central Paper Co., tall stack, Muskegon	64	249	23
Challenge Refrigerator Co., stack	63	249	23
Chambers Island Lighthouse (Wis.)	112	328	9, 31
Chambers Island north base (U. S. L. S.)	145	343	9
Chambers Island south base (U. S. L. S.)	145	343	9
Charity (U. S. L. S.)	49	227	13
Charles (U. S. L. S.)	35	198	14
Charlevoix (U. S. L. S.)	24	184	9
Charlevoix 2	77	274	9
Charlevoix, water tank	79	279	9
Cheboygan Lighthouse (U. S. L. S.)	123	335	14
Cheboygan Point Lighthouse (U. S. L. S.)	36	200	14

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Chelsea:			
Municipal water tank	104	313	19
Tower Building, finial	104	313	19
Cheney	107	319	27, 30
Chesaning:			
G. M. P. Packing Co., water tank	94	304	28
Municipal water tank	94	304	28
Chevrolet Foundry, stack, Saginaw	85	291	28
Childrens Hospital, water tank, Farmington	102	312	21
Chimney, Jackson (U. S. L. S.)	152	346	19
Chippewa County, Mich., section corner, 5, 6, 31, 32, T. 51 N., R. 5 W. (U. S. L. S.)	129	337	32
Chippewa Point (U. S. L. S.), 1864	119	334	9
Chippewa Point (U. S. L. S.), 1896	146	343	40
Christ Evangelical Lutheran Church, spire, Menominee	112	328	31
Christian Church, spire, New Carlisle (U. S. L. S.) (Ind.)	153	346	17
Chrysler Co. plant, stack, Detroit	99	311	29
Chrysler sign, stem of Y, Detroit	100	311	29
Chub Lake	105	315	27
Chub Lake, fire lookout tower	106	317	27
Church:			
Bad Axe (U. S. L. S.)	53	231	22
Detour (U. S. L. S.)	133	339	41
Forester (U. S. L. S.)	52	231	22
Grosse Pointe (U. S. L. S.)	159	349	21
Middle Village (U. S. L. S.)	31	194	15, 16
Prattville (U. S. L. S.)	152	346	19
Richmondville (U. S. L. S.)	52	231	22
St. Paul's (U. S. L. S.)	158	348	29
Three Rivers (U. S. L. S.)	153	346	18
Church of Christ, spire, Kalkaska	107	318	27
Church Point crib light (U. S. L. S.)	142	342	34, 35
City Airport, beacon, Detroit	100	311	21
City Bank and Trust Co., tip of flagpole, Jackson	90	301	19
City College, belfry, Detroit	100	311	29
City Hall:			
Bay City	84	291	28
Dome, Marquette	114	332	9
Flagstaff, Detroit (U. S. L. S.)	159	348	29
Foot of flagpole, Saginaw	85	291	28
City Light Co., stack, Holland	62	248	17, 23
City power plant:			
Northwest stack, Lansing	91	302	19
Southeast stack, Lansing	91	302	19
City water tank, Detroit	99	311	21
Clare, municipal water tank	109	324	30
Clark (U. S. L. S.)	157	348	29
Clark	88	297	19, 28
Claybank	68	260	23
Claybanks (astronomic latitude) (U. S. L. S.)	161	350	23
Cleveland Cliffs (U. S. L. S.)	23	182	10
Clock tower, Detroit University	98	311	21
Clock tower, spire, First Baptist Church, Bay City	84	291	28
Coats (U. S. L. S.)	35	199	14
Colby Wringer Factory, S. E. Corner, Reading (U. S. L. S.)	153	346	18, 19
Colchester (U. S. L. S.) (Canada)	45	220	20
Colchester Reef Lighthouse (U. S. L. S.) (Canada)	47	222	20
Cole	81	282	28
Coleman	108	322	30
College Clock Tower, Hillsdale (U. S. L. S.)	153	346	18, 19
College hospital, flagstaff, Ann Arbor	103	313	21
Colony Tower Lighthouse	47	222	21
Columbia Sugar Co., stack, Bay City	84	291	28
Comins	104	314	13, 27
Comstock (U. S. L. S.)	50	229	13
Comstock	73	267	25
Congregational Church at New Baltimore (U. S. L. S.)	160	349	21
Congregational Church, Hudson	152	346	19
Congregational Church, Port Sanilac (U. S. L. S.)	51	230	22
Congregational Church, Saint Joseph (U. S. L. S.)	153	346	17
Conklin (U. S. L. S.)	52	230	22
Constantine schoolhouse (U. S. L. S.)	153	346	18
Consumers Heating Co., stack, Saginaw	85	291	28
Consumers Light and Power Co., stack, Alma	87	292	30
Consumers Power Co., north stack, Saginaw	85	291	28
Consumers Power Co., south stack, Saginaw	85	291	28
Coolidge Station, Detroit City Gas Co., gas tank, finial, Detroit	100	311	21
Coopersville, municipal tank, finial	63	248	23
Copper Harbor astronomic station (U. S. L. S.)	116	333	8
Copper Harbor latitude mark (U. S. L. S.)	116	330, 333	8
Copper Harbor Lighthouse (U. S. L. S.)	116	333	8
Corbay Lighthouse (U. S. L. S.) (Canada)	127	337	32

Station	Geographic position	Description and/or plane coordinates	Sketch
Corner of sections:			
2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.) (*see* Saint Joseph County, Ind.: corner of secs. 2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.) (Ind.))	*Page* 155	*Page* 347	*Figure* 17
4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.) (*see* Cass County: corner of secs. 4, 5, 8, 9, T. 8 S., R. 16 W. (U. S. L. S.))	155	347	17, 18
14, 15, 22, 23 T. 6 S., R. 4 E. (U. S. L. S.) (*see* Lenawee County: corner of secs. 14, 15, 22, 23, T. 6 S., R. 4 E. (U. S. L. S.))	155	347	19, 20
19, 20, 29, 30, T. 6 S., R. 1 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: corner of secs. 19, 20, 29, 30, T. 6 S., R. 1 W. (U. S. L. S.))	155	347	19
25, 26, 35, 36, T. 6 S., R. 6 E. (U. S. L. S.) (*see* Monroe County, Mich.: corner of secs. 25, 26, 35, 36, T. 6 S., R. 6 E. (U. S. L. S.))	155	347	20
Corson (U. S. L. S.)	27	190	9, 11
Corunna	89	299	28
Corunna, Corunna Weatherproof Body Corp., water tank	93	303	28
Cottam (U. S. L. S.) (Canada)	45	220	20, 21
County farm, water tank	91	302	19
Courthouse:			
Hillsdale (U. S. L. S.)	153	346	18, 19
Ludington, Mason County, cupola, final	71	263	23, 24
Mason	91	301	19
Monroe (U. S. L. S.)	152	346	20
Muskegon, tip of spire	63	249	23
Rogers (U. S. L. S.)	37	201	12
Saginaw	85	291	28
Sandwich (U. S. L. S.)	158	348	29
Sault Ste. Marie, flagstaff (U. S. L. S.)	129	337	33
Coventry Gardens, water tank	102	312	21
Cranberry (U. S. L. S.)	31	193	16
Crane (U. S. L. S.)	24	185	9, 11, 15, 16
Crawford (U. S. L. S.) (Canada)	128	331, 337	32
Crawford	107	319	27, 30
Crebassa (U. S. L. S.)	18	175	8
Crebassa latitude post (U. S. L. S.)	117	333	8
Crib E (1879) (U. S. L. S.) (Canada)	143	342	35
Crib E (1881) (U. S. L. S.) (Canada)	143	342	35
Crib light (foot of flats) (U. S. L. S.)	143	342	35
Crib light (head of flats) (U.S L. S.)	142	342	35
Crib light post (Ross) (U. S. L. S.) (Canada)	130	338	38
Crib W (1879) (U. S. L. S.)	143	342	35
Crib W (1881) (U. S. L. S.)	143	342	35
Crib W (1882) (U. S. L. S.)	143	342	35
Crisp (U. S. L. S.)	39	203	11
Crisp	57	241	23
Cross Village (U. S. L. S.) 1902	33	197	15, 16
Cross Village (old) (U. S. L. S.)	151	345	15, 16
Cross Village, Catholic Church (U. S. L. S.)	32	196	15, 16
Croswell, Croswell Sugar Co., stack (U. S. L. S.)	51	230	22
Crystal	67	257	23
Cupola of School House E. Side of Chestnut St., Reading (U. S. L. S.)	153	346	18, 19
Curran, fire lookout tower	105	317	13
Custer (U. S. L. S.)	48	224	22
d (U. S. L. S.), 1853	120	334	15
D (U. S. L. S.), 1863	119	334	9
D (U. S. L. S.), 1865	116	333	8
D (U. S. L. S.) (Canada)	125	336	32
D. St. Ignace (U. S. L. S.)	25	186	11, 14
d. SW. point of Harbor Island (U. S. L. S.)	150	345	41
Dake	58	245	23
Danish Lutheran Church, spire, Edmore	87	292	25, 26, 30
Dansville, Ingham Agricultural School, stack	91	301	19
David	54	233	17
Day Forest estate, water tank	69	262	24
Day River (U. S. L. S.)	23	183	10
De Junge	57	240	23
Dearborn:			
Ford Airport, beacon	101	312	21
Ford Airport, checkered water tank	101	312	21
Ford Airport, stack	101	312	21
Municipal water tank	101	312	21
Deckerville, Presbyterian Church (U. S. L. S.)	52	231	22
Deckerville, school (U. S. L. S.)	52	231	22
Deerbrook (U. S. L. S.) (Canada)	46	220	21
Delta County:			
NW. corner of NE. quarter of sec. 16, T. 42 N., R. 19 W. (U. S. L. S.)	115	332	9
SE. corner of sec. 12, T. 38 N., R. 23 W. (U. S. L. S.)	115	332	10
Denton	69	261	24
De Shone	81	285	28

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Detachee (U. S. L. S.)	35	199	14
Detour (U. S. L. S.)	26	187	12, 41, 42
Detour church (U. S. L. S.)	133	339	41
Detour Lighthouse (1849) (U. S. L. S.)	124	336	42
Detour Lighthouse (U. S. L. S.), 1894	38	203	42
Detour smokestack (U. S. L. S.)	133	339	41
Detroit:			
Belle Isle, Azimuth Post (U. S. L. S.) (*see* Azimuth Post Belle Isle (U. S. L. S.))	158	348	29
Briggs Body Co., stack	99	311	21, 29
Chrysler Co. plant, stack	99	311	29
City Airport, beacon	100	311	21
City College, belfry	100	311	29
City Hall Flagstaff (U. S. L. S.)	159	348	29
City water tank	99	311	21
Detroit City Gas Co., Coolidge Station, gas tank finial	100	311	21
Detroit City Gas. Co., Lynch Road Plant, gas tank	99	311	21
Duns Scotus Church, belfry	101	312	21
Edison Co. plant, north stack	99	311	29
Fisher Building, east finial	98	310	29
Fisher Building, west finial	98	310	29
Home of Correction, men's division, stack	103	312	21
Home of Correction, men's division, water tank	103	312	21
Home of Correction, women's division, water tank	103	312	21
Hudson Building, flagpole	98	310	29
Hupmobile Motor Co., water tank	100	311	29
Lee Plaza Hotel, north finial	100	311	29
Lincoln Motor Co., stack	100	311	29
Municipal water tank, Redford	101	312	21
Municipal water tank, Rouge Park	101	312	21
Municipal waterworks, spire	99	311	29
Old Observatory (U. S. L. S.)	159	348	29
Peach Island front range light	99	311	21
Penobscot Building, red ball	98	310	29
St. Josephat Catholic Church, cross on spire	100	311	29
Stem of Y in Chrysler sign	100	311	29
Sweetest Heart of Mary Catholic Church, cross on north spire	100	311	29
Union Guardian Building, flagpole	98	310	29
U. S. Marine Hospital, stack	99	311	29
University, clock tower	98	311	21
Windmill Point Lighthouse	99	311	29
WXYZ Radio Station, east mast	100	311	29
Deutsche Evangelical Church, Michigan City (U. S. L. S.) (Ind.)	154	346	
Dexter	96	308	19, 21
Dias	74	268	25
Dietrich	58	244	23, 25
Dietrich, Lutheran Church steeple, 1 mile north of	63	249	23, 25
Divide (U. S. L. S.)	20	178	9
Divis	55	234	17
Dix	96	307	21
Dodge Brothers Estate, black tank, yellow top	104	313	21
Dollar Settlement (U. S. L. S.)	129	337	32
Dome, Marinette County Courthouse, Marinette (Wis.)	113	329	31
Door Bluff (U. S. L. S.) (Wis.)	21	180	9
Door Bluff (U. S. L. S.) *latitude station* (Wis.)	23	183	9
Doster	73	267	25
Douglas (astronomic latitude) (U. S. L. S.)	162	350	17
Douglas, municipal tank, finial	61	248	17
Dover	108	322	30
Dow Chemical Co.:			
Largest stack, Midland	86	292	28, 30
Northern stack, Midland	86	292	28, 30
Down River	107	319	27
Down River, fire lookout tower	109	323	27
Downs	65	252	24
Driggs (U. S. L. S.)	27	190	9
Drummond (U. S. L. S.)	38	202	41
Duck Island (U. S. L. S.) (Canada)	26	188	12
Duck Lake (astronomic latitude) (U. S. L. S.)	162	350	23
Duke (U. S. L. S.)	25	186	11, 12
Dunbar, fire lookout tower	70	263	23, 24
Dundee (U. S. L. S.)	43	215	20
Duns Scotus Church, belfry, Detroit	101	312	21
Durand, water tank	93	303	28
Dury	44	217	18, 19
Dygert	74	269	25
E (north) (U. S. L. S.)	119	334	9
E (south) (U. S. L. S.)	119	334	9
E (U. S. L. S.) (Canada)	125	336	32
E′ of E. P. S., (U. S. L. S.)	122	335	14, 42
Eagle (old) (U. S. L. S.)	145	343	9

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Eagle Bluff (U. S. L. S.) (Wis.)	21	180	9, 31
Eagle Bluff Lighthouse (Wis.)	113	330	9, 31
Eagle Harbor Lighthouse (U. S. L. S.)	117	333	8
Eagle Ottawa Leather Co.:			
Stack, Grand Haven	63	249	23
Stack, Whitehall	65	249	23
East Atlanta, fire lookout tower	106	317	12, 13, 27
East base:			
A (U. S. L. S.)	119	334	9
B. Mackinac (old) (U. S. L. S.)	121	335	14
Batchewana (U. S. L. S.) (Canada)	39	203	11, 32
Lake St. Clair (U. S. L. S.)	159	349	21
Mackinac (U. S. L. S.) (*see* B′ Mackinac East Base (U. S. L. S.))	25	186	11, 14
Sand Point (U. S. L. S.)	49	227	13, 22
Soo (U. S. L. S.)	39	204	33
Sturgis	73	265	18
East Bay (U. S. L. S.) (Canada)	127	331, 337	32
East Bluff (U. S. L. S.)	115	332	8
East Lansing, municipal tank	93	303	19
East Saugatuck, church steeple	61	248	17
East Sawteeth (U. S. L. S.) (Minn.)	18	174	8
East Sawteeth (U. S. L. S.) latitude station	19	177	8
East Sister Island (U. S. L. S.)	156	348	20
Eastern High School, tip of dome, Bay City	84	291	28
Eckerman (U. S. L. S.)	28	191	9, 11
Ecorse (U. S. L. S.)	157	348	29
Eddy Paper Co., stack, Three Rivers	76	272	18
Edenville, fire lookout tower	110	324	30
Edison Co. plant, north stack, Detroit	99	311	29
Edmore	83	290	25, 26, 30
Edmore, Danish Lutheran Church, spire	87	292	25, 26, 30
Edmore, Hart Canning Co., tallest stack	87	292	25, 26, 30
Edmunds (U. S. L. S.)	27	190	9
Elback (U. S. L. S.)	27	190	9
Elevator (U. S. L. S.)	23	182	10
Elevator, Michigan Central (U. S. L. S.)	158	348	29
Elk Hill	107	318	27
Elk Hill, fire lookout tower	109	323	27
Elkhart County: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 6 E. (U. S. L. S.) (Ind.)	155	347	18
Ellsworth	77	274	9, 27, 43
Elmira	105	316	27
Eloise, hospital, large brick stack	102	312	21
Emanuel Lutheran Church, spire, Ludington	71	263	23, 24
Emerson (U. S. L. S.)	128	332, 337	9, 32
Emerson smokestack (U. S. L. S.)	129	337	9, 32
Emmett, Catholic Church (U. S. L. S.)	51	229	22
Engine house center (U. S. L. S.)	158	348	29
Engine house No. 2, Adrian (U. S. L. S.)	152	346	19, 20
Ensley	75	271	25, 26
Epileptic Institute, stack Wahjamega	83	291	28
Epiphany Church, spire, Menominee	111	327	31
Epoufette (U. S. L. S.)	30	193	16
Escanaba Lighthouse (U. S. L. S.)	22	182	10
Escanaba River (U. S. L. S.)	22	182	10
Evangelical Lutheran Church, steeple, Marinette (Wis.)	112	328	31
Everett Piano Co.:			
South stack, South Haven	61	248	17
Water tank, South Haven	61	247	17
F (north) (U. S. L. S.)	119	334	9
F. South (U. S. L. S.)	22	182	10
Fairfield (U. S. L. S.)	42	214	19, 20
Farmington, Children's Hospital, water tank	102	312	21
Farquhars Knob (U. S. L. S.) (Minn.)	18	174	8
Farquhars Knob (U. S. L. S.) latitude station (Minn.)	19	177	8
Farwell, fire lookout tower	109	324	30
Feich	110	325	9, 31
Fennville, black municipal water tank, finial	61	248	17
Fiber Paper Co., taller of two stacks, Filer City	70	263	24
Field (U. S. L. S.)	158	348	29
Fighting Island (U. S. L. S.)	157	348	29
Filer City, Fiber Paper Co., taller of two stacks	70	263	24
Fire lookout tower:			
Bear Creek	106	318	27
Blue Lake, and primary traverse station No. 53 F (U. S. G. S.) eccentric	72	264	23
Brier Hill	79	279	24, 26
Cedar	69	262	24
Chub Lake	106	317	27
Curran	105	317	13

Station	Geographic position	Description and/or plane coordinates	Sketch
Fire lookout tower—Continued.	*Page*	*Page*	*Figure*
Down River	109	323	27
Dunbar	70	263	23, 24
East Atlanta	106	317	12, 13, 27
Edenville	110	324	30
Elk Hill	109	323	27
Farwell	109	324	30
Garfield	79	279	26, 27
Gladwin Game Refuge	109	324	30
Grass Lake	109	323	27, 30
Harrison	109	324	30
Honor	69	262	24
Houghton Lake	109	324	30
Hudson	106	318	27
Indian Springs	109	324	30
Jordan	106	318	27
Kingsley	79	279	24, 26, 27
Lake Emma	106	317	12
Mack Lake	109	323	13, 27
Mancelona	107	318	27
Mecosta	87	293	26
Mt. Tom	108	323	13, 27
Ogemaw	109	324	30
Pentwater	71	264	23
Pickerel Lake	107	318	27
Pikes Peak	105	317	13
Portage Lake	109	323	27, 30
Roscommon	109	324	27, 30
Rose City	109	324	30
Selma	79	279	26
South Pigeon River	106	317	12, 27
Turtle Lake	106	317	13
Twin Lake	72	264	23
Wellston	70	263	24
West Atlanta	106	317	12, 27
First Baptist Church:			
Clock tower, spire, Bay City	84	291	28
Reading (U. S. L. S.)	153	346	18, 19
First Congregational Church:			
Spire, Manistee	70	263	24
Steeple, Grand Haven	63	249	23
First M. E. Church, Jackson (U. S. L. S.)	152	346	19
First Methodist Church, spire, Ann Arbor	103	313	21
Fish Creek (U. S. L. S.)	145	343	9
Fishdam (old) (U. S. L. S.)	119	334	9
Fishdam (U. S. L. S.)	20	178	9
Fisher Building:			
East finial, Detroit	98	310	29
West finial, Detroit	98	310	29
Fisk	75	270	25
Fisk Knob, scenic lookout tower	77	273	25
Flagpole:			
Bell Telephone Building	98	311	21
Hudson Building, Detroit	98	310	29
Old State prison, Jackson	90	301	19
Tip of, City Bank and Trust Co., Jackson	90	301	19
Union Guardian Building, Detroit	98	310	29
Flagstaff:			
Canal Park, (U. S. L. S.)	129	337	33
College hospital, Ann Arbor	103	313	21
Courthouse, Sault Ste. Marie, (U. S. L. S.)	129	337	33
Detroit City Hall (U. S. L. S.)	159	348	29
Fort Brady, Sault Ste. Marie, (U. S. L. S.)	129	337	33
Grand Hotel (U. S. L. S.)	32	196	14
Indian Home, Sault Ste. Marie, Ontario (U. S. L. S.)	130	338	33
Flanders (U. S. L. S.)	26	188	12, 13
Flat Rock (U. S. L. S.)	119	334	9
Flat Rock, airway beacon no. 11 B	102	312	20
Flushing, municipal water tank	94	303	28
Ford Airport:			
Beacon, Dearborn	101	312	21
Checkered water tank, Dearborn	101	312	21
Stack, Dearborn	101	312	21
Ford Plant, southeast stack, Highland Park	98	310	21
Ford River (old) (U. S. L. S.)	120	334	9
Ford River (U. S. L. S.)	21	179	9, 10
Fordney (U. S. L. S.)	28	191	9, 11
Foremast of wreck *Josephine* (U. S. L. S.) (Canada)	129	337	32
Forester:			
Church (U. S. L. S.)	52	231	22
Town hall (U. S. L. S.)	52	231	22
Forestville:			
Lutheran Church (U. S. L. S.)	53	231	22
Methodist Church (U. S. L. S.)	53	231	22

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Fort and Griswold Sts., intersection (U. S. L. S.)	159	348	29
Fort Brady flagstaff, Sault Ste. Marie, (U. S. L. S.)	129	337	33
Foot Gratiot Lighthouse (U. S. L. S.)	51	229	22
Fort St. Joe (U. S. L. S.) (Canada)	38	202	39
Forty Mile Point (U. S. L. S.)	36	201	12
Fowlerville, water tank	91	302	19
Fox (U. S. L. S.)	30	193	9, 16
Fox	74	267	25
Frakenlust, St. Paul's German Luthern Church, spire	86	291	28
Frankfort:			
(Astronomic latitude) (U. S. L. S.)	161	349	24
South breakwater light eccentric	69	262	24
Franklin shaft house No. 2 (U. S. L. S.)	114	332	8
Freeland	81	285	28
Freiburger, Lutheran Church (U. S. L. S.)	53	231	22
Fremont (U. S. L. S.) (Ind.)	42	211	18
Fremont, water tank finial	72	264	23
French	74	268	25
French Church of St. Joseph, statue on dome, Marinette (Wis.)	113	329	31
Front range light:			
Peach Island, Detroit	99	311	21
Pilot Island (U. S. L. S.)	130	338	38
Frying Pan Lighthouse (U. S. L. S.)	130	338	41
Fulford	77	275	27, 43
Furlong (U. S. L. S.)	28	191	11
Fuyards (U. S. L. S.)	34	198	14
G (north) (U. S. L. S.)	119	334	9
G. M. P. Packing Co., water tank, Chesaning	94	304	28
G or 8 (on main shore) (U. S. L. S.)	123	336	14
G (south) (U. S. L. S.)	119	334	9
Galena (U. S. L. S.) (Ind.)	41	207	17
Garden (U. S. L. S.)	30	193	16
Garden Bluff (U. S. L. S.)	119	334	9
Garden Island (U. S. L. S.)	121	335	16
Garfield	77	275	26, 27
Garfield, fire lookout tower	79	279	26, 27
Gargantua (U. S. L. S.) (Canada)	118	----------	11
Gargantua Lighthouse (U. S. L. S.) (Canada)	127	----------	----------
Garth (U. S. L. S.)	23	183	10
Gas tank:			
Detroit City Gas Co., Coolidge Station, finial, Detroit	100	311	21
Detroit City Gas Co., Lynch Road Plant, Detroit	99	311	21
Gatacre (U. S. L. S.) (Canada)	40	206	12
Gaylord:			
Municipal water tank, finial	106	317	27
St. Mary's Church, spire	106	318	27
General	95	305	21, 29
General Motors Co:			
Stack, Windsor (Canada)	97	310	29
Water tank, Windsor (Canada)	97	310	29
German Lutheran Church (U. S. L. S.)	53	231	22
German Lutheran Church, Monroe (U. S. L. S.)	152	346	20
Getz farm, tank, north of State park zoo, Holland	61	248	17, 23
Gladwin Game Refuge, fire lookout tower	109	324	30
Glover	66	253	24
Goodhart (U. S. L. S.)	24	184	9, 11, 15, 16
Goose Island (U. S. L. S.)	25	186	11, 12, 14
Goudreau (U. S. L. S.)	33	196	14, 15
Goulais Point (1868) (U. S. L. S.) (Canada)	128	331, 337	32
Goulais Point (1895) (U. S. L. S.) (Canada)	128	331, 337	32
Graafschap, church steeple	62	248	17, 23
Graham	89	297	19, 28
Graham Body Co., stack, Wayne	102	312	21
Gram Methodist Episcopal Church, spire, Marinette (Wis.)	113	329	31
Grand Haven	57	243	23
Grand Haven:			
Eagle Ottawa Leather Co., stack	63	249	23
First Congregational Church, steeple	63	249	23
Pierhead front range light	63	248	23
Pierhead rear range light	63	248	23
Grand Hotel, flagstaff (U. S. L. S.)	32	196	14
Grand Island (U. S. L. S.)	19	176	9
Grand Rapids:			
Black water tank	76	273	25
National Bank, red light on dome	76	273	25
Silver water tank	76	273	25
Grand River and Park Place, SE. corner building, office (U. S. L. S.)	158	348	----------
Grand Traverse Lighthouse (U. S. L. S.)	120	335	43
Grande Point (U. S. L. S.) (Canada)	146	343	12
Granite Island (U. S. L. S.)	19	176	8, 9
Granite Island Lighthouse (U. S. L. S.)	114	332	8, 9

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Grannis	75	270	25
Grant (Canada)	95	304	21
Grass Lake:			
Fire lookout tower	109	323	27, 30
Tallest church steeple	91	301	19
Gravelly Island (U. S. L. S.)	165	351	9
Grays Reef (U. S. L. S.)	151	345	16
Great Lakes Sugar Co.:			
Brick stack, St. Louis	86	292	30
Tall concrete stack, St. Louis	86	292	30
Green (U. S. L. S.)	34	197	14, 15
Green Island (U. S. L. S.)	145	343	9
Green Island Lighthouse (U. S. L. S.) (Ohio)	46	222	20
Greenan (U. S. L. S.)	52	230	22
Greenbush (U. S. L. S.)	50	228	13
Greer	107	321	30
Grew	81	283	28
Gros Cap (U. S. L. S.)	32	196	14, 15
Grosse Isle (U. S. L. S.)	157	348	29
Grosse Point (1871) (U. S. L. S.)	159	349	21
Grosse Point (1918) (U. S. L. S.)	29	191	14
Grosse Pointe:			
Church (U. S. L. S.)	159	349	21
High School, finial	97	310	21
Grostick	88	296	19
Guardian Angel Catholic Church, spire, Manistee	69	262	24
Guild	83	289	25, 30
Gull (U. S. L. S.)	31	194	16
Gull Island (U. S. L. S.)	165	351	9
Gull Island (1855) (U. S. L. S.)	121	335	16
Gun	67	255	24
H (U. S. L. S.)	119	334	9
H. near Pine River (U. S. L. S.)	122	335	14
Hackett (U. S. L. S.)	157	348	29
Haddock	56	238	17
Hall-Doyle Co., tank, Ypsilanti	103	313	20, 21
Hamburg	96	308	21
Hamilton	96	307	21
Hamlin	67	256	24
Hammond	75	270	25
Hammond (U S. L. S.)	36	200	12
Happy (U .S. L. S.)	159	349	29
Harbor Island (No. 281) (U. S. L. S.)	38	203	40, 41
Harbor Point (U. S. L. S.)	32	196	16
Harrietta	78	277	24, 26
Harrison, fire lookout tower	109	324	30
Harryman	89	298	28
Hart:			
Canning Co., tallest stack, Edmore	87	292	25, 26, 30
Catholic Church spire three miles NNE. of	72	264	23
Hat (U. S. L. S.)	33	196	16
Hat Island (U. S. L. S.), 1853	120	334	16
Hat Island (U. S. L. S.), 1864	145	343	9
Hatt	87	293	19
Havilland (U. S. L. S.) (Canada)	38	203	11, 32
Hayes	105	315	27
Hayes (U. S. L. S.)	50	228	13
Hayes Wheel Co., stack, Jackson	90	301	19
Heinz Canning Co., stack, Holland	62	248	17, 23
Henley	55	234	17
Henry (U. S. L. S.)	50	228	13
Hersey	79	278	26
Hicks	88	295	19
High (U. S. L. S.)	29	192	9, 16
High Island (U. S. L. S.)	121	335	16
High School:			
Belfry, finial, Ludington	71	263	23, 24
Finial, Grosse Pointe	97	310	21
Michigan City (U. S. L. S.) (Ind.)	154	346	----------
Highland Park, Ford Plant, southeast stack	98	310	21
Hillock (U. S. L. S.)	51	229	22
Hillsdale (U. S. L. S.)	42	212	18, 19
Hillsdale College clock tower (U. S. L. S.)	153	346	18, 19
Hillsdale Courthouse (U. S. L. S.)	153	346	18, 19
Hillsdale County, Mich.:			
Corner of secs. 19, 20, 29, 30, T. 6 S., R. 1 W. (U. S. L. S.)	155	347	19
Corner of secs. 22, 23, 26, 27, T. 7 S., R. 4 W. (U. S. L. S.)	155	347	18, 19
NE. corner of sec. 26, T. 7 S., R. 4 W. (U. S. L. S.)	155	347	18, 19
NW. corner of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.)	155	347	18, 19
SE. corner of sec. 8, T. 5 S., R. 1 W. (U. S. L. S.)	155	347	19
SE. corner of sec. 36, T. 7 S., R. 2 W. (U. S. L. S.)	155	347	19

Station	Geographic position	Description and/or plane coordinates	Sketch
Hillsdale County, Mich.—Continued.			
SW. corner of NW. quarter of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.)	*Page* 155	*Page* 347	*Figure* 18, 19
SW. corner of NW. quarter of sec. 29, T. 6 S., R. 1 W. (U. S. L. S.)	155	347	19
Hog Island (U. S. L. S.)	24	185	9, 11, 16
Hog Island Reef (U. S. L. S.)	151	345	16
Holland:			
Black Lake, front range light	62	248	17, 23
Black Lake, rear range light	62	248	17, 23
Bush Lane Piano Co., tank	61	248	17, 23
City Light Co., stack	62	248	17, 23
Heinz Canning Co., stack	62	248	17, 23
Holland Furnace Co., tank	61	248	17, 23
Holland Shoe Co., stack	62	248	17, 23
Municipal standpipe	62	248	17, 23
North of State park zoo, Getz farm, tank	61	248	17, 23
Holland Church, white steeple, Spring Lake	63	249	23
Holy Family Catholic Church, belfry, Saginaw	85	291	28
Home of Correction:			
Men's division, stack, Detroit	103	312	21
Men's division, water tank, Detroit	103	312	21
Women's division, water tank, Detroit	103	312	21
Honor	65	251	24
Honor, fire lookout tower	69	262	24
Horseshoe Island (U. S. L. S.)	145	343	9
Hoskin-Morainville Paper Co.:			
Stack, Menominee	111	327	31
Tank, Menominee	111	327	31
Hospital, large brick stack, Eloise	102	312	21
Hotel Dieu, steeple, Windsor (Canada)	97	310	29
Houghton	107	320	30
Houghton Lake, fire lookout tower	109	324	30
Howard base A station	75	272	25
Howard City, municipal water tank	77	273	25, 26
Howard north base	75	271	25, 26
Howard south base	75	270	25
Hudson	105	315	27
Hudson Building, flagpole, Detroit	98	310	29
Hudson Congregational Church (U. S. L. S.)	152	346	19
Hudson, fire lookout tower	106	318	27
Hughes (U. S. L. S.) 1917	29	192	16
Hughes (old) (U. S. L. S.)	151	345	16
Hupmobile Motor Co., water tank, Detroit	100	311	29
Huron (U. S. L. S.)	53	232	22
Huron Island (U. S. L. S.)	117	333	8
Huron Island Lighthouse (U. S. L. S.)	117	333	8
Huron Mountains (U. S. L. S.)	18	175	8
Huron Mountains (U. S. L. S.) latitude station	20	177	8
Huron Point (U. S. L. S.) 1871	160	349	21
Huron Point (U. S. L. S.), 1916	37	202	14, 42
Huron Portland Cement Co., flashing white light, Alpena	105	317	12, 13
Huston	75	272	26
Hyde (U. S. L. S.)	51	229	22
I (mouth of Whitefish River) (U. S. L. S.)	119	334	9
I (U. S. L. S.)	124	336	32
I of E. P. S. (U. S. L. S.)	124	336	14
I. Point St. Martin (U. S. L. S.)	122	335	14
Indian	107	320	30
Indian Home flagstaff, Sault Ste. Marie, Ontario (U. S. L. S.)	130	338	33
Indian Point (U. S. L. S.)	119	334	9
Indian School, tank, Lansing	92	302	19
Indian Springs, fire lookout tower	109	324	30
Ingham Agriculture School, stack, Dansville	91	301	19
Inlet (Wis.)	111	326	31
Insane Asylum, stack, Pontiac	101	312	21
International Hotel, Sault Ste. Marie, Ontario (U. S. L. S.)	130	337	33
Iron tower (Winter Point, back range) (U. S. L. S.)	130	338	38
Iroquois (old station) (U. S. L. S.)	128	337	32
Iroquois (U. S. L. S.)	25	187	11, 32
Iroquois Island (U. S. L. S.)	129	337	32
Iroquois Lighthouse (U. S. L. S.)	128	337	32
Iroquois Lighthouse (old) (U. S. L. S.)	128	337	32
Iroquois Point observatory post (U. S. L. S.)	128	337	32
Isle Royale East (U. S. L. S.)	18	175	8
Isle Royale East (U. S. L. S.) latitude station	20	177	8
Isle Royal Lighthouse (U. S. L. S.)	115	332	8
Isle St. Martin (U. S. L. S.)	35	199	14
Ives Hill (U. S. L. S.)	19	176	8
J. Wallace Sons & Co., western stack, Saint Joseph	60	247	17
Jackman (U. S. L. S.)	51	229	22
Jackson	88	295	19

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Jackson:			
Chimney (U. S. L. S.)	152	346	19
City Bank and Trust Co., tip of flagpole	90	301	19
First M. E. Church (U. S. L. S.)	152	346	19
Hayes Wheel Co., stack	90	301	19
Lefere Co., tall concrete stack	90	301	19
Mackling Grinding Wheel Co., tank	91	301	19
Michigan State Prison (U. S. L. S.)	152	346	19
Michigan State prison, tank	90	301	19
Old State prison, flagpole	90	301	19
Reynolds Field, airport beacon	90	301	19
Southwest, Automotive Fan and Bearing Co., tank	91	301	19
James Clements Airport, beacon, Bay City	85	291	28
Jamieson (U. S. L. S.)	35	199	14
Jefferson (U. S. L. S.) (Ind.)	41	209	18
Jenkinson	89	300	28
Jewell	73	265	18
Johannes	105	314	12, 27
John Davis School, stack, Menominee	112	328	31
Johnston	55	237	17
Jonas	81	283	28
Jones	57	242	23
Jordan	105	316	27
Jordan, fire lookout tower	106	318	27
K (U. S. L. S.)	126	336	32
K. Goose Island (north end) (U. S. L. S.)	122	335	14
K. O. T. M. Temple, dome, Port Huron (U. S. L. S.)	51	229	22
Kalamazoo, State Hospital, standpipe	76	273	25
Kalkaska, Church of Christ, spire	107	318	27
Kaul	81	284	28
Kelvinator Building, finial	100	311	21
Kelvinator Co., stack	101	311	21
Kent	58	244	25
Kentucky (U. S. L. S.)	27	189	9
Keweenaw (U. S. L. S.)	117	333	8
Keweenaw Point, middle base (U. S. L. S.)	115	330, 332	8
Keweenaw Point north base (U. S. L. S.)	19	175	8
Keweenaw Point south base (U. S. L. S.)	19	176	8
Keweenaw Point south base (U. S. L. S.) latitude station	20	177	8
Kingsley	78	276	24, 26, 27
Kingsley, fire lookout tower	79	279	24, 26, 27
Kingsville (U. S. L. S.) (Canada)	156	348	20
Kingsville:			
M. E. Church (U. S. L. S.) (Canada)	156	348	20
Power house stack (U. S. L. S.) (Canada)	47	222	20
Schoolhouse (U. S. L. S.) (Canada)	156	348	20
Kintner	67	256	23, 24
Kirby	65	251	24
Knollwood Country Club, tank	101	312	21
Kocruish (U. S. L. S.) (Canada)	146	343	40
Korah (U. S. L. S.) (Canada)	39	204	32, 33
Kotman	55	237	17
L (U. S. L. S.) (Charlevoix County)	151	345	16
L (U. S. L. S.) (Chippewa County)	126	336	32
L. Point Fuyard (U. S. L. S.)	122	335	14
La Fayette (U. S. L. S.)	28	191	14
La Grange County:			
Corner of secs. 4, 5, 8, 9, T. 37 N., R. 11 E. (U. S. L. S.) (Ind.)	155	347	18
SW. corner of NW. quarter of sec 33, T. 38 N., R. 8 E. (U. S. L. S.) (Ind.)	155	347	18
La Porte County:			
NW. corner of sec. 10, T. 36 N., R. 4 W (U. S. L. S.) (Ind.)	155	347	17
SE. corner of sec. 10, T. 37 N., R. 3 W. (U. S. L. S.) (Ind.)	155	347	17
SW. corner of SE. quarter of SW. quarter of sec. 32, T. 38 N., R. 2 W (U. S. L. S.) (Ind.)	155	347	17
La Puce (1869) (U. S. L. S.)	159	349	21
La Puce (1871) (U. S. L. S.)	160	349	21
Laidlaw (U. S. L. S.)	50	228	13
Laingsburg	89	297	28
Laingsburg, St. Catherine Church, steeple	93	303	28
Laird (U. S. L. S.) (Canada)	25	187	12, 35
Lake Emma, fire lookout tower	106	317	12
Lake George Lighthouse (U. S. L. S.)	118	334	35
Lake St. Clair east base (U. S. L. S.)	159	349	21
Lake St. Clair west base (U. S. L. S.)	159	349	29
Lakeview	75	271	25, 26
Lakeview, municipal water tank	87	292	26
Lammon	87	293	19
Lamson's tree (U. S. L. S.)	114	332	8
Lansing	89	298	19, 28
Lansing:			
Burton Dixie Co., tank	93	303	19
Capital City Airport, beacon	92	302	19

Station	Geographic position	Description and/or plane coordinates	Sketch
Lansing—Continued.	*Page*	*Page*	*Figure*
Capital National Bank Building, steel mast	92	302	19
City power plant, northwest stack	91	302	19
City power plant, southeast stack	91	302	19
Indian School, tank	92	302	19
Michigan State College Memorial finial	92	302	19
Michigan State College, power plant stack	92	302	19
Municipal standpipe	92	302	19
Olds Motor Co., stack	92	302	19
Reo Motor Co., old duplex plant, tank	91	302	19
Reo Motor Co., tank	92	302	19
State Capitol, tip of dome	93	302	19
Larke (U. S. L. S.)	25	187	11, 12, 32, 33
Latitude Mark, Copper Harbor, (U. S. L. S.)	116	330, 333	8
Latitude Post:			
Crebassa, (U. S. L. S.)	117	333	8
Whitefish Point, (U. S. L. S.)	118	333	32
Latitude Station:			
Door Bluff (U. S. L. S.) (Wis.)	23	183	9
East Sawteeth (U. S. L. S.) (Minn.)	19	177	8
Farquhars Knob (U. S. L. S.) (Minn.)	19	177	8
Huron Mountains (U. S. L. S.)	20	177	8
Isle Royale East (U. S. L. S.)	20	177	8
Keweenaw Point south base (U. S. L. S.)	20	177	8
Porcupine Mountains (U. S. L. S.)	19	177	8
Vulcan Post No. 1 (U. S. L. S.)	20	177	8
Vulcan Post No. 2 (U. S. L. S.)	20	177	8
Wheal Kate (U. S. L. S.)	19	177	8
Lauerman's Department Store, tank, Marinette (Wis.)	113	329	31
Le Roy	78	277	26
Leamington Lighthouse (U. S. L. S.) (Canada)	47	222	20
Lee Plaza Hotel, north finial, Detroit	100	311	29
Lees Point (U. S. L. S.)	164	351	43
Lefere Co., tall concrete stack, Jackson	90	301	19
Leifsen	55	236	17
Lemley	66	253	24
Lenawee County:			
Corner of secs. 14, 15, 22, 23, T. 6 S., R. 4 E. (U. S. L. S.)	155	347	19, 20
Corner of secs. 22, 23, 26, 27, T. 7 S., R. 5 E. (U. S. L. S.)	155	347	20
NE. corner of sec. 1, T. 6 S., R. 1 E. (U. S. L. S.)	155	347	19
NE. corner of sec. 3, T. 8 S., R. 3 E. (U. S. L. S.)	155	347	19, 20
Lenox (U. S. L. S.)	48	222	21, 22
Lewiston	105	314	27
Light (post) Sweets Point (U. S. L. S.)	130	338	39
Lighthouse:			
Baileys Harbor (U. S. L. S.)	165	351	9
Beaver Harbor (U. S. L. S.)	29	191	16
Beaver Island	79	279	11, 16
Beaver Island (U. S. L. S.)	121	335	11, 16
Big Sable	70	263	24
Bois Blanc (U. S. L. S.) 1849	122	335	14
Bois Blanc (U. S. L. S.) 1896	28	191	14
Caribou Island (U. S. L. S.) (Canada)	39	203	11
Chambers Island (Wis.)	112	328	9, 31
Cheboygan, (U. S. L. S.)	123	335	14
Cheboygan Point (U. S. L. S.)	36	200	14
Colchester Reef, (U. S. L. S.) (Canada)	47	222	20
Colony Tower	47	222	21
Copper Harbor, (U. S. L. S.)	116	333	8
Corbay, (U. S. L. S.) (Canada)	127	337	32
Detour (1849), (U. S. L. S.)	124	336	42
Detour, (U. S. L. S.) 1894	38	203	42
Eagle Bluff (Wis.)	113	330	9, 31
Eagle Harbor, (U. S. L. S.)	117	333	8
Escanaba, (U. S. L. S.)	22	182	10
Fort Gratiot, (U. S. L. S.)	51	229	22
Frying Pan (U. S. L. S.)	130	338	41
Gargantua (U. S. L. S.) (Canada)	127	----------	----------
Grand Traverse, (U. S. L. S.)	120	335	43
Granite Island, (U. S. L. S.)	114	332	8, 9
Green Island, (U. S. L. S.) (Ohio)	46	222	20
Huron Island, (U. S. L. S.)	117	333	8
Iroquois (U. S. L. S.)	128	337	32
(old), Iroquois (U. S. L. S.)	128	337	32
Isle Royal, (U. S. L. S.)	115	332	8
Lake George, (U. S. L. S.)	118	334	35
Leamington, (U. S. L. S.) (Canada)	47	222	20
Little Sable	72	264	23
McGulpin Point (1896) (U. S. L. S.)	121	335	14, 15
McGulpin Point (U. S. L. S.)	34	198	14, 15
Manitou Island, (U. S. L. S.)	116	332	8
Marquette, (U. S. L. S.)	114	332	9
Martin Reef, (U. S. L. S.)	29	191	14
Michigan City (U. S. L. S.) (Ind.)	154	346	----------

Station	Geographic position	Description and/or plane coordinates	Sketch
Lighthouse—Continued.	*Page*	*Page*	*Figure*
Michigan Island, (U. S. L. S.)	114	332	
Middle Island (U. S. L. S.) (Ohio.)	46	222	20
Mission Point	69	262	27, 43
Monroe (U. S. L. S.)	152	346	20
North Manitou Island	69	262	9, 24
Old Mackinac Point, (U. S. L. S.)	33	197	14, 15
Pelée Island, (U. S. L. S.) (Canada)	46	222	20
Pelée Passage, (U. S. L. S.) (Canada)	46	222	20
Peninsula Point, (U. S. L. S.)	21	181	9, 10
Pilot Island (U. S. L. S.)	165	351	9
Pipe Island (U. S. L. S.)	130	338	41
Poe Reef, (U. S. L. S.)	36	200	12, 14
Point aux Pins, (U. S. L. S.) (Canada)	129	337	32
Point Betsie	69	262	24
Point Betsie (U. S. L. S.)	163	350	24
Port Austin, (U. S. L. S.)	54	232	22
Port Sanilac, (U. S. L. S.)	51	230	22
Portage Entry, (U. S. L. S.)	117	333	8
Poverty Island, (U. S. L. S.)	22	181	9
Rock Island, (U. S. L. S.) (Wis.)	21	181	9
Rock Island (old) (U. S. L. S.) (Wis.)	165	351	9
Round Island (U. S. L. S.)	33	197	14
Round Island (lower St. Marys River) (U. S. L. S.)	130	338	39
Round Island (upper St. Marys River) (U. S. L. S.)	129	337	32
St. Clair Flats Rear Range (U. S. L. S.)	160	349	21
St. Helena, (U. S. L. S.)	33	197	14, 15
Saint Joseph	60	247	17
Saugatuck	61	248	17
Seul Choix, (U. S. L. S.)	29	192	16
Shoal Island, (U. S. L. S.) (Canada)	144	342	37
Skilligallee, (U. S. L. S.)	33	197	15, 16
South Bass Island, (U. S. L. S.) (Ohio.)	46	222	20
South Fox, (U. S. L. S.)	33	196	9
South Haven (geodetic) (U. S. L. S.)	162	350	17
South Manitou (U. S. L. S.)	163	350	24
South Manitou Island	69	262	24
Spectacle Reef, (U. S. L. S.)	28	191	12, 14
Squaw Island, (U. S. L. S.)	29	192	16
Squaw Point, (U. S. L. S.)	22	182	10
Sulphur Island (U. S. L. S.) (Canada)	146	343	12
Thames River (U. S. L. S.)	160	349	21
Turtle Island (U. S. L. S.)	156	348	20
Waugoshance (1853) (U. S. L. S.)	121	335	15, 16
Waugoshance (1902) (U. S. L. S.)	33	197	15, 16
West Sister, (U. S. L. S.)	47	222	20
White River	65	249	23
White Shoal, (U. S. L. S.)	30	193	15, 16
Whitefish Point (U. S. L. S.)	129	337	32
William Livingstone Memorial, Belle Isle	97	310	29
Windmill Point (U. S. L. S.)	159	349	29
Windmill Point, Detroit	99	311	29
Lightkeeper's house, chimney, Winter Point (U. S. L. S.)	130	338	38
Lima School (U. S. L. S.) (Ind.)	153	346	18
Lime (U. S. L. S.) (Canada)	40	205	12
Lincoln Motor Co., stack, Detroit	100	311	29
Linda (U. S. L. S.)	51	229	22
Little	108	323	30
Little Girls Point, stake 57, Gillman (U. S. L. S.)	115	332	8
Little Gull (U. S. L. S.)	22	181	9
Little Hog (U. S. L. S.)	30	193	16
Little Hog Island (U. S. L. S.)	164	351	43
Little Lake (U. S. L. S.)	23	183	10
Little Point (U. S. L. S.)	156	348	20
Little Point Sable (astronomic latitude) (U. S. L. S.)	161	349	23
Little Point Sable, Observatory Post, O. B. Wheeler (1866) (U. S. L. S.)	161	349	23
Little Sable Lighthouse	72	264	23
Little St. Martin (U. S. L. S.)	35	199	14
Little Summer Island (U. S. L. S.)	165	351	9
Lloyd Manufacturing Company, tank, Menominee	112	328	31
Lloyd's Department Store, tank, Menominee	111	327	31
Locust Point (U. S. L. S.) (Ohio)	45	220	20
Longitude post, stone, Toledo (U. S. L. S.) (Ohio)	156	348	20
Lookout, Stephenson	111	326	31
Lookout tower, Middle Inlet (Wis.)	113	329	31
Luce County, Mich.: Section corner 11, 12, 13, 14, T. 50 N., R. 8 W. (U. S. L. S.)	129	337	11
Ludington:			
Carrom Co., tank	71	263	23, 24
Emanuel Lutheran Church, spire	71	263	23, 24
High school belfry, finial	71	263	23, 24
Mason County Courthouse cupola, finial	71	263	23, 24
Morton Salt Co,, white brick stack	71	263	23, 24

Station	Geographic position	Description and/or plane coordinates	Sketch
Ludington—Continued.	*Page*	*Page*	*Figure*
North breakwater, front range light	71	263	23, 24
North pierhead, rear range light	71	263	23, 24
Pere Marquette Co., radio mast	71	263	23, 24
South breakwater light	71	263	23, 24
South pierhead light	71	263	23, 24
Luther	79	278	24, 26
Lutheran Church:			
At New Baltimore (U. S. L. S.)	160	349	21
Forestville, (U. S. L. S.)	53	231	22
Freiburger, (U. S. L. S.)	53	231	22
German (U. S. L. S.)	53	231	22
Port Hope, (U. S. L. S.)	53	232	22
Steeple, one mile north of Dietrich	63	249	23, 25
Lynch Road Plant, gas tank, Detroit City Gas Co., Detroit	99	311	21
Lynn (U. S. L. S.) (Canada)	40	205	12
McDonald	67	257	23, 24
McGonigal	108	321	30
McGregor (U. S. L. S.)	49	225	22
McGulpin (U. S. L. S.)	34	198	14, 15
McGulpin Point Lighthouse (U. S. L. S.)	34	198	14, 15
McGulpin Point Lighthouse (1896) (U. S. L. S.)	121	335	14, 15
McKain	73	266	18, 25
McLeod (U. S. L. S.)	28	191	9, 11
McMillan	27	190	9
M (U. S. L. S.)	125	336	32
M. & M. Paper Company:			
Plant No. 1, stack, Marinette (Wis.)	112	328	31
Plant No. 1, tank, Marinette (Wis.)	112	328	31
Plant No. 2, tank, Menominee	111	327	31
M. water station (1851) (U. S. L. S.)	122	335	14
Mac (U. S. L. S.)	27	189	13
Mack Lake, fire lookout tower	109	323	13, 27
Mackinac East Base (U. S. L. S.) (*see* B′ Mackinac East Base (U. S. L. S.))	25	186	11, 14
Mackinac Island (U. S. L. S.) (*see* C. Mackinac Island (U. S. L. S.))	25	186	11, 14
Mackinac West Base (U. S. L. S.) (*see* A. Mackinac West Base (U. S. L. S.))	24	185	11, 14, 15
Mackinac West Base Magnetic Station (U. S. L. S.)	121	335	14, 15
Mackling Grinding Wheel Co., tank, Jackson	91	301	19
Macomb County Building, highest point, Mount Clemons	97	310	21
Magnetic station:			
No. 1 (U. S. L. S.)	127	336	33
No. 2 (U. S. L. S.)	127	336	33
(Mackinac) west base (U. S. L. S.)	121	335	14, 15
Maidstone (U. S. L. S.) (Canada)	45	220	20, 21, 29
Mair	90	300	28
Mamainse (U. S. L. S.) (Canada)	39	203	11
Mancelona	105	316	27
Mancelona, fire lookout tower	107	318	27
Manchester Shoal crib (U. S. L. S.)	141	342	34
Manistee	67	255	24
Manistee:			
(Astronomic latitude) (U. S. L. S.)	161	349	24
Breakwater light	69	262	24
First Congregational Church, spire	70	263	24
Guardian Angel Catholic Church, spire	69	262	24
Mercy Hospital, cupola finial	70	263	24
Pierhead light	69	262	24
Ruggles & Rademaker Salt Co., stack	70	263	24
Woodrow Wilson High School	70	263	24
Manistique (U. S. L. S.)	20	178	9
Manitou Island (U. S. L. S.)	117	333	8
Manitou Island Lighthouse (U. S. L. S.)	116	332	8
Manitou Payment (U. S. L. S.)	24	185	9, 11, 15, 16
Manton	78	276	26
Maple Hill (U. S. L. S.)	24	185	11
Maple Island (U. S. L. S.) (Canada)	128	331, 337	32
Marinette:			
County Courthouse, dome, Marinette (Wis.)	113	329	31
Evangelical Lutheran Church, steeple (Wis.)	112	328	31
French Church of St. Joseph, statue on dome (Wis.)	113	329	31
Gram Methodist Episcopal Church, spire (Wis.)	113	329	31
Lauerman's Department Store, tank (Wis.)	113	329	31
M. & M. Paper Company, Plant No. 1, stack (Wis.)	112	328	31
M. & M. Paper Company, Plant No. 1, tank (Wis.)	112	328	31
Marinette County Courthouse, dome (Wis.)	113	329	31
Pioneer Presbyterian Chruch, spire (Wis.)	113	329	31
Sacred Heart Church, spire (Wis.)	113	329	31
Tall steel stack (Wis.)	113	329	31
Marq (U. S. L. S.)	35	198	14

Station	Geographic position	Description and/or plane coordinates	Sketch
Marquette:	*Page*	*Page*	*Figure*
Catholic Church (U. S. L. S.)	114	332	9
Dome of City Hall (U. S. L. S.)	114	332	9
Lighthouse (U. S. L. S.)	114	332	9
M. E. Church (U. S. L. S.)	114	332	9
Old schoolhouse (U. S. L. S.)	114	332	9
Martin Reef Lighthouse (U. S. L. S.)	29	191	14
Marygrove College:			
Silver water tank	99	311	21
Stack	99	311	21
Mason	83	290	26
Mason County Courthouse, cupola, finial, Ludington	71	263	23, 24
Mason:			
Courthouse	91	301	19
S. M. A. Corporation, tank	91	301	19
Mast (U. S. L. S.)	123	335	12
Mast, 1909 (U. S. L. S.)	36	200	12, 14
Maybury Sanitarium, tall red brick stack	103	312	21
Maywood (U. S. L. S.)	23	182	10
Mead Johnson Co., tank, Zeeland	62	248	17, 23
Mecosta, fire lookout tower	87	293	26
Meiste	55	237	17
Mendon	73	265	18
Menominee (old) (1865) (U. S. L. S.) (Wis.)	145	343	9
Menominee (1874) (U. S. L. S.) (Wis.)	21	181	9, 31
Menominee astronomical station (U. S. L. S.) (Wis.)	23	183	9
Menominee (U. S. L. S.) latitude station and Menominee (U. S. L. S.) longitude station (*see* Menominee astronomical station (U. S. L. S.) (Wis.)).			
Menominee R. M. No. 2 (Wis.)	110	324	9, 31
Menominee:			
Christ Evangelical Lutheran Church, spire	112	328	31
County Courthouse, tower	111	327	31
Epiphany Church, spire	111	327	31
Hoskin-Morainville Paper Co., stack	111	327	31
Hoskin-Morainville Paper Co., tank	111	327	31
John Davis School, stack	112	328	31
Lloyd Manufacturing Company, tank	112	328	31
Lloyd's Department Store, tank	111	327	31
M. & M. Paper Co., Plant No. 2, tank	111	327	31
Menominee County Courthouse, tower	111	327	31
Pierhead front range light	111	326	31
St. Adelbert's Church, spire	112	328	31
Superior Sugar Refining Company, brick stack	111	327	31
Superior Sugar Refining Company, concrete stack	112	328	31
Mercy Hospital, cupola finial, Manistee	70	263	24
Merritt Lutheran Church, Munger	84	291	28
Methodist Church:			
Forestville, (U. S. L. S.)	53	231	22
Port Hope, (U. S. L. S.)	53	232	22
Port Huron, (U. S. L. S.)	50	229	22
Port Sanilac, (U. S. L. S.)	51	230	22
M. E. Church:			
Kingsville (U. S. L. S.) (Canada)	156	348	20
Marquette, (U. S. L. S.)	114	332	9
Monroe, (U. S. L. S.)	152	346	20
Steeple, New Carlisle (U. S. L. S.) (Ind.)	153	346	17
Sturgis (U. S. L. S.)	153	346	18
Mettawas (U. S. L. S.) (Canada)	45	220	20
Michigan Central Elevator (U. S. L. S.)	158	348	29
Michigan City (U. S. L. S.) (Ind.)	41	206	17
Michigan City:			
Deutsche Evangelical Church (U. S. L. S.) (Ind.)	154	346	----------
High School (U. S. L. S.) (Ind.)	154	346	----------
Lighthouse (U. S. L. S.) (Ind.)	154	346	----------
Michigan Island Lighthouse (U. S. L. S.)	114	332	----------
Michigan Land Survey, Post on Base Line (U. S. L. S.)	159	349	21
Michigan State College:			
Bench mark	92	302	----------
Memorial, finial, Lansing	92	302	19
Power plant stack, Lansing	92	302	19
South base, No 2	92	302	19
Michigan State Prison:			
Jackson (U. S. L. S.)	152	346	19
Tank, Jackson	90	301	19
Michigan State Sanitorium, water tank	91	302	19, 21
Michigan Sugar Co.:			
North stack, Caro	83	290	22, 28
South stack, Caro	83	290	22, 28
Stack, Owosso	94	303	28
Michipicoten (U. S. L. S.) (Canada)	118	330, 333	----------
Micklos	89	300	28
Middle (U. S. L. S.)	18	175	8

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Middle Base:			
Batchewana (U. S. L. S.) (Canada)	118	330, 333	32
Keweenaw Point (U. S. L. S.)	115	330, 332	8
Middle Bass Island (U. S. L. S.) (Ohio)	45	219	20
Middle Bluff (U. S. L. S.)	119	334	9
Middle Inlet lookout tower (Wis.)	113	329	31
Middle Island Lighthouse (U. S. L. S.) (Ohio)	46	222	20
Middle Pancake (U. S. L. S.) (Canada)	127	331, 337	32
Middle Sister (U. S. L. S.) (Canada)	45	219	20
Middle Strawberry (U. S. L. S.)	145	343	9
Middle Village (U. S. L. S.)	120	334	15, 16
Middle Village Church (U. S. L. S.)	31	194	15, 16
Middlecamp	68	259	23
Midland:			
Dow Chemical Co., largest stack	86	292	28, 30
Dow Chemical Co., northern stack	86	292	28, 30
Municipal water tank	86	292	28, 30
Mike Hagle's estate, water tank	86	291	28
Milk River (U. S. L. S.)	159	349	21
Mille Coquins (old) (U. S. L. S.)	151	345	16
Mille Coquins (1911) (U. S. L. S.)	31	194	16
Mills (U. S. L. S.)	50	228	13
Milton (U. S. L. S.)	41	208	17, 18
Miner (U. S. L. S.) (Canada)	45	220	20
Mirron (U. S. L. S.)	39	204	33
Misery (U. S. L. S.) (Canada)	40	206	12
Mission Point Lighthouse	69	262	27, 43
Mitchel (U. S. L. S.) (Canada)	160	349	21
Mongo (U. S. L. S.) (Ind.)	42	210	18
Monroe (U. S. L. S.)	43	215	20
Monroe County, Mich.:			
Corner of secs. 25, 26, 35, 36, T. 6 S., R. 6 E. (U. S. L. S.)	155	347	20
NE. corner of sec. 5, T. 8 S., R. 7 E. (U. S. L. S.)	155	347	20
SW. corner of private claim No. 432 (U. S. L. S.)	155	347	20
Monroe:			
Courthouse (U. S. L. S.)	152	346	20
German Lutheran Church (U. S. L. S.)	152	346	20
Lighthouse (U. S. L. S.)	152	346	20
M. E. Church (U. S. L. S.)	152	346	20
Presbyterian Church (U. S. L. S.)	152	346	20
Montague	58	246	23
Montpelier, municipal power plant, brick stack (Ohio)	45	219	18, 19
Montreal (U. S. L. S.)	116	333	8
Morton Salt Co., white brick stack, Ludington	71	263	23, 24
Mt. Bohemia (U. S. L. S.)	116	333	8
Mount Clemens (U. S. L. S.)	46	221	21
Mount Clemens eccentric	97	310	21
Mount Clemens:			
Black water tank	97	310	21
Catholic Church (U. S. L. S.)	47	222	21
Macomb County Building, highest point	97	310	21
Selfridge Field, beacon	97	310	21
Mount Houghton (U. S. L. S.)	115	332	8
Mount Lookout (U. S. L. S.) (Bald Pate, 1855)	117	333	8
Mount Mesnard (U. S. L. S.)	19	176	9
Mount Pisgah (U. S. L. S)	151	345	16
Mount Pleasant:			
Indian School, stack	110	324	30
Sugar Co., stack	110	324	30
Mount Tom, fire lookout tower	108	323	13, 27
Mud Lake (U. S. L. S.)	20	177	9
Munger, Merritt Lutheran Church	84	291	28
Municipal tank, finial light, New Carlisle (Ind.)	59	247	17
Municipal waterworks, spire, Detroit	99	311	29
Murray Body Co. plant, stack, Bay City	84	291	28
Muskegon	58	246	23
Muskegon:			
American Showcase Co., stack	63	249	23
Bennet Pump Co., water tank, finial	64	249	23
Breakwater, front range light	64	249	23
Brunswick Radio Corp., brick stack	64	249	23
Campbell-Wyant Foundry, water tank, finial	64	249	23
Central Paper Co., tall stack	64	249	23
Courthouse, tip of spire	63	249	23
Municipal standpipe, center	64	249	23
North breakwater light	64	249	23
Pierhead, rear range light	64	249	23
Piston Rings Co., tallest stack	64	249	23
MXII (U. S. L. S.)	31	194	16
N (U. S. L. S.)	125	336	32
N. Beaver Tail Point (U. S. L. S.)	122	335	14
National Bank, red light on dome, Grand Rapids	76	273	25
Naubinway Island (U. S. L. S.)	31	194	16

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Naylor	96	307	21
Near N. Y. C. R. R., brick stack	90	301	19
New Baltimore:			
Catholic Church (U. S. L. S.)	47	222	21
Congregational Church (U. S. L. S.)	160	349	21
Lutheran Church (U. S. L. S.)	160	349	21
Standpipe (U. S. L. S.)	47	222	21
New Carlisle:			
Ind., M. E. Church steeple (U. S. L. S.)	153	346	17
Ind., spire of Christian Church (U. S. L. S.)	153	346	17
Municipal tank, finial light (Ind.)	59	247	17
Newberry (U. S. L. S.)	28	190	9, 11
Newport airway beacon (*see* Newport, airway beacon No. 24)			
Newport, airway beacon No. 24	103	312	20, 21
Nichol	80	279	22
Niemshack	95	306	21
Niles, municipal standpipe	59	247	17
Nine (U. S. L. S.)	35	200	14
North Ann Arbor, Barton Hills Golf Club, tank	103	313	21
North base:			
Chambers Island (U S. L. S.)	145	343	9
Howard	75	271	25, 26
Keweenaw Point (U. S. L. S.)	19	175	8
Wyandotte (U. S. L. S.)	157	348	29
North Beaver (U. S. L. S.)	32	195	16
North breakwater, front range light, Ludington	71	263	23, 24
North breakwater light, Muskegon	64	249	23
North Chambers (U. S. L. S.)	145	343	9
North Channel (34 O. N. Chaffee, 1867) (U. S. L. S.)	160	349	21
North Egg (U. S. L. S.)	145	343	9
North Fox (1860) (U. S. L. S.)	121	335	9
North Fox (1923) (U. S. L. S.)	30	193	9, 16
North Gros Cap (U. S. L. S.) (Canada)	128	332, 337	32
North Manitou (U. S. L. S.)	163	350	9, 24
North Manitou Island Lighthouse	69	262	9, 24
North Parisian (U. S. L. S.) (Canada)	128	331, 337	32
North pierhead, rear range light, Ludington	71	263	23, 24
North Sandy (1868) (U. S. L. S.) (Canada)	127	331, 337	32
North Sandy (1895) (U. S. L. S.) (Canada)	39	203	11, 32
North Strawberry (U. S. L. S.)	145	343	9
North Sturgeon (old) (U. S. L. S.)	145	343	----------
North Wyandotte (U. S. L. S.)	157	348	29
Northeast Beaver (U. S. L. S.)	31	194	16
N. E. Corner Big Beaver Island (U. S. L. S.)	151	345	16
N. E. corner of section:			
1, T. 6 S., R. 1 E. (U. S. L. S.) (*see* Lenawee County: NE. corner of sec. 1, T. 6 S., R. 1 E. (U. S. L. S.))	155	347	19
3, T. 8 S., R. 3 E. (U. S. L. S.) (*see* Lenawee County: NE. corner of sec. 3, T. 8 S., R. 3 E. (U. S. L. S.))	155	347	19, 20
5, T. 8 S., R. 7 E. (*see* Monroe County, Mich.: NE. corner of sec. 5 T. 8 S., R. 7 E. (U. S. L. S.))	155	347	20
26, T. 7 S., R. 4 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: NE. corner of sec. 26, T. 7 S., R. 4 W. (U. S. L. S.))	155	347	18, 19
N. W. corner big Beaver Island (U. S. L. S.)	151	345	16
N. W. corner of section:			
10, T. 36 N., R. 4 W. (U. S. L. S.) (*see* La Porte County: NW. corner of sec. 10, T. 36 N., R. 4 W. (U. S. L. S.) (Ind.))	155	347	17
27, T. 6 S., R. 3 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: NW. corner of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.))	155	347	18, 19
Northwest corner of Ezra Haskens' tombstone	86	292	30
N. W. Garden (U. S. L. S.)	31	193	16
N. W. Hog (U. S. L. S.)	32	195	16
N. W. Manitou (U. S. L. S.)	23	183	9
Northwest Manitou (1864) (U. S. L. S.)	120	334	9
N. W. point Hog Island (U. S. L. S.)	151	345	16
Norton	57	243	23
Notre Dame University:			
Administration Building, tip of gold dome, South Bend (Ind.)	43	216	17
Sacred Heart Church, tip of steeple, South Bend (Ind.)	43	216	17
No. 220, Burnt Point (U. S. L. S.), (Canada)	38	202	39, 40
No. 281, Harbor Island (U. S. L. S.)	38	203	40, 41
Nun (U. S. L. S.)	51	229	22
Nuns Creek (U. S. L. S.)	35	198	14
O (U. S. L. S.)	125	336	32
O. Bois Blanc Island (U. S. L. S.)	122	335	14
Oak Point (U. S. L. S.)	49	227	13, 22
Oakland Hills Country Club, silver water tank	101	312	21
O'Brien	82	288	30
Observation tower, Sven (Wis.)	113	329	9, 31
Observatory:			
Post 3 (U. S. L. S.)	162	350	23
Post 4 (U. S. L. S.)	162	350	17, 23

Station	Geographic position	Description and/or plane coordinates	Sketch
Observatory—Continued.	*Page*	*Page*	*Figure*
Post, east pier (U. S. L. S.)	159	348	29
Post, Iroquois Point (U. S. L. S.)	128	337	32
Post, O. B. Wheeler, Big Pt. Sable (1866) (U. S. L. S.)	161	349	24
Post, O. B. Wheeler, Little Pt. Sable (1866) (U. S. L. S.)	161	349	23
Post, Thones Hill (U. S. L. S.)	114	332	9
West pier, Sault Ste. Marie, (U. S. L. S.)	118	334	33
Office SE. corner building Grand River and Park Place (U. S. L. S.)	158	348	
Ogemaw, fire lookout tower	109	324	30
Ohio-Michigan boundary monument No.:			
1	44	218	18, 19
9	44	218	18, 19
Ojibway Steel Co., concrete stack (Canada)	98	310	29
Old Hen Island (U. S. L. S.)	156	348	20
Old Mackinac Point Lighthouse (U. S. L. S.)	33	197	14, 15
Old normal school, spire, Ypsilanti	103	313	20, 21
Old Observatory, Detroit (U. S. L. S.)	159	348	29
Old Schoolhouse, Marquette (U. S. L. S.)	114	332	9
Old State prison, flagpole, Jackson	90	301	19
Olds Motor Co., stack, Lansing	92	302	19
Olive	57	241	23
Onekama	66	254	24
Orono	79	278	24, 26
Otsego	73	267	25
Overisel, church steeple	61	248	17, 23
Owosso:			
American Malleable Co., water tank	93	303	28
Michigan Sugar Co., stack	94	303	28
Owosso Manufacturing Co., stack	94	303	28
Owosso Manufacturing Co., water tank	94	303	28
Owosso Weatherproof Body Corp., water tank	93	303	28
St. Pauls Catholic Church	94	303	28
P (U. S. L. S.)	125	336	32
P (U. S. L. S.) 1851	123	335	14
P (Merrels Point) (U. S. L. S.)	164	351	43
P of E. P. S. (U. S. L. S.)	124	336	14
P of E. P. S., 1851, Les Cheneaux (U. S. L. S.)	124	336	14
Page Milk Co., stack (U. S. L. S.)	53	231	22
Palms (U. S. L. S.)	49	226	22
Palms, Catholic Church (U. S. L. S.)	53	231	22
Pancake Shoal water station (of 1868 survey) (U. S. L. S.) (Canada)	129	337	32
Paris	79	279	26
Parisian Island (U. S. L. S.) (Canada)	38	203	11, 32
Parisville, Catholic Church (U. S. L. S.)	53	231	22
Park	57	240	17, 23
Patterson (U. S. L. S.)	29	192	16
Paugon (U. S. L. S.) (Canada)	118	330, 333	
Peach Island front range light, Detroit	99	311	21
Peck	88	294	19
Pelée Island Lighthouse (U. S. L. S.) (Canada)	46	222	20
Pelée Passage Lighthouse (U. S. L. S.) (Canada)	46	222	20
Peninsula Point (U. S. L. S.)	120	334	9
Peninsula Point Lighthouse (U. S. L. S.)	21	181	9, 10
Penn (U. S. L. S.) (Ind.)	41	208	17, 18
Pennefather (U. S. L. S.) (Canada)	25	187	11, 12, 32
Penny (U. S. L. S.)	34	198	14
Penny ⊙ 203 (U. S. L. S.)	164	351	43
Penobscot	95	305	21, 29
Penobscot Building, red ball, Detroit	98	310	29
Pentwater	67	258	23
Pentwater:			
Fire lookout tower	71	264	23
Municipal tank, finial	71	263	23
Pierhead light	71	263	23
Pere Marquette Co., radio mast, Ludington	71	263	23, 24
Perry, water tank	93	303	28
Peshtigo (old) (U. S. L. S.) (Wis.)	145		
Petite Cote (U. S. L. S.)	157	348	29
Phillips (U. S. L. S.) (Canada)	118	330	12
Phillips Hill (U. S. L. S.)	26	187	11, 12, 14
Pickerel Lake, fire lookout tower	107	318	27
Pierhead front range light:			
Grand Haven	63	248	23
Menominee	111	326	31
Saint Joseph	60	247	17
South Haven	61	247	17
Pierhead light:			
Manistee	69	262	24
Pentwater	71	263	23
Portage Lake	69	262	24
White River	65	249	23

Station	Geographic position	Description and/or plane coordinates	Sketch
Pierhead rear range light:	*Page*	*Page*	*Figure*
Grand Haven	63	248	23
Muskegon	64	249	23
Pierson (U. S. L. S.)	54	232	13
Pikes Peak	104	313	13, 27
Pikes Peak, fire lookout tower	105	317	13
Pilot Island, front range light (U. S. L. S.)	130	338	38
Pilot Id. Lighthouse (U. S. L. S.)	165	351	9
Pinckney	97	309	19, 21
Pinckney, St. Marys Catholic Church, tip of cross	104	313	19, 21
Pine Hill (U. S. L. S.)	21	178	9, 10
Pine River (U. S. L. S.)	120	334	9
Pioneer Presbyterian Church, spire, Marinette (Wis.)	113	329	31
Pipe Island Lighthouse (U. S. L. S.)	130	338	41
Pisgah (U. S. L. S.)	30	193	16
Piston Rings Co., tallest stack, Muskegon	64	249	23
Pittsburg, white church steeple	93	303	28
Pittsford (U. S. L. S.)	42	212	19
Poe Reef Lighthouse (U. S. L. S.)	36	200	12, 14
Point Abbeye (U. S. L. S.)	117	333	8
Point au Sable (U. S. L. S.)	50	227	13
Point aux Becs Scies (U. S. L. S.)	163	350	24
Pt. aux Chenes (1853) (U. S. L. S.)	120	334	14, 15
Point aux Chenes (U. S. L. S.)	24	185	11, 14, 15
Point aux Frenes (U. S. L. S.)	38	202	39
Point aux Pins Lighthouse (U. S. L. S.) (Canada)	129	337	32
Point Betsie Lighthouse	69	262	24
Point Betsie Lighthouse (U. S. L. S.)	163	350	24
Point Fuyard (new) (U. S. L. S.)	121	335	14
Point La Barbe (U. S. L. S.)	34	197	14, 15
Point Lookout (U. S. L. S.)	49	227	13
Point Mouillée (U. S. L. S.)	156	348	20
Point Paterson (U. S. L. S.)	121	335	16
Point Pelée (U. S. L. S.) (Canada)	45	219	20
Point St. Martin (U. S. L. S.)	35	199	14
Point St. Martin (new) (U. S. L. S.)	121	335	14
Point St. Vital (U. S. L. S.)	122	335	14, 42
Pointe aux Barques (U. S. L. S.)	54	232	22
Pointe Mouillée (1910) (U. S. L. S.)	47	222	20
Pollum (U. S. L. S.)	49	226	22
Pontiac, Insane Asylum, stack	101	312	21
Poplar	82	287	30
Popple (U. S. L. S.)	49	226	22
Porcupine Mountains (U. S. L. S.)	18	174	8
Porcupine Mountains (U. S. L. S.) latitude station	19	177	8
Porcupine Point (U. S. L. S.)	119	334	9
Port Austin (U. S. L. S.)	49	227	22
Port Austin Lighthouse (U. S. L. S.)	54	232	22
Port Austin, Roman Catholic Church (U. S. L. S.)	54	232	22
Port Hope (U. S. L. S.)	53	231	22
Port Hope:			
Lutheran Church (U. S. L. S.)	53	232	22
Methodist Church (U. S. L. S.)	53	232	22
Presbyterian Church (U. S. L. S.)	53	232	22
Port Huron:			
K. O. T. M. Temple, dome (U. S. L. S.)	51	229	22
Methodist Church (U. S. L. S.)	50	229	22
Post office building (U. S. L. S.)	51	229	22
St. Clair County Courthouse (U. S. L. S.)	50	229	22
Tunnel Power Co., stack (U. S. L. S.)	51	229	22
Port Sanilac:			
Catholic Church (U. S. L. S.)	51	230	22
Congregational Church (U. S. L. S.)	51	230	22
Lighthouse (U. S. L. S.)	51	230	22
Methodist Church (U. S. L. S.)	51	230	22
Portage	68	261	24
Portage Entry Lighthouse (U. S. L. S.)	117	333	8
Portage Lake:			
Fire lookout tower	109	323	27, 30
Pierhead light	69	262	24
Porter (U. S. L. S.)	41	209	18
Posen (U. S. L. S.)	26	188	12
Post office building, Port Huron, (U. S. L. S.)	51	229	22
Post on base line Michigan Land Survey (U. S. L. S.)	159	349	21
Poverty Island (U. S. L. S.)	165	351	9
Poverty Island Lighthouse (U. S. L. S.)	22	181	9
Power plant stack, Michigan State College, Lansing	92	302	19
Prattville Church (U. S. L. S.)	152	346	19
Presbyterian Church:			
Deckerville (U. S. L. S.)	52	231	22
Monroe (U. S. L. S.)	152	346	20
Port Hope (U. S. L. S.)	53	232	22

Station	Geographic position	Description and/or plane coordinates	Sketch
Presbyterian Church—Continued.	*Page*	*Page*	*Figure*
Sturgis (U. S. L. S.)	153	346	18
Tecumseh (U. S. L. S.)	152	346	19, 20
Presque Isle (U. S. L. S.)	26	188	12
Primary traverse station:			
No. 2 (U. S. G. S.)	77	273	25
No. 2 (U. S. G. S.) eccentric	76	273	25
No. 3 (U. S. G. S.)	93	303	19, 28
No. 4 (U. S. G. S.)	76	273	25
No. 8 (U. S. G. S.)	94	303	28
No. 8 (U. S. G. S.) eccentric	89	299	28
No. 9 (U. S. G. S.)	87	292	30
No. 13 (U. S. G. S.)	84	291	28
No. 14 (U. S. G. S.)	86	291	28, 30
No. 16 (U. S. G. S.)	95	304	28
No. 16 F (U. S. G. S.)	63	249	23
No. 16 F (U. S. G. S.) eccentric	63	249	23
No. 17 (U. S. G. S.)	91	301	19
No. 21 (U. S. G. S.)	93	303	28
No. 37 Y (U. S. G. S.)	60	247	17
No. 37 Y (U. S. G. S.) eccentric	56	238	17
No. 39 Y (U. S. G. S.)	56	238	17
No. 53 F (U. S. G. S.)	72	264	23
No. 53 F (U. S. G. S.) eccentric, and Blue Lake fire lookout tower	72	264	23
No. 53 Y (U. S. G. S.)	60	247	17
No. 53 Y (U. S. G. S.) eccentric	56	239	17
No. 108 Y (U. S. G. S.)	62	248	23
Prospect	87	294	19
P. T. S. (*see* Primary traverse station)			
Purdy	95	306	21
Pyramid	65	250	24
Pyramid Point (U. S. L. S.)	163	350	24
Q (U. S. L. S.)	123	335	14
Quaquaming (U. S. L. S.)	19	175	8
Quast (U. S. L. S.)	52	230	22
Quincy (U. S. L. S.)	42	211	18
R (U. S. L. S.)	125	336	32
R (U. S. L. S.), 1853	123	335	14
R (U. S. L. S.), 1860	164	351	43
R. 1854 (west coast of Beaver Island) (U. S. L. S.)	151	345	16
R. Gage Coal Co., No. 8 stack, Saint Charles	95	304	28
R". South point St. Joseph Island (U. S. L. S.) (Canada)	150	345	39
Rabbit back (U. S. L. S.)	24	185	11, 14
Raber (U. S. L. S.)	38	202	39
Raco (U. S. L. S.)	25	186	11
Radio mast, Pere Marquette Co., Ludington	71	263	23, 24
Radio station WXYZ, east mast, Detroit	100	311	29
Raisin (U. S. L. S.)	43	214	19, 20
Randall	74	269	25
Range Light, rear, Thames River, (U. S. L. S.) (Canada)	47	222	21
Rankin Mountain (U. S. L. S.) (Canada)	25	187	11, 12, 33
Reading (U. S. L. S.)	42	212	18, 19
Reading eccentric	45	219	18, 19
Reading:			
Acme Chair Co., red tank	45	219	18, 19
Cupola of schoolhouse E. side of Chestnut St. (U. S. L. S.)	153	346	18, 19
First Baptist Church (U. S. L. S.)	153	346	18, 19
Municipal water tank, finial	45	219	18, 19
S. E. corner of Colby Wringer Factory (U. S. L. S.)	153	346	18, 19
Rear range light:			
Black Lake, Holland	62	248	17, 23
South Haven	60	247	17
Rear Range Lighthouse, St. Clair Flats (U. S. L. S.)	160	349	21
Redford:			
Detroit municipal water tank	101	312	21
St. Mary's Church, cross on belfry	99	311	21
Reid (U. S. L. S.) (Canada)	26	188	12
Reo Motor Co., old duplex plant, tank, Lansing	91	302	19
Reo Motor Co., tank, Lansing	92	302	19
Reynolds Field, airport beacon, Jackson	90	301	19
Richmond, standpipe (U. S. L. S.)	47	222	21, 22
Richmondville:			
Church (U. S. L. S.)	52	231	22
School (U. S. L. S.)	52	231	22
River Rouge (U. S. L. S.)	157	348	29
Robbins (U. S. L. S.)	118	330, 333	9, 32
Robinson (U. S. L. S.)	25	186	11, 12, 14
Rochereau (old) (U. S. L. S.)	145	343	9
Rochereau (U. S. L. S.)	21	180	9, 31
Rock (U. S. L. S.) (Canada)	127	331, 337	32
Rock Island (U. S. L. S.) (Wis.)	21	179	9

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Rock Island Lighthouse (U. S. L. S.)	21	181	9
Rock Island Lighthouse (old) (U. S. L. S.)	165	351	9
Rocky Island (△ Heardings R 1863) (U. S. L. S.)	165	351	9
Rocky Point (U. S. L. S.)	37	202	38
Rogers, courthouse (U. S. L. S.)	37	201	12
Roman Catholic Church, Port Austin (U. S. L. S.)	54	232	22
Roscommon, fire lookout tower	109	324	27, 30
Rose	68	259	23
Rose City, fire lookout tower	109	324	30
Ross (U. S. L. S.)	37	202	38
Ross, crib light post (U. S. L. S.) (Canada)	130	338	38
Rosymound	57	242	23
Rouge	95	305	21
Rouge Park, Detroit municipal water tank	101	312	21
Round Island (U. S. L. S.)	119	334	9
Round Island astronomical station (U. S. L. S.)	123	335	14
Round Island Lighthouse (Lower St. Marys River) (U. S. L. S.)	130	338	39
Round Island Lighthouse (Upper St. Marys River) (U. S. L. S.)	129	337	32
Round Island Lighthouse (U. S. L. S.), 1896	33	197	14
Rubicon (U. S. L. S.)	53	231	22
Rudder Head (1868) (U. S. L. S.) (Canada)	127	331, 337	32
Rudder Head (1895) (U. S. L. S.) (Canada)	127	331, 337	32
Ruggles & Rademaker Salt Co., stack, Manistee	70	263	24
Rush Lake (U. S. L. S.)	161	349	24
S (Hog Island) (U. S. L. S.)	164	351	43
S (U. S. L. S.)	123	335	14
S. M. A. Corporation, tank, Mason	91	301	19
Sable (U. S. L. S.)	145	343	9
Sackrider	87	293	19
Sacred Heart Church:			
Saginaw	85	291	28
Marinette, spire (Wis.)	113	329	31
Saddlebag (U. S. L. S.)	37	201	14, 42
Saginaw	81	285	28
Saginaw:			
Bean Co. sign, letter A	85	291	28
Chevrolet Foundry, stack	85	291	28
City Hall, foot of flagpole	85	291	28
Consumers Heating Co., stack	85	291	28
Consumers Power Co., north stack	85	291	28
Consumers Power Co., south stack	85	291	28
Courthouse	85	291	28
Holy Family Catholic Church, belfry	85	291	28
Sacred Heart Church	85	291	28
Sonora Talking Machine Co., flagpole	85	291	28
Sailors Encampment, tallest of 3 smokestacks (U. S. L. S.) (*see* Smokestack (tallest of three at Sailors Encampment) (U. S. L. S.))	130	338	38
St. Adelbert's Church, spire, Menominee	112	328	31
St. Aloysius Church or Westminster, SW. corner (U. S. L. S.)	159	348	29
St. Basil's Catholic Church, steeple, South Haven	61	248	17
St. Catherine Church, steeple, Laingsburg	93	303	28
St. Charles:			
Municipal water tank	94	304	28
R. Gage Coal Co., no. 8 stack	95	304	28
St. Clair (U. S. L. S.)	48	223	21, 22
St. Clair County Courthouse, Port Huron, (U. S. L. S.)	50	229	22
St. Clair Flats Rear Range Lighthouse (U. S. L. S.)	160	349	21
St. Helena Lighthouse (U. S. L. S.)	33	197	14, 15
St. Ignace (U. S. L. S.) (see D. St. Ignace (U. S. L. S.))	25	186	11, 14
St. Ignace (U. S. L. S.) (Canada)	118	330	----------
St. Ignace smokestack (U. S. L. S.)	121	335	14
St. Joe	56	238	17
St. Joseph:			
Berrien County Courthouse, dome	59	247	17
Catholic Church, steeple	59	247	17
J. Wallace Sons & Co., western stack	60	247	17
Lighthouse	60	247	17
Congregational Church (U. S. L. S.)	153	346	17
Municipal standpipe, finial	59	247	17
Pierhead front range light	60	247	17
South pierhead, light	60	247	17
Whitcomb Hotel, spire on dome	60	247	17
St. Joseph County:			
Ind.: Corner of secs. 2, 3, 10, 11, T. 37 N., R. 1 W. (U. S. L. S.)	155	347	17
Ind.: Corner of secs. 17, 18, 19, 20, T. 37 N., R. 3 E. (U. S. L. S.)	155	347	17, 18
SW. corner of SE. quarter of sec. 22, T. 7 S., R 10 W. (U. S. L. S.)	155	347	18
St. Joseph Station, or △ Azimuth IV (U. S. L. S.)	154	346	----------
St. Josephat Catholic Church, cross on spire, Detroit	100	311	29
St. Louis	82	288	30
St. Louis:			
Great Lakes Sugar Co., brick stack	86	292	30
Great Lakes Sugar Co., tall concrete stack	86	292	30

Station	Geographic positions	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Ste. Marie (U. S. L. S.) (Canada)	39	204	33
St. Martin Point (U. S. L. S.)	35	199	14
St. Martins (U. S. L. S.)	22	182	9
St. Martins Island (U. S. L. S.)	165	351	9
St. Mary's Catholic Church:			
Spire, Sault Ste. Marie, (U. S. L. S.)	129	337	33
Tip of cross, Pinckney	104	313	19, 21
St. Mary's Church:			
Cross on belfry, Redford	99	311	21
Spire, Gaylord	106	318	27
Toledo (U. S. L. S.) (Ohio)	152	346	20
St. Patricks Catholic Church, spire	104	313	21
St. Paul's Catholic Church, Owosso	94	303	28
St. Paul's Church (U. S. L. S.)	158	348	29
St. Paul's German Lutheran Church, spire, Frankenlust	86	291	28
St. Stanislaus Church:			
North steeple, Bay City	85	291	28
South steeple, Bay City	85	291	28
St. Vital (U. S. L. S.)	37	201	14, 42
St. Vidal Island (U. S. L. S.)	119	334	9
St. Vidal Point (U. S. L. S.)	119	334	9
Salt Point (U. S. L. S.)	118	330, 333	32
Salters Hill (U. S. L. S.) (Canada)	26	187	12, 38
Sand	82	286	28, 30
Sand Bank (U. S. L. S.)	23	182	10
Sand Point (U. S. L. S.), 1863	119	334	9
Sand Point (U. S. L. S.) (Canada)	127	331, 337	32
Sand Point (U. S. L. S.), 1903	22	182	10
Sand Point east base (U. S. L. S.)	49	227	13, 22
Sand Point west base (U. S. L. S.)	49	227	13, 22
Sandusky:			
Borden Milk Co., stack	83	290	22
Municipal water tank	83	290	22
Sandwich (U. S. L. S.)	158	348	29
Sandwich, Assumption Church, spire (Canada)	97	310	29
Sandwich Courthouse (U. S. L. S.)	158	348	29
Sandy (U. S. L. S.)	31	195	16
Saugatuck	56	239	17
Saugatuck Lighthouse	61	248	17
Sault Ste. Marie:			
Courthouse flagstaff (U. S. L. S.)	129	337	33
Fort Brady flagstaff (U. S. L. S.)	129	337	33
Observatory, west pier (U. S. L. S.)	118	334	33
Ontario, Catholic Church spire (U. S. L. S.)	130	338	33
Ontario, Indian Home flagstaff (U. S. L. S.)	130	338	33
Ontario, International Hotel (U. S. L. S.)	130	337	33
St. Marys Catholic Church spire (U. S. L. S.)	129	337	33
Scammons, M., Drummond Island (U. S. L. S.)	150	345	41
Scenic lookout tower, Fisk Knob	77	273	25
School:			
Bad Axe, (U. S. L. S.)	53	231	22
Deckerville, (U. S. L. S.)	52	231	22
Lima (U. S. L. S.) (Ind.)	153	346	18
Richmondville, (U. S. L. S.)	52	231	22
Schoolhouse:			
Constantine (U. S. L. S.)	153	346	18
Kingsville (U. S. L. S.) (Canada)	156	348	20
Sturgis (U. S. L. S.)	153	346	18
Schoolcraft County, Mich.:			
NE. corner of sec. 27, T. 46 N., R. 19 W. (U. S. L. S.)	115	332	9
SE. corner of sec. 4, T. 45 N., R. 20 W. (U. S. L. S.)	115	332	9
Schoolcraft, water tank	76	272	18
Schultz (1865) (U. S. L. S.)	117	333	8
Scott	66	254	24
Scott Point (U. S. L. S.)	121	335	16
Scott Point (U. S. L. S.), 1917	29	192	16
Scottville:			
Eastern municipal water tank	71	263	23, 24
Western municipal water tank finial	70	263	23, 24
SE. corner of Colby Wringer Factory, Reading (U. S. L. S.)	153	346	18, 19
SE. corner of sec. 8, T. 5 S., R. 1 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: SE. corner of sec. 8, T. 5 S., R. 1 W. (U. S. L. S.))	155	347	19
SE. corner of sec. 10, T. 37 N., R. 3 W. (U. S. L. S.) (*see* La Porte County: SE. corner of sec. 10, T. 37 N., R. 3 W. (U. S. L. S.) (Ind.))	155	347	17
SE. corner of sec. 12, T. 38 N., R. 23 W. (U. S. L. S.) (*see* Delta County: SE. corner of sec. 12, T. 38 N., R. 23 W. (U. S. L. S.))	115	332	10
SE. corner of sec. 35, T. 6 S. R. 20 W. (U. S. L. S.) (*see* Berrien County. SE. corner of sec. 35, T. 6 S., R. 20 W. (U. S. L. S.)	155	347	17
S. E. corner of sec. 36, T. 7 S., R. 2 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: SE corner of sec. 36, T. 7 S., R. 2 W. (U. S. L. S.))	155	347	19

Station	Geographic position	Description and/or plane coordinates	Sketch
SE. end Scammons (S. coast Drummond Island) *see* 1. Southeast end Scammons, 1853 (south coast Drummond Island (U. S. L. S.))	*Page*	*Page*	*Figure*
S. E. Garden (U. S. L. S.)	32	195	16
Section corner (see Township—Tps.)			
Selfridge Field, beacon, Mount Clemens	97	310	21
Selma	78	277	26
Selma, fire lookout tower	79	279	26
Seney (U. S. L. S.)	27	190	9
Serpent (U. S. L. S.) (Canada)	146	343	40
Seul Choix (U. S. L. S.)	121	335	16
Seul Choix Lighthouse (U. S. L. S.)	29	192	16
Seven and Seven observation tower (*see* Sven and Sven observation tower).			
Shaull (Ohio)	44	216	18, 19
Shelby	67	259	23
Shelldrake smokestack (U. S. L. S.)	129	337	9, 32
Shelter Bay (U. S. L. S.)	19	176	9
Shepherd, municipal water tank, finial	87	292	30
Sherman (U. S. L. S.)	41	210	18
Sherman (U. S. L. S.) latitude station	43	216	18
Shingleton (U. S. L. S.)	27	190	9
Shoal Island Lighthouse (U. S. L. S.) (Canada)	144	342	37
Silver Creek (U. S. L. S.)	116	333	8
Silvernail	82	287	30
Simmons Reef (U. S. L. S.)	151	345	16
Sister Bluff (U. S. L. S.)	145	343	9
Sister Island (U. S. L. S.)	145	343	9
Skilligallee Lighthouse (U. S. L. S.)	33	197	15, 16
Sleeping Bear	65	250	24
Sleeping Bear (U. S. L. S.)	163	350	24
Smokestack:			
Detour (U. S. L. S.)	133	339	41
Emerson (U. S. L. S.)	129	337	9, 32
St. Ignace, (U. S. L. S.)	121	335	14
Shelldrake (U. S. L. S.)	129	337	9, 32
Tallest of three at Sailors' Encampment (U. S. L. S.)	130	338	38
Waiska, (U. S. L. S.)	129	337	32
Sonora Talking Machine Co., flagpole, Saginaw	85	291	28
Soo (U. S. L. S.)	40	205	33
Soo east base (U. S. L. S.)	39	204	33
Soo west base (U. S. L. S.)	39	205	33
Sorson	96	306	21
South base:			
Chambers Island, (U. S. L. S.)	145	343	9
Howard	75	270	25
Keweenaw Point (U. S. L. S.)	19	176	8
Wyandotte (U. S. L. S.)	157	348	29
South base No. 2, Michigan State College	92	302	19
South Bass Island Lighthouse (U. S. L. S.) (Ohio)	46	222	20
South Beaver (U. S. L. S.)	32	195	16
South Bend:			
Bendix Corporation, center of neon sign (Ind.)	43	216	17
Bendix Corporation, stack (Ind.)	43	216	17
Notre Dame University, Administration Building, tip of gold dome (Ind.)	43	216	17
Notre Dame University, Sacred Heart Church, tip of steeple (Ind.)	43	216	17
Studebaker Corporation, slowly revolving light on tank (Ind.)	43	216	17
South Bend, standpipe (U. S. L. S.) (Ind.)	153	346	17
South breakwater light eccentric, Frankfort	69	262	24
South breakwater light, Ludington	71	263	23, 24
South Cape Garden Island (U. S. L. S.)	151	345	16
South Egg (old) (U. S. L. S.) (Wis.)	145	343	9
South Egg (U. S. L. S.) (Wis.)	21	181	9, 31
South Fox (1860) (U. S. L. S.)	120	334	9
South Fox (U. S. L. S.), 1906	23	183	9
South Fox Lighthouse (U. S. L. S.)	33	196	9
South Garden (U. S. L. S.)	32	195	16
South Gros Cap (U. S. L. S.) (Canada)	124	331, 336	32
South Gull (U. S. L. S.)	29	192	16
South Haven	56	239	17
South Haven (geodetic) (U. S. L. S.)	162	350	17
South Haven:			
Everett Piano Co., south stack	61	248	17
Everett Piano Co., water tank	61	247	17
Lighthouse (geodetic) (U. S. L. S.)	162	350	17
Municipal concrete storage tank	61	248	17
Municipal standpipe	61	248	17
Pierhead front range light	61	247	17
Rear range light	60	247	17
St. Basil's Catholic Church, steeple	61	248	17

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
South Hog, 1903 (U. S. L. S.)	31	194	16
South Hog, 1917 (U. S. L. S.)	31	195	16
South Lyon, municipal water tank	103	312	21
South Manitou (U. S. L. S.)	163	350	24
South Manitou Island Lighthouse	69	262	24
South Manitou Lighthouse (U. S. L. S.)	163	350	24
South Pancake (U. S. L. S.) (Canada)	127	331, 337	32
South Parisian (U. S. L. S.) (Canada)	128	332, 337	32
South pierhead light:			
Ludington	71	263	23, 24
Saint Joseph	60	247	17
South Pigeon River, fire lookout tower	106	317	12, 27
South Sandy (U. S. L. S.) (Canada)	127	331, 337	32
South Shore (U. S. L. S.) (Canada)	127	331, 337	32
South Strawberry Island (U. S. L. S.)	145	343	9
South Twin Sister (astronomic latitude) (U. S. L. S.)	162	350	23
S. W. corner of N. W. quarter of:			
Sec. 27, T. 6 S., R. 3 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 27, T. 6 S., R. 3 W. (U. S. L. S.))	155	347	18, 19
Sec. 27, T. 7 S., R. 14 W. (U. S. L. S.) (*see* Cass County: SW. corner of NW. quarter of sec. 27, T. 7 S., R. 14 W. (U. S. L. S.))	155	347	17, 18
Sec. 29, T. 6 S., R. 1 W. (U. S. L. S.) (*see* Hillsdale County, Mich.: SW. corner of NW. quarter of sec. 29, T. 6 S., R. 1 W. (U. S. L. S.))	155	347	19
Sec. 33, T. 38 N., R. 8 E. (U. S. L. S.) (*see* La Grange County: SW. corner of NW. quarter of sec. 33, T. 38 N., R. 8 E. (U. S. L. S.) (Ind.))	155	347	18
S. W. corner of private claim No. 432, Monroe County (U. S. L. S.)	155	347	20
S. W. corner of S. E. quarter of sec. 16, T. 7 S., R. 8 W. (U. S. L. S.) (*see* Branch County: SW. corner of SE. quarter of sec. 16, T. 7 S., R. 8 W. (U. S. L. S.))	155	347	18
S. W. Hog (U. S. L. S.)	32	195	16
Southwest Jackson, Automotive Fan and Bearing Co., tank	91	301	19
Southwest side Garden Island (U. S. L. S.)	151	345	16
Speaker (U. S. L. S.)	48	224	22
Spectacle Reef Lighthouse (U. S. L. S.)	28	191	12, 14
Spectacle Reef water station (U. S. L. S.)	122	335	14
Spicer	75	272	26
Spire:			
Ann Arbor, First Methodist Church	103	313	21
Bay City, First Baptist Church, clock tower	84	291	28
Detroit, municipal waterworks	99	311	29
Detroit, St. Josephat Catholic Church, cross on	100	311	29
Detroit, Sweetest Heart of Mary Catholic Church, cross on north	100	311	29
Edmore, Danish Lutheran Church	87	292	25, 26, 30
Frankenlust, St. Paul's German Lutheran Church	86	291	28
Gaylord, St. Mary's Church	106	318	27
Kalkaska, Church of Christ	107	318	27
Ludington, Emanuel Lutheran Church	71	263	23, 24
Manistee, First Congregational Church	70	263	24
Manistee, Guardian Angel Catholic Church	69	262	24
Marinette, Gram Methodist Episcopal Church (Wis.)	113	329	31
Marinette, Pioneer Presbyterian Church (Wis.)	113	329	31
Marinette, Sacred Heart Church (Wis.)	113	329	31
Menominee, Christ Evangelical Lutheran Church	112	328	31
Menominee, Epiphany Church	111	327	31
Menominee, St. Adelbert's Church	112	328	31
Muskegon, courthouse, tip of	63	249	23
St. Patricks Catholic Church	104	313	21
Sandwich, Assumption Church (Canada)	97	310	29
Sault Ste. Marie, Catholic Church, Ontario (U. S. L. S.)	130	338	33
Sault Ste. Marie, St. Marys Catholic Church (U. S. L. S.)	129	337	33
Ypsilanti, old normal school	103	313	20, 21
Spring Lake:			
Holland Church, white steeple	63	249	23
Municipal tank	63	249	23
Springville (U. S. L. S.) (Ind.)	41	206	17
Squaw Island (U. S. L. S.)	151	345	16
Squaw Island Lighthouse (U. S. L. S.)	29	192	16
Squaw Point Lighthouse (U. S. L. S.)	22	182	10
Stack:			
Alma, Consumers Light and Power Co	87	292	30
Ann Arbor, University of Michigan, power plant	103	313	21
Bay City, Columbia Sugar Co	84	291	28
Bay City, Murray Body Co. plant	84	291	28
Bay City, water works	84	291	28
Benton Harbor, Baker Vawter Co., white	59	247	17
Benton Harbor, High School	59	247	17
Brick, near N. Y. C. R. R	90	301	19
Cadillac, white	79	279	26

Station	Geographic position	Description and/or plane coordinates	Sketch
Stack—Continued.	*Page*	*Page*	*Figure*
Caro, Michigan Sugar Co., north	83	290	22, 28
Caro, Michigan Sugar Co., south	83	290	22, 28
Caro, W. N. Clark Co	83	290	22, 28
Challenge Refrigerator Co	63	249	23
Croswell, Croswell Sugar Co. (U. S. L. S.)	51	230	22
Dansville, Ingham Agricultural School	91	301	19
Dearborn, Ford Airport	101	312	21
Detroit, Briggs Body Co	99	311	21, 29
Detroit, Chrysler Co. plant	99	311	29
Detroit, Edison Co. plant, north	99	311	29
Detroit, Home of Correction, Men's division	103	312	21
Detroit, Lincoln Motor Co	100	311	29
Detroit, U. S. Marine Hospital	99	311	29
Edmore, Hart Canning Co., tallest	87	292	25, 26, 30
Eloise, hospital, large brick	102	312	21
Filer City, Fiber Paper Co., taller of two	70	263	24
Grand Haven, Eagle Ottawa Leather Co	63	249	23
Highland Park, Ford Plant, southeast	98	310	21
Holland, City Light Co	62	248	17, 23
Holland, Heinz Canning Co	62	248	17, 23
Holland, Holland Shoe Co	62	248	17, 23
Jackson, Hayes Wheel Co	90	301	19
Jackson, Lefere Co., tall concrete	90	301	19
Kelvinator Co	101	311	21
Kingsville, power house (U. S. L. S.) (Canada)	47	222	20
Lansing, city power plant, northwest	91	302	19
Lansing, city power plant, southeast	91	302	19
Lansing, Michigan State College, power plant	92	302	19
Lansing, Olds Motor Co	92	302	19
Ludington, Morton Salt Co., white brick	71	263	23, 24
Manistee, Ruggles & Rademaker Salt Co	70	263	24
Marinette, M. & M. Paper Company, Plant No. 1 (Wis.)	112	328	31
Marinette, tall steel (Wis.)	113	329	31
Marygrove College	99	311	21
Maybury Sanitarium, tall red brick	103	312	21
Menominee, Hoskin-Morainville Paper Co	111	327	31
Menominee, John Davis School	112	328	31
Menominee, Superior Sugar Refining Company, brick	111	327	31
Menominee, Superior Sugar Refining Company, concrete	112	328	31
Midland, Dow Chemical Co., largest	86	292	28, 30
Midland, Dow Chemical Co., northern	86	292	28, 30
Montpelier, municipal power plant, brick (Ohio)	45	219	18, 19
Mount Pleasant Indian School	110	324	30
Mount Pleasant Sugar Co	110	324	30
Muskegon, American Showcase Co	63	249	23
Muskegon, Brunswick Radio Corp., brick	64	249	23
Muskegon, Central Paper Co., tall	64	249	23
Muskegon, Piston Rings Co., tallest	64	249	23
Ojibway Steel Co., concrete (Canada)	98	310	29
Owosso, Michigan Sugar Co	94	303	28
Owosso, Owosso Manufacturing Co	94	303	28
Page Milk Co. (U. S. L. S.)	53	231	22
Pontiac, Insane Asylum	101	312	21
Port Huron, Tunnel Power Co. (U. S. L. S.)	51	229	22
Saginaw, Chevrolet Foundry	85	291	28
Saginaw, Consumers Heating Co	85	291	28
Saginaw, Consumers Power Co., north	85	291	28
Saginaw, Consumers Power Co., south	85	291	28
Saint Charles, R. Gage Coal Co., No. 8	95	304	28
Saint Joseph, J. Wallace Sons & Co., western	60	247	17
Saint Louis, Great Lakes Sugar Co., brick	86	292	30
Saint Louis, Great Lakes Sugar Co., tall concrete	86	292	30
Sandusky, Borden Milk Co	83	290	22
South Bend, Bendix Corporation (Ind.)	43	216	17
South Haven, Everett Piano Co., south	61	248	17
Three Rivers, Eddy Paper Co	76	272	18
Wahjamega, Epileptic Institute	83	291	28
Wayne County Training School	102	312	21
Wayne, Graham Body Co	102	312	21
Whitehall, Eagle Ottawa Leather Co	65	249	23
White Pigeon, tall	75	272	18
Windsor, General Motors Co. (Canada)	97	310	29
Stafford (U. S. L. S.)	53	231	22
Standpipe:			
Bad Axe (U. S. L. S.)	53	231	22
Benton Harbor, black municipal, finial	59	247	17
Caro, municipal	83	290	28
Holland, municipal	62	248	17, 23
Kalamazoo, State Hospital	76	273	25
Lansing, municipal	92	302	19
Muskegon, municipal, center	64	249	23
New Baltimore (U. S. L. S.)	47	222	21
Niles, muncipal	59	247	17

Station	Geographic position	Description and/or plane coordinates	Sketch
Standpipe—Continued.	*Page*	*Page*	*Figure*
Richmond (U. S. L. S.)	47	222	21, 22
Saint Joseph, municipal, finial	59	247	17
South Bend (U. S. L. S.) (Ind.)	153	346	17
South Haven, municipal	61	248	17
Whitehall, municipal, finial	65	249	23
Stannard Rock day beacon (U. S. L. S.)	117	333	8
State	89	299	19
State Capital, tip of dome, Lansing	93	302	19
State Hospital, standpipe, Kalamazoo	76	273	25
State Prison, Jackson, Michigan (U. S. L. S.)	152	346	19
Station 20 (geodetic) (U. S. L. S.)	162	350	17
Steamboat Island (U. S. L. S.) (Canada)	127	331, 337	32
Steeple:			
Bay City, St. Stanislaus Church, north	85	291	28
Bay City, St. Stanislaus Church, south	85	291	28
East Saugatuck, church	61	248	17
Dietrich, Lutheran Church, one mile north of	63	249	23, 25
Graafschap, church	62	248	17, 23
Grand Haven, First Congregational Church	63	249	23
Grass Lake, tallest church	91	301	19
Laingsburg, St. Catherine Church	93	303	28
Marinette, Evangelical Lutheran Church (Wis.)	112	328	31
Overisel, church	61	248	17, 23
Pittsburg, white church	93	303	28
Saint Joseph, Catholic Church	59	247	17
South Haven, St. Basil's Catholic Church	61	248	17
Spring Lake, Holland Church, white	63	249	23
Three Rivers, tall (U. S. L. S.)	153	346	18
Winsor, Hotel Dieu (Canada)	97	310	29
Stem of Y in Chrysler sign, Detroit	100	311	29
Stephenson Lookout	111	326	31
Stephensville	54	233	17
Steuben County, Ind.: NW. corner of section 31, T. 38 N., R. 14 E. (U. S. L. S.) (Ind.)	155	347	18
Stevens	73	266	18, 25
Stockbridge, black water tank, finial	91	301	19
Stofer	96	309	19
Stone longitude post, Toledo (U. S. L. S.) (Ohio)	156	348	20
Stonington (U. S. L. S.)	22	182	10
Stony Point (U. S. L. S.), 1864	119	334	9
Stony Point (U. S. L. S.), 1871	160	349	21
Stony Point (U. S. L. S.), 1877	43	215	20
Stony Point (U. S. L. S.), 1903	32	195	16
Stony Point Catholic Church (U. S. L. S.) (Canada)	47	222	21
Storm signal tower (U. S. L. S.)	32	196	16
Stovel (U. S. L. S.)	27	189	13
Stovel eccentric	27	189	13
Studebaker Corporation, slowly revolving light on tank, South Bend (Ind.)	43	216	17
Sturgeon (old) (U. S. L. S.) (Wis.)	145		
Sturgeon (U. S. L. S.), 1874	20	178	9
Sturgeon (U. S. L. S.), 1924	33	197	15
Sturgis:			
East base	73	265	18
M. E. Church (U. S. L. S.)	153	346	18
Presbyterian Church (U. S. L. S.)	153	346	18
Schoolhouse (U. S. L. S.)	153	346	18
Water tank	75	272	18
West base	73	264	18
Suburban Development Co., water tank, Beverly Hills	101	311	21
Sugar Island (U. S. L. S.)	157	348	29
Sulphur Island Lighthouse (U. S. L. S.) (Canada)	146	343	12
Summer Island (U. S. L. S.)	165	351	9
Summit	67	257	23, 24
Sundre (Wis.)	111	326	31
Superior Sugar Refining Company:			
Brick stack, Menominee	111	327	31
Concrete stack, Menominee	112	328	31
Suttons Point (U. S. L. S.)	164	351	43
Sven (Wis.)	110	325	9, 31
Sven observation tower (Wis.)	113	329	9, 31
Swayne (U. S. L. S.)	158	348	29
Sweetest Heart of Mary Catholic Church, cross on north spire, Detroit	100	311	29
Sweets Point light (post) (U. S. L. S.)	130	338	39
Swenson	77	274	9, 24, 27, 43
T (U. S. L. S.)	123	335	14
T. T. S. (*see* Transit traverse station)			
Tall transmission tower, Bay City (*see* Bay City, red light, tip of tall transmission tower)	84	291	28
Tamarack	67	256	24
T (Blacks Point) (U. S. L. S.)	164	351	43

Station	Geographic position	Description and/or plane coordinates	Sketch
Tank:	*Page*	*Page*	*Figure*
Alma, municipal water	87	292	30
Bancroft, water	93	303	28
Bangor, black municipal, finial	60	247	17
Bay City, Bigelow Flooring Co., water, finial	84	291	28
Belle River, municipal water (Canada)	97	310	21
Belvedere Farm, water, gray	61	248	17
Berkley, municipal water	101	312	21
Beverly Hills, Suburban Development Co., water	101	311	21
Birmingham, silver municipal water	99	311	21
Bloomingfield Hills Country Club	101	312	21
Bridgeman, municipal water, finial	59	247	17
Cass City, municipal water	83	290	22
Cedar Springs, water	76	273	25
Charlevois, water	79	279	9
Chelsea, municipal water	104	313	19
Chesaning, G. M. P. Packing Co., water	94	304	28
Chesaning, municipal water	94	304	28
Clare, municipal water	109	324	30
Coopersville, municipal, finial	63	248	23
Corunna, Corunna Weatherproof Body Corp., water	93	303	28
County farm, water	91	302	19
Coventry Gardens, water	102	312	21
Day Forest estate, water	69	262	24
Dearborn, Ford Airport, water, checkered	101	312	21
Dearborn, municipal water	101	312	21
Detroit, city, water	99	311	21
Detroit, Home of Correction, men's division, water	103	312	21
Detroit, Home of Correction, women's division, water	103	312	21
Detroit, Hupmobile Motor Co., water	100	311	29
Dodge Brothers Estate, black, yellow top	104	313	21
Douglas, municipal, finial	61	248	17
Durand, water	93	303	28
East Lansing, municipal	93	303	19
Farmington, Childrens Hospital, water	102	312	21
Fennville, black municipal water, finial	61	248	17
Flushing, municipal water	94	303	28
Fowlerville, water	91	302	19
Fremont, water, finial	72	264	23
Gaylord, municipal water, finial	106	317	27
Grand Rapids, water, black	76	273	25
Grand Rapids, water, silver	76	273	25
Holland, Bush Lane Piano Co	61	248	17, 23
Holland, Getz farm, north of State park zoo	61	248	17, 23
Holland, Holland Furnace Co	61	248	17, 23
Howard City, Municipal water	77	273	25, 26
Jackson, Mackling Grinding Wheel Co	91	301	19
Jackson, Michigan State Prison	90	301	19
Knollwood Country Club	101	312	21
Lakeview, municipal water	87	292	26
Lansing, Burton Dixie Co	93	303	19
Lansing, Indian School	92	302	19
Lansing, Reo Motor Co	92	302	19
Lansing, Reo Motor Co., old duplex plant	91	302	19
Ludington, Carrom Co	71	263	23, 24
Marinette, Lauerman's Department Store (Wis.)	113	329	31
Marinette, M. & M. Paper Company, Plant No. 1 (Wis.)	112	328	31
Marygrove College, silver water	99	311	21
Mason, S. M. A. Corporation	91	301	19
Menominee, Hoskin-Morainville Paper Co	111	327	31
Menominee, Lloyd Manufacturing Company	112	328	31
Menominee, Lloyd's Department Store	111	327	31
Menominee, M. & M. Paper Co., Plant No. 2	111	327	31
Michigan State Sanitorium, water	91	302	19, 21
Midland, municipal water	86	292	28, 30
Mike Hagle's Estate, water	86	291	28
Mount Clements, water, black	97	310	21
Muskegon, Bennet Pump Co., water, finial	64	249	23
Muskegon, Campbell-Wyant Foundry, water, finial	64	249	23
North Ann Arbor, Barton Hills Golf Club	103	313	21
Oakland Hills County Club, silver water	101	312	21
Owosso, American Malleable Co., water	93	303	28
Owosso, Owosso Manufacturing Co., water	94	303	28
Owosso, Owosso Weatherproof Body Corp., water	93	303	28
Pentwater, municipal, finial	71	263	23
Perry, water	93	303	28
Reading, Acme Chair Co., red	45	219	18, 19
Reading, municipal water, finial	45	219	18, 19
Redford, Detroit Municipal, water	101	312	21
Rouge Park, Detroit Municipal, water	101	312	21
Saint Charles, municipal water	94	304	28
Sandusky, municipal water	83	290	22
Schoolcraft, water	76	272	18

Station	Geographic position	Description and/or plane coordinates	Sketch
Tank—Continued.	*Page*	*Page*	*Figure*
Scottville, eastern municipal water, finial	71	263	23, 24
Scottville, western municipal water, finial	70	263	23, 24
Shepherd, municipal water, finial	87	292	30
South Haven, Everett Piano Co., water	61	247	17
South Haven, municipal concrete storage	61	248	17
South Lyon, municipal water	103	312	21
Southwest Jackson, Automotive Fan and Bearing Co	91	301	19
Spring Lake, municipal	63	249	23
Stockbridge, water, black, finial	91	301	19
Sturgis, water	75	272	18
Three Oaks, Warren Featherbone Co., water	59	247	17
Vicksburg, water	76	272	18
Watervliet, silver municipal, finial	60	247	17
Wayne County Training School, water	102	312	21
Wayne, municipal water	102	312	21
Windsor, General Motors Co., water (Canada)	97	310	29
Ypsilanti, Hall-Doyle Co	103	313	20, 21
Zeeland, Mead Johnson Co	62	248	17, 23
Zeeland, west side, municipal	62	248	17, 23
Zoological Gardens, water	99	311	21
Taquamenon Island (U. S. L. S.)	128	332, 337	32
Tecumseh (U. S. L. S.) (Canada)	46	221	21
Tecumseh:			
Catholic Church, cross (Canada)	97	310	21
Presbyterian Church (U. S. L. S.)	152	346	19, 20
Teichman	89	298	28
Thames River Lighthouse (U. S. L. S.)	160	349	21
Thames River rear range light (U. S. L. S.) (Canada)	47	222	21
Thomas	82	288	30
Thompson Aeronautical Corporation, west of Coopersville, airway beacon	63	248	23
Thones Hill, Observatory Post (U. S. L. S.)	114	332	9
Three Oaks, Warren Featherbone Co., water tank	59	247	17
Three Rivers:			
Church (U. S. L. S.)	153	346	18
Eddy Paper Co., stack	76	272	18
Tall steeple (U. S. L. S.)	153	346	18
Thunder	55	235	17
Tip Top (U. S. L. S.) (Canada)	118	330, 333	
Tobacco River (U. S. L. S.)	117	333	8
Toledo, St. Mary's Church (U. S. L. S.) (Ohio)	152	346	20
Toledo stone longitude post (U. S. L. S.) (Ohio)	156	348	20
Tovey (U. S. L. S.)	54	232	13
Tower Building, finial, Chelsea	104	313	19
Tower, Menominee County Courthouse, Menominee	111	327	31
Tower, Storm signal, (U. S. L. S.)	32	196	16
Town Hall, Forester, (U. S. L. S.)	52	231	22
T. 1 N., R. 17 W., SW. corner of sec. 36, Van Buren County (U. S. L. S.)	155	347	17
T. 5 S., R. 1 W., SE. corner of sec. 8, Hillsdale County, Mich. (U. S. L. S.)	155	347	19
T. 6 S., R. 1 E., NE. corner of sec. 1, Lenawee County (U. S. L. S.)	155	347	19
T. 6 S., R. 1 W., corner of secs. 19, 20, 29, 30, Hillsdale County, Mich. (U. S. L. S.)	155	347	19
T. 6 S., R. 1 W., SW. corner of NW. quarter of sec. 29, Hillsdale County, Mich. (U. S. L. S.)	155	347	19
T. 6 S., R. 3 W., NW. corner of sec. 27, Hillsdale County, Mich. (U. S. L. S.)	155	347	18, 19
T. 6 S., R. 3 W., SW. corner of NW. quarter of sec. 27, Hillsdale County, Mich. (U. S. L. S.)	155	347	18, 19
T. 6 S., R. 4 E., corner of secs. 14, 15, 22, 23, Lenawee County (U. S. L. S.)	155	347	19, 20
T. 6 S., R. 5 W., SW. corner of SE. quarter of sec. 7, Branch County (U. S. L. S.)	155	347	18
T. 6 S., R. 6 E., corner of secs. 25, 26, 35, 36, Monroe County, Mich. (U. S. L. S.)	155	347	20
T. 6 S., R. 20 W., SE. corner of sec. 35, Berrien County (U. S. L. S.)	155	347	17
T. 7 S., R. 2 W., SE. corner of sec. 36, Hillsdale County, Mich. (U. S. L. S.)	155	347	19
T. 7 S., R. 4 W., corner of secs. 22, 23, 26, 27, Hillsdale County, Mich. (U. S. L. S.)	155	347	19
T. 7 S., R. 4 W., NE. corner of sec. 26, Hillsdale County, Mich. (U. S. L. S.)	155	347	18, 19
T. 7 S., R. 5 E., corner of secs. 22, 23, 26, 27, Lenawee County (U. S. L. S.)	155	347	20
T. 7 S., R. 8 W., SW. corner of SE. quarter of sec. 16, Branch County (U. S. L. S.)	155	347	18
T. 7 S., R. 10 W., SW. corner of SE. quarter of sec. 22, Saint Joseph County (U. S. L. S.)	155	347	18
T. 7 S., R. 13 W., SW. corner of NW. quarter of sec. 36, Cass County (U. S. L. S.)	155	347	18
T. 7 S., R. 14 W., SW. corner of NW. quarter of sec. 27, Cass County (U. S. L. S.)	155	347	17, 18

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
T. 8 S., R. 3 E., NE. corner of sec. 3, Lenawee County (U. S. L. S.)	155	347	19, 20
T. 8 S., R. 7 E., NE. corner of sec. 5, Monroe County, Mich. (U. S. L. S.)	155	347	20
T. 8 S., R. 16 W., corner of secs. 4, 5, 8, 9, Cass County (U. S. L. S)	155	347	17, 18
T. 8 S., R. 18 W., corner of secs. 14, 15, 22, 23, Berrien County (U. S. L. S.)	155	347	17
T. 36 N., R. 4 W., NW. corner of sec. 10, La Porte County (U. S. L. S.) (Ind.)	155	347	17
T. 37 N., R. 1 W., corner of secs. 2, 3, 10, 11, Saint Joseph County, Ind. (U. S. L. S.) (Ind.)	155	347	17
T. 37 N., R. 3 E., corner of secs. 17, 18, 19, 20, Saint Joseph County, Ind. (U. S. L. S.) (Ind.)	155	347	17, 18
T. 37 N., R. 3 W., SE. corner of sec. 10, La Porte County (U. S. L. S.) (Ind.)	155	347	17
T. 37 N., R 6 E., corner of secs. 2, 3, 10, 11, Elkhart County (U. S. L. S.) (Ind.)	155	347	18
T. 37 N., R. 11 E., corner of secs. 4, 5, 8, 9, La Grange County (U. S. L. S.) (Ind.)	155	347	18
T. 38 N., R. 2 W., SW. corner of SE. quarter of SW. quarter of sec. 32, La Porte County (U. S. L. S.) (Ind.)	155	347	17
T. 38 N., R. 8 E., SW. corner of NW. quarter of sec. 33, La Grange County (U. S. L. S.) (Ind.)	155	347	18
T. 38 N., R. 14 E., NW. corner of sec. 31, Steuben County, Ind. (U. S. L. S.) (Ind.)	155	347	18
T. 38 N., R. 23 W., SE. corner of sec. 12, Delta County (U. S. L. S.)	115	332	10
T. 42 N., R. 19 W., NW. corner of NE. quarter of sec. 16, Delta County (U. S. L. S.)	115	332	9
T. 45 N., R. 20 W., SE. corner of sec. 4, Schoolcraft County, Mich. (U. S. L. S.)	115	332	9
T. 46 N., R. 19 W., NE. corner of sec. 27, Schoolcraft County, Mich. (U. S. L. S.)	115	332	9
T. 50 N., R. 8 W., section corner 11, 12, 13, 14, Luce County, Mich. (U. S. L. S.)	129	337	11
T. 51 N., R. 5 W., section corner 5, 6, 31, 32, Chippewa County, Mich. (U. S. L. S.)	129	337	32
Transit Post (Boyers Bluff, old) (U. S. L. S.)	165	351	9
Transit Post (Burnt Bluff, old) (U. S. L. S.)	165	351	9
Transit traverse (B. M. 693) (U. S. G. S.)	86	292	30
Transit traverse station:			
No. 1 Tex. (U. S. G. S.)	72	264	23
No. 2 W (U. S. G. S.)	70	263	24
No. 10 (U. S. G. S.)	72	264	23
No. 22 W (U. S. G. S.)	69	262	24
No. 36 Tex. (U. S. G. S.)	68	261	23
Traverse Island (U. S. L. S.)	18	175	8
Traverse Point (Lake Michigan) (U. S. L. S.)	164	351	43
Traverse Point (U. S. L. S.)	18	175	8
Triangle Island (U. S. L. S.)	151	345	16
Triloba (U. S. L. S.)	19	176	8, 9
Trout (U. S. L. S.)	31	194	16
Trout Island (U. S. L. S.)	151	345	16
Tunnel Power Co., stack, Port Huron (U. S. L. S.)	51	229	22
Turkey Island (U. S. L. S.)	157	348	29
Turtle Island Lighthouse (U. S. L. S.)	156	348	20
Turtle Lake, fire lookout tower	106	317	13
Tuscola	80	281	22, 28
Twelve Mile	95	305	21
Twin Lake	68	260	23
Twin Lake, fire lookout tower	72	264	23
Twin Lakes (U. S. L. S.)	37	201	12
U (U. S. L. S.), 1851	123	335	14
U (U. S. L. S.), 1860	164	351	43
Union Guardian Building, flagpole, Detroit	98	310	29
U. S. Marine Hospital, stack, Detroit	99	311	29
University of Michigan, hospital flagstaff (see Ann Arbor, College hospital, flagstaff)	103	313	21
University of Michigan, power plant stack, Ann Arbor	103	313	21
V (Norris Point) (U. S. L. S.)	164	351	43
V (U. S. L. S.)	123	335	14
V Mainland (west of Lime Island) (U. S. L. S.)	150	345	39
V of E. P. S. (U. S. L. S.)	123	336	14
Valentine Point (U. S. L. S.)	119	334	9
Van Auken	55	234	17
Van Buren (U. S. L. S.) (Ind.)	41	210	18
Van Buren County; SW. corner of sec. 36, T. 1 N., R. 17 W. (U. S. L. S.)	155	347	17
Verona (U. S. L. S.)	49	227	22
Vicksburg, water tank	76	272	18
Vulcan (U. S. L. S.)	18	175	8
Vulcan Post No. 1 (U. S. L. S.) latitude station	20	177	8

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Vulcan Post No. 2 (U. S. L. S.) latitude station	20	177	8
W (U. S. L. S.), 1851	123	335	14
W (U. S. L. S.), 1860	164	351	43
W 1849 (Goose Island Reef) (U. S. L. S.)	124	336	14
W. N. Clarke Co., stack, Caro	83	290	22, 28
W. West side St. Marys River (opposite 19) (U. S. L. S.)	150	345	41
W. Whaleback water station (U. S. L. S.)	145	343	9
WXYZ radio station, east mast, Detroit	100	311	29
Wahjamega, Epileptic Institute, stack	83	291	28
Waiska smokestack (U. S. L. S.)	129	337	32
Walker (U. S. L. S.)	26	188	12
Walker	55	236	17
Walkhouse (U. S. L. S.) (Canada)	40	205	12
Walpole (U. S. L. S.) (Canada)	46	221	21
Warner	88	296	19
Warren Featherbone Co., water tank, Three Oaks	59	247	17
Washington Island (U. S. L. S.)	145	343	9
Water station:			
Pancake Shoal (of 1868 survey) (U. S. L. S.) (Canada)	129	337	32
Spectacle Reef (U. S. L. S.)	122	335	14
W. Whaleback (U. S. L. S.)	145	343	9
Water tank (*see* Tank, water).			
Water tower, municipal, dome, Ypsilanti	103	313	20, 21
Watervliet, silver municipal tank, finial	60	247	17
Water works stack, Bay City	84	291	28
Watts (Ind.)	44	217	18, 19
Waugoshance Lighthouse (U. S. L. S.), 1853	121	335	15, 16
Waugoshance Lighthouse (U. S. L. S.), 1902	33	197	15, 16
Waugoshance Point (U. S. L. S.)	33	196	15
Waugoshance Reef (U. S. L. S.)	33	197	15
Wayne:			
Graham Body Co., stack	102	312	21
Municipal water tank	102	312	21
Wayne County:			
Airport, beacon	102	312	20, 21
Training School, stack	102	312	21
Training School, water tank	102	312	21
Wellston	66	254	24
Wellston, fire lookout tower	70	263	24
Wemple	88	295	19
Wendt (U. S. L. S.)	52	230	22
West Atlanta, fire lookout tower	106	317	12, 27
West base:			
A. Mackinac (U. S. L. S.)	24	185	11, 14, 15
B (U. S. L. S.)	119	334	9
Batchewana (U. S. L. S.) (Canada)	39	203	11, 32
Lake St. Clair (U. S. L. S.)	159	349	29
Mackinac, Magnetic station (U. S. L. S.)	121	335	14, 15
Sand Point (U. S. L. S.)	49	227	13, 22
Soo (U. S. L. S.)	39	205	33
Sturgis	73	264	18
West Bluff (U. S. L. S.)	116	333	8
West Cape Garden Island (U. S. L. S.)	151	345	16
West Sister Lighthouse (U. S. L. S.)	47	222	20
Western Duck (U. S. L. S.) (Canada)	40	205	12
Westminster or St. Aloysius Church, SW. corner (U. S. L. S.)	159	348	29
Wheal Kate (U. S. L. S.)	18	174	8
Wheal Kate (U. S. L. S.) latitude station	19	177	8
Wheatland (U. S. L. S.)	42	212	19
Wheeler	82	287	30
Whiskey (U. S. L. S.)	30	193	16
Whiskey Island (U. S. L. S.)	151	345	16
Whitcomb Hotel, spire on dome, Saint Joseph	60	247	17
White Pigeon:			
Baptist Church (U. S. L. S.)	153	346	18
Tall stack	75	272	18
Woolen Mill (U. S. L. S.)	153	346	18
White River:			
Lighthouse	65	249	23
Pierhead light	65	249	23
White Shoal (U. S. L. S.)	151	345	16
White Shoal Lighthouse (U. S. L. S.)	30	193	15, 16
Whitefish Point (U. S. L. S.)	39	204	11, 32
Whitefish Point latitude post (U. S. L. S.)	118	333	32
Whitefish Point Lighthouse (U. S. L. S.)	129	337	32
Whitehall	58	245	23
Whitehall:			
Eagle Ottawa Leather Co., stack	65	249	23
Municipal standpipe finial	65	249	23
Whiting	77	275	24, 27, 43
Whittier	95	304	21, 29
Wilber (U. S. L. S.)	50	228	13

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
Wildfong	105	317	27
Wilkins	82	286	28, 30
William Livingstone Memorial Lighthouse, Belle Isle	97	310	29
Williams	108	322	30
Wilmot	80	280	22
Wilson	108	322	30
Windmill Point Lighthouse (U. S. L. S.)	159	349	29
Windmill Point Lighthouse, Detroit	99	311	29
Windsor (U. S. L. S.)	158	348	29
Windsor:			
General Motors Co., stack (Canada)	97	310	29
General Motors Co., water tank (Canada)	97	310	29
Hotel Dieu, steeple (Canada)	97	310	29
Winter Point (U. S. L. S.)	37	202	38
Winter Point, back range iron tower (U. S. L. S.)	130	338	38
Winter Point, Lightkeeper's house, chimney (U. S. L. S.)	130	338	38
Woodrow Wilson High School, Manistee	70	263	24
Woodstock (U. S. L. S.)	42	214	19
Woolen Mill, White Pigeon (U. S. L. S.)	153	346	18
Worth (U. S. L. S.)	48	224	22
Wyandotte (U. S. L. S.)	157	348	29
Wyandotte north base (U. S. L. S.)	157	348	29
Wyandotte south base (U. S. L. S.)	157	348	29
X (U. S. L. S.)	123	335	14
Y (U. S. L. S.)	123	335	14
Y of E. P. S. (U. S. L. S.)	124	336	14
Ypsilanti:			
Hall-Doyle Co., tank	103	313	20, 21
Municipal water tower, dome	103	313	20, 21
Old normal school, spire	103	313	20, 21
Z (U. S. L. S.)	123	335	14
Zakrzewski	88	295	19
Zeeland	57	240	17, 23
Zeeland:			
Mead Johnson Co., tank	62	248	17, 23
Muncipal tank, west side	62	248	17, 23
Zoological Gardens, water tank	99	311	21
1 (U. S. L. S.)	134	339	33
1 (U. S. L. S.), 1860	164	351	43
1. N (end of small island two miles south of R" Scammons, 1854) (U. S. L. S.)	150	345	39
1 O. N. Chaffee (1867) (U. S. L. S.)	161	349	21
1. SE. end Scammons, 1853 (south coast Drummond Island) (U. S. L. S.)	150	345	12
2 (U. S. L. S.)	164	351	43
2b (U. S. L. S.)	150	345	41
2 of E. P. S., 1849, northwest point of Isle Brule or Great St. Martin Island (U. S. L. S.)	123	336	14
2 of E. P. S., 1849, N. W. point of Isle Brule or St. Martins Island (U. S. L. S.) (*see* 2 of E. P. S., 1849, northwest point of Isle Brule or Great St. Martin Island (U. S. L. S.))	123	336	14
3 (U. S. L. S.)	125	336	32, 33
3 (U. S. L. S.)	134	339	33
3 (U. S. L. S.), 1860	164	351	43
3 on Isle Brule (U. S. L. S.)	124	336	14
4 (U. S. L. S.)	164	351	43
4 U (U. S. L. S.)	134	339	33
5 (U. S. L. S.)	126	336	33
5 (U. S. L. S.)	134	339	33
5 (U. S. L. S.), 1860	164	351	43
6 (U. S. L. S.)	134	339	33
6 (U. S. L. S.), 1860	164	351	43
6 (U. S. L. S.) (Canada)	125	336	33
7 (U. S. L. S.)	125	336	33
7 (U. S. L. S.)	134	339	33, 36
7 (U. S. L. S.), 1860	164	351	43
8 (U. S. L. S.)	134	339	33
8 (U. S. L. S.) (Canada)	126	336	33
8 (U. S. L. S.), 1860	164	351	43
9 (U. S. L. S.)	125	336	33
9 (U. S. L. S.)	134	339	36
9 (U. S. L. S.), 1860	164	351	43
9 Macomb (O. N. C. 1867) (U. S. L. S.)	161	349	21
10 (U. S. L. S.)	134	339	33, 36
10 (U. S. L. S.), 1861	164	351	43
10 (U. S. L. S.) (Canada)	125	336	32
10R (U. S. L. S.) (Canada)	141	341	34
11 (Old Mission) (U. S. L. S.)	164	351	43
11 (U. S. L. S.)	126	336	32

Station	Geographic position	Description and/or plane coordinates	Sketch
	Page	*Page*	*Figure*
11 (U. S. L. S.)	134	339	36
12 (U. S. L. S.)	134	339	36
12 (U. S. L. S.) (Canada)	125	336	32
12 (New Mission Point) (U. S. L. S.)	164	351	43
12R (U. S. L. S.) (Canada)	141	341	34
13 (U. S. L. S.)	126	336	32
13 (U. S. L. S.)	135	339	36
14 (U. S. L. S.)	135	339	36
14 (U. S. L. S.), 1861	164	351	43
14, Ripley, Topsail Island (U. S. L. S.) (Canada)	126	336	33
15 (U. S. L. S.)	135	339	36
15 (U. S. L. S.), 1861	164	351	43
15, Ripley (U. S. L. S.)	125	336	32
16 (U. S. L. S.), 1861	164	351	43
16 (U. S. L. S.)	135	339	36
16 (U. S. L. S.) (Canada)	134	339	33
17 (U. S. L. S.)	125	336	32
17 (U. S. L. S.)	135	339	36
18 (U. S. L. S.)	135	339	36
18 (U. S. L. S.) (Canada)	138	341	33
19. Drummond Island (U. S. L. S.)	150	345	41
19 Hay Lake (U. S. L. S.)	37	202	36, 37
20 (U. S. L. S.)	135	339	36, 37
20 (U. S. L. S.) (Canada)	139	341	33
21 (U. S. L. S.)	126	336	33
21 (U. S. L. S.)	135	339	37
22 (U. S. L. S.) (Canada)	139	341	33
23 (U. S. L. S.)	133	339	33
24 (U. S. L. S.) (Canada)	139	341	33, 34
25 (U. S. L. S.)	133	339	33
26 (U. S. L. S.) (Canada)	139	341	33, 34
27 (U. S. L. S.)	138	341	33
28 (U. S. L. S.) (Canada)	139	341	34
29 (U. S. L. S.)	139	341	33
30 (U. S. L. S.) (Canada)	139	341	34
31 (U. S. L. S.)	139	341	33
32 (U. S. L. S.) (Canada)	139	341	34
33 (U. S. L. S.)	139	341	33
34 (U. S. L. S.) (Canada)	139	341	34
34 O. N. Chaffee, 1867 (North Channel) (U. S. L. S.)	160	349	21
34R (U. S. L. S.) (Canada)	141	341	34
35 (U. S. L. S.)	139	341	33, 34
36 (U. S. L. S.) (Canada)	141	342	34
37 (U. S. L. S.)	139	341	34
38 (U. S. L. S.) (Canada)	141	341	34
39 (U. S. L. S.)	139	341	34
40 (U. S. L. S.) (Canada)	140	341	34
41 (U. S. L. S.)	139	341	34
42 (U. S. L. S.) (Canada)	140	341	34
42½ (U. S. L. S.) (Canada)	142	342	34, 35
43 (U. S. L. S.)	139	341	34
44 (U. S. L. S.) (Canada)	140	341	34, 35
45 (U. S. L. S.)	139	341	34
46 (U. S. L. S.) (Canada)	140	341	35
46R (U. S. L. S.) (Canada)	142	342	35
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64 (U. S. L. S.)	36	200	14
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65 (U. S. L. S.)	138	340	38
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