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Graduating Thesis  
James Madison Harvey.

Subject.  
The Evolution of The United States Public  
Land Surveys.

19520

## Synopsis

The origin of the system of public land surveys with a committee in The Continental Congress.

Later acts of Congress relating to the public land surveys.

The early surveys in Ohio.

The present system of surveying the public lands based on the Initial Point, Base Line, Principal Meridian, Standard Parallel, and Guide Meridian.

The convergency of meridians and its importance in the public land surveys.

Township lines.

The system of numbering townships by township and range.

Subdividing a township into sections.

A few points in regard to public land surveys.

The benefits derived from the public land surveys.

## References.

"The Public Domain".

"Levenger's Government Surveying".

"Instructions to Surveyors General".

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

|                            |                |
|----------------------------|----------------|
| Thomas Jefferson, chairman | Virginia       |
| Hugh Williamson            | North Carolina |
| David Howell               | Rhode Island   |
| Elbridge Gerry             | Massachusetts  |
| Jacob Read                 | South Carolina |

On the 7<sup>th</sup> 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 herein mentioned." This ordinance required the public lands to be divided into "hundreds" of ten geographical miles square, the "hundreds" 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 was considered, debated, and amended, and reported to Congress April 26, 1785. As reported, this required surveyors "to divide the said territory into townships 7 miles square, by running lines due north and south, and others crossing these at right angles."

The plats of the townships shall be marked by subdivisions into sections of one (1) mile square, or 640 acres, in the same direction as the external lines, and numbered from 1 to 36."

This is the first record of the use of the terms "township" and "section". On May 3<sup>d</sup>, 1785, 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 ordinance finally passed Congress, on the 20<sup>th</sup> of May, 1785. It provided for townships six miles square, containing 36 sections of one (1) mile square. The first public surveys were made under this ordinance.

### The Early Surveys in Ohio.

Townships six miles square, were laid out in tiers, extending northward from the Ohio river, the townships being numbered from south to north, and the ranges from east to west.

The sections in the township were numbered from 1 to 36 commencing with No. 1. in the south-east corner of the township, and running from south to north in each tier, ending with number 36 in the northwest corner of the township as

shown by the following diagram:

N

W

|    |    |    |    |    |   |
|----|----|----|----|----|---|
| 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 |

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The region embraced by the survey under this law forms a part of the present state of Ohio, and is usually styled "The Seven Ranges".

An act of Congress passed May 18<sup>th</sup>, 1796, provides among other things, that "sections shall be numbered, respectively, beginning with number one (1) in the northeast corner and proceeding west and east alternately, through the township, with progressive numbers till the thirtieth (30<sup>th</sup>) be completed" This method of numbering the sections of a township, as shown by the following diagram is still in use:

N

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

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## The Present System of Surveying the Public Lands

### The Initial Point.

In commencing the division of the public lands in unsurveyed territory, the first subject for consideration is the point of beginning or the

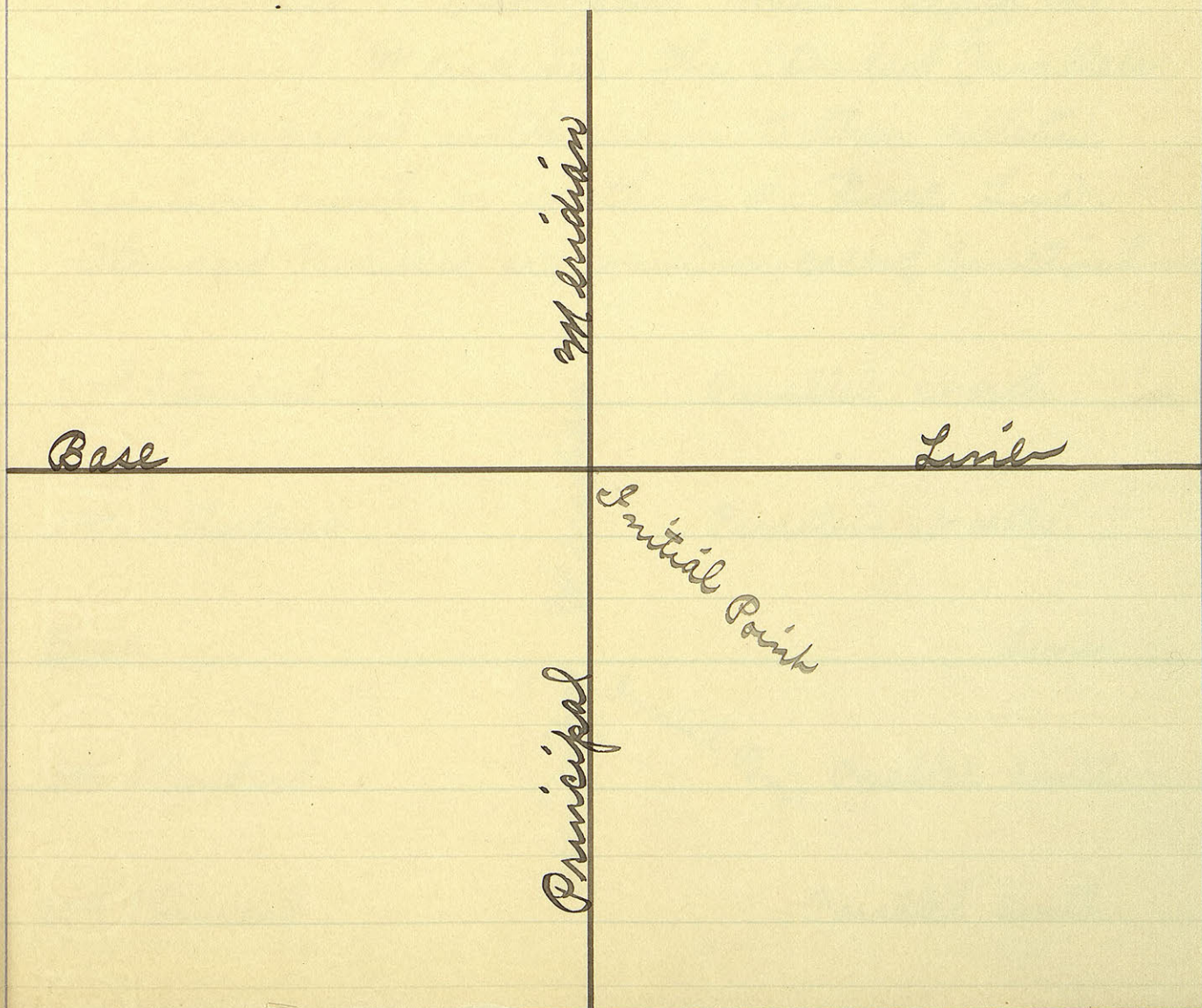
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Initial Point. The location of this point involves questions mainly of convenience, such as being centrally located as regards the territory to be surveyed, but after locating the point, its geographical position must be carefully determined, and the point perpetuated by a suitable monument of metal or stone.

### The Base Line.

After the Initial Point has been satisfactorily established a line is run, east and west, therefrom, this line is called the Base Line, it is marked at each half mile or 40 chains, with a quarter section corner, and at each mile or 80 chains, with a section corner. The greatest care must be exercised in running and chaining this line, as any mistake in this line would be multiplied in the later surveys which start from it. Two sets of chainmen are employed in chaining this line and the work tested at intervals astronomically to determine whether the extremes of the line are in their proper longitude and the entire line to be in one parallel of latitude.

## The Principal Meridian.

After the Base Line is located, a line is run due north and south from the Initial Point. This line is called the Principal Meridian it is marked as was the Base Line at every 40 chains with a quarter section corner and at 80 chains with a section corner. The same care is exercised in running and measuring this line, as was exercised in the case of the Base Line.



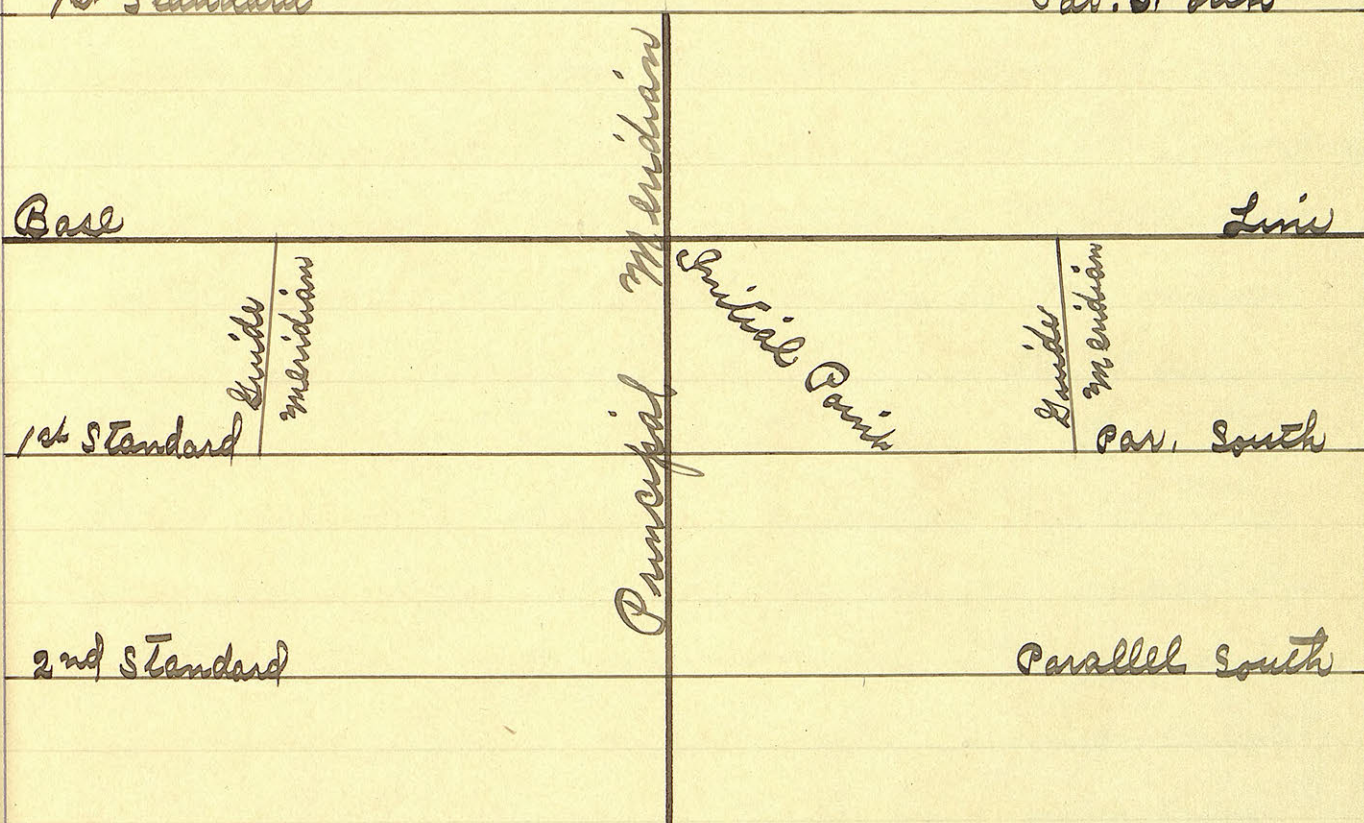
## The Standard Parallel.

From a point on the Principal Meridian twentyfour miles south of the Initial Point a line is run east and west parallel to the Base Line. This line is called The 1st Standard Parallel South, it is marked, as are all true lines run in the public land surveys, with section and quarter section corners at the proper intervals. Other Standard Parallels are run parallel to the Base Line, starting from points at intervals of twentyfour miles along the Principal Meridian. The Standard Parallels are designated with respect to their relative position north or south of the Base Line. Standard Parallels are sometimes called Correction Lines.

|              |                    |                              |
|--------------|--------------------|------------------------------|
| 2nd Standard | Principal Meridian | Parallel North               |
| 1st Standard |                    | Parallel North               |
| Base         |                    | Line                         |
| 1st Standard |                    | Initial Point Parallel South |
| 2nd Standard |                    | Parallel South               |

## The Guide Meridian

From a point on the first Standard Parallel South that is 48 miles west of the Principal Meridian the first Guide Meridian west of the Principal Meridian is run due north to the Base Line, and marked at the proper intervals with section and quarter section corners.



The area enclosed by the Base Line, Principal Meridian, Standard Parallel, and Guide Meridian, would be a rectangular parallelogram if the earth were a plane instead of a spherical surface, but owing to the convergency of

meridians, (and it should be remembered that all meridians meet at a point in the poles of the earth,) we find that the enclosed area above mentioned is really a trapezoid and not a rectangle, the Guide Meridian intersecting the Base Line at a point several chains east of the 48<sup>th</sup> section corner west of the Initial Point, the distance being greater or less depending upon the latitude, the higher the latitude, the greater the Convergence. This question of the Convergency of meridians or true north and south lines is one which constantly confronts the public land surveyor. "The law requires that the lines of the public land survey 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 to strictly conform to the true meridian necessarily throws the township out of square, by reason of the convergency of meridians".\* It is doubtless in view of these facts that the act of May 18<sup>th</sup> 1796, provides that sections of a mile square shall contain the

\* "Instructions to Surveyors General" page 7.

quantity of 3640 acres, as nearly as may be, the act of May 10<sup>th</sup> 1800 also makes provision for the convergency of meridians in the following words: "And in all cases where the exterior lines of the township thus to be surveyed 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 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 or half sections bounded on the northern and western lines of such township shall be sold as containing only the quantity expressed in the returns and plats, respectively, and all others as containing the complete legal quantity."

### Township Lines.

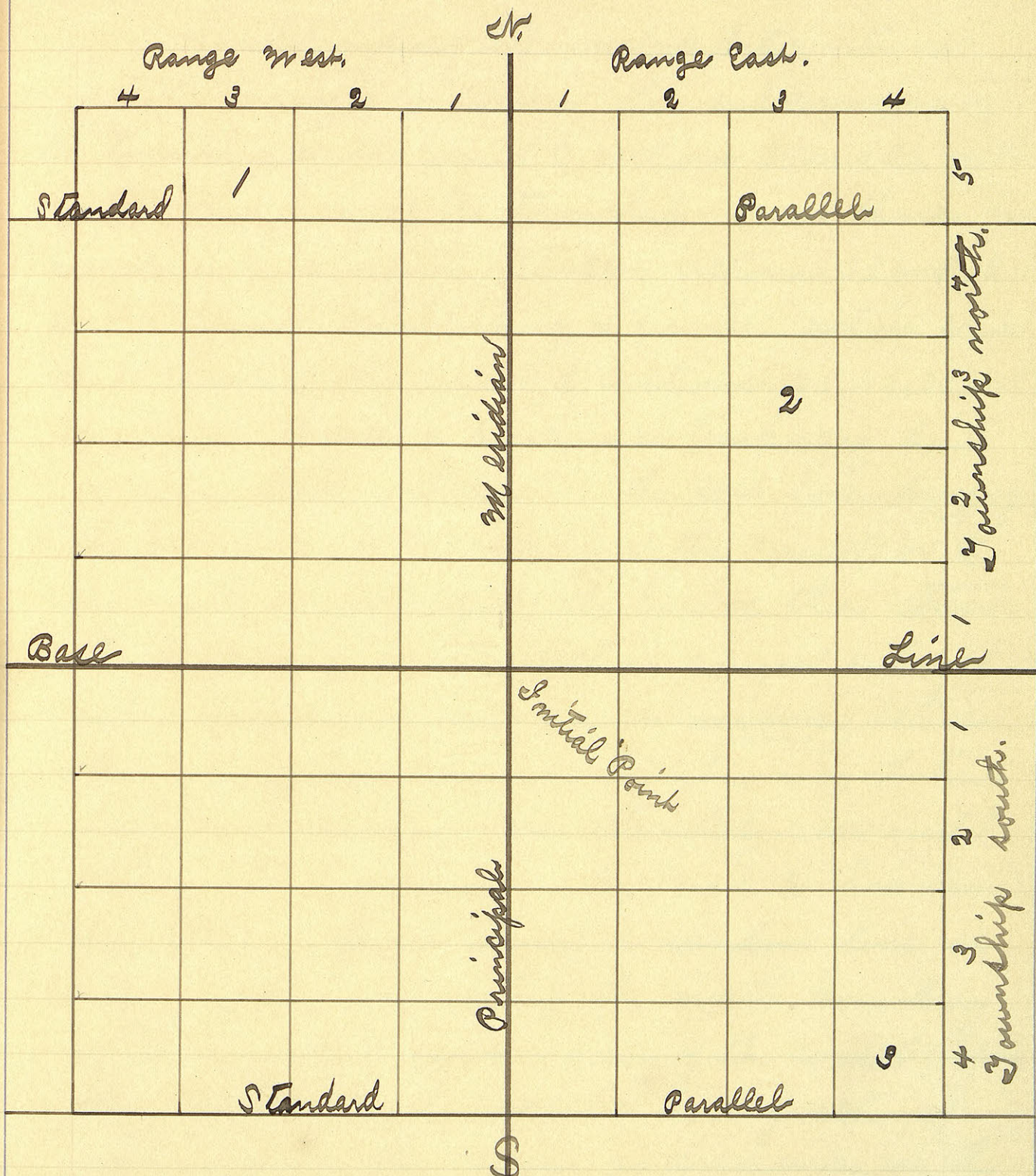
After an area of land 24 by 48 miles, approximately, has been inclosed by the Base Line, Standard Parallel, Principal Meridian and Guide Meridian; the surveyor proceeds

to subdivide the Chuck into townships. Commencing at a point on the standard parallel 6 miles west of the Principal Meridian a line is run north and marked at proper intervals with section and quarter section corners; at the end of the sixth mile, a township corner is established and then a random line is run east to the 6<sup>th</sup> section corner on Principal Meridian north of the Standard Parallel, this line is marked at the proper intervals with temporary section and quarter section corners, this temporary or random line seldom closes exactly at the corner but must be made to do so by retracing the line with a corrected course or calculated course that will establish a straight line back to the starting point. The temporary corners on the random line are destroyed, and permanent ones established on the true or corrected line any excess or deficiency in the measurements being thrown into the last half mile of the line, that is the westernmost half mile of the line. The process of establishing township boundaries by running a true line north 6 miles,

and then ranging east and correcting west is continued until the township corner next south of the Base Line is established. From thence, a line is run north to the Base Line where a township corner is established called a township closing corner. It is generally less than 6 miles west of the Principal Meridian, due to the convergency of meridians. The other tiers of townships in the check are surveyed in like manner.

The System of Numbering Townships by Townships and Range.

Strictly speaking, the exterior meridian lines of a township are Range and the parallel exterior of the township are Township lines. The terms ranges and townships applying to the area of which the range and township lines form the boundaries. Ranges are numbered with respect to the distance they lie east or west of the Principal Meridian. Townships are numbered with respect to the distance they lie north or south of the Base Line.



Number 1 in the plat is township 5 north, range 3 west. Number 2. is township 3 north, range 3 east. Number 3 is township 4 south, range 4 east.

### Subdividing a Township Into Sections

The surveyor commences the subdivision of the township at the corner to sections 35 and 36 on the south boundary of the township; from thence he runs a line north between sections 35 and 36, at 40 chains, establishing a quarter section corner at 80 chains, the corner to sections 25, 26, 35 and 36; from thence a random or temporary line is run east, intersecting the east boundary of the township, either exactly at the corner, or to the north or south of it; the line is then retraced, the temporary quarter section corner destroyed and a permanent one built midway between the two section corners. In this way the true lines and randoms are alternately run until the corner to sections 1, 2, 11 and 12 has been established, from thence a random line is run north, intersecting the north boundary of the township east or west of the corner; it is then retraced and corrected as a fractional section line, the excess or deficiency in the measurements being left in the northern half mile of the line. In like manner the other tiers of sections in the township are surveyed except that in the west end

tier the randoming is done from the interior  
 section corners, west to the west boundary of  
 of the township, and the line corrected back to  
 the east, the excess or deficiency in measure-  
 ments being left in the western half mile  
 of the line. A township bounded on the north  
 by a Standard Parallel or Base Line must  
 be subdivided by closing the last section  
 lines north, the lines between sections 1 and 2,  
 2 and 3, 3 and 4, 4 and 5, 5 and 6 as true lines;  
 that is establishing the section corner at  
 the point the line strikes the Parallel or  
 Base Line. In establishing the interior  
 lines of a township, but little attention  
 is paid to the convergency of meridians;  
 more frequently it is desirable that the  
 lines should diverge from each other in  
 endeavoring to lay off sections of 3640 acres\*  
 The boundaries of adjacent sections are  
 consequently often at a slight angle to each  
 other, and not continuous straight lines  
 running through the township, as many  
 people suppose them to be.

\* "Clevenger's Government Surveying" page 30.

"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" \*

### A Few Points in Regard to Public Land Surveys

1. "Every north-and-south section line, except those terminating in the north boundary of the township, must be 80 chains in length". \*
- 2<sup>nd</sup> "The east-and-west section lines, except those terminating in the west boundary of the township, are to be within 80 links of the actual distance established on the south boundary line of the township for the width of said tier of sections" \*
- 3 "Upon section lines closing to the north and west boundaries of a township, the quarter section corners are established at precisely 40 chains to the north or west of the last interior section corner, the excess or deficiency in the measurements being thrown on the outer tier of lots, as per act of Congress approved May 10-1800" \*

\* "The Public Domain", page 602.

4<sup>th</sup> "The boundaries of the public lands established and returned by the duly appointed United States deputy surveyors, when approved by the surveyors general and accepted by the United States government, are unchangeable.\*

|             |             |             |             |             |             |
|-------------|-------------|-------------|-------------|-------------|-------------|
| 6<br>78.40  | 5<br>79.96  | 4<br>79.64  | 3<br>79.80  | 2<br>80.00  | 1<br>80.06  |
| 7<br>78.30  | 8<br>80.08  | 9<br>79.90  | 10<br>79.70 | 11<br>80.06 | 12<br>79.99 |
| 18<br>78.50 | 17<br>79.72 | 16<br>79.89 | 15          | 14          | 13<br>80.01 |
| 19<br>78.70 | 20<br>79.80 | 21<br>79.85 | 22<br>79.96 | 23<br>79.97 | 24          |
| 30<br>79.00 | 29          | 28          | 27          | 26          | 25          |
| 31          | 32          | 33          | 34          | 35          | 36          |

The figures on the section lines give their length in chains when it exceeds or falls short of 80 chains (1 mile)

\* "The Public Domain": page 671.

## Benefits Derived From The Public Land Surveys.

The public land surveys have been and will continue to be of vast benefit to the people of the public land states. Its recommendations to the public lie in first, its uniformity; the same system of measurements and subdivisions is found in Florida, Kansas, and Oregon. Second, its brevity and accuracy of description of lands, even to the smallest subdivisions; thus any fairly intelligent person can readily discover that — The S.E.  $\frac{1}{4}$  Section 31, Township 10 South, Range 8 East of 6<sup>th</sup> Principal Meridian, Kansas, is a complete, accurate, and brief description of 160 acres of land lying on the Kansas river just south of Manhattan, Kans. Third, the United States public land surveys furnish a complete transcript of the meter and bounds of the surface of the states over which it is laid. Fourth, it prevents, to a great extent, litigation over land boundaries. Fifth, the original source of title is never obscure or uncertain, coming as it does direct from the national government. The public land system has been in operation more than a hundred years. It has been a faithful friend to the settlers upon the public domain, spreading its beneficent influence from the coral strand of Florida to "where rolls the Oregon".