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*(The 1881 Manual is copied from an original volume now in the possession of the BLM, Oregon State Office, Portland.)*

**INSTRUCTIONS  
OF THE  
COMMISSIONER  
OF THE  
GENERAL LAND OFFICE  
TO THE  
SURVEYORS GENERAL OF THE UNITED  
STATES  
RELATIVE TO THE  
SURVEY OF THE PUBLIC LANDS  
AND  
PRIVATE LAND CLAIMS.**

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MAY 3, 1881.

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WASHINGTON:  
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1881.

**DEPARTMENT OF THE INTERIOR,  
GENERAL LAND OFFICE,  
Washington, D.C., May 3, 1881.**

GENTLEMEN: The following instructions, including full and minute directions for the execution of surveys in the field, are issued under the authority given me by sections 453, 456, 2398, and 2399 United States Revised Statutes, and must be strictly complied with by yourselves and your deputy surveyors.

Very respectfully,

J. A. WILLIAMSON,  
*Commissioner.*

To SURVEYORS GENERAL OF THE UNITED STATES.

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**INTRODUCTORY.**

The present system of survey of the public lands was inaugurated by a committee appointed by the Continental Congress, and consisting of the following delegates:

- Hon. THOS. JEFFERSON, *Chairman* ..... Virginia.
- Hon. HUGH WILLIAMSON ..... North Carolina.
- Hon. DAVID HOWELL ..... Rhode Island.
- Hon. ELBRIDGE GERRY ..... Massachusetts.
- Hon. JACOB READ ..... South Carolina.

On the 7th of May, 1784, this committee reported "An ordinance for ascertaining the mode of locating and disposing of lands in the western territory, and for other purposes therein mentioned." This ordinance required the public lands to be divided into "hundreds" of ten geographical miles square, and those again to be subdivided into lots of one mile square each, to be numbered from 1 to 100, commencing in the northwestern corner, and continuing from west to east and from east to west consecutively. This ordinance was considered, debated, and amended, and reported to Congress April 26, 1785, and required the surveyors "to divide the said territory into townships of 7 miles square, by lines running due north and south, and others crossing these at right angles. \* \* \* The plats of the townships, respectively, shall be marked by subdivisions into sections of 1 mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 49. \* \* \* And these sections shall be subdivided into lots of 320 acres." This is the first record of the use of the terms "township" and "section."

May 3, 1785, on motion of Hon. William Grayson, of Virginia, seconded by Hon. James Monroe, of Virginia, the section respecting the extent of townships was amended by striking out the words "seven miles square" and substituting the words "six miles square." The record of these early sessions of Congress are not very full or complete; but it does not seem to have occurred to the members until the 6th of May, 1785, that a township six miles square could not contain 49 sections of 1 mile square. At that date a motion to amend was made, which provided, among other changes, that a township

should contain 36 sections; and the amendment was *lost*. The ordinance as finally passed, however, on the 20th of May, 1785, provided for townships, 6 miles square, containing 36 sections of 1 mile square. The first public surveys were made under this ordinance. The townships, 6 miles square, were laid out in ranges, extending northward from the Ohio River, the townships being numbered from south to north, and the ranges from east to west. The region embraced by the surveys under this law forms a part of the present State of Ohio, and is usually styled "The Seven Ranges." In these initial surveys only the *exterior lines* of the townships were surveyed, but the plats were marked by subdivisions into sections of 1 mile square, and mile corners were established on the township lines. The sections were numbered from 1 to 36, commencing

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with No. 1 in the southeast corner of the township, and running from *south to north* in each tier to No. 36 in the *northwest* corner of the township, as shown in the following diagram:

36	30	24	18	12	6
35	29	23	17	11	5
34	28	22	16	10	4
33	27	21	15	9	3
32	26	20	14	8	2
31	25	19	13	7	1

The surveys were made under the direction of the Geographer of the United States.

The act of Congress approved May 18, 1796, provided for the appointment of a surveyor-general, and directed the survey of the lands northwest of the Ohio River, and above the mouth of the Kentucky River, "in which the titles of the Indian tribes have been extinguished." Under this law *one-half* of the townships surveyed were subdivided into sections "by running through the same, each way, parallel lines at the end of every two miles, and by making a corner on each of said lines at the end of every mile," and it further provided that "the sections shall be numbered, respectively, beginning with the number one in the northeast section and proceeding west and east alternately, through the township, with progressive numbers till the thirty-sixth be completed." This method of numbering sections, as shown by the following diagram, is still in use:

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
30	29	28	27	26	25
31	32	33	34	35	36
31	25	19	13	7	1

The act of Congress approved May 10, 1800, required the "townships west of the Muskingum, which \* \* \* are directed to be sold in quarter townships, to be subdivided into half sections of three hundred and twenty acres each, as nearly as may be, by running parallel lines through the same from east to west, and from south to north, at the distance of one mile from each other, and marking corners, at the distance of each half mile on the lines running from east to west, and at the distance of each mile on those running from south to north.\* \*

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\* And the interior lines of townships intersected by the Muskingum, and of all the townships lying east of that river, which have not been heretofore actually subdivided into sections shall also be run and marked. \* \* \* And in all cases where the exterior lines of the townships thus to be subdivided into sections or half sections shall exceed, or shall not extend, six miles, the excess or deficiency shall be specially noted, and added to or deducted from the western and northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west or from south to north."

The act of Congress approved February 11, 1805, directs the subdivision of the public lands into quarter sections, and provides that all the corners marked in the public surveys shall be established as the proper corners of sections or subdivisions of sections, which they were intended to designate, and that corners of half and quarter sections *not marked* shall be placed as nearly as possible "equidistant from those two corners which stand on the same line." This act further provides that "The boundary lines actually run and marked \* \* \* shall be established as the proper boundary lines of the sections or subdivisions for which they were intended; and the length of such lines as returned by \* \* \* the surveyors \* \* \* shall be held and considered as the true length thereof, and the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners; but in those portions of the fractional townships, where no such opposite or corresponding corners have been or can be fixed, the said boundary line shall be ascertained by running from the established corners due north and south or east and west lines, as the case may be, to the \* \* \* external boundary of such fractional township."

The act of Congress approved April 25, 1812, provided "That there shall be established in the Department of the

Treasury an office to be denominated the General Land Office; the chief officer of which shall be called the Commissioner of the General Land Office, whose duty it shall be, under the direction of the head of the department, to superintend, execute, and perform all such acts and things touching or respecting the public lands of the United States, and other lands patented or granted by the United States, as have heretofore been directed by law to be done or performed in the office of the Secretary of State, of the Secretary and Register of the Treasury, and of the Secretary of War, or which shall hereafter by law be assigned to the said office."

The act of Congress approved April 24, 1820, provides for the sale of public lands in half quarter sections, and requires that "in every case of the division of a quarter section the line for the division thereof shall run north and south \* \* \* and fractional sections, containing 160 acres and upwards, shall, in like manner, as nearly as practicable, be subdivided into half quarter sections, under such rules and regulations as may be prescribed by the Secretary of the Treasury; buy fractional sections containing less than 160 acres shall not be divided."

The act of Congress approved May 24, 1824, provides "That whenever, in the opinion of the President of the United States, a departure from the ordinary mode of surveying land on any river, lake, bayou, or watercourse would promote the public interest, he may direct the surveyor-general in whose district such land is situated, and where the change is intended to be made, under such rules and regulations as the President may prescribe, to cause the lands thus situated to be surveyed

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in tracts of two acres in width, fronting on any river, bayou, lake, or watercourse, and running back the depth of forty acres."\* \* \*

The act of Congress approved May 29, 1830, provides for the fine and imprisonment of any person obstructing the survey of the public lands, and for the protection of surveyors, in the discharge of their official duties, by the United States marshal, with sufficient force, whenever necessary.

The act of Congress approved April 5, 1832, directed the subdivision of the public lands into quarter-quarters; that in every case of the division of a half-quarter section the dividing line should run east and west, and that fractional sections should be subdivided under rules and regulations prescribed by the Secretary of the Treasury. Under the latter provision the Secretary directed that fractional sections containing less than 160 acres, or the residuary portion of a fractional section, after the subdivision into as many quarter-quarter sections as it is susceptible of, may be subdivided into lots, each containing the quantity of a quarter-quarter section as nearly as practicable, by so laying down the line of subdivision that they shall be 20 chains wide, which distances are to be marked on the plat of subdivision, as are also the areas of the quarter-quarters and residuary fractions.

The two acts last above mentioned provided that the corners and contents of half-quarter and quarter-quarter sections should be ascertained, as nearly as possible, in the manner and on the principles directed and prescribed in the act of Congress approved February 11, 1805.

## SYSTEM OF RECTANGULAR SURVEYING.

The act of Congress approved July 4, 1836, provided for the reorganization of the General Land Office, and that the executive duties of said office "shall be subject to the supervision and control of the Commissioner of the General Land Office under the direction of the President of the United States." The repealing clause is, "That such provisions of the act of the twenty-fifth of April, in the year one thousand eight hundred and twelve, entitled 'An act for the establishment of a General Land Office in the Department of the Treasury' and of all acts amendatory thereof, as are inconsistent with the provisions of this act, be, and the same are hereby, repealed."

From the wording of this act it would appear that the control of the General Land Office was removed from the Treasury Department, and that the Commissioner reported direct to the President, but, as a matter of fact, the Secretary of the Treasury still had supervisory control, for the act of Congress approved March 3, 1849, by which the Department of the Interior was established, provided "That the Secretary of the Interior shall perform all the duties in relation to the General Land Office, of supervision and appeal, now discharged by the Secretary of the Treasury \* \* \*." By this act the General Land Office was transferred to the Department of the Interior, where it still remains.

In 1855 a manual of instructions to surveyors general was prepared, under the direction of the Commissioner of the General Land Office, by John M. Moore, then principal clerk of surveys, and the act of Congress approved May 30, 1862, provided "That the printed manual of instructions relating to the public surveys, prepared at the General Land Office, and bearing the date February twenty-second, eighteen hundred and fifty-five, the instructions of the Commissioner of the General Land Office, and the special instructions of the surveyor-general, when not in conflict with said printed manual or the instructions of said Commissioner, shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The instructions contained in this volume are issued under the author-

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ity given in the clause in said act providing that "The instructions of the Commissioner of the General Land Office \* \* \* shall be taken and deemed to be a part of every contract for surveying the public lands of the United States."

The following comprise so much of the general laws relating to the survey of the public domain as it is deemed necessary to incorporate in this volume, reference being made by chapter and section to the codification of the Public Land Laws, prepared pursuant to acts of Congress approved March 3, 1879, and June 16, 1880, and by section number to the Revised Statutes of the United States.

*[The remainder of page 9 and pages 10 through 17 deleted. These pages contain sections of the Revised Statutes pertaining to the public land surveys, and forms of contracts between Surveyors General and their Deputies.]*

1. The public lands of the United States are ordinarily surveyed into rectangular tracts, bounded by lines conforming to the cardinal points.

2. The public lands shall be laid off, in the first place, into bodies of land of 24 miles square, as near as may be. This shall be done by the extension of standard lines from the principal meridian every 24 miles, and by the extension, from the base and standard lines, of auxiliary meridians every 24 miles. Thereafter they shall be laid off into bodies of land of 6 miles square, as near as may be, called *townships*, containing as near as may be 23,040 acres. The townships shall be subdivided into 36 tracts, called sections, each containing as near as may be 640 acres. Any number or series of contiguous townships, situate north or south of each other, constitute a *range*.

The law requires that the lines of the public surveys shall be governed by the true meridian, and that the townships shall be *six miles square*—two things involving in connection a mathematical impossibility—for, strictly to conform to the meridian, necessarily throws the township out of square, by reason of the convergency of meridians, and hence, by adhering to the true meridian, results the necessity of departing from the strict requirements of law, as respects the precise area of townships and the subdivisional parts thereof, the township assuming something of a trapezoidal form, which inequality develops itself more and more as such, the higher the latitude of the surveys. It is doubtless in view of these circumstances that the law provides (see section 2 of the act of May 18, 1796) that the sections of a mile square shall contain the quantity of 640 acres, *as nearly as may be*; and, moreover, provides (see section 3 of the act of May 10, 1800) in the following words: "And in all cases where the exterior lines of the townships, thus to be subdivided into sections or half sections, shall exceed, or shall not extend 6 miles, the excess or deficiency shall be specially noted, and added to or deducted from the western or northern ranges of sections or half sections in such township, according as the error may be in running the lines from east to west, or from south to north; the sections and half sections bounded on the northern and western lines of such townships shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

The accompanying diagram, marked A, and the specimen field-notes pertaining to the same, will serve to illustrate the method of running lines to form tracts of land 24 miles square, as well as the method of running out the exterior lines of townships, and the order and mode of subdividing townships will be found illustrated in the accompanying specimen field-notes, conforming with the township diagram B. The method here presented is designed to insure as full a compliance with all the requirements, meaning, and intent of the surveying laws as, it is believed, is practicable.

The section lines are surveyed from *south* to north on true meridians, and from *east* to west, in order to throw the excesses or deficiencies in measurements on the north and west sides of the township, as required by law. In case where a

township has been partially surveyed, and it is necessary to complete the survey of the same, or where the character of the land is such that only the north or west portions of the township can be surveyed, this rule can not be strictly adhered to, but, in such cases, must be departed from only so far as is absolutely necessary. It will also be necessary to depart from this rule where surveys close upon

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State or Territorial boundaries, or upon surveys extending from different meridians.

3. The townships are to bear numbers in respect to the base line, either north or south of it; and the tiers of townships called "ranges" will bear numbers in respect to the meridian line according to their relative position to it, either on the east or west.

4. The thirty-six sections into which a township is subdivided are numbered, commencing with number one at the *northeast* angle of the township, and proceeding west to number six, and thence proceeding east to number twelve, and so on, alternately, until the number thirty-six in the southeast angle. In all cases of surveys of fractional townships, the sections should bear the same numbers as they would if the township was full.

5. Standard parallels shall be established at intervals of every 24 miles, north and south of the base line, and auxiliary meridians at intervals of every 24 miles, east and west of the principal meridian; the object being to confine the errors resulting from convergence of meridians, and inaccuracies in measurements, within the tracts of lands bounded by the lines so established.

6. The survey of all principal base and meridian, standard parallels, and auxiliary meridian, and township lines must be made with an instrument operating independently of the magnetic needle. Burt's *improved solar compass*, or other instrument of equal utility, must be used of necessity in such cases; and it is deemed best that such instrument should be used under all circumstances. Where the needle can be relied on, however, the ordinary compass may be used in subdividing and meandering. Whenever deputies use instruments with magnetic apparatus only, they must test the accuracy of their work and the condition of their instruments by at least three observations upon a circumpolar star, upon different days, between the commencement and the close of surveying operations in any given township. Deputies using instruments with solar apparatus are not required to make observations of the star Polaris, but they must test their instruments by taking the latitude daily, weather permitting, in running base, standard, meridian, and range lines, and upon three different days during the execution of subdivisional surveys in each township. They must make complete records in their field-notes, under proper dates, of the making of all observations in compliance with these instructions, showing the style and condition of the instrument in use, and the angle formed, by comparing the line run with the meridian as by observation determined.

7. The construction and adjustments of all surveying instruments used in the surveying of the public lands of the United States must be tested at least once a year, and oftener if necessary, by comparison with the true meridian, estab-

lished under the direction of the surveyor general of the district; and the instruments must be so modified in construction, or in such a way corrected, as may be necessary to produce the closest possible approximation to accuracy and uniformity in the operation of all such instruments. A record will be made of such examinations, showing the number and style of the instrument, name of the maker, the quantity of instrumental error discovered by comparison, in either solar or magnetic apparatus, or both, and means taken for correction. The surveyor-general will allow no surveys to be made until the instruments to be used therefor have been approved by him.

8. The township lines and the subdivision lines will usually be measured by a two-pole chain of 33.03 feet in length, consisting of 50 links, and each link being 7 inches and ninety-two hundredths of an inch long.

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On uniform and level ground, however, the four-pole chain may be used. The measurements will, however, always be represented according to the four-pole chain of 100 links. The four-pole chains must be adjusted to lengths of 66.06 feet. The object in adding six-hundredths of a foot to the 66 feet of a four-pole chain is to assure thereby that 66 feet will be set off upon the earth's surface without the application of a greater strain than about 20 pounds by the chainmen, thus providing for loss by vertical curvature of the chain, and at the same time avoiding the uncertain results attending the application of strains taxing its elasticity. The deputy surveyor must provide himself with a measure of the standard chain kept at the office of the surveyor-general, to be used by him as a field standard. The chain in use must be compared and adjusted with this field standard each working day, and such field standard must be returned to the surveyor-general's office for examination when his work is completed.

#### OF TALLY PINS.

9. You will use eleven tally pins made of steel, not exceeding 14 inches in length, weighty enough toward the point to make them drop perpendicularly, and having a ring at the top, in which is to be fixed a piece of red cloth, or something else of conspicuous color, to make them readily seen when stuck in the ground.

#### PROCESS OF CHAINING.

10. In measuring lines with a two-pole chain, every *five* chains are called "*a tally*;" and in measuring lines with a four-pole chain, every *ten* chains are called "*a tally*," because at that distance the last of the ten tally pins with which the forward chainman set out will have been stuck. He then cries "*tally*;" which cry is repeated by the other chainman, and each registers the distance by slipping a thimble, button, or ring of leather, or something of the kind, on a belt worn for that purpose, or by some other convenient method. The hind chainman then comes up, and having counted in the presence of his fellow the tally pins which he has taken up, so that both may be assured that none of the pins have been lost, he then takes the forward end of the chain, and proceeds to set the



pins. Thus the chainmen alternately change places, each setting the pins that he has taken up, so that one is forward in all the odd, and the other in all the even tallies. Such procedure, it is believed, tends to insure accuracy in measurement, facilitates the recollection of the distances to objects on the line, and renders a mis-tally almost impossible.

### LEVELING THE CHAIN AND PLUMBING THE PINS.

11. The length of every line you run is to be ascertained by precise horizontal measurement, as nearly approximating to an air line as is possible in practice on the earth's surface. This all-important object can only be attained by a rigid adherence to the three following observances:

1. Ever keeping the chain *stretched* to its utmost degree of tension on even ground.

2. On uneven ground, keeping the chain not only stretched as aforesaid, but horizontally *leveled*. And when ascending and descending steep ground, hills, or mountains, the chain will have to be *shortened* to

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one-half its length (and sometimes more), in order accurately to obtain the true horizontal measure.

3. The careful plumbing of the tally pins, so as to attain precisely *the spot* where they should be stuck. The more uneven the surface, the greater the caution needed to set the pins.

### MARKING LINES.

12. All lines on which are to be established the legal corner boundaries are to be marked after this method, viz: Those trees which may intercept your line must have two chops or notches cut on each side of them without any other marks whatever. These are called "*sight trees*" or "*line trees*." A sufficient number of other trees standing within 50 links of the line, on either side of it, are to be *blazed* on two sides diagonally, or quartering toward the line, in order to render the line conspicuous, and readily to be traced, the blazes to be opposite each other, coinciding in direction with the line where the trees stand very near it, and to approach nearer each other the farther the line passes from the blazed trees. Due care must ever be taken to have the lines so well marked as to be readily followed, and to cut the blazes deep enough to have recognizable scars as long as the trees stand.

Where trees 2 inches or more in diameter are found, the required blazes must not be omitted.

Bushes on or near the line should be bent at right angles therewith, and receive a blow of the ax at about the usual height of blazes from the ground sufficient to leave them in a bent position, but not to prevent their growth.

### ON TRIAL, OR RANDOM LINES,

the trees are not to be blazed, unless occasionally, from indispensable necessity, and then it must be done so guardedly as to prevent the possibility of confounding the marks of the

trial line with the *true*. But bushes and limbs of trees may be lopped, and *stakes set* on the trial or random line, at every *ten* chains, to enable the surveyor on his return to follow and correct the trial line and establish therefrom the *true line*. To prevent confusion, the temporary stakes set on the trial or random lines must be *pulled up* when the surveyor returns to establish the true line.

### INSUPERABLE OBJECTS ON LINE— WITNESS POINTS.

13. Under circumstances where your course is obstructed by impassable obstacles, such as ponds, swamps, marshes, lakes, rivers, creeks, &c., you will prolong the line across such obstacles by taking the necessary right angle offsets; or, if such be inconvenient, by a traverse or trigonometrical operation, until you regain the line on the opposite side. And in case a north and south, or a true east and west, line is regained in advance of any such obstacle, you will prolong and mark the line back to the obstacle so passed, and state all the particulars in relation thereto in your field-book. And at the intersection of lines with both margins of impassable obstacles, you will establish a *witness point* (for the purpose of perpetuating the intersections therewith), by setting a post, and giving in your field-book the course and distance therefrom to two trees on opposite sides of the line, each of which trees you will mark with a blaze and notch facing the post; but on the margins of navigable water-courses, or navigable lakes, you will mark the trees with the proper number of the fractional section, township and range.

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The best marking tools adapted to the purpose must be provided for marking neatly and *distinctly* all the letters and figures required to be made at corners, *arabic* figures being used exclusively; and the deputy is always to have at hand the necessary implements for keeping his marking irons in order.

### ESTABLISHING CORNERS.

To procure the faithful execution of this portion of a surveyor's duty is a matter of the utmost importance. After a true coursing and most exact measurements the establishment of corners is the consummation of the work. If, therefore, the corner be not perpetuated in a permanent and workmanlike manner the *great aim* of the surveying service will not have been attained.

The following are the different points for perpetuating corners, viz:

1. For township boundaries, at intervals of every 6 miles.  
2. For section boundaries, at intervals of every mile, or 80 chains.

3. For quarter-section boundaries, at intervals of every half mile, or 40 chains. Exceptions, however, occur as fully set forth hereafter in that portion of the manual showing the manner of running township lines and method of subdividing.

4. Meander corners are established at all those points where the lines of the public surveys intersect the banks of

such rivers, bayous, lakes, or islands as are by law directed to be meandered.

### DESCRIPTION OF CORNERS.

The following is the form and language to be used by deputy surveyors in describing the establishment of corners in their field-notes, and their work in the field must strictly comply with the same.

### STANDARD TOWNSHIP CORNERS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C. with 6 notches on N., E. & W. edges, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of stone 6 ft. dist. and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C., with 6 notches on N., E. & W. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C., with 6 notches on N., E. & W. edges, from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks., dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears N. \_\_\_\_\_° W. \_\_\_\_\_ lks., dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

SEC. 4. <sup>4</sup>Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal), 12 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., marked S. C. T. 5 N. on N.

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R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, dug pits, 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of post, 6 ft. dist. and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. <sup>5</sup>Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W. marked

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears N \_\_\_\_\_° E. \_\_\_\_\_ lks., dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins., diam., bears N \_\_\_\_\_° W. \_\_\_\_\_ lks., dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° W. \_\_\_\_\_ lks., dist. marked T. 4 N. R. 3 W. S. 1, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Tps. 5 N., R's 2 & 3 W., dug pits. 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of cor., 6 ft. dist. and raised a mound of

earth 2½ feet high, 5 ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces.<sup>6</sup>

SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

S. C. T. 5 N. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, dug pits 24 x 18 x 12 ins. crosswise on each line, N., E. & W. of tree 6 ft. dist., and raised a mound of earth around tree, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

T. 5 N. S. C. on N.

R. 2 W. S. 31, on E. and

R. 3 W. S. 36 on W. faces, with 6 notches on N., E. & W. faces, for Standard Cor. to Tps. 5 N., R's 2 & 3 W.; from which A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W., S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist., marked T. 4 N. R. 3 W. S. 1, B. T.

### CLOSING TOWNSHIP CORNERS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S. E. & W. edges, dug pits, 24 x 18 x 12 ins., crosswise on each line, S., E. & W. of stone, 6 ft. dist., and raised a mound of earth, 2½ ft. high, 5 ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S. E. and W. edges, and raised a mound of stone alongside. Pits impracticable.

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SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked C. C. with 6 notches on S., E., & W. edges; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

SEC. 4. <sup>4</sup>Set a post, 4½ ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked

1. Stone with Pits and Mound.

2. Stone with Mound of Stone.

3. Stone with Bearing Trees.

4. Post in Mound.

5. Post with Bearing Trees.

6. Mound without Post or Stone.

7. Tree Corner without Bearing Trees.

8. Tree Corner with Bearing Trees.



C. C. T. 4 N. on S.  
R. 2 W. S. 6, on E. and  
R. 3 W. S. 1 on W. faces, with 6 notches on S., E., & W. faces, dug pits 24 x 18 x 12 ins., crosswise on each line, S., E., & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, around post.

SEC. 5. <sup>5</sup>Set a post, 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., marked

C. C. T. 4 N. on S.  
R. 2 W. S. 6, on E. and  
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor. to (e.g.) Tps. 4 N., R's 2 & 3 W., dug pits 24 x 18 x 12 ins. crosswise on each line, S., E., & W. of corner, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base, over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

C. C. T. 4 N. on S.  
R. 2 W. S. 6, on E. and  
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces.  
SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked

(e.g.)  
C. C. T. 4 N. on S.  
R. 2 W. S. 6, on E. and  
R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces, dug pits 24 x 18 x 12 ins. crosswise on each line S. E. & W. of tree, 6 ft. dist. and raised a mound of earth around tree, for Closing Cor. to Tps. 4 N. R's 2 & 3, W.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)  
C. C. T. 4 N. on S.  
R. 2 W. S. 6, on E. and

R. 3 W. S. 1 on W. faces, with 6 notches on S., E. & W. faces for Closing Cor. to Tps. 4 N., R's 2 & 3 W.; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 2 W. S. 31, B. T.

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SEC. 9. All Closing Township Corners must be connected with the nearest corner on the Standard line.

### STANDARD SECTION CORNERS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x ins., in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked S. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins., N., E. & W. of stone, 5½ ft. dist., and raised a mound of earth, 2 ft. high, 4½ ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Standard Cor. to (e.g.) Secs. 33 & 34, marked S. C., with 3 notches on E. & W. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Standard Cor. 50 (e.g.) Sec. 35 & 36, marked S. C., with 1 notch on E and 5 notches on W. edges; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

SEC. 4. <sup>4</sup>Set a post, 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked S. C. T. 5 N. R. 3 W., on N.

S. 36, on E. and  
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits, 18 x 18 x 12 ins., N., E. and W. of post, 5½ ft. dist. and raised a mound of earth 2 ft. high, 4½ ft. base round post.

SEC. 5. <sup>5</sup>Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Standard Cor. to (e.g.) Secs. 35 & 36, marked S. C. T. 5 N. R. 3 W., on N.

S. 36, on E. and  
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Standard Cor. to (e.g.) Secs. 33 & 34, dug pits, 18 x 18 x 12 ins., N., E. and W. of corner, 5½ ft. dist., and raised a mound of earth 2 ft. high, 4¼ ft. base over it. In E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

T. 5 N. R. 3 W., S. C. on N.  
S. 34 on E. and  
S. 33 on W. faces, with 3 notches on E. & W. faces.

SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins, diam., which I marked (e.g.)

S. C. T. 5 N. R. 3 W., on N.  
S. 36, on E. and  
S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces,

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dug pits, 18 x 18 x 12 ins. N., E. & W. of tree, 5½ ft. dist. and

1. Stone with Pits and Mound.
2. Stone with Mound of Stone.
3. Stone with Bearing Trees.
4. Post in Mound.
5. Post with Bearing Trees.
6. Mound without Post or Stone.
7. Tree Corner without Bearing Trees.
8. Tree Corner with Bearing Trees.

raised a mound of earth around tree, for Standard Cor. to Secs. 35 & 36.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

S. C. T. 5 N. R. 3 W., on N.

S. 36, on E. and

S. 35 on W. faces, with 1 notch on E. and 5 notches on W. faces, for Standard Cor. to Secs. 35 & 36; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 35, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

**SECTION CLOSING CORNERS.**

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges, dug pits, 18 x 18 x 12 ins. S., E. & W. of stone, 5½ feet dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Closing Cor. to (e.g.) Secs. 3 & 4, marked C. C., with 3 notches on E. and W. edges, & raised, a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked C. C., with 1 notch on E. and 5 notches on W. edges; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 4. <sup>4</sup>Set a post 4 ft. long, 4 ins. square, with marked stone, (charred stake or quart of charcoal) 12 ins. in the ground for Closing Cor. to (e.g.) Secs. 1 & 2, marked

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits, 18 x 18 x 12 ins., S., E. & W. of post 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. <sup>5</sup>Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Closing Cor. to (e.g.) Secs. 1 & 2, marked

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3, W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Closing Cor. to (e.g.) Secs. 3 & 4, dug pits, 18 x 18 x 12 ins., S., E. & W. of Cor., 5½

ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base over it. In E. pit drove a stake, 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

C. C. T. 4 N. R. 3 W., on S.

S. 3, on E. and

S. 4 on W. faces, with 3 notches on E. & W. faces.

SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with 1 notch on E. and 5 notches on W. faces, dug pits 18 x 18 x 12 ins. S., E. & W. of tree, 5½ ft. dist., and raised a mound of earth around tree, for closing Cor. to Secs. 1 & 2.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

C. C. T. 4 N. R. 3 W., on S.

S. 1, on E. and

S. 2 on W. faces, with one notch on E. and 5 notches on W. faces, for Closing Cor. to Secs. 1 & 2; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 4 N. R. 3 W. S. 2, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 5 N. R. 3 W. S. 36, B. T.

SEC. 9. <sup>9</sup>All Section Closing Corners must be connected with the nearest corner on the Standard line.

**CORNERS COMMON TO 4 TOWNSHIPS.**

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W., marked with 6 notches on each edge, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E. & W. of stone, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked with 6 notches on each edge, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R. 2 & 3 W. marked with 6 notches on each edge; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

SEC. 4. <sup>4</sup>Set a post, 4½ ft. long, 4 ins. square, with marked

- |                               |                                       |
|-------------------------------|---------------------------------------|
| 1. Stone with Pits and Mound. | 6. Mound without Post or Stone.       |
| 2. Stone with Mound of Stone. | 7. Tree Corner without Bearing Trees. |
| 3. Stone with Bearing Trees.  | 8. Tree Corner with Bearing Trees.    |
| 4. Post in Mound.             | 9. Connection Lines.                  |
| 5. Post with Bearing Trees.   |                                       |

stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked  
 T. 3 N. S. 31, on N. E.  
 R. 2 W. S. 6, on S. E.  
 T. 2 N. S. 1, on S. W. and  
 R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge, dug pits,

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24 x 18 x 12 ins., lengthwise on each line, N., S., E. & W. of post, 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base around post.

SEC. 5. <sup>5</sup>Set a post 4½ ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W. marked

T. 3 N. S. 31, on N. E.  
 R. 2 W. S. 6, on S. E.  
 T. 2 N. S. 1, on S. W. and  
 R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground for Cor. to (e.g.) Tps. 2 & 3 N. R's 2 & 3 W., dug pits, 24 x 18 x 12 ins., lengthwise on each line, N., S., E. & W. of cor., 6 ft. dist., and raised a mound of earth 2½ ft. high, 5 ft. base over it. In S. E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1 on S. W. and

R. 3 W. S. 36, on N. W. faces, with 6 notches on each edge.

SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36 on N. W. faces, with 6 notches on each edge, dug pits, 24 x 18 x 12 ins. lengthwise on each line, N., S., E. & W. of tree, 6 ft. dist., and raised a mound of earth around tree, for Cor. to Tps. 2 & 3 N. R's 2 & 3 W.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

T. 3 N. S. 31, on N. E.

R. 2 W. S. 6, on S. E.

T. 2 N. S. 1, on S. W. and

R. 3 W. S. 36, on N. W. faces, with 6 notches on each edge, for Cor. to Tps. 2 & 3 N. R's 2 & 3 W. from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 2 W. S. 31, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 3 W. S. 1, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 3 N. R. 3 W. S. 36, B. T.

## CORNERS COMMON TO 4 SECTIONS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground for Cor. to (e.g.) Secs. 25, 26, 35 & 36, marked with 1 notch on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

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SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Cor. to (e.g.) Secs. 14, 15, 22 & 23, marked with 3 notches on S. and 2 notches on E. edges, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins. \_\_\_\_\_ ins. in the ground, for Cor. to (e.g.) Secs. 9, 10, 15 & 16, marked with 4 notches on S. & 3 notches on E. edges, from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 10, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 15, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 16, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 9, B. T.

SEC. 4. <sup>4</sup>Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Secs. 15, 16, 21 & 22, marked

T. 2 N. S. 15, on N. E.

R. 2 W. S. 22, on S. E.

S. 21, on S. W. and

S. 16 on N. W. faces, with 3 notches on S. & E. edges, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist., and raised a mound of earth 2 ft. high, 4½ ft. base around post.

SEC. 5. <sup>5</sup>Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Cor. to (e.g.) Secs. 25, 26, 35 & 36, marked

T. 2 N. S. 25, on N. E.

R. 2 W. S. 36, on S. E.

S. 35, on S. W. and

S. 26, on N. W. faces, with 1 notch on S. & E. edges; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 25, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 36, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 35, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 26, B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Cor. to (e.g.) Secs. 25, 26, 35 & 36, dug pits, 18 x 18 x 12 ins. in each Sec., 5½ ft. dist.,

1. Stone with Pits and Mound.

2. Stone with Mound of Stone.

3. Stone with Bearing Trees.

4. Post in Mound.

5. Post with Bearing Trees.

6. Mound without Post or Stone.

7. Tree Corner without Bearing Trees.

8. Tree Corner with Bearing Trees.

and raised a mound of earth 2 ft. high, 4½ ft. base over it.

In S. E. pit drove a stake 2 ins. square, 2 ft. long, 12 ins in the ground, marked

T. 2 N. S. 25, on N. E.

R. 2 W. S. 36, on S. E.

S. 35, on S. W. and

S. 26 on N. W. faces, with 1 notch on S. & E. edges.

SEC. 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

T. 2 N. S. 29, on N. E.

R. 2 W. S. 32, on S. E.

S. 31, on S. W. and

S. 30, on N. W. faces, with 1 notch on S. and 5 notches on E. edges, dug pits, 18 x 18 x 12 ins. in each sec. 5½ ft. dist. and raised a mound of earth around tree, for Cor. to Secs. 29, 30, 31 & 32.

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SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.)

T. 2 N. S. 5, on N. E.

R. 2 W. S. 8, on S. E.

S. 7, on S. W. and

S. 6 on N. W. faces, with 5 notches on S. & E. edges, for Cor. to Secs. 5, 6, 7 & 8; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 5, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 8, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 7, B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 6, B. T.

## ARTICLE X.

### QUARTER SECTION CORNERS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, dug pits, 18 x 18 x 12 ins., N. & S., (or E. & W.) of stone 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for ¼ Sec. Cor., marked ¼ on N. (or W.) face, and raised a mound of stone alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for ¼ Sec. Cor. marked ¼ on N. (or W.) face; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked ¼ S. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked ¼ S. B. T.

SEC. 4. <sup>4</sup>Set a post 3 ft. long, 3 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec Cor., marked ¼ S. on N. (or W.) face, dug pits, 18 x 18 x 12 ins., N. & S., (or E. and W.) of post 5½ ft. dist., and raised a mound of earth 1½ ft. high, 3½ ft. base around post.

SEC. 5. <sup>5</sup>Set a post 3 ft. long, 3 ins. square, 24 ins. in the ground, for ¼ Sec. Cor., marked ¼ S. on N. (or W.) face; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears N. \_\_\_\_\_° E., \_\_\_\_\_ lks., dist. marked ¼ S. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° W., \_\_\_\_\_ lks., dist. marked ¼ S. B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins., N. & S., (or E. & W.) of post 5½ ft. dist. and raised a mound of earth 1½ ft. high, 3½ ft. base over it. In E. (or N.) pit drove a stake 2 ft. long, 2 ins. square, 12 ins. in the ground, marked ¼ S. on N. (or W.) face.

SEC 7. <sup>7</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked ¼ S. on N. (or W.) face, for ¼ Sec. Cor., dug pits, 18 x 18 x 12 ins. N. & S. (or E. & W.) of tree, 5½ ft. dist. and raised a mound of earth around tree.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I mark ¼ S. on N. (or W.) face, for ¼ Sec Cor.; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° E. \_\_\_\_\_ lks. dist. marked ¼ S. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked ¼ S. B. T.

SEC. 9. <sup>10</sup>On N. and S. lines the marks must be made on W. side, and on E. and W. lines on N. side of the stone, post or tree.

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SEC. 10. <sup>11</sup>On N. & S. lines, the pits must be dug N. & S. of Cor. and on E. & W. lines, E. & W. of Cor.

SEC. 11. <sup>12</sup>On N. & S. lines, the stakes must be driven in N. pit, and on E. & W. lines, E. pit.

### STANDARD QUARTER SECTION CORNERS.

All Quarter Section Corners on Standard lines must be established in all respects like other Quarter Section Corners, with the addition of the letters S. C., and if bearing trees are established for such Corners, each tree must be marked S. C. ¼ S. B. T.

### MEANDER CORNERS.

SEC. 1. <sup>1</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 1 & 2, marked M. C., dug a pit 3 ft. square, 1 ft. deep, 8 lks. \_\_\_\_\_ of stone, and raised a mound of earth 2 ft. high, 4½ ft. base alongside.

SEC. 2. <sup>2</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_ ins., \_\_\_\_\_ ins. in the ground for Meander Cor. to (e.g.) Fractional Secs. 35 & 36, marked M. C., and raised a mound of stone 2 ft. high, 4½ ft. base alongside. Pits impracticable.

SEC. 3. <sup>3</sup>Set a \_\_\_\_\_ stone \_\_\_\_\_ x \_\_\_\_\_ x \_\_\_\_\_

1. Stone with Pits and Mound.

2. Stone with Mound of Stone.

3. Stone with Bearing Trees.

4. Post in Mound.

5. Post with Bearing Trees.

6. Mound without Post or Stone.

7. Tree Corner without Bearing Trees.

8. Tree Corner with Bearing Trees.

9. Connection Lines.

10. Marks.

11. Pits.

12. Stakes in Pits.

ins., \_\_\_\_\_ ins. in the ground for Meander Cor. to (e.g.) Fractional Secs, 9 & 10, marked M. C.; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° E. \_\_\_\_\_ lks., dist. marked T. 2 N. R. 2 W. S. 10, M. C. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 9, M. C. B. T.

SEC. 4. <sup>4</sup>Set a post 4 ft. long, 4 ins. square, with marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 35 & 36, marked M. C., with

T. 2 N. on N.

R. 2 W. S. 36, on E. and

S. 35 on W. faces, dug a pit, 3 ft. square, 1 ft. deep, 8 lks. \_\_\_\_\_ of post, and raised a mound of earth 2 ft. high, 4½ ft. base, around post.

SEC. 5. <sup>5</sup>Set a post 4 ft. long, 4 ins. square, 24 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 20 & 21, marked M. C. with

T. 2 N. on S.

R. 2 W. S. 21 on E. and

S. 20 on W. faces; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° E. \_\_\_\_\_ lks., dist. marked T. 2 N. R. 2 W. S. 21, M. C. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam., bears S \_\_\_\_\_° W. \_\_\_\_\_ lks., dist. marked T. 2 N. R. 2 W. S. 20, M. C. B. T.

SEC. 6. <sup>6</sup>Deposited a marked stone (charred stake or quart of charcoal) 12 ins. in the ground, for Meander Cor. to (e.g.) Fractional Secs. 11 & 12, dug a pit, 3 ft. square, 1 ft. deep, 8 lks. \_\_\_\_\_ of Cor., and raised a mound of earth 2 ft. high, 4½ ft. base, over it. In pit drove a stake 2 ins. square, 2 ft. long, 12 ins. in the ground, marked M. C. with

T. 2 N. on S.

R. 2 W. S. 12 on E. and

S. 11 on W. faces.

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SEC. 7. <sup>7</sup>A, \_\_\_\_\_, \_\_\_\_\_ ins diam., which I marked (e.g.) M. C. with

T. 2 N. on W.

R. 2 W. S. 13 on N. and

S. 24 on S. faces, for Meander Cor. to Fractional Secs. 13 & 24.

SEC. 8. <sup>8</sup>A \_\_\_\_\_, \_\_\_\_\_ ins. diam., which I marked (e.g.) M. C. with

T. 2 N. on E.

R. 2 W. S. 6 on N. and

S. 7 on S. faces, for Meander Cor. to Fractional Secs. 6 & 7; from which

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears N \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 6, M. C. B. T.

A \_\_\_\_\_, \_\_\_\_\_ ins. diam. bears S \_\_\_\_\_° W. \_\_\_\_\_ lks. dist. marked T. 2 N. R. 2 W. S. 7, M. C. B. T.

SEC. 9. <sup>11</sup>When a pit is dug at a Meander Cor. it must be 8 lks. from the Cor., on the side opposite the river or lake meandered.

SEC. 10. <sup>10</sup>The letters "M. C." for Meander Corner must be marked on the side facing the river or lake meandered.

## WITNESS CORNERS.

A Witness Corner must bear the same marks that would be placed upon the Corner for which it is a witness, with the addition of the letters W. C., and be established in all respects like such Corner.

If bearing trees are established for a Witness Corner, each tree must be marked W. C., in addition to the usual marks.

## MISCELLANEOUS.

SEC. 1. <sup>13</sup>When a rock in place is established for a Corner, its dimensions above ground must be given, and a cross (X) marked at exact Corner point. In other respects form for stone corners will be used.

SEC. 2. <sup>14</sup>Where mounds of earth are raised "alongside" of Corners, on N. and S. lines, they must be placed on the W. and on E. and W. lines on the N. side of Corner. In case the character of the land is such that this cannot be done, the deputy will state in his notes instead of "alongside," "S" (or E.)

SEC. 3. <sup>15</sup>In case where pits are practicable, the deputy prefers raising a mound of stone, or stone covered with earth, as more likely to perpetuate the Corner, he will use the form given for mound of stone, omitting the words "pits impracticable," and adding "covered with earth," when so established.<sup>15</sup>

SEC. 4. <sup>16</sup>Where the requisite number of trees can be found within 300 links of the Corner point, three (3) bearing trees should be established for every Standard or Closing Cor., four (4) for every Cor. common to 4 Townships or Sections, and two (2) for every Quarter Sec. Cor. or Meander Cor. In case the requisite number cannot be found within limits, the deputy must state in his field notes after describing those established, "no other trees within limits," and "dug pits in Secs. \_\_\_\_\_ & \_\_\_\_\_," or "raised a mound of stone alongside."

SEC. 5. <sup>17</sup>Stones 18 ins. and less long must be set two-thirds, and over 18 ins. long, three-fourths of their length in the ground. No stones containing less than 504 cubic inches must be used for corners.

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SEC. 6. <sup>18</sup>Particular attention is called to the "Summary of objects and data required to be noted," on pages \_\_\_\_ and \_\_\_\_ of these instructions, and it is expected that the deputy will thoroughly comply with same in his work and field notes.

SEC. 7. <sup>19</sup>No mountains, swampy lands, or lands not classed as surveyable are to be meandered, and all lines approaching such lands must be discontinued at the section or quarter section corner.

SEC. 8. <sup>20</sup>Where by reason of impassable objects the south

4. Post in Mound.

5. Post with Bearing Trees.

6. Mound without Post or Stone.

7. Tree Corner without Bearing Trees.

8. Tree Corner with Bearing Trees.

9. Connection Lines.

10. Marks.

11. Pits.

12. Stakes in Pits.

13. Rock in Place.

14. Mounds of Earth.

15. Mounds of Stone.

16. Bearing Trees.

17. Stones.

18. Objects to be Noted.

19. Lines Discontinued at Legal Corners.

20. Fractional Townships.

boundary of a township cannot be established, an east and west line should be run through the Township, first random, then corrected, from one range line to the other, and as far south as possible, and from such line the section lines will be extended in the usual manner, except over any fraction south of said line, which may be surveyed in the opposite direction from the Section Corners on the auxiliary base thus established.

SEC. 9. <sup>21</sup>When no part of the east or west boundaries can be run, both the north and south boundaries will be established as true lines.

SEC. 10. <sup>22</sup>Allowance for the convergency of Meridians must be made whenever necessary.

SEC. 11. <sup>23</sup>All letters and figures cut in posts or trees must be marked over with red chalk to make them still more plain and durable.

SEC. 12. <sup>24</sup>Township corners common to four townships, and section corners common to four sections, are to be set diagonally in the earth, with the angles in the direction of the lines. All other corners are to be set square, with the sides facing the direction of the lines.

SEC. 13. <sup>25</sup>The sizes of wooden posts, mounds, and pits noted in foregoing descriptions of corners are to be regarded as *minimum*, and whenever practicable to increase their dimensions it is desirable to do so.

SEC. 14. <sup>26</sup>In establishing corners, stones should be used wherever practicable; then, posts; and lastly, mounds, with stake in pit.

SEC. 15. <sup>27</sup>It is expected that the deputy surveyors will carefully read and familiarize themselves with these instructions, and all others contained in this volume, and will instruct their assistants as to their duties before commencing work. Extra copies will be furnished the deputies for the use of their assistants.

## MEANDERING.

SEC. 1. Proceeding *down* stream, the bank on the *left* hand is termed the "left bank," and that on the *right* hand the "right bank." These terms are to be universally used to distinguish the two banks of a river or stream.

SEC. 2. Both banks of *navigable* rivers are to be meandered by taking the general courses and distances of their sinuosities, and the same are to be entered in the field book.

At those points where either the township or section lines intersect the banks of a navigable stream, corners are to be established at the time of running these lines. These are called "meander corners"; and in meandering you are to commence at one of those corners, coursing the banks, and measuring the distance of each course from your com-

The crossing distance *between* the MEANDER CORNERS on same line is to be ascertained by triangulation, in order that the river may be protracted with entire accuracy. The particulars to be given in the field notes.

Rivers not embraced in the class denominated "navigable" under the statute, but which are well-defined natural arteries of internal communication, will only be meandered *on one bank*. For the sake of uniformity, the surveyor will traverse the *right bank* when not impracticable; but where serious obstacles are met with, rendering it difficult to course along the right bank, he may cross to the left bank and continue the meanders as far as necessary; but all changes from one bank to the other will be made at the point of intersection of some line of the public surveys with the stream being meandered.

The subdividing deputies will be required to establish meander corners on both banks of such meanderable streams at the intersection of all section lines, and the distances across the river will be noted in the field book.

In meandering water-courses, where a distance is more than *ten chains* between stations, even chains only should be taken; but if the distance is *less* than ten chains, and it is found convenient to employ chains and links, the number of links should be a multiple of ten, thereby saving time and labor in testing the closings both in the field and in the surveyor-generals' office.

SEC. 3. You are also to meander, in manner aforesaid, all lakes, bayous, and deep ponds, which may serve as public highways of commerce. Shallow lakes or ponds, readily to be drained or likely to dry up, are not to be meandered. Lakes, bayous, and ponds lying entirely within a section are not to be meandered.

In meandering lakes, bayous, or ponds you are to commence at a meander corner, and proceed as above directed for meandering the banks of navigable streams; and from said corner take the courses and distances of the entire margin of the same, noting the intersections with all meander corners established thereon.

You will notice all streams of water falling into the river, lake, or bayou you are surveying, stating the width of the same at their mouth; also all springs, noting the size thereof and depth, and whether the water be pure or mineral; also the head and mouth of all bayous; and all islands, rapids, and bars are to be noticed, with intersections to their upper and lower points to establish their exact situation. You will also note the elevation of the banks of rivers and streams, the heights of falls and cascades, and the length of rapids.

SEC. 4. Meander lines should not be established at the segregation line between dry and swamp or overflowed land, but at the ordinary low-water mark of the actual margin of the rivers or lakes on which such swamp or overflowed lands border. In cases where such meander lines were formerly established at the segregation line between dry and swamp or overflowed lands, new and proper meander lines may be established under the direction of the surveyor general, and the township and section lines extended over such swamp or overflowed lands and the corners established, as hereinbefore provided, in order that the plats and field-notes of surveys may show the actual facts in the case.

5. The precise relative position of islands, in a township made fractional by the river in which the same are situated,

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mencing corner to the next "meander corner." By the same method you are to meander the opposite bank of the same river.

21. Boundaries.

25. Size of Posts, etc.

22. Convergency.

26. Corner Materials.

23. Red Chalk.

27. Examine Instructions.

24. Mode of Setting Corners.



is to be determined trigonometrically; sighting to a flag or other fixed object on the island,

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from a special and carefully measured base line, connected with the surveyed lines, on or near the river bank, you are to form connection between the meander corners on the river to points corresponding thereto, in direct line, on the bank of the island, and there establish the proper meander corners, and calculate the distance across.

6. In taking the connection of an island with the main land, when there is no meander corner in line, opposite thereto, to sight from, you will measure a special base from the meander corner nearest to such island, and from such base you will triangulate to some fixed point on the shore of the island, ascertain the distance across, and there establish a special meander corner, wherefrom you will commence to meander the island.

7. The field-notes of meanders will be set forth in the field-books showing the dates when the work is performed, as illustrated in the specimen notes annexed. They are to state and describe particularly the meander corner from which they commenced, and each one upon which they close, and are to exhibit the meanders of each fractional section separately; following, and composing a part of such notes, will be given a description of the land, timber, depth of inundation to which the bottom is subject, and the banks, current, and bottom of the stream or body of water you are meandering. The utmost care must be taken to pass no object of topography, or *change therein*, without giving a particular description.

### SURVEYING.

Initial points from which the lines of the public surveys are to be extended must be established whenever necessary under such special instructions as may be prescribed in each case by the Commissioner of the General Land Office. The locus of such initial points must be selected with great care and due consideration for their prominence and easy identification, and must be established astronomically.

The initial point having been established, the lines of the public surveys are to be extended therefrom as follows:

#### BASE LINE.

The base line shall be extended east and west from the initial point by the use of solar instruments or transits, as may be directed by the surveyor-general, in his special written instructions. Where solar instruments are used, the deputy must test said instruments in every 12 miles of line run, by taking the latitude, or by observation on the polar star; and in all cases where he has reason to suppose that said instrument is in error, he must take an observation on the polar star, and if error be found, must make the necessary corrections before proceeding with his survey. The proper corners shall be established at each 40 and 80 chains, and at the intersection of the line with rivers, lakes, or bayous that should be meandered, in accordance with the instructions for the establishment of corners. In order to check errors in

measurement, two sets of chainmen, operating independently of each other, must be employed.

Where transits are used, the line will be run by setting off at the point of departure on the principal meridian, a tangent to the parallel of latitude, which will be a line falling at right angles to the said meridian. The survey will be continued on this line for twelve (12) miles, but the corners will be established at the proper points by offsets north-

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erly from said line, at the end of each half mile. In order to offset correctly from the tangent to the parallel, the deputy will be guided by the table of offsets and azimuths contained in this volume. As the azimuth of the tangent is shown, the angle thence to the true meridian at each mile is readily found, thus indicating the direction of the offset line. The computations are made for a distance of 12 miles, at the end of which observations on the polar star must be taken for the projection of a new tangent. The computations are also upon even degrees of latitude; offsets for intervening parallels can be readily determined by interpolation. Where offset distances to quarter-section corners exceed 50 links, their direction to the parallel can be determined in like manner by interpolation for azimuth.

Where said distances are less than 50 links interpolations for determining directions will not be required.

### PRINCIPAL MERIDIAN.

The principal meridian shall be extended north and south from the initial point, by the use of solar instruments or transits, as may be directed by the surveyor general in his special written instructions. Where solar instruments are used, the line will be run in the same manner as prescribed for running the base line by solar instruments. Where transits are used, observations upon the polar star must be taken within each 12 miles of line run. In addition to the above general instructions, it is required that in all cases where the establishment of a new principal meridian seems to be necessary to the surveyor-general, he shall submit the matter, together with his reasons therefor, to the Commissioner of the General Land Office, and the survey of such principal meridian shall not be commenced until written authority, together with such special instructions as he may deem necessary, shall have been received from the Commissioner.

### STANDARD PARALLELS.

Standard parallels, which are also called correction lines, shall be extended east and west from the principal meridian, at intervals of every 24 miles north and south of the base line, in the same manner as prescribed for running the base line.

### AUXILIARY MERIDIANS.

Auxiliary meridians shall be extended north and south from the base line, at intervals of every 24 miles east and west from the principal meridian, in the same manner as prescribed for running the principal meridian.

It is contemplated that these base, principal meridian, standard, and auxiliary meridian lines shall first be ex-

tended over the territory to be surveyed, and that afterwards township and section lines shall be run, where needed, within these tracts of 24 miles square, formed by the extension of these principal lines; and each surveyor general will therefore cause said principal lines to be extended as rapidly as practicable.

### EXTERIORS OR TOWNSHIP LINES.

The east and west boundaries of townships are always to be run from south to north on a true meridian line; and the north and south bounda-

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ries are to be run from east to west, or from west to east (according to the location of the township to be surveyed with reference to prior surveys), on a *random* or trial line and corrected back on a true line. The distance north or south of the township corner to be closed upon, from the point of intersection of these random lines with the east or west boundary of the township, must be carefully measured and noted. Should it happen, however, that such random line should fall short, or overrun in length, or intersect the east or west boundary more than *three chains'* distance from the township corner thereon, as compared with the corresponding boundary on the south (due allowance being made for convergency), the line, and if necessary the entire exterior boundaries of the township, must be retraced, so as to discover and correct the error. In running random lines temporary corners are to be set at each 40 and 80 chains, and permanent corners established upon the true line as corrected back, in accordance with instructions, throwing the excess or deficiency on the west half mile, as prescribed by law. Permanent corners are to be established in accordance with instructions on the east and west township boundaries at the time they are run. Whenever practicable the township lines within these tracts of 24 miles square must be surveyed in regular order from *south to north*, i. e., the exterior boundaries of the township in any one range lying immediately north of the south boundary of such tract of 24 miles square must first be surveyed, and the exteriors of the other three townships in said range extended therefrom, in regular order from *south to north*, and it is preferable to first survey the entire range of townships in such tract adjoining the east boundary or adjoining the west boundary, and the other three ranges in regular sequence. In cases, however, where the character of the land is such that this rule cannot be complied with, the following will be observed.

In extending the *south* or *north* boundaries of a township to the *west*, where the *southwest* or *northwest* corners cannot be established in the regular way by running a north and south line, such boundaries will be run *west on a true line*, allowing for convergency on the west half mile; and from the township corner established at the end of such boundary, the west boundary will be run *north* or *south*, as the case may be. In extending *south* or *north* boundaries of a township to the *east*, where the *southeast* or *northeast* corner cannot be established in the regular way, the same rule will be observed, except that such boundaries will be run *east on a true line*, and the *east* boundary run *north* or *south*, as the case may be. One set of chainmen only is required in running township lines.

### METHOD OF SUBDIVIDING.

1. The first mile, both of the south and east boundaries of each township you are required to subdivide, is to be carefully traced and measured before you enter upon the subdivision thereof. This will enable you to observe any change that may have taken place in the magnetic variation, as it existed at the time of running the township lines, and will also enable you to compare your chaining with that upon the township lines.

2. Any discrepancy arising either from a change in the magnetic variation or a difference in measurement, is to be carefully noted in the field-notes.

3. After adjusting your compass to a variation which you have thus found will retrace the eastern boundary of the township, you will commence at the corner, to sections 35 and 36, on the south boundary, and

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run a line parallel to the range line, forty chains, to the quarter-section corner, which you are to establish between sections 35 and 36; continuing on said course forty chains farther, you will establish the corner to sections 25, 26, 35, and 36.

4. From the section corner last named run a *random* line, without blazing, *due east*, for the corner of sections 25 and 36, on east boundary, and at forty chains from the starting point set a post for *temporary* quarter-section corner. If you intersect exactly at the corner, you will blaze your random line back, and establish it as the *true* line; but if your random line intersects the said east boundary, either north or south of said corner, you will measure the distance of such intersection, from which you will calculate a course that will run a *true* line back to the corner from which your random started. You will establish the permanent quarter-section corner at a point equidistant from the two terminations of the *true* line.

5. From the corner of sections 25, 26, 35, and 36, run due north between sections 25 and 26, setting the quarter-section post as before, at forty chains, and at eighty chains establishing the corner of sections 23, 24, 25, and 26. Then run a random *due east* for the corner of sections 24 and 25 on east boundary; setting temporary quarter-section post at forty chains; correcting back, and establishing *permanent* quarter-section corner at the equidistant point on the *true* line, in the manner directed on the line between sections 25 and 36.

6. In this manner you will proceed with the survey of each successive section in the first tier, until you arrive at the north boundary of the township, which you will reach in running up a random line between sections 1 and 2. If this random line should not intersect at the corner established for sections 1, 2, 35, and 36, upon the township line, you will note the distance that you fall east or west of the same, from which distance you will calculate a course that will run a true line south to the corner from which your random started. If the north boundary of a township is a base or standard line, the line between sections 1 and 2 is to be run north as a *true* line, and the closing corner established at the point of intersection with such base or standard line; and in such case the distance from said closing corner to the nearest section or quarter-

section corner on such base or standard line must be carefully measured and noted as a *connection line*.

7. In like manner proceed with the survey of each successive tier of sections, until you arrive at the fifth tier; and from each section corner which you establish upon this tier you are to run random lines to the corresponding corners established upon the range line forming the western boundary of the township; setting, as you proceed, each *temporary* quarter-section corner at forty chains from the interior section corner, so as to throw the excess or deficiency of measurement on the extreme tier of quarter sections contiguous to the township boundary; and on returning establish the *true* line, and establish thereon the *permanent* quarter-section corner.

8. It is not required that the deputy shall complete the survey of the first tier of sections from south to north, before commenting the survey of the second or any subsequent tier, but the corner on which the random line closes must have been previously established by running the line north on which it is established, except as follows: Where it is impracticable to establish such section corner in the regular manner it may be established by running the east and west line *east* or *west*, as the case may be, on a *true line*, setting the quarter-section corner at 40 chains and the section corner at 80 chains.

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9. Quarter-section corners, both upon north and south and upon east and west lines, are to be established at a point *equidistant* from the corresponding section corners, except upon the lines closing on the north and west boundaries of the township, and in those situations the quarter-section corners will always be established at precisely *forty chains* to the north or west (as the case may be) of the respective section corners from which those lines respectively *start*, by which procedure the excess or deficiency in the measurements will be thrown, according to law, on the extreme tier of quarter-sections.

#### PRESCRIBED LIMITS FOR CLOSINGS AND LENGTH OF LINES IN CERTAIN CASES.

1. Every north-and-south section line, except those terminating in the north boundary of the township, must be *eighty chains* in length.

2. The east-and-west *section lines*, except those terminating in the west boundary of the township, are to be within *eighty links* of the actual distance established on the south boundary line of the township for the width of said tier of sections, and must close within eighty links north or south of the section corner.

3. The north boundary and south boundary of any one section, except in the extreme western tier, are to be within *eighty links* of equal length.

4. The meanders within each fractional section, or between any two meander posts, or of an island in the interior of a section, must close within one chain and fifty links.

5. In running *random* township exteriors, if such random lines fall short or overrun in length, or intersect the eastern or western boundary, as the case may be, of the township, at more than *three chains* north or south of the true corner, the

lines must be retraced, even if found necessary to remeasure the meridional boundaries of the township. One set of chainmen, only, is required in subdividing.

#### SUBDIVISION OF SECTIONS.

Under the provisions of the act of Congress approved February 11, 1805, the course to be pursued in the subdivision of sections is to run straight lines from the established quarter-section corners—United States surveys—to the opposite corresponding corners, and the point of intersection of the lines so run will be the corner common to the several quarter-sections, or, in other words, the legal center of the section.

In the subdivision of fractional quarter sections where no opposite corresponding sections have been or can be fixed, the subdivision lines should be ascertained by running from the established corners due north, south, east, or west lines, as the case may be, to the water-course, Indian boundary line, or other external boundary of such fractional section.

The law presupposes the section lines surveyed and marked in the field by the United States deputy surveyors to be due north and south or east and west lines, but in actual experience this is not always the case; hence, in order to carry out the spirit of the law, it will be necessary, in running the subdivisional lines through fractional sections, to adopt mean courses where the section lines are not due lines, or to run the subdivision line parallel to the section line when there is no opposite section line.

Upon the lines closing on the north and west boundaries of a township, the quarter-section corners are established by the United States deputy surveyors at precisely forty chains to the north or west of the

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last interior section corners, and the excess or deficiency in the measurement is thrown on the outer tier of lots, as per act of Congress approved May 10, 1800.

In the subdivision of quarter-sections the quarter-quarter corners are to be placed at points equidistant between the section and quarter-section corners and between the quarter corners and the common center of the section, *except* on the last half mile of the lines closing on the north or west boundaries of a township, where they should be placed at twenty chains, proportionate measurement, to the north or west of the quarter-section corner.

The subdivisional lines of fractional quarter sections should be run from points on the section lines intermediate between the section and quarter-section corners due north, south, east, or west, to the lake, water-course, or reservation which renders such tracts fractional.

When there are double sets of section corners on township and range lines, the quarter corners for the sections south of the township lines and east of the range lines are not established in the field by the United States surveyors, but in subdividing such sections said quarter corners should be so placed as to suit the *calculations of the areas of the quarter-sections adjoining the township boundaries* as expressed upon the official plat, adopting proportionate measurements were the present measurements of the north or west boundaries of the sections differ from the original measurements.

## RE-ESTABLISHMENT OF LOST CORNERS.

The original corners, when they can be found, must stand as the true corners they were intended to represent, even though not exactly where the restrict professional care might have placed them in the first instance.

Missing corners should be re-established in the identical localities they originally occupied. When the point cannot be determined by the existing landmarks in the field, resort must be had to the field notes of the original survey. The law provides that the lengths of the lines as stated in the field notes shall be considered as the true lengths thereof, and the distances between corners set down in the field notes constitute proper data from which to determine the true locality of a missing corner; hence the rule that all such should be restored at distances proportionate to the original measurements between existing original corners. That is, if the measurement between two existing corners differs from that stated in the field notes, the excess or deficiency should be distributed proportionately among the intervening section lines between the said existing corners standing in their original places. Missing corners on standard, township, and range lines should be restored by proportionate measurement between the nearest existing original corners on those lines. Missing section corners in the interior of townships should be re-established at proportionate distances between the nearest existing original corners *north* and *south* of the missing corners.

As has been observed, no existing original corner can be disturbed, and it will be plain that any excess or deficiency in measurements between existing corners cannot in any degree affect the distances beyond said existing corners, but must be added or subtracted proportionately to or from the intervals embraced between the corners which are still standing.

## RETRACING TOWNSHIP LINES.

If, in subdividing a township, it is found that the exterior boundaries have been improperly run, measured, or marked, or the corners estab-

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lished thereon have been obliterated, the deputy will resurvey so much of said exterior boundaries as may be necessary, and establish new corners upon same wherever necessary. Where no subdivisions have been made on either side of a township boundary, it will be corrected, if necessary, in point of alignment as well as measurement, by establishing the section corners at lawful distances from the south or east boundaries of the township (as the case may be), and upon a right line extending between the township corners; and in such case, the old corners on said township boundaries will be destroyed.

Where subdivisional lines have been closed upon a township boundary in advance of the preliminary survey of the same, its alignment will not be changed. If it is found necessary to establish new corners on such boundary they will receive only the marks referring to the sections in the township being subdivided, and the marks on the old corners on such boundary, which refer to such sections, will be obliterated.

In all cases such necessary corrections will be made as will place the section corners at the aforesaid lawful distances from the south or east boundary, in order that a legal subdivision of the township may be made, and where new corners are thus necessarily established, the distance, be it one hundred links or more, and direction between new and old corners must be carefully noted.

New corners on township boundaries must be established by a survey of such lines, and in *no case* will such corners be established from *data* acquired in running lines closing on such boundaries. One set of chainmen, only, is required in retracing township lines.

If, in the subdivision of part of a township, the lands to be surveyed cannot be reached by lines extending from the south boundary of the township, a line corresponding to the south boundary of the same shall be extended from some section corner on the east boundary of the township to the west boundary thereof, in order that it may constitute the south boundary of the surveyable area; from which subdivisional meridian lines will be projected northward, and the surveys carried forward in the same manner as for the subdivision of a full township, in order that regular and fractional areas shall occupy their true and legal positions.

Fragmentary portions of surveyable lands lying south of the provisional base last described may be included in the survey by extending lines *south* from the same in harmony with the general system.

When the proper point for the establishment of a section corner is inaccessible, and a witness monument can be erected upon each of the two lines which approach the same at distances not exceeding twenty chains therefrom, the quarter-sections depending thereon will be disposed of in the same manner as if the corner had been regularly established.

The witness monument must be marked as conspicuously as a section corner, and bearing trees used wherever possible.

The deputy will be required to furnish good evidence that the section corner is actually inaccessible.

When township or subdivision lines intersect the boundaries of confirmed private land claims, the latter must be retraced so far as may be necessary to establish the corners to the fractional sections at their proper places, and such corners must be established, in all respects, like meander corners, except that instead of the letters "M. C." the letters used to designate such private land claim must be marked on corners. In retracing the boundary of such claim the deputy must set stakes thereon, at each forty chains, where the ground is level, and on broken

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ground, at every spur, ridge, or other prominent point, and also at each angle formed by a change in the direction of such boundary.

## FIELD NOTES.

The deputy surveyor will provide himself with proper blank books for his field notes, or same will be furnished to him by the surveyor general, and in such books he must make a faithful, distinct, and minute record of everything officially done and observed by himself and his assistants, pursuant to

instructions, in relation to running, measuring and marking lines, establishing corners, &c., and present, as far as possible, a full and complete topographical description of the country surveyed.

From the *data* thus recorded at the time when the work is done on the ground, the deputy must prepare *true* field notes of the surveys executed by him, in the manner hereinafter prescribed, and return same to the surveyor general, together with the required sketches, at the earliest practicable date after the completion of his work in the field.

The field notes of the survey of base, meridian, standard, exterior, and subdivision lines are each to be written in separate books.

The first, or title, page of the field-note book is to describe the subject-matter of the same, the locus of the survey, by whom surveyed, date of contract, and the dates of commencement and completion of the work. The second page is to contain the names and duties of the assistants, and the index is to be placed on same or following page. Whenever a new assistant is employed, or the duties of any one of them changed, such facts are to be stated in an appropriate entry immediately preceding the notes taken under such changed arrangements.

The exhibition of every mile of surveying, whether on township or subdivisional lines, and of meanders in each section, must be *complete in itself*, and be separated by a black line drawn across the paper.

The variation of the needle must always occupy a *separate line* preceding the notes of measurements on line.

The description of the surface, soil, minerals, timber, undergrowth, &c., on *each mile* of line, is to follow the notes of survey of such line, and not be mixed up with them.

The date of each day's work must follow immediately after the notes thereof.

No abbreviations of words are allowable, except of such words as are constantly occurring, such as "*sec.*" for "*section*"; "*in. diam.*" for "*inches diameter*"; "*chs.*" for "*chains*"; "*lks.*" for "*links*"; "*dist.*" for "*distant*"; "*1/4 sec. cor.*" for "*quarter-section corner*"; "*va.*" for "*variation*," &c.; for 14 inches long, 12 inches wide, and 3 inches thick, in describing a corner stone, use 14 x 12 x 3, being particular to always observe the same order of length, width, and thickness. Proper names must never be abbreviated, however often their recurrence.

When the lines of survey cross hills or ravines, the height or depth of same, in feet, must be noted as nearly as practicable.

The corners established in previous surveys, from which the lines start, or upon which they close, must be fully described in the field notes. A full description of such corners will in all cases be furnished the deputy from the surveyor general's office at the date authority is given for commencing work.

In all cases where a corner is re-established the field notes must describe fully the manner in which it is done.

Field notes of the survey of base, standard, and meridian lines must describe all corners established thereon, how established, the crossings

timber, minerals, &c.; and after the description of each township corner established in running such lines, the deputy will note particularly in the "general description" the townships on each side of the lines run.

Field notes of the survey of exterior boundaries of townships must describe the corners and topography, as above required, and the "general description" at the end of such notes must describe the townships as fully as may be, and also state whether or not they should be subdivided. The topography on the *true line* of exterior boundaries must be given, and not that on the random line.

Field notes of the subdivisional survey of townships must describe the corners and topography as above required, and the "general description" at the end of such notes must state minutely the character of the land, soil, timber, &c., found in such townships.

A blank line must be left at the bottom of each page of the field notes, and the notes must be written in a plain, legible hand, and in clear and precise language, so that the figures, letters, words, and meaning will always be unmistakable, and erasures and interlineations avoided, as far as possible.

With the notes of the survey of principal lines forming a tract of 24 miles square the deputy will submit a plat of the lines run, on a scale of one-half inch to the mile, and with the notes of survey of the exterior lines of townships, a plat of the lines run, on the scale of two inches to the mile, on which are to be noted all the objects of topography on line necessary to illustrate the notes, viz, the distance on line at the crossings of streams, so far as such can be noted on the paper, and the direction of each by an arrow head pointing down stream; also the intersection of line by prairies, marshes, swamps, ravines, ponds, lakes, hills, mountains, and all other matters indicated by the notes, to the fullest extent practicable.

With the instructions for making subdivisional surveys of townships into sections, the deputy will be furnished by the surveyor general with a diagram of the *exterior* lines previously established of the townships to be subdivided (on the above-named scale), upon which are carefully to be laid down the measurements of each of the lines on such boundaries whereon he is to close, and the magnetic variation of each mile. And on such diagram the deputy who subdivides will make appropriate sketches of the various objects of topography as they occur on his lines, so as to exhibit not only the points on line at which the same occur, but also the direction and position of each between the lines, or within each section, as far as practicable, so that every object of topography may be properly completed or connected in the showing.

#### SUMMARY OF OBJECTS AND DATA REQUIRED TO BE NOTED.

1. The precise length of every line run, noting all necessary offsets therefrom, with the reason and mode thereof.
2. The kind and diameter of all "*bearing trees*," with the course and distance of the same from their respective corners; and the precise relative position of WITNESS CORNERS to the *true corners*.
3. The kind of materials of which corners are constructed.
4. *Trees on line*. The name, diameter, and distance on line to all trees which it intersects.
5. Intersections by line of *land objects*. The distance at



which the line first intersects and then leaves every *settler's claim and improvement*; prairie, river, creek, or other "bottom"; or swamp, marsh, grove, and

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wind fall, with the course of the same at both points of intersection; also the distances at which you begin to ascend, arrive at the top, begin to descend, and reach the foot of all remarkable hills and ridges, with their courses, and *estimated* height, in feet, above the level land of the surrounding country, or above the bottom lands, ravines, or waters near which they are situated.

6. Intersections by line of *water objects*. All rivers, creeks, and smaller streams of water which the line crosses; the distances on line at the points of intersection, and their *widths on line*. In cases of *navigable* streams, their width will be ascertained between the *meander corners*, as set forth under the proper head.

7. The land's *surface*—whether level, rolling, broken, or hilly.

8. The *soil*—whether first, second, third, or fourth rate.

9. *Timber*—the several kinds of timber and undergrowth, in the order in which they predominate.

10. *Bottom lands*—to be described as wet or dry, and if subject to inundation, state to what depth.

11. *Springs of water*—whether fresh, saline, or mineral, with the course of the stream flowing from them.

12. *Lakes and ponds*—describing their banks and giving their height, and also depth of water, and whether it be pure or stagnant.

13. *Improvements*. Towns and villages; houses or cabins; fields, or other improvements; sugar-tree groves, sugar camps, mill seats, forges, and factories.

14. *Coal banks or beds*; *peat* or turf grounds; *minerals* and ores; with particular description of the same as to quality and extent, and all *diggings* therefor; also *salt* springs and licks. All reliable information you can obtain respecting these objects, whether they be on your immediate line or not, is to appear on the general description to be given at the end of the notes.

15. *Roads and trails*, with their directions, whence and whither.

16. Rapids, cataracts, cascades, or falls of water, with the estimated height of their fall in feet.

17. Precipices, caves, sink holes, ravines, stone quarries, ledges of rocks, with the kind of stone they afford.

18. *Natural curiosities*, interesting fossils, petrifications, organic remains, &c.; also all ancient works of art, such as mounds, fortifications, embankments, ditches, or objects of like nature.

19. The *variation* of the needle must be noted at all points or places on the lines where there is found any material *change* of variation, and the position of such points must be perfectly identified in the notes.

20. Besides the ordinary notes taken on line (and which must always be written down on the spot, leaving nothing to be supplied by memory), the deputy will subjoin, at the conclusion of his book, such further description or information touching any matter or thing connected with the township (or other survey) which he may be able to afford, and may deem

useful or necessary to be known—with a *general description* of the township in the *aggregate*, as respects the face of the country, its soil and geological features, timber, minerals, waters, &c.

Following the "general descripton" of the township is to be "A list of the names of the individuals employed to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of township No. \_\_\_\_\_ of the BASE LINE of range No. \_\_\_\_\_ of the \_\_\_\_\_ MERIDIAN, showing the respective capacities in which they acted."

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## AFFIDAVITS TO FIELD NOTES.

The following are the forms of official oaths to be taken by deputy surveyors and their assistants. The original oaths are to be affixed to the *true* field notes returned to the surveyor-general by the deputy surveyor; the preliminary oaths being placed immediately after the index of the first book, and the final oaths at the end of the last book of field notes of the surveys to which they refer:

### PRELIMINARY OATHS OF ASSISTANTS.

I, \_\_\_\_\_, do solemnly swear that I will well and truly perform the duties of compassman, according to instructions given me, and to the best of my skill and ability, in the survey of the \_\_\_\_\_.

\_\_\_\_\_, *Compassman.*

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

We, \_\_\_\_\_ and \_\_\_\_\_, do solemnly swear that we will well and faithfully execute the duties of chain carriers; that we will level the chain upon even and uneven ground and plumb the tally pins, either by sticking or dropping the same; that we will report the true distance to all notable objects, and the true length of all lines that we assist in measuring, to the best of our skill and ability, and in accordance with instructions given us, in the survey of the \_\_\_\_\_.

\_\_\_\_\_, *Chainman.*

\_\_\_\_\_, *Chainman.*

\_\_\_\_\_, *Chainman.*

\_\_\_\_\_, *Chainman.*

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

We, \_\_\_\_\_ and \_\_\_\_\_, do solemnly swear that we will well and truly perform the duties of axemen, in the establishment of corners and other duties, according to instructions given us, and to the best of our skill and ability, in the survey of \_\_\_\_\_.

\_\_\_\_\_, *Axeman.*

\_\_\_\_\_, *Axeman.*



Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

**FINAL OATHS FOR SURVEYS.**

**List of names.**

A list of the names of the individuals employed by \_\_\_\_\_, United States deputy surveyor, to assist in running, measuring, and marking the lines and corners described in the foregoing field notes of the survey of \_\_\_\_\_, showing the respective capacities in which they acted.

- \_\_\_\_\_, *Compassman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Axeman.*
- \_\_\_\_\_, *Axeman.*
- \_\_\_\_\_, *Flagman.*

**FINAL OATHS OF ASSISTANTS.**

We hereby certify that we assisted \_\_\_\_\_, United States deputy surveyor, in surveying all those parts or portions of the \_\_\_\_\_ of the \_\_\_\_\_ base and \_\_\_\_\_ meridian, \_\_\_\_\_ of \_\_\_\_\_, as are represented in the foregoing field notes as having been surveyed by him and under his direction; and that said survey has been in all respects, to the best of our knowledge and belief, well and faithfully surveyed, and

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the corner monuments established according to the instructions furnished by the United States surveyor-general for \_\_\_\_\_.

- \_\_\_\_\_, *Compassman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Chainman.*
- \_\_\_\_\_, *Axeman.*
- \_\_\_\_\_, *Axeman.*
- \_\_\_\_\_, *Flagman.*

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

**FINAL OATH OF UNITED STATES DEPUTY SURVEYOR.**

I, \_\_\_\_\_, United States deputy surveyor, do solemnly swear that in pursuance of instructions received from \_\_\_\_\_, United States surveyor general for \_\_\_\_\_, bearing date of the \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_, I have well, faithfully, and truly, in my own proper person, and

in strict conformity with the instructions furnished by the United States, surveyed all those parts or portions of \_\_\_\_\_ of the \_\_\_\_\_ base and \_\_\_\_\_ meridian in the \_\_\_\_\_ of \_\_\_\_\_, as are represented in the foregoing field notes as having been surveyed by me and under my directions; and I do further solemnly swear that all the corners of said survey have been established and perpetuated in strict accordance with the surveying manual, printed instructions, the special written instructions of the United States surveyor general for \_\_\_\_\_, and in the specific manner described in the field notes, and that the foregoing are the *true* field notes of such survey; and, should any fraud be detected, I will suffer the penalty of perjury, under the provisions of an act of Congress, approved August 8, 1816.

\_\_\_\_\_,  
*United States Deputy Surveyor.*

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_, 18\_\_\_\_.

The final oath of the deputy surveyor must, in all cases, be taken before some officer duly authorized to administer oaths. It is preferable that all oaths—both preliminary and final—of assistants should also be taken before such officer. In cases, however, where great delay or inconvenience would result from a strict compliance with this rule, the deputy surveyor is authorized to administer the necessary oaths to his assistants, but in each case where this is done he must submit a full written report to the proper surveyor general of the circumstances of such case.

To enable the deputy surveyor to fully understand and appreciate the responsibility under which he is acting, his attention is invited to the provisions of the second section of the act of Congress, approved August 8, 1846, entitled "An act to equalize the compensation of the surveyors-general of the public lands of the United States, and for other purposes," and which is as follows:

"SEC. 2. That the surveyors-general of the public lands of the United States, in addition to the oath now authorized by law to be administered to deputies on their appointment to office, shall require each of their deputies, on the return of his surveys, to take and subscribe an oath or affirmation that those surveys have been faithfully and correctly executed according to law and the instructions of the surveyor-general; and on satisfactory evidence being presented to any court of competent jurisdiction that such surveys, or any part thereof, had not been thus executed, the deputy making such false oath or affirmation shall be deemed guilty of perjury, and shall suffer all the pains and penalties attached to that offense; and the district attorney of the United States for the time being, in whose district any such false, erroneous, or fraudulent surveys shall have been executed, shall, upon the application of the proper surveyor-general, immediately institute suit upon the bond of such deputy; and the institution of such suit shall act as a lien upon any property owned or held

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## SPECIMEN FIELD NOTES AND PLATS.

Diagram A illustrates the method of laying off tracts of land 24 miles square, as nearly as practicable, by the survey of principal lines, and the survey of exteriors or township lines within such tracts, north of the base line and east of the principal meridian. The same general principles will apply equally to the survey of such tracts differently located with reference to the initial point. The topography noted on said diagram is on those portions of the lines of surveys for which specimen field notes are given.

Diagram B illustrates the method of laying off a township into sections and quarter sections. In the subdivision of townships lying *south* of and *contiguous* to the base line, or to any standard parallel, the lines between the northern tier of sections will be run north as *true* lines; quarter-section corners will be established at 40 chains, closing section corners will be established at the points of intersection of such lines with the base or standard lines (as the case may be), and the *course* and *distance* from such corners to the nearest corner upon the line closed upon are to be accurately ascertained and set down in the field notes.

Diagram C illustrates the mode of establishing stone, post, and mound corners for townships, sections, and quarter sections.

Specimen field notes Nos. 1, 2, 3, 4, and 5 illustrate, respectively, the mode and order of surveying standard lines, meridian lines, exteriors or township lines, resurveying exteriors or township lines, and subdividing a township into sections and quarter sections. The attention of the deputy is particularly directed to these specimens, as indicating only the method in which his work is to be conducted, but also the order, manner, language, &c., in which his field notes are required to be returned to the surveyor general's office; and such specimens are to be deemed part of these instructions, and any *departure* from their details, without special authority, in cases where the circumstances are analogous in practice, *will be regarded as a violation of his contract and oath.*

The subdivisions of fractional sections into 40-acre lots (as near as may be) are to be so laid down on the official township plat in dotted black lines as to admit of giving to each a specific designation, if possible, according to its relative position in the fractional section, as per examples afforded by Diagram B, as well as by a number, in all cases where the lot cannot properly be designated as a quarter-quarter. Those fractional subdivision lots which are not susceptible of being described according to relative local position, are to be numbered in regular series; those bordering on the north boundary of a township to be numbered progressively from east to west, and those bordering on the west boundary of a township to be numbered progressively from north to south, in each section. As section 6 borders on both the north and west boundaries of the township, the fractional lots in same will be numbered as follows: Commencing with No. 1 in the northeast, thence progressively west to No. 4 in the northwest, and south to No. 7 in the southwest corner of the section.

In numbering fractional lots, other than those above specified (wherever practicable and as a general rule), the series should commence with

No. 1 in the northeastern or the most easterly fractional lot, and continue from east to west, and west to east, alternately, to the end of the series, as shown in Diagram B; but such general rule is departed from under circumstances given as examples in said diagram.

Interior lots are to be, as nearly as possible, 20 chains long by 20 chains wide; and the excess or deficiency of measurement is always to be thrown on the lots bordering on the northern and western boundaries of the township, or those made fractional by meander lines.

The official township plat to be returned to the General Land Office is to show on its face, on the right-hand margin, the meanders of navigable streams, islands, and lakes. Such details are wanted in the adjustment of the surveying accounts, but may be omitted in the copy of the township plat to be furnished to the district land office by the surveyor general. A suitable margin for *binding* is to be preserved on the left-hand side of each plat. Each plat is to be certified, with table annexed, according to the forms subjoined to "Diagram B," and is to show the areas of public land, of private surveys, and of water, with the aggregate area as shown on the diagram.

Each township plat is to be prepared in *triplicate*: one for the General Land Office, one for the United States district land office, and the third to be retained as the record in the office of the surveyor general.

The plat for the local land office must not be forwarded until notice is received by the surveyor-general from the Commissioner of the General Land Office that the survey represented on said plat has been approved.

The plats must be prepared as nearly as possible in accordance with the specimen plat designated as "Diagram B." The use of all fluids, except a preparation of India ink of good quality, must be avoided by the draughtsman in delineations relating to the public surveys. All lines, figures, &c., must be sharply defined. All lettering on the plats must be clear and sharp in outline and design, and ornamentation of any kind is prohibited. These requirements are necessary in order that everything shown upon original plats may be fairly reproduced in making photolithographic copies of the same.

All towns, settlements, permanent buildings, private claims, reservations, water courses, ditches, lakes, islands, mountains, buttes, canons, roads, railroads, telegraph lines, canals, &c., will be shown upon the plats and designated by proper names where such are known.

The mean magnetic declinations determined at the date of the survey of the exterior and subdivisional lines will be entered upon each plat in the manner shown in Diagram B. This will be ascertained by taking the mean of the greatest and least magnetic declination found at the dates of surveys, excluding such changes as are clearly attributable to local attraction.

All plats are to be drawn to a uniform scale of 40 chains to 1 inch, United States standard.

Surveyors general will require that the specimen plat shall be closely followed in order that uniformity of appearance and expression of drawings representing the public land surveys may be attained.

The true field books, each bearing the *written approval* of

the surveyor-general, are to be substantially bound into volumes of suitable size, and retained in the surveyor-general's office, and certified *transcripts* of such field books (to be of *foolscap* size) are to be prepared and forwarded, from time to time, to the General Land Office.

All transcripts of surveys must be written in a bold, legible hand, with durable black ink, and such transcripts of any series of surveys

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included in one account forwarded to the General Land Office must be firmly fastened together at the surveyor-general's office prior to transmittal.

With the copy of each township plat furnished to a district land office, the surveyor-general is required by law to furnish *descriptive notes* as to the character and quality of the soil and timber found on and in the vicinity of each surveyed line, and giving a description of each corner.

Printed blank forms for such notes will be furnished by the General Land Office. The forms provide eighteen spaces for *meander corners*, which, in most cases, will be sufficient; but when the number shall exceed eighteen, the residue will have to be inserted on the face of the township plat, to be furnished to the register of the district land office, or on a supplemental blank form.

There is shown a series of meander corners on Diagram B, viz, from No. 1 to No. 12 on the river and island, and No. 1 to No. 5 on Lin's Lake.

### THE MAGNETIC DECLINATION OR VARIATION OF THE NEEDLE.

The magnetic declination at any place is the angle which the compass needle, when it is correctly constructed and freely suspended, makes with the true meridian. The true meridian is fixed, but the declination varies because the direction in which the needle points is in a continuous state of change. Therefore, whenever a measure of the declination of the needle is taken, the exact time (year, day of month, and hour of the observations) should be recorded, as well as the geographical position of the place, or its latitude and longitude expressed to the nearest minutes of arc.

The declination is called "West" when the north end of the needle points to the west of the true meridian, and it is called "East" when the north end of the needle points east of the true meridian. In order to give an idea of the amount of the declination at present observable within the limits of the United States we instance the following places at or near which it reaches extreme value, which are given to the nearest whole degree.

At Eastport, Me., the declination is 18° west.

At the mouth of the Rio Grande, Texas, 8° east.

At San Diego, Cal., 14° east.

At Sitka, Alaska, 29° east.

At Fort Yukon, Alaska, 36° east.

The accuracy with which the declination may be determined depends chiefly upon the instrumental means, but also, and in a great measure, upon the care taken in the use of the instruments and the selection of the proper methods and times for observing.

The instruments ordinarily at the disposal of the surveyor are sufficiently described, but for a description and illustration of more refined ones, as used by scientists, we refer to the instructions for magnetical observations published as Appendix No. 16, Coast Survey Report for 1875.

Omitting any detailed notice of the irregular variations to which the magnetic needle is subject, it becomes important for the purposes of the surveyor to refer particularly to the changes which have a special bearing upon his observations. These are the *daily variation* and the *secular variation*.

*The daily variation.*—It has been found that at about the time of sunrise the north end of the needle has a slow motion towards the east which soon ceases. The needle is then said to be at its eastern elongation; its

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north end then begins a retrograde motion towards the west, and at about one o'clock in the afternoon reaches the point at which it is said to be at its western elongation, after which it again turns back towards the east.

The times at which the needle reaches its eastern and western elongations vary with the seasons of the year (with the sun's declination), happening a little earlier in summer than in winter.

The angular range between the eastern and western elongations varies also with the seasons of the year.

The average position of the needle for the day is called the *mean magnetic meridian*.

At about six o'clock in the evening (and for about an hour before and after), throughout the year, the position of the needle coincides very nearly with the mean magnetic meridian, and this, therefore, is the time most favorable for making observations to obtain at once the mean declination.

For reducing the direction of the needle observed at other hours to the mean magnetic meridian the following table is furnished. It gives to the nearest minute the variations of the needle from its average position during the day, for each hour in the day for the four seasons of the year.

*Table for reducing the observed declination to the mean declination of the day.*

	The needle points east of the mean magnetic meridian.						The needle points west of the mean magnetic meridian.						
	A.M.	A.M.	A.M.	A.M.	A.M.	A.M.	Noon.	P.M.	P.M.	P.M.	P.M.	P.M.	
Hour	6	7	8	9	10	11	Noon.	1	2	3	4	5	6
Spring	3	4	4	3	1	1	4	5	5	4	3	2	1
Summer	4	5	5	4	1	2	4	6	5	4	3	2	1
Autumn	2	3	3	2	0	2	3	4	3	2	1	1	0
Winter	1	1	2	2	1	0	2	3	3	2	1	1	0

*The secular variation* of the magnetic declination is a subject of the greatest importance to surveyors. It manifests itself by a gradual change in one direction, which at first increases slowly, then more rapidly, diminishing again afterward until the needle becomes stationary and subsequently returns by similar changes to its former position, the whole period extending over nearly two and a half centuries. Thus it

will be seen by a table given below that at Philadelphia the declination was  $8\frac{3}{4}^{\circ}$  west in 1700, whence it diminished until in 1800 it reached a minimum  $2^{\circ}.1$  ( $2^{\circ}6'$ ), and will increase again to  $6^{\circ}.8$  in 1880. At present all along the Atlantic and Gulf coasts the effect of the secular variation is to *increase west declinations* or to *decrease east declinations* by from  $2'$  to  $5'$ , but on the Pacific coast the effect is opposite in direction, viz, *increasing east declinations* by from  $1'$  to  $3'$ .

In Alaska, however, we have indications of a decrease of east declinations.

The following table of computed declinations at various places, taken from the Coast Survey Report for 1874, exhibits the effect of the secular variation for a number of places, and will be found especially useful where old lines have to be retraced.

The table should not be extended in time either way without the support of additional observations.

[Pages 51 and 52 are deleted. They contain a "Table of Decimal Values of the Magnetic Declination."]

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It will be observed that the amount of change is by no means the same even in places not far remote from each other, as New York and Philadelphia.

In grouping together a table of the present rate of change much allowance must therefore be made for possible local peculiarities that have not been ascertained.

The following statement of the present (1878) annual change in the magnetic declination, due to the secular variation, may serve to give a general idea of the *approximate* amount of change along our immediate sea-coast. For the interior States the information is very scanty, and therefore less trustworthy, or altogether wanting.

The annual change is expressed in minutes of arc, a + sign indicating increase of westerly or decrease of easterly declination.

Locality.	Annual change.
Maine, coast of .....	+2
Maine, interior .....	+3
New Hampshire .....	+3½
Vermont .....	+5½
Massachusetts, eastern part .....	+2¾
Massachusetts, western part .....	+3 to 4
Rhode Island and Connecticut .....	+3¼
New York, Long Island .....	+3
New York, northern and western part .....	+4½
New Jersey .....	+3
Pennsylvania .....	+3¾
Ohio .....	+2½
Tennessee, eastern part .....	+2½
Tennessee, western part .....	+2
Missouri .....	+2
Delaware, Maryland, and Virginia .....	+3
West Virginia .....	+3½
North Carolina, South Carolina, and Georgia .....	+3½
Florida, northern part .....	+3½
Florida, southern part .....	+3
Alabama and Mississippi, Gulf coast of .....	+3
Louisiana, eastern part .....	+2½

Louisiana, western coast .....	+2
Texas, coast of .....	+1
Texas, southwestern part .....	+0 (probably.)
New Mexico and Southwestern Arizona .....	+0 (probably.)
California, coast of .....	-1½
Oregon, coast of .....	-2 to 2½
Washington Territory, coast of .....	-2½ to 3

The negative sign indicates an increase of easterly direction.

### METHOD OF ASCERTAINING THE TRUE MERIDIAN AND THEREBY THE MAGNETIC DECLINATION OR VARIATION OF THE COMPASS.

The following chapter, on the subject of the declination of the magnetic needle, is extracted from the revised edition of the work on surveying by Dr. Charles Davies, a graduate of the Military Academy at West Point. The work itself will be a valuable acquisition to the deputy surveyor, and his attention is particularly invited to the following chapter, which sets forth the usual easy modes by which the true meridian and magnetic declination may be approximately ascertained; his attention is also called to more complete statements on the subject given in the work "A treatise on land-surveying, &c.," by Dr. W. M. Gillespie, professor of engineering, Union College, in chapter treating of the declination of the magnetic needle. For more refined methods, he may consult Coast Survey Report for 1875, Appendix No. 16.

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### METHOD OF ASCERTAINING THE TRUE MERIDIAN.

The best practical method of determining the true meridian of a place is by observing the north star. If this star were precisely at the point in which the axis of the earth, prolonged, pierces the heavens, then the intersection of the vertical plane passing through it and the place, with the surface of the earth, would be the true meridian. But the star being at a distance from the pole equal to  $1^{\circ}30'$  nearly, it performs a revolution about the pole in a circle, the polar distance of which is  $1^{\circ}30'$ ; the time of revolution is 23 hours and 56 minutes.

To the eye of an observer this star is continually in motion, and is due north but twice in 23 hours and 56 minutes; and is then said to be on the meridian. Now, when it departs from the meridian, it apparently moves east or west for 5 hours and 59 minutes, and then returns to the meridian again.

When at its greatest distance from the meridian, east or west, it is said to be at its *eastern or western elongation*.

The following tables show the times of its eastern and western elongations:

*Time of elongation of Polaris (a Ursa Min.), April 1, 1883, to April 1, 1884, computed for north latitude  $38^{\circ}$ , and which will serve for all latitudes from  $26^{\circ}$  to  $50^{\circ}$  north, and for all dates from April, 1878, to April, 1888, with an error of less than five minutes.*

[The times are reckoned from noon (astronomical time).]

EASTERN ELONGATIONS.

Day.	April.	May.	June.	July.	August.	September.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1.....	18 37	16 39	14 37	12 39	10 37	8 36
7.....	18 14	16 16	14 14	12 16	10 14	8 12
13.....	17 50	15 52	13 50	11 52	9 50	7 48
19.....	17 26	15 28	13 26	11 29	9 27	7 25
25.....	17 03	15 05	13 03	11 05	9 03	7 01

WESTERN ELONGATIONS.

Day.	October.	November.	December.	January.	February.	March.
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.
1.....	18 27	16 25	14 28	12 26	10 24	8 30
7.....	18 04	16 02	14 04	12 02	10 00	8 06
13.....	17 40	15 38	13 40	11 39	9 37	7 43
19.....	17 17	15 15	13 17	11 15	9 13	7 19
25.....	16 53	14 51	12 53	10 51	8 49	6 55

The eastern elongations are put down from the beginning of April to the end of September, and the western from the beginning of October to the end of March. The time is computed from noon. The western elongations in the first case, and the eastern in the second, occurring in the day-time, cannot be used. Some of those put down are also invisible, occurring in the evening before it is dark, or after daylight in the morning.

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In such case, if it be necessary to determine the meridian at that particular season of the year, let 5 hours 59 minutes be added to or subtracted from the time of greatest eastern or western elongation, and the observation be made at night when the star is on the meridian.

The following table exhibits the angle which the meridian plane makes with the vertical plane passing through the pole-star when at its greatest eastern or western elongation; such angle is called the *azimuth*.

The mean angle only is put down, being calculated for the first of July of each year.

*Azimuth of Polaris (a Ursa Min.) at elongation, 1878 to 1888.*

(Latitude 2°6 to 50° north.)

	26°	28°	30°	32°	34°	36°	38°	40°	42°	44°	46°	48°	50°
1878.....	1 29½	1 31¼	1 33	1 35	1 37¼	1 39½	1 42¼	1 45¼	1 48½	1 52	1 56	2 00½	2 05¼
1879.....	29¼	30¾	32¼	34½	36¾	39¼	41¾	44¾	48	51½	55½	2 00	04¾
1880.....	29	30½	32¼	34¼	36½	38¾	41½	44¼	47½	51	55	1 59½	04¼
1881.....	28½	30¼	32	33¾	36	38½	41	44	47	50¾	54½	59	03¾
1882.....	28¼	29¾	31½	33½	35¾	38	40½	43½	46¾	50¼	54¼	58½	03¼
1883.....	28	28½	31¼	33	35¼	37½	40¼	43q	46¼	49¼	53¼	58	02¾
1884.....	27½	29	30¾	32¾	35	37¼	39¾	42¾	45¾	49¼	53¼	57½	02¼
1885.....	27¼	28¾	30½	32¼	34½	36¾	39¾	42¼	45½	49	52¾	57	02
1886.....	26¾	28¼	30	32	34	36½	39	41¾	45	48½	52¼	56½	01½
1887.....	26½	28	29¾	31½	33¾	36	38½	41½	44½	48	51¾	56¼	01
1888.....	26	27¾	29¼	31¼	33¾	35¾	38¾	41	44	47½	51½	55¾	00½

TO FIND THE TRUE MERIDIAN WITH THE THEODOLITE.

Take a board, of about one foot square, paste white paper upon it, and perforate it through the center; the diameter of the hole being somewhat larger than the diameter of the telescope of the theodolite. Let this board be so fixed to a vertical staff as to slide up and down freely; and let a small piece of board, about three inches square, be nailed to the lower edge of it, for the purpose of holding a candle.

About twenty-five minutes before the time of the greatest eastern or western elongation of the pole-star, as shown by the tables of elongations, let the theodolite be placed at a convenient point and leveled. Let the board be placed about one foot in front of the theodolite, a lamp or candle placed on the shelf at its lower edge; and let the board be slipped up or down, until the pole-star can be seen through the hole. The light reflected from the paper will show the cross hairs in the telescope of the theodolite.

Then, let the vertical spider's line be brought exactly upon the pole-star, and if it is an eastern elongation that is to be observed, and the star has not yet reached the most easterly point, it will move from the line toward the east, and the reverse when the elongation is west.

At the time the star attains its greatest elongation, it will appear to coincide with the vertical spider's line for some time, and then leave it, in the direction contrary to its former motion.

As the star moves toward the point of greatest elongation, the telescope must be continually directed to it, by means of the tangent screw of the vernier plate; and when the star has attained its greatest elongation, great care should be taken that the instrument be not afterward moved.

Now, if it be not convenient to leave the instrument in its place until daylight, let a staff, with a candle or small lamp upon its upper extremity, be arranged at thirty or forty yards from the theodolite, and in the

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same vertical plane with the axis of the telescope. This is easily effected, by revolving the vertical limb about its horizontal axis without moving the vernier plate, and aligning the staff to coincide with the vertical hair. Then mark the



point directly under the theodolite; the line passing through this point and the staff, makes an angle with the true meridian equal to the azimuth of the pole star.

From the table of azimuths, take the azimuth corresponding to the year and nearest latitude. If the observed elongation was east, the true meridian lies on the west of the line which has been found, and makes with it an angle equal to the azimuth. If the elongation was west, the true meridian lies on the east of the line; and, in either case, laying off the azimuth angle with the theodolite, gives the true meridian.

### TO FIND THE TRUE MERIDIAN WITH THE COMPASS.

1. Drive two posts firmly into the ground, in a line nearly east and west; the uppermost ends, after the posts are driven, being about three feet above the surface, and the posts about four feet apart; then lay a plank, or piece of timber three or four inches in width, and smooth on the upper side, upon the posts, and let it be pinned or nailed, to hold it firmly.

2. Prepare a piece of board four or five inches square, and smooth on the under side. Let one of the compass sights be placed at right angles to the upper surface of the board, and let a nail be driven through the board, so that it can be tacked to the timber resting on the posts.

3. At about twelve feet from the stakes, and in the direction of the pole star, let a plumb be suspended from the top of an inclined stake or pole. The top of the pole should be of such a height that the pole star will appear about six inches below it; and the plumb should be swung in a vessel of water to prevent it from vibrating.

This being done, about twenty minutes before the time of elongation place the board to which the compass sight is fastened on the horizontal plank, and slide it east or west until the aperture of the compass sight, the plumb line, and the star are brought into the same range. Then if the star depart from the plumb line move the compass sight east or west along the timber, as the case may be, until the star shall attain its greatest elongation, when it will continue behind the plumb line for several minutes, and will then recede from it in the direction contrary to its motion before it became stationary. Let the compass sight be now fastened to the horizontal plank. During this observation it will be necessary to have the plumb line lighted; this may be done by an assistant holding a candle near it.

Let now a staff, with a candle or lamp upon it, be placed at a distance of thirty or forty yards from the plumb line, and in the same direction with it and the compass sight. The line so determined makes, with the true meridian, an angle equal to the azimuth of the pole star; and from this line the variation of the needle is readily determined, even without tracing the true meridian on the ground.

Place the compass upon this line, turn the sights in the direction of it, and note the angle shown by the needle. Now, if the elongation at the time of observation was west, and the north end of the needle is on the west side of the line, the azimuth, plus the angle shown by the needle, is the true variation. But should the north end of the needle be found on the east side of the line, the elongation being west, the difference between the azimuth and the angle would show the variation, and the reverse when the elongation is east.

1. Elongation west, azimuth .....	2°04'
North end of the needle on the west, angle..	4°06'
Variation .....	6°10' west.
<hr/>	
2. Elongation west, azimuth .....	4°59'
North end of the needle on the east, angle..	4°50'
Variation .....	2°51' east.
<hr/>	
3. Elongation east, azimuth .....	2°05'
North end of the needle on the west, angle..	8°30'
Variation .....	6°25' west.
<hr/>	
4. Elongation east, azimuth .....	1°57'
North end of the needle on the east, angle..	8°40'
Variation .....	10°37' east.

The variation at West Point in September, 1835, was 6° 32' west.

The variation of the needle should always be noted on every survey made with the compass, and then if the land be surveyed at a future time the old lines can always be rerun.

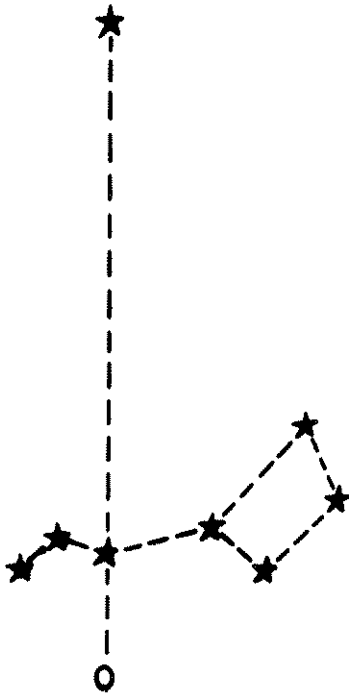
It has been found by observation that heat and cold sensibly affect the magnetic needle, and that the same needle will at the same place indicate different lines at different hours of the day.

If the magnetic meridian be observed early in the morning, and again at different hours of the day, it will be found that the needle will continue to recede from the meridian as the day advances, until about the time of the highest temperature, when it will begin to return, and at evening will make the same line as in the morning. This change is called the *diurnal variation*, and varies, during the summer season, from one-fourth to one-fifth of a degree.

A very near approximation to a true meridian, and consequently to the variation, may be had, by remembering that the pole star very nearly reaches the true meridian when it is in the same vertical plane with the star Alioth in the tail of the Great Bear, which lies nearest the four stars forming the quadrilateral.

The vertical position can be ascertained by means of a plumb line. To see the spider's lines in the field of the telescope at the same time with the star, a faint light should be placed near the object glass. When the plumb line, the star Alioth, and the north star fall on the vertical spider's line, the horizontal limb is firmly clamped and the telescope brought down to the horizon; a light, seen through a small aperture in a board, and held at some distance by an assistant, is then moved according to signals, until it is covered by the intersection of the spider's lines. A picket driven into the ground, under the light, serves to mark the meridian line for reference by day, when the angle formed by it and the magnetic meridian may be measured.





*[Pages 58 and 59 are deleted. They contain a table of latitudes and departures, and a table of offsets from the tangent to the parallel.]*

# DIAGRAM A

FOURTH STANDARD PARALLEL NOR

FIFTH AUXILIARY MERIDIAN EAST

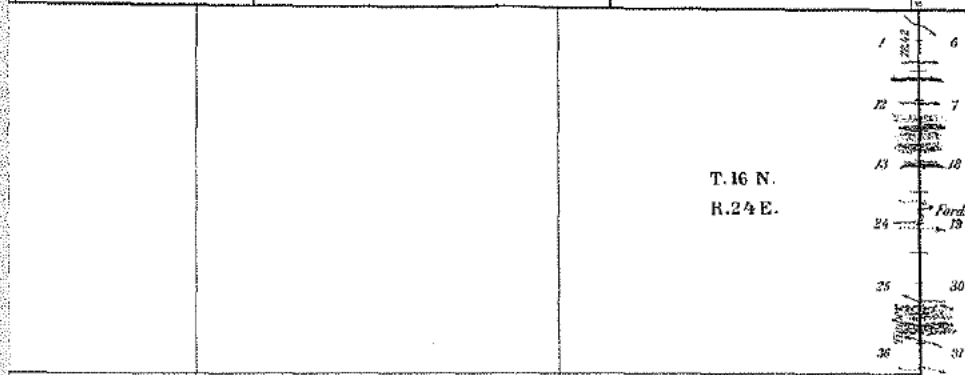
T. 13 N.  
R. 21 E.

31 32 33 34 35 36  
Number

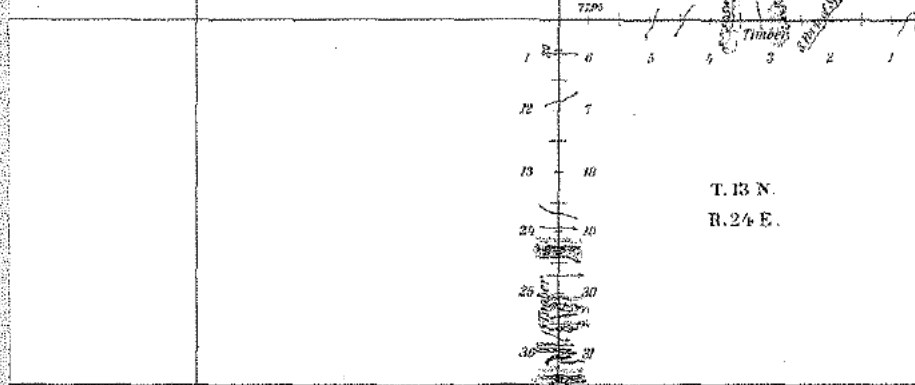
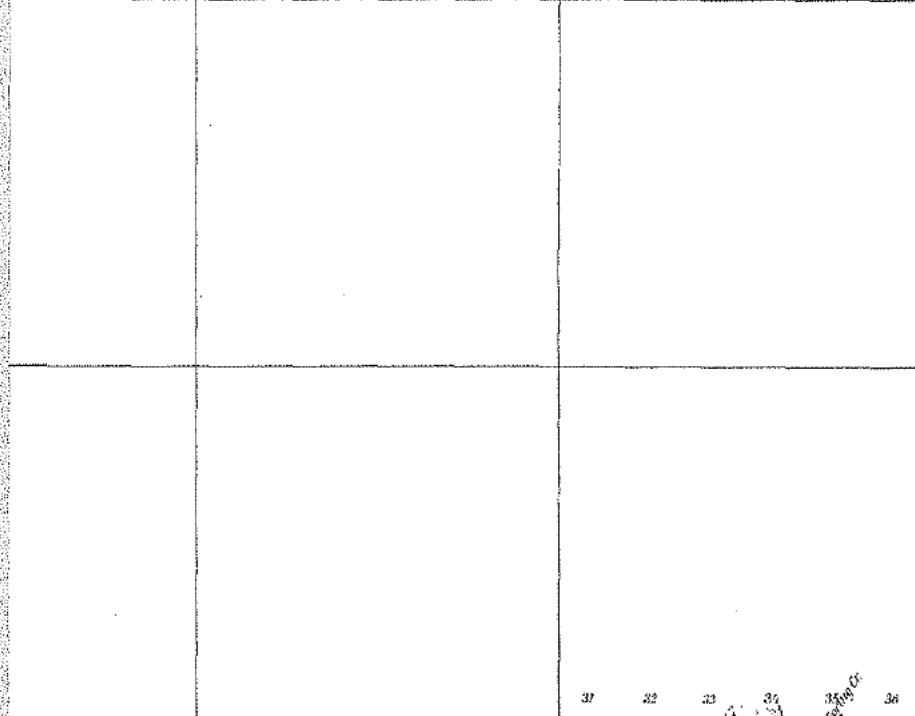
THIRD STANDARD PARALLEL NOR

# DIAGRAM A

RTH STANDARD PARALLEL NORTH



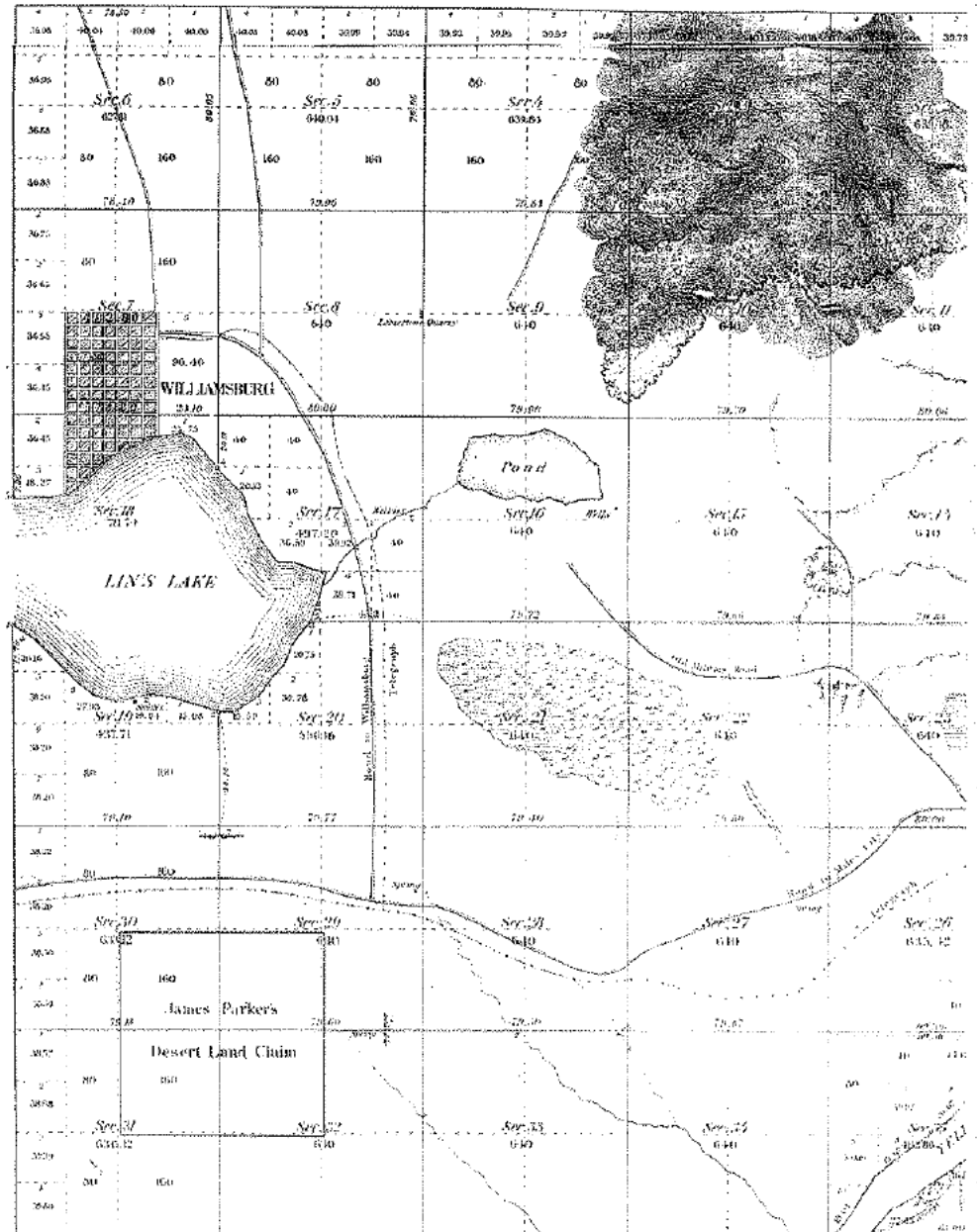
SIXTH AUXILIARY MERIDIAN EAST



IRD STANDARD PARALLEL NORTH

# DIAGRAM B

TOWNSHIP N° 6 NORTH RANGE N° 34 EAST OF THE PR



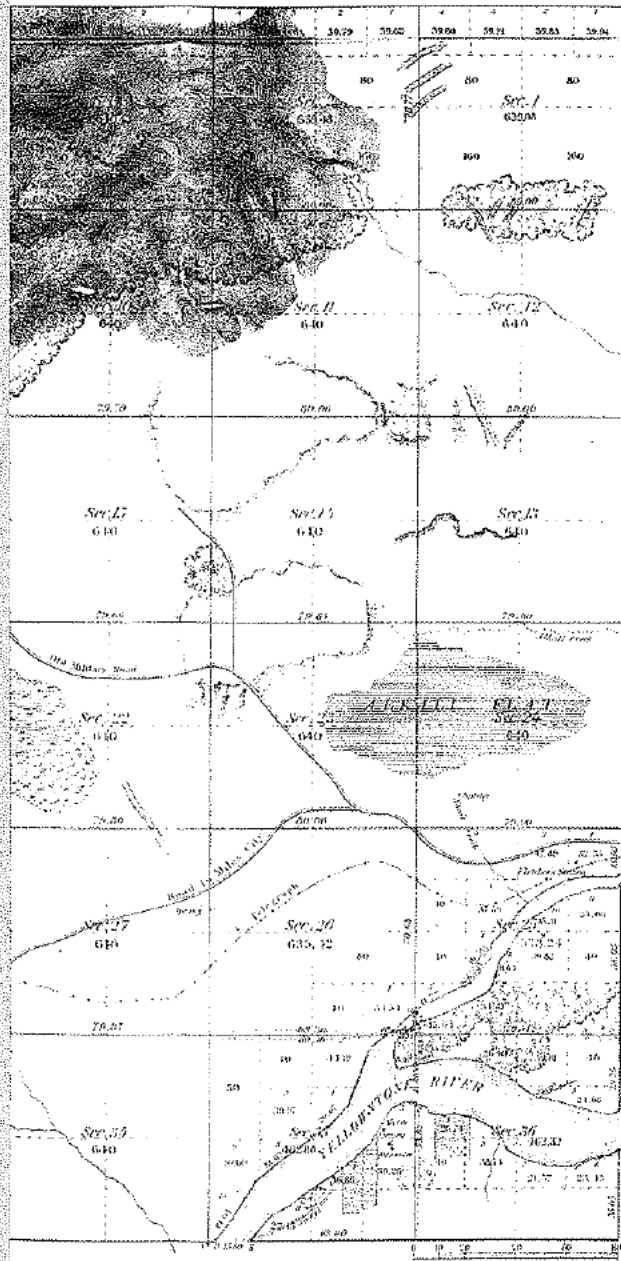
Area of Public Land 2462.71 Acres. of Water Surface 130.96 Acres. of Town Site 207.09 Acres. Total number of Acres 2802.76

Surveys Designated	By Whom Surveyed	Date of Contract	Amount of Surveys	When Surveyed	Area Acreage
Township Sites			307	76	141
Subdivisions	Walter W. de Lary	March 22 <sup>nd</sup> 1870	57	26	99
Meanders	"	"	11	16	09



DIAGRAM B

34 EAST OF THE PRINCIPAL MERIDIAN MONTANA



**Boundaries of Yellowstone River**

Right Bank	Sec. 23 Cont.	Sec. 20 Cont.
Sec. 16	Sec. 23	Sec. 20
Sec. 17	Sec. 24	Sec. 21
Sec. 18	Sec. 25	Sec. 22
Sec. 19	Sec. 26	Sec. 23
Sec. 20	Sec. 27	Sec. 24
Sec. 21	Sec. 28	Sec. 25
Sec. 22	Sec. 29	Sec. 26
Sec. 23	Sec. 30	Sec. 27
Sec. 24	Sec. 31	Sec. 28
Sec. 25	Sec. 32	Sec. 29
Sec. 26	Sec. 33	Sec. 30
Sec. 27	Sec. 34	Sec. 31
Sec. 28	Sec. 35	Sec. 32
Sec. 29	Sec. 36	Sec. 33
Sec. 30	Sec. 37	Sec. 34
Sec. 31	Sec. 38	Sec. 35
Sec. 32	Sec. 39	Sec. 36
Sec. 33	Sec. 40	Sec. 37
Sec. 34	Sec. 41	Sec. 38
Sec. 35	Sec. 42	Sec. 39
Sec. 36	Sec. 43	Sec. 40
Sec. 37	Sec. 44	Sec. 41
Sec. 38	Sec. 45	Sec. 42
Sec. 39	Sec. 46	Sec. 43
Sec. 40	Sec. 47	Sec. 44
Sec. 41	Sec. 48	Sec. 45
Sec. 42	Sec. 49	Sec. 46
Sec. 43	Sec. 50	Sec. 47
Sec. 44	Sec. 51	Sec. 48
Sec. 45	Sec. 52	Sec. 49
Sec. 46	Sec. 53	Sec. 50
Sec. 47	Sec. 54	Sec. 51
Sec. 48	Sec. 55	Sec. 52
Sec. 49	Sec. 56	Sec. 53
Sec. 50	Sec. 57	Sec. 54
Sec. 51	Sec. 58	Sec. 55
Sec. 52	Sec. 59	Sec. 56
Sec. 53	Sec. 60	Sec. 57
Sec. 54	Sec. 61	Sec. 58
Sec. 55	Sec. 62	Sec. 59
Sec. 56	Sec. 63	Sec. 60
Sec. 57	Sec. 64	Sec. 61
Sec. 58	Sec. 65	Sec. 62
Sec. 59	Sec. 66	Sec. 63
Sec. 60	Sec. 67	Sec. 64
Sec. 61	Sec. 68	Sec. 65
Sec. 62	Sec. 69	Sec. 66
Sec. 63	Sec. 70	Sec. 67
Sec. 64	Sec. 71	Sec. 68
Sec. 65	Sec. 72	Sec. 69
Sec. 66	Sec. 73	Sec. 70
Sec. 67	Sec. 74	Sec. 71
Sec. 68	Sec. 75	Sec. 72
Sec. 69	Sec. 76	Sec. 73
Sec. 70	Sec. 77	Sec. 74
Sec. 71	Sec. 78	Sec. 75
Sec. 72	Sec. 79	Sec. 76
Sec. 73	Sec. 80	Sec. 77
Sec. 74	Sec. 81	Sec. 78
Sec. 75	Sec. 82	Sec. 79
Sec. 76	Sec. 83	Sec. 80
Sec. 77	Sec. 84	Sec. 81
Sec. 78	Sec. 85	Sec. 82
Sec. 79	Sec. 86	Sec. 83
Sec. 80	Sec. 87	Sec. 84
Sec. 81	Sec. 88	Sec. 85
Sec. 82	Sec. 89	Sec. 86
Sec. 83	Sec. 90	Sec. 87
Sec. 84	Sec. 91	Sec. 88
Sec. 85	Sec. 92	Sec. 89
Sec. 86	Sec. 93	Sec. 90
Sec. 87	Sec. 94	Sec. 91
Sec. 88	Sec. 95	Sec. 92
Sec. 89	Sec. 96	Sec. 93
Sec. 90	Sec. 97	Sec. 94
Sec. 91	Sec. 98	Sec. 95
Sec. 92	Sec. 99	Sec. 96
Sec. 93	Sec. 100	Sec. 97

Site 207.0 Acres. Total number of Acres 2296.77

Year	When Surveyed	Mean Declination
1871		
89	Aug. 6 <sup>th</sup> to 10 <sup>th</sup> 1880	11° 37' 30"
00		

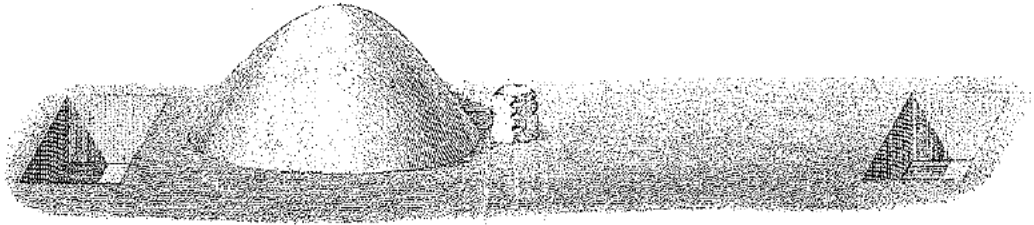
Note: In chains to an inch  
 The above Map of Township No. 6 North, of Range No. 34 East of the Principal Meridian Montana, is strictly conformable to the field notes of the survey thereof on file in this office which have been examined and approved  
 Surveyor General's Office  
 J. H. Bent

DIAGRAM C

Illustrating mode of establishing Stone, Post and Mound Corners



Township Corner Stone with mound of Stone



Section Corner Stone with pis and mound of earth

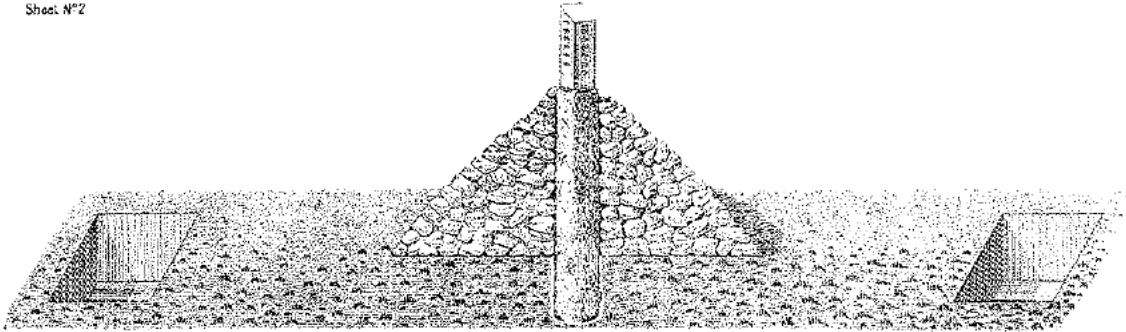


Quarter Section Corner with mound of earth

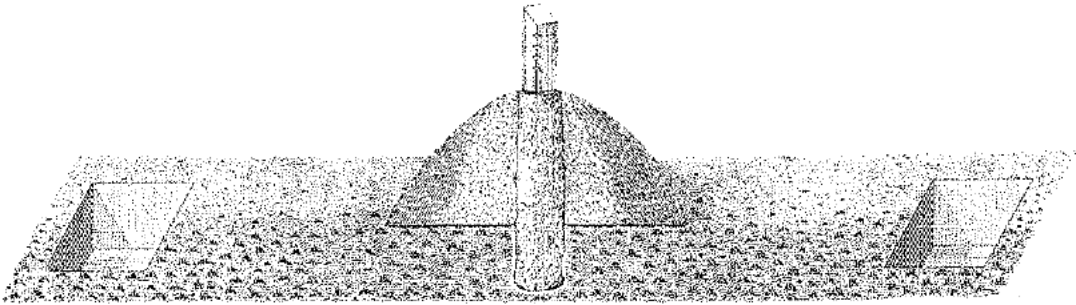


DIAGRAM C

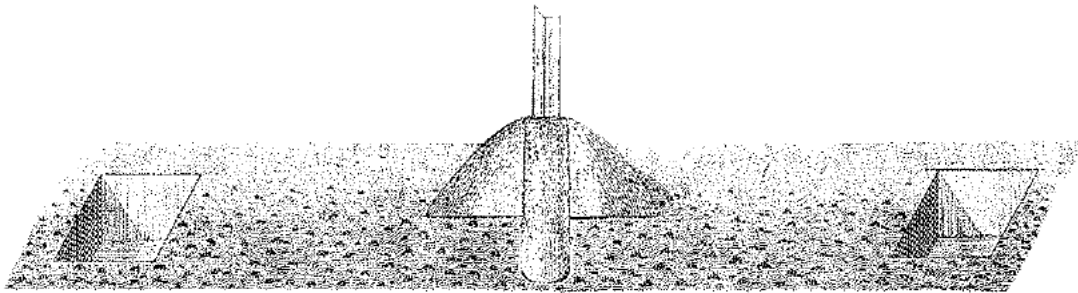
Sheet N°2



Township Corner Post on Standard Lites with mound of stone



Section Corner Post with mound of earth



Quarter Section Corner Post with mound of earth

Sheet №3

DIAGRAM C



Mound Corner on Standard Line



Mound Corner Common to 4 Sections



Quarter Section Mound Corner