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Cunyngham: Cunyngham: Making Land Surveys  
**MAKING LAND SURVEYS AND PREPARING  
DESCRIPTIONS TO MEET LEGAL REQUIREMENTS†**

WILKIE CUNNYNGHAM\*

Land surveys may be made for many different purposes: e.g., agricultural surveys to determine types and productivity of soil; water control surveys; industrial surveys to determine access to transportation facilities, labor, raw products, etc.; market value surveys; or highway surveys to determine needs, comparative service at different locations, design data, and probable construction costs. We are here concerned only with (1) *making surveys* and (2) *preparing descriptions* to meet the requirements of law for *finding* and *properly identifying* specific tracts of land (which may be the subject of a patent from the United States Government, a conveyance from one person to another, a lease, a mortgage, a will, a trust agreement, a tax assessment, a condemnation for public use, a benefit or damage assessment for public improvements, or a court action such as partition, ejectment, etc.).

The description is the identification on paper of the particular parcel of land. The identifying *description on paper* is usually prepared from, and must be capable of being translated back with ease and certainty to an identifying *survey on the ground*.

Sometimes the making of the survey precedes the writing of the description; at other times the description will be in existence before the particular survey. In the first case the survey is (1) for the purpose of locating such already existing physical objects or features as can be found on, or associated with the tract of land involved, and which can be set out in *words, numbers, or a plat* on paper and recorded, filed, or otherwise preserved or (2) for the purpose of creating such new or additional objects or features. A survey made after the description is prepared will be for the purpose of translating the description on paper back into the physical features on the ground, thus identifying a definite parcel of land with the description.

For purposes of identification, it is customary to use such physical things as rivers, hills, bluffs, springs, ravines, trees (natural monuments),

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†A revision of a paper presented before the American Association of State Highway Officials, Committee on Right of Way, 1953 Annual Convention.

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surveyors' stones, stakes, artificial mounds, pits, walls, fences, buildings, street curbs (artificial monuments), courses (both bearings and distances), and curve data.

The tract of land may be irregular in shape. The King of England, Spain, or France may have granted all the land bounded by, or within a specified distance and direction from a river, sea coast, valley, bluff, or the boundaries of lands previously granted to other persons. For example, part of the land around Potosi, Missouri, granted to Moses Austin<sup>1</sup> and his joint adventurers, was known as the Handkerchief Tract because of the fancied resemblance of its boundaries to the edges of a folded handkerchief.

The following description of a tract of land in Missouri is copied from a deed written in 1903:

"A tract of land situated in the County of Ste. Genevieve, on the waters of the Establishment Creek, and being part of Survey No. 2088, confirmed to Jean Bte Valle, to-wit- beginning at the Southwest corner of a tract of land sold by the said Felix Valle to Louis Lalumondiere, containing sixty arpents and from thence North 55° West along and with the said Lalumondiere line 35 chains and 60 links, to said Lalumondier's corner stone and continuing said line to 53 09/100 chains set a Flower stone 18 x 6 x 3 inches for a corner stone from said stone a Post Oak tree 7 inches in diameter bears S. 70° W. 17½ links distant and a Post oak 8 inches in diameter bears S. 27° E. 17 links distant. Thence S. 35° W. 16.14/100 chains intersecting the line sold by said Felix Valle to Charles Carsow, set a corner stone 18 x 6 x 4 inches for a corner stone, and from said stone a Black oak Tree 10 inches in diameter bears S. 55° E. 22 links distant, and a Black oak tree, four inches in diameter bears N. 22° E. 37 links distant, and from thence S. 55° E, with the line of said Carsow 53.00 chains and 9 links to the Establishment Creek, and from thence down said Establishment Creek with the meanders thereof to the place of beginning, containing 103 arpents and 90/100 of an arpent, more or less. Excepting and reserving 1.69/100 acres in the N. W. corner of said tract conveyed to John Kertz in

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1. Moses Austin and its associates received their Mine á Breton grant in 1797. In 1799 and 1804 there were attacks on the settlement by Indians. Austin became bankrupted in 1818 during the depression following the Napoleonic Wars, and in 1820 went to Texas where he received a grant from Mexico upon which to settle 300 American Colonists. He returned to Potosi, where he died in 1821 and was buried in the little Presbyterian cemetery. His son, Stephen Austin, became known as the Father of the Texas Republic.

January 1888. Also all that part of U. S. Survey No. 2088 described as follows, begin at most Eastern corner on Establishment Creek, of land belonging to John Kertz at a stone from which a sycamore 14 in. in diameter bears N. 60° W. 60 links distant and a Burr Oak 7 in. in diameter bears N. 8° W. 72 links distance; thence N. 55° W. 11.37/100 chains to a stone for corner; thence S. 18° E. 5.00/100 chains to a point on said Establishment Creek from which a hickory 7 in. in diameter bears N. 10° E. 23 links and an Elm 7 in. in diameter bears N. 60° W. 22 links distant, thence down and with the meanders of said creek to the beginning corner containing one 69/100 acres, more or less."

One of these descriptions might not only become very long, but involve tracking down innumerable descriptions in long chains of title to the ancient sources of many boundary tracts. Yet this is the method used in most of the world, including 19 of the American States (Texas, and the states in, or carved out of the original Thirteen Colonies—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, Kentucky, North Carolina, Tennessee, South Carolina, and Georgia).

Land descriptions in the other 29 states are generally much simpler. Most of the lands in these states were at one time owned by the Federal Government. The disposition of such a vast acreage presented a major problem in identification and description. The fertile imagination and inventive genius of Thomas Jefferson worked out a plan<sup>2</sup> for dividing the public lands into a gigantic checkerboard of uniform square tracts each measuring one mile (80 chains) on its sides, and containing 640 acres. These "sections" are divided into "quarters" of 160 acres each, ½ mile (40 chains) on a side; and may be still further subdivided into "quarter-quarter-sections" (1/16-section) of 40 acres, ¼ mile on each side etc.<sup>3</sup> The boundaries of these sections were to be a series of parallel north-south lines one mile apart, and east-west lines, also one mile apart.

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2. 1 STAT. 465 (1796) 43 STAT. 1144 (1925), 43 U.S.C.A. § 751.

3. Section 137.190 and 137.185, MO. REV. STAT. (1949) make it a misdemeanor to "divide any tract of land into parcels less than one-sixteenth part of a section or otherwise, in such manner that such parcels cannot be described in the usual manner of describing lands in accordance with the surveys made by the general government" without making, certifying, and recording a plat thereof particularly describing and setting forth "the lots or parcels" with the lots and blocks "numbered in progressive numbers", etc.

A square of 36 sections constitutes a "township" six miles on each side. The sections in a township are numbered from 1 to 36, starting at the north-east, and proceeding west and then east alternately to the 36th section in the south-east corner. Townships are identified by assigning to each a number which will show how many other townships intervene between the particular township and (1) a certain east-west line on its north or south (called the "*base line*"), and (2) east or west from one of the north-south lines (called the "*principal meridian*"). Under this system it should be possible to describe almost any tract in the 29 states so surveyed, by the simple statement that it is, for example: The (a) north-east one-fourth of the (b) south-east one-fourth of (c) Section 6 in (d) Township 44 north of the Little Rock, Arkansas, Base Line and Range 3 east of the Fifth Principal Meridian, in (e) St. Louis County, (f) State of Missouri, (g) containing 40 acres, more or less. This may be shortened to: A tract of land in St. Louis County, Missouri, being the NE $\frac{1}{4}$ , SE $\frac{1}{4}$ . Sec. 6, T. 44 N., R. 3 E., containing 40 acres, more or less.

However, in actual practice and for many reasons, sections will not always be found to fit into such a scheme with perfect uniformity. If two lines, drawn exactly one mile apart at the Base Line, are projected due north, they must approach closer together each mile as they proceed north, until they will have merged into a single point at the North Pole.

There are also mechanical and human surveying errors in determining bearings and distances in the east-west, as well as the north-south, lines. We should remember that some of the first surveys were made 150 years ago through almost impenetrable wildernesses, over wild land of little value, perhaps under harassment from hostile Indians, by contract surveyors sometimes interested only in collecting their pay for as little time and effort as possible, using crude instruments and methods (*e.g.*, reputedly measuring distance by counting revolutions of a cartwheel with a rag tied around the rim or by a hemp rope dragged on horse back). Even with the most modern transit, the magnetic needle is not supported to point toward true north, but toward a "magnetic" north which is continually shifting and changing the magnetic "declination". Local ore deposits, metal objects, and power lines affect the needle. "It (the magnetic compass) is an instrument helpful for finding general directions but not reliable when accuracy is required, nor is it used except for checking purposes in surveys."<sup>4</sup> When using the transit for turning

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4. *Henrie v. Hyer*, 70 P. 2d 154, 158 (Utah, 1937).

angles from a base line, the finest gradation on the horizontal circle may be one degree, or on the more expensive instruments with vernier attachments, one-half minute.

In a discussion before the American Society of Civil Engineers, J. C. Carpenter, Chairman, Committee on Highways, American Congress on Surveying and Mapping, compared the location of two section corners 14 miles apart in Minnesota, the first made in 1872 under the public land survey, and the resurvey in 1906 with triangulation of first-order accuracy. This last survey showed that an error of 141.72 feet was made in this distance by the earlier survey, an average error in length of 10.12 feet per mile, or of 1 part in 522. Mr. Carpenter commented: "Considering the circumstances existing at the time of the original survey, this accuracy is reasonable. In the link chain used for liner measurement there is a loop on each end of each link and there are two rings between the links so that there are 588 bearing surfaces to wear and 396 loops and rings that may elongate as the chain is dragged over the ground. The excess length of 10.12 ft. per mile means 1.52 in. per chain or a 0.0015-in. average wear or stretch for each bearing surface loop or ring."<sup>6</sup>

In 1951 the American Congress on Surveying and Mapping urged the adoption of specifications for three orders of minimum accuracy for the transit traverse of highway center lines or control base lines. Under these specifications, to secure *first-order accuracy*, for length alone, the error in closure shall not exceed 1 part in 25,000, and the probable error in main scheme angles shall not exceed 1.5 seconds; for *second-order accuracy*, the error in length shall not exceed 1 part in 10,000, and 4 seconds in azimuth per main station; and for *third-order accuracy*, the error in length shall not exceed 1 part in 5,000. Even under the most favorable conditions, not many surveys are of first-order or second-order accuracy. Few surveyors carry thermometers on their tape lines and correct for the proper co-efficient of expansion and contraction due to temperature or for the number of pounds of pull on the tape ends, or take the average of six or more angle readings with a magnifying glass, etc.

In view of all these facts it is not surprising that courts should have made such comments as the following:

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5. 115 AM. SOC. OF CIV. ENG., *Transactions*, 68 (1950).

"The mistakes and abuses which have crept into the official surveys of the public domain form a fruitful theme of complaint in the political branches of the government."<sup>6</sup>

"Nothing is better understood than that few of our early plats will stand the test of a careful and accurate survey without disclosing error. This is as true of the government surveys as of any other."<sup>7</sup>

"It is a matter of general observation to the bench and bar that a large percentage of the original government surveys of agricultural land in this State were in some degree inaccurate. The work was done under difficulties and at a time when an acre of land had only nominal value. Section lines theoretically straight are not so in fact."<sup>8</sup>

"Carelessness and inattention marking the original government surveys in this part of the country have led the courts to say of their own judicial knowledge that a survey is seldom correct."<sup>9</sup>

To keep errors, which may be only small in the beginning, from pyramiding into larger and larger ones as to the survey proceeds, 16 townships are grouped into a "quadrangle", 24 miles square, bounded on the north and south by standard parallels or "correction lines," and on the east and west by "guide meridians" (which will converge some 1/8-mile in their 24-mile length). In some earlier surveys correction lines were run 30 or 36 miles apart. Under the quadrangle system, the slate could be (but was not always) wiped clean of discrepancies where the survey, proceeding north, crossed the correction line. Within each quadrangle, the first north-south section line should have been located parallel to, and exactly one mile from, the guide line which is the quadrangle's east boundary, and, as the survey proceeds toward the west, each succeeding section line should be similarly located from the line immediately east of it, except, of course, the guide line which forms the west boundary should be one mile distant only where it begins at the correction line on the south, and should not be parallel to, but converge toward the line east of it. Since surveys normally proceed toward the west and north, with east and south boundaries as governing lines, excesses and deficiencies should be found in "lots" in the north and west half-miles of the north and west tiers of sections in a township.

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6. *Cragin v. Powell*, 128 U.S. 691, 32 L.Ed. 566, 568, 9 Sup. Ct. 203 (1888).

7. *Judge Cooley in Diehl v. Zanger*, 39 Mich. 601, 605 (1878).

8. *Capps v. Clark*, 196 Iowa 758, 195 N.W. 372, 375 (1923).

9. *Hale v. Ball*, 70 Wash. 435, 126 Pac. 942 (1912).

When surveys of the public lands were completed, approved, and filed in what is now the Bureau of Land Management in the United States Department of the Interior, they became official, and errors in them, no matter how glaring, cannot be corrected *after* title has passed from the Government. Each record landowner must trace back through the "chain of title" to the *first link*—the survey and description under which title first emanated from the Government.

Copies of Government surveys, plats, and field notes are deposited with the Secretary of State of Missouri. Section 60.350, *Missouri Revised Statutes* (1949), authorizes the several county courts "to obtain from the surveyor-general of the United States, at St. Louis, a certified copy of so much of the field notes of all surveys lying within their counties, respectively . . . as relates to the description of the township, section . . . —the same to be filed in the office of the county surveyors. . . ."

However, even in the 29 sectionalized public-land states, not all land has been surveyed into sections. Many tracts of irregular shapes and sizes were granted to private persons while the Louisiana Territory was alternately under French and Spanish rule before its purchase by the United States under the treaty signed April 30, 1803. It was not until after the close of the Civil War that Congressional commissions had completed examination into the validity of such claims to some 1,463,000 acres of land in Missouri. Most of these grants (*numbered "surveys"*) were

Conversion Table -- Lineal Measure

	Inches	Feet	Yards	Miles	Chains	Links	Rods Poles Perch
1 Inch	1	1/12	1/36				
1 Foot	12	1	1/3				
1 Yard	36	3	1		1/22	4.454	
1 Mile		5280	1760	1	80	3,000	320
1 Chain	792	66	22		1	100	4
1 Link	7.92	0.66	.22			1	
1 Kilometer				0.62137			
1 Vara	33 (approx.)						
1 Rod 1 Pole 1 Perch		16.5	5.5	1/320	1/4	25	1
1 Furlong		660	220	1/8	10	1,000	40
1 League		3,888.8	1,296.3	2.7			

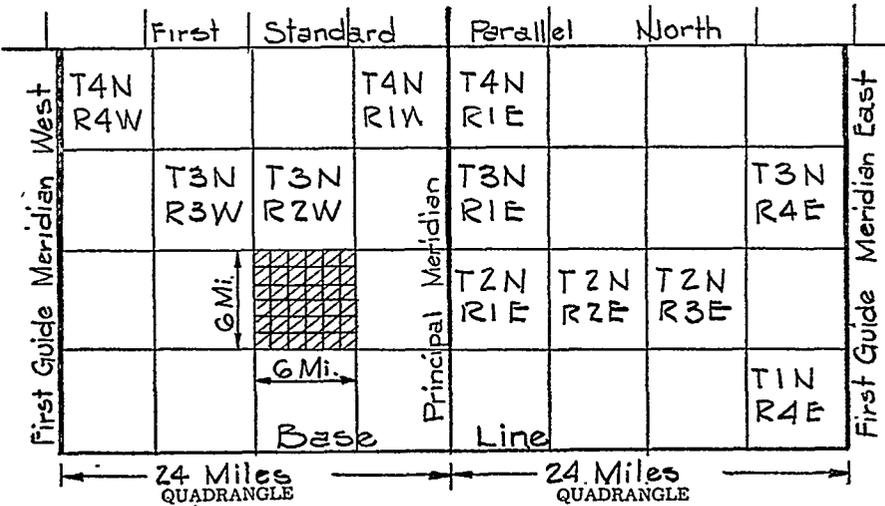
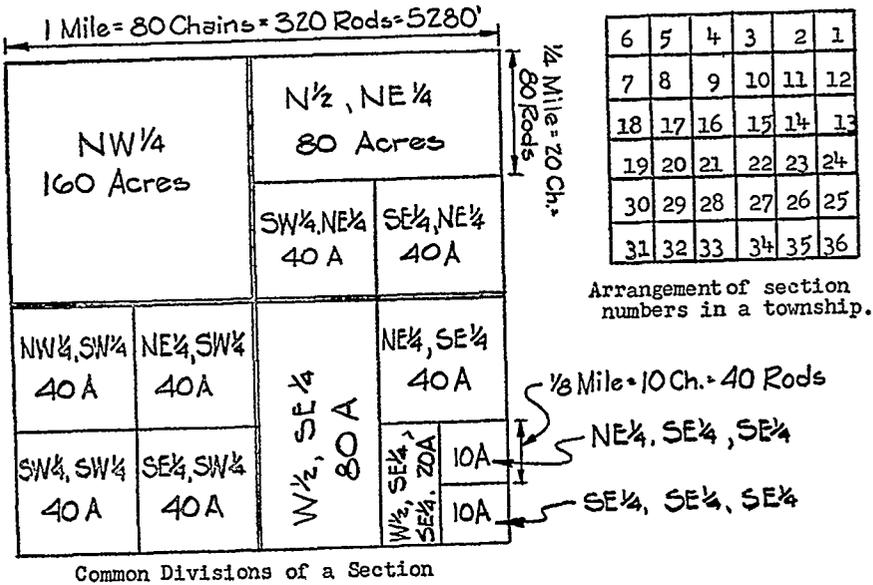
1 Arpent = 192'6" (linear) or 0.85 acres (area).

1 Acre is 43,560 sq. ft. - 4,840 sq. yd. - 10 sq. chains - 160 sq. rods.  
208.71 ft. sq. - 1.1765 arpents.

1 Sec. has 640 acres - 1 mile square - 80 chains or 320 rods square.

1/4 Sec. has 160 acres - 1/4 mile square - 40 chains or 160 rods square.

1/16 Sec. has 40 acres - 1/16 mile square - 20 chains or 80 rods square.



ultimately confirmed by Acts of Congress. Also, "New Madrid" claims in east and central Missouri were given by Congress to alleged owners of land in New Madrid County, Missouri—in lieu of other lands injured by a series of earthquakes which began December 16, 1811, and lasted for over two years.<sup>10</sup>

The actual deed-description to a tract of land in a "Spanish grant"

10. Act of Feb. 17, 1815, 3 STAT. 211 (1815).

	A Sec. 31	B 32	C 33	D 34	E 35	F 36	G Sec. 31	
X	41.43 80.50	35.36 80	31.38 81.1	160 Ac.	160 Ac.	160 Ac.	160 Ac.	h
W	52.4 80	160 Ac						I
W	52.9 80	160 Ac	640 Ac	640 Ac	640 Ac	640 Ac	640 Ac	i
U	52.09 80	160 Ac						K
V	45.7 80	160 Ac	20	21	22	23	24	k
u	47.1 80	160 Ac						L
U	43.1 80	160 Ac	23	28	27	26	25	l
Y	24.4 80	158 Ac						M
	39 80	160 Ac.	32	33	34	35	36	m
	38.1 80	160 Ac.	640 Ac	640 Ac	640 Ac	640 Ac	640 Ac.	n

T.60 N., R.19 W. of the 5th Principal Meridian, Linn County, Missouri, according to the Government survey, an example of an irregular Township.

N 85° W Random Line N

May 8, 1839

is set out on page 235 above. A 1951 deed-description in the abstract of title read:

“All that part of United States Survey No. 2088 which is described as follows, to-wit: Beginning at the North East corner of a 103.90 arpent parcel as is recorded in Book 62 page 59, Ste. Genevieve County land records. Running thence South 55° East 17.49 chains to a corner. Thence South 58° E. 19.00 chains. Thence South 35° West 7.85 chains to a corner in the East R/W line of Missouri State Highway No. 25. Thence with said R/W line South-Eastwardly a distance of 18.00 chains, more or less to the center of the Establishment Creek. Thence with the meanders of said creek Southwestwardly to the most Southern corner of a 1.69 acre parcel as is recorded in Book 37 page 359. Thence with the South line of said parcel North 77° West 8.00 chains. Thence North 18° West 4.15 chains to the South West corner of a 12/100 acre parcel as is recorded in Book 93 page 385. Thence N. 50° West—365 feet to a corner in the South West line of the 103.90 arpent parcel as first above mentioned. Thence with said line North 55° West—30.00 chains to a corner. Thence North 35° East 3.00 chains. Thence North 55° West 5.63 chains. Thence North 35° East 13.40 chains to the place of beginning.

“Excepting however from the above all that part which has heretofore been conveyed to the State of Missouri for highway purposes, leaving the aggregate hereby conveyed equal to 73.06 acres.”

The title examiner must determine whether the land in the last description is contained within the boundaries of the first description—whether the title to the land in the last description can be traced back through the first description, as one of the links in the chain of title, to the original government source of title.

If these two descriptions had been referenced to the “*Missouri Coordinate System*”, not only could a surveyor accurately locate each tract on the ground, but any layman familiar with the system could (1) plot each tract to scale on paper, (2) have the length of lines and size of angles with very small tolerance of error (in contrast to the gross errors sometimes contained in the public land survey figures), and (3) know the position and direction of each line of either description in relation to those of the other description (indeed, to every other description and point in the United States which is tied into a state coordinate system, since all state coordinate systems are accurately related to each other through being based directly on the national geodetic survey).

In 1933 the United States Coast and Geodetic Survey established what are known as the State Coordinate Systems, with a separate system for each state in the Union.<sup>11</sup> In these systems, representations of the surface of the earth are projected mathematically onto plane-rectangular grid zones, each zone usually 158 miles in width but of indefinite length. The number of such zones for a given system depends upon the size and shape of the state to which it pertains. By thus limiting a dimension of the grid zones, the scale error resulting from representing the curved surface of the earth on a plane can be kept within a limit of 1 part in 10,000, which is the minimum standard accuracy for second-order triangulation. In the uniform legislative acts prepared for the various states to define their state systems and give them legal status for referencing boundary surveys, there is a provision that no land description purporting

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11. For details see U. S. Coast and Geodetic Survey Special Publication No. 235, *MANUAL FOR SURVEYORS*, by Hugh C. Mitchell, Mathematician (retired), and Lansing G. Simmons, Chief Mathematician. See also *A State System of Plane Coordinates and Property Surveys—A Basic Method of Eliminating Boundary Difficulties*, by Philip Kissam, Professor of Civil Engineering, Princeton University, 1939 *PROCEEDINGS*, Section of Real Property, Probate and Trust Law, American Bar Association, p. 79.

to be based upon a state coordinate system may be recorded in any public land records unless the survey of the land was tied in to a station in the system (1) no more distant than  $\frac{1}{2}$  mile and (2) established by an accuracy no lower than second-order.

The Council of State Governments, in its General Report on Suggested State War and Postwar Legislation for 1945, said:

"The Coast and Geodetic Survey computes and publishes the plane coordinates, on the appropriate State coordinate system, of all points for which it determines geographic positions (latitudes and longitudes). Just as there is but one point on the surface of the earth corresponding to a geographical position stated by latitude and longitude, so too there is but one point corresponding to a given pair of plane coordinates, stated as  $x$  (east-west) and  $y$  (north-south) on a definite plane projection. As an example, when all surface marks at a landmark or station have disappeared it has been very effective practice to reproduce on the ground by surveys from other stations the coordinate position of the sought-for point, and on digging there, to recover the underground mark. In this way old stations and lost points are retrieved and the plane coordinate system has afforded a simple means of utilizing geodetic data.

"The results of the national triangulation (by the U. S. Coast and Geodetic Survey) in which surveyors generally will be interested consists of accurately-determined coordinates of points on the ground which are marked with substantial material monuments, and so described that these monuments may be readily recovered and used as starting points for local surveys. The monuments or points or stations, however they are referred to, usually consist of concrete shafts, four or five feet long, set nearly flush with the ground, with bronze disks in their tops to identify them and a small hole representing the exact position. Buried under each shaft is a short cylinder of concrete with another disk set in direct vertical line with the surface disk. Usually, three reference monuments with disks are established near each station, and tied thereto by accurate measures of distance and bearing. Current publications of geodetic data contain both geographic positions and State coordinates of the survey stations reported on. They also include the descriptions of the locations and markings of those stations with the lengths and azimuths of the lines between contiguous stations. The land surveyor who ties his work into stations of the national triangulation net, and defines the positions of his land corners by giving their plane coordinates on a State system, provides

indisputable evidence for their accurate restoration should they ever be destroyed.

“Today, for every geographic position (stated in latitude and longitude) determined by the national geodetic survey in any of the States, there is a corresponding plane-coordinate position, which is obtained, not by scaling from a map, but by accurate and precise mathematical procedure. The United States Coast and Geodetic Survey computes and makes generally available the State coordinates of all stations for which it determines standard geographic positions. The surveyors who desires to make use of those stations may do so through the medium of their plane coordinates on the State systems. He need know nothing of the geodetic processes by which the geographic values were obtained or of the mathematics used in converting the geographic positions into State coordinates. He starts with plane-coordinate data and uses plane-surveying methods throughout the work. The value of basing his surveys on such data is obvious. A given geographic position, and its equivalent State-coordinate position, can indicate one and only one point on the earth.

“In practice, the land surveyor uses one of the metal-disk-topped monuments or other station, as the initial of his survey. (Such point not only provides a position on the State system, but usually the direction or bearing to a second marked point.) From this point he runs a traverse to the nearest or most conveniently located corner of the land which he is to survey, and continues around the land to its initial corner. He makes his computations in much the same way as he would have done had there been no station with State coordinates available, but with this difference: he starts with a known, not assumed, position and bearing and he takes account of each extra or additional traverse which was needed to connect the land survey to the State system. But when he has completed the work and its computation, he has a State-coordinate position for each of the corners of the land, and he has in effect keyed his survey to all the stations of the national geodetic survey, not simply with the one which was used as an initial point. He might have used any conveniently located station of the national survey for his initial point and obtained the same coordinates for his land corners.

“As a result, all stations of the national geodetic survey become witnesses to the positions of land corners whose coordinates on a State system are known. The material marks of the land corners, such as trees, stones, fence posts, stakes, or

any sort of artificial markers, may be destroyed, yet the positions they occupied on the ground can be closely reproduced from any recoverable stations of the national survey which are within practical surveying distances of those corners. In this manner, a survey station or land corner which is described in terms of a State coordinate system is practically indestructible."

In establishing the State systems, two conformal map projections were employed: the *Lambert projection* for zones of limited north-south dimension, and the *Transverse Mercator projection* for zones of limited east-west dimension. The Missouri Coordinate System is composed of three zones, each based on the *Transverse Mercator projection*. The dividing line between contiguous zones follows county boundaries, so that no county has land lying in more than one zone. The proposed legislation for Missouri establishes these three zones as follows: The *East Zone*, with the mathematical origin of coordinates at the intersection of (1) its central meridian (running north and south)  $90^{\circ} 30'$  west of Greenwich, England, with (2) parallel  $35^{\circ} 50'$  north latitude; the *Central Zone*, with its origin of coordinates at the intersection of (1) its central meridian  $92^{\circ} 30'$  west, with (2) parallel  $35^{\circ} 50'$  north latitude; and the *West Zone*, with its origin of coordinates at the intersection of (1) its central meridian  $94^{\circ} 30'$  west, with (2) parallel  $36^{\circ} 10'$  north latitude. In each zone this origin is given the coordinates:  $x = 500,000$  feet and  $y = 0$  feet. The east-west position of any point can be located and expressed as the "x — coordinate"; and the north-south position as the "y — coordinate". The x-coordinates increase numerically from west to east, and the y-coordinates from south to north. Each central meridian is assigned an x-coordinate large enough, and each y-coordinate origin is far enough south, so that all coordinate values will be positive. A point a short distance inside the southwest corner of Missouri could be located and described as "having grid coordinates  $x = 468,320$  ft.,  $y = 126,720$  ft., on the Missouri Coordinate System, West Zone".

By dividing the state into zones of lesser width than 158 miles, required for second-order accuracy, the scale errors of the grids range from 0 (exact scale) to less than 1 part in 15,000 (1 in 17,000 in the West Zone), which is a higher order of accuracy than is obtained or necessary in most land surveys; and, therefore, scale errors may be negligible in practically all land survey computations under the Missouri Coordinate System. But should it be desired to take scale error into account, the

necessary corrections of grid values may be easily obtained with simple formulas.

In 1938 the Joint Committee on Land Surveys and Titles recommended to its parent organizations, the American Bar Association and the American Society of Civil Engineers, "That each state legislature enact an enabling law as described above and designate by law the establishment of a bureau of surveys. . . ." <sup>12</sup> On September 13, 1940, the American Bar Association by action of its House of Delegates adopted a resolution "that the American Bar Association favors the establishment of the State Plane Coordinate System by the state legislatures." <sup>13</sup>

The Council of State Governments, in its General Report on Suggested State War and Postwar Legislation for 1945, said: "The State coordinate systems provide a means for the scientific location and description of land boundaries. Their use for that purpose has developed an urgent need for legislation designed to give each system an official designation and a legal definition. The proposed legislation is intended (a) to establish the legal status of the state systems; (b) to insure uniformity and definiteness in terms used; and (c) to impose reasonable standards in the use of the systems when the State coordinates are to become a part of the public records. . . . The legislation proposed is similar in form for all States, except for a difference in the technical descriptions of the separate systems. . . . The legislation proposed provides that the use of the State coordinate system shall be permissive, not mandatory."

New Jersey was the first state to pass such legislation. <sup>14</sup> Before the end of 1951 the following states had adopted similar acts: Pennsylvania in 1937; New York in 1938; North Carolina, Maryland, and Georgia (one county) in 1939; Massachusetts in 1941; Texas in 1943; Louisiana in 1944; Alabama, Connecticut, Delaware, Georgia, Minnesota, Nevada, Ohio, Oregon, Rhode Island, Vermont, and Washington in 1945; Virginia in 1946; California, Maine, South Dakota and Tennessee in 1947; Indiana in 1951. Section 8 of this uniform legislation, if adopted in Missouri, would provide: Whenever coordinates based on the Missouri Coordinate Sys-

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12. PROCEEDINGS, Section of Real Property, Probate and Trust Law, American Bar Association, pp. 81-84 (1938).

13. 65 A.B.A. REPORTS 365 (1940).

14. N.J. Laws 1935, Ch. 116.

tem are used to describe any tract of land which in the same document is also described by reference to any subdivision, line, or corner of the United States public land surveys, the description by coordinates shall be construed as supplemental to the basic description . . . and in the event of any conflict the description by reference to the subdivision, line, or corner of the United States public land surveys shall prevail over the description by coordinates."

There are many advantages from use of the state coordinate system. Each point referenced to it is tied to every station of the United States Coast and Geodetic Survey's very precise triangulation system. There are already over 150,000 such stations. There is now being established a minimum of one such station for each 7½-minute mapping quadrangle and, in addition, monumented triangulation points are established at about four-mile intervals along the major highways. Each station is a reference point for every other station. Very elaborate precautions are used for setting monuments so they will not be destroyed or lost. But even the most apparently secure survey monuments that can be set are subject to destruction or may be moved. However, if the physical monument marking a station or land corner should be completely destroyed, its position on the ground can be accurately re-established to conform to its coordinates on a state system if they have been determined and are available. Such a point can never become a *lost point* within the meaning of that term as long as its state coordinates are known and there remain other proven stations on the state system within survey distance of the point. This is in contrast to the countless destroyed section monuments in Missouri, and the grossly erroneous lengths and bearings between these monuments which were shown by the original public land survey.

Of course, everyone is familiar with the division of land in the more thickly populated centers into *subdivisions*, *blocks*, and *lots*, with the survey plat and information property authenticated and recorded, so that any lot, or part of a lot, can be easily identified, both on the ground and on paper, by reference thereto.

#### THE CURRENT SURVEY

Most of our present day surveys begin, at least, as an effort to translate from a description on paper back into the location of a specific area on the ground, some previous survey of which had furnished the

information from which had been written the description being followed. In short, *most current surveys are made for the purpose of finding and again retracing the footsteps of some former surveyor.*

The requirements for making a *survey which would be admissible in court* (that being the ultimate test) may be summarized as those rules which experience has taught will most certainly insure the finding and retracing of the footsteps of the person who made the previous survey which furnished the groundwork or basis for the description (generally going back to the government land surveyor who set the section and quarter-section corners). Where there are many possible courses or procedures from which to select, it is not only desirable that the best shall be selected, but that this preferred procedure shall be known in advance or be predictable with certainty so that no effort will be wasted on unacceptable methods.

The legal requirements as to surveying are intended to aid in finding on the ground, and insuring the true identity of the monuments and courses noted by the original surveyor, regardless of whether or not he measured and noted them correctly.<sup>15</sup> But retracing the old survey is

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15. *Ayers v. Watson*, 137 U.S. 584, 34 L.Ed. 803, 11 Sup. Ct. 201 (1891) ("Your duty is to follow the tracks of the surveyor, so far as we can discover them on the ground with reasonable certainty . . ."); *Diehl v. Zanger*, 39 Mich. 601 (1878) ("The Surveyor has missed entirely the point to which his attention should have been directed. The question is not how an entirely accurate survey would locate these lots, but how the original stakes located them"); *Ohlson v. Batterton*, 230 S.W. 110 (Mo. 1921) ("Corners established by United States surveyors in surveying the public lands are conclusive as to the actual location of the boundary lines of sections and their legal subdivisions, and it cannot be shown that such corners were mistakenly located by said surveyor."); *Henrie v. Hyer*, 70 P. 2d 154 (Utah, 1937) (" . . . the original corners as established by the government surveyors, if they can be found, or the places where they were originally established, if that can be definitely determined, are conclusive on all persons owning or claiming to hold with reference to such survey, and the monuments placed by the original surveyor without regard to whether they were correctly located or not."); *Galt v. Willingham*, 11 F. 2d 757 (5th Cir. 1926); *Fellows v. Willett*, 98 Okla. 248, 224 Pac. 298 (1924); *Cragin v. Powell*, 128 U.S. 691, 32 L.Ed. 566, 9 Sup. Ct. 203 (1888); *Beltz v. Mathiowitz*, 72 Minn. 443, 75 N.W. 699 (1898); *Goltermann v. Schiermeyer*, 111 Mo. 404, 19 S.W. 484 (1892); *Armstrong v. Batterton*, 303 Mo. 220, 223, 260 S.W. 80 (1923); *Bowzer v. State Highway Commission*, 170 S.W. 2d 399, 404-407 (Mo. 1943); *Klinhart v. Mueller*, 166 S.W. 2d 519 (Mo. 1942); *Pioneer Cooperage Co. v. Bland*, 228 Mo. App. 994, 75 S.W. 2d 431 (1934); *Wright Lumber Co. v. Ripley County*, 270 Mo. 121, 135, 192 S.W. 996 (1917); *Cordell v. Sanders* 331 Mo. 84, 52 S.W. 2d 834 (1932); *Eversmeyer v. Broyles*, 280 Mo. 99, 106, 216 S.W. 317 (1919); *Simpson v. Stewart*, 281 Mo. 228, 232, 219 S.W. 589 (1920); *Schell v. City of Jefferson*, 357 Mo. 1020, 1027, 212 S.W. 2d 430 (1948) (*en banc*)—all recorded evidence, if there ever was any, of lots, inlots, and property lines in Missouri's capital city, probably destroyed by burning of the State Capitol and the Cole County court house; *Clark v. McAtee*, 227 Mo. 152, 182-192, 127 S.W. 37 (1910), 253 Mo. 196, 161 S.W. 698 (1913); *Cox v. Hart*, 260 U.S. 427, 436, 67 L.Ed. 332, 43 Sup. Ct. 154, 157 (1922).

sometimes very difficult, and grows more so as the passage of time erases more and more of those footsteps or makes them harder to find and identify with certainty.

Our first purpose is to determine the *intent* of the person who prepared the description, plat, or field notes which we are to translate into the proper location on the ground. In case there are *conflicts* or *mistakes* which are *apparent on the face of the instrument* being translated (rather than made to appear only from outside evidence), there are certain rules of law which make it more probable the true intent will be followed.

Mr. McCune Gill, the dean of real property or title lawyers in Missouri, says in his *Treatise on Real Property Law in Missouri*:<sup>16</sup>

"The description in a deed must definitely locate the property. The elements of description are: (1) natural monuments, (2) artificial monuments, (3) plats, (4) courses, (5) distance, and (6) acreage. If any of these elements conflict, they will govern in the above order of priority."<sup>17</sup>

"In view of the above it is evident that one should use monuments wherever possible in the description of property and deeds, mortgages, leases, wills, and other documents, as the location of such monuments will govern if there is any doubt or error as to the distances or areas used in the description.

"Monuments are either natural or artificial. Natural monuments include rivers, creeks, trees, and other natural objects. Artificial monuments include surveyors' stones and stakes, streets and alleys, walls and bounding owners. In case of a conflict, natural monuments will govern over artificial monuments."<sup>18</sup>

#### HOW THE SURVEY SHOULD BE MADE

The surveyor should get his results from a survey actually run out on the ground, rather than on paper. In *Bowzer v. State Highway Commission*,<sup>19</sup> the question was whether a filling station was in, or outside,

16. 1 TREATISE OF REAL PROPERTY LAW IN MISSOURI 34 (1949).

17. *Galt v. Willingham*, 11 F. 2d 757, 758 (5th Cir. 1926); *Diehl v. Zanger*, 39 Mich. 601 (1878); *Johnson v. Bowlware*, 149 Mo. 451, 456, 51 S.W. 109 (1899); *Henrie v. Hyer*, 70 P. 2d 154 (Utah, 1937); *Ohlson v. Batterton*, 230 S.W. 110 (Mo. 1921).

18. 2 GILL, TREATISE OF REAL PROPERTY LAW IN MISSOURI 715 (1949).

19. 170 S.W. 2d 399, 404-407 (Mo. 1943).

the right of way of U. S. Highway No. 36 at Macon. It was contended that the center-line of the concrete slab, laid some years after the right of way was condemned, was not put on the transit or right of way center-line. A section corner referred to in the condemnation description is now in the bottom of an artificial lake. The Supreme Court of Missouri held that neither party had offered in evidence a competent survey. Plaintiff's surveyor had concluded that there was a 25-foot error in the distance shown to a quarter-section corner in the government survey, and his survey was erroneous because based on his "corrected" distance. The state highway engineer put in evidence a concrete marker in the northwest corner of the NW $\frac{1}{4}$ , Sec. 17, and the recorded survey data of a former county surveyor showing its setting in conformance with proper monuments existing at that time. The court said: "We believe the establishment of the northwest corner NW $\frac{1}{4}$  17 is sufficiently shown by the evidence to meet the requirements of this court, as announced in *Cordell v. Sanders*, supra 331 Mo. 84, 52 S.W. 2nd 839, . . ."20

But the evidence and plat offered by the engineer was based upon distances by triangulation from said NW corner and a second corner, which the Engineer located "From the survey recorded in Book 2, page 123, under date of April 1st and 2nd, 1857 . . . a survey by W. G. Walker, County Surveyor, and which the stone at the northeast corner of the northwest quarter of Section 17, T. 57, R. 14 shows it to be 'U.S. Stumps set, lost rock 6 + 8 + 10'. This quoted legend is ambiguous."

The opinion further states that the survey should have started at "monuments, shown to have been lawfully established, and on evidence of sure projections made by actual survey rather than by computation, or composite studies, from plans."

"Evidence of a survey which is not definitely shown to have been commenced from a corner established by the government or, if lost, re-established in accordance with statutes, is of no probative force."<sup>21</sup> In this case four different county surveyors had surveyed without consulting the notes of the government survey, and starting from various points, such as a pile of stones indicated by one of the contestants.

It may be that a "Water Witch" equipped with the proper "divining

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20. *Id.* at 406.

21. *Klinhart v. Mueller*, 166 S.W. 2d 519 (1942).

rod" (bent or forked stick) can know the exact location of underground rivers, but an engineer's or surveyor's license is not recognized in law as conferring any such occult power, intuition, or divine right to say where old monuments, now invisible to other eyes, were located. This is the effect of Judge Hyde's opinion in *Cordell v. Sanders*,<sup>22</sup> where a state highway engineer, employed by one of the parties, testified that he found no government monument from which to start his survey (in fact had looked for none); that, anyway, the government survey was wrong; that he knew "the exact point where the corner should be"; that it was where two fences and two roads intersected; that "it was not necessary to survey, and there is no better way to get about it to establish a corner than the way I did"; and where no question has been raised as to the location of a corner, he wouldn't start any trouble by searching for its true location.

*Clark v. McAtee*<sup>23</sup> is an interesting case. One neighbor hired the official county surveyor to determine where the property line ran through one of the city blocks in Edina, Missouri, so a fence could be built at the proper place. The other neighbor questioned the location so determined, and hired this same county surveyor to run the line for him, and a different location was determined. When suit was brought, the court appointed this same county surveyor to make a third survey, which resulted in still a third location of the property line. The Missouri Supreme Court held that none of the three surveys were admissible in evidence, because, among other errors, one of the starting points was a government corner stone which, as was brought out in evidence late in the case, was lying back of the ditch where a road-working gang had dumped it years before after plowing it up from the middle of the road. Incidentally, it was held on the second appeal that the survey offered by plaintiff at the second trial was still inadmissible.

The opinion in *Henrie v. Hyer*<sup>24</sup> quotes from instructions to surveyors, page 285 of what is, in the last of many editions, entitled *Manual of Instructions for the Survey of the Public Lands of the United States*, by the Bureau of Land Management, United States Department of the Interior:

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22. 331 Mo. 84, 52 S.W. 2d 834 (1932).

23. 227 Mo. 152, 182-192, 127 S.W. 37 (1910), up a second time in 253 Mo. 196, 161 S.W. 698 (1913).

24. 70 P. 2d 154, 156 (Utah, 1937).

"An obliterated corner is one where no visible evidence remains of the work of the original surveyors in establishing it. The location may, however, have been preserved beyond all question by acts of landowners, and by the memory of those who knew and recollect the true situs of the original monument. In such case *it is not a lost monument*.

"A *lost corner* is one whose position cannot be determined beyond reasonable doubt, either from original marks or reliable external evidence."<sup>25</sup> (Emphasis mine.)

For restoration of *lost* (as distinguished from *obliterated*) corners, the *Manual of Instructions for the Survey of the Public Lands of the United States* (1947) says, p. 289:

*"A lost corner is a point of a survey whose position can not be determined, beyond reasonable doubt, either from traces of the original marks or from acceptable evidence or testimony that bears upon the original position, and whose location can be restored only by reference to one or more interdependent corners.*

"If there is some acceptable evidence of the original location that position will be employed in preference to the rule that would be applied to a lost corner.

"The engineer is not prepared to consider the restoration of a lost corner until he has exhausted every other means of identifying its original position, and at this stage of his work he should have determined upon an approximate position of the original monument based upon his findings resulting from retracements leading from known corners to the lost corner, from one, two, three, or four directions in accordance with the plan of the original survey. The principle of proportionate measurement, which most nearly harmonizes surveying practice with the legal and equitable considerations involved in controversies concerning lost land boundaries, enters into the problem at this stage, and this plan of relocating a lost corner will always be employed unless outweighed to the contrary by physical evidence of the original survey. In cases where the relocated corner can not be made to harmonize with all the calls of the original field notes, due to unexplained discrepancy which is made apparent by the retracement, the engineer is required to determine which calls will be given major control, and those which must be subordinated."

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25. See *Beltz v. Mathiowitz*, 72 Minn. 443, 75 N.W. 699 (1898); *Eversmeyer v. Broyles*, 280 Mo. 99, 106, 216 S.W. 317 (1919); *Simpson v. Stewart*, 281 Mo. 228, 219 S.W. 589 (1920); *Hopper v. Hickman*, 145 Mo. 411, 46 S.W. 973 (1898).

A word of caution should be inserted at this point. The early surveys in public-land states did not always conform to the present instructions for the survey of the public lands. Since, from a legal standpoint, we must find and retrace the steps of the original government surveyor, a surveyor should obtain a copy of the actual instructions under which the first survey of the given section of land was made, and follow them. He should never take for granted that the present instructions were the ones actually used in a particular location.

Title 18 U.S.C.A., Section 1858, provides:

"Whoever wilfully destroys, defaces, changes, or removes to another place any section corner, quarter-section corner, or meander post, on any Government line of survey, or wilfully defaces, changes, or removes any monument or bench mark of any Government survey, shall be fined not more than \$250 or imprisoned not more than six months, or both."

Section 60.320, *Missouri Revised Statutes*, 1949, says:

"It shall be duty of every county surveyor and every deputy county surveyor to report as soon as practicable all violations of law relative to the destruction of landmarks that come under their observation, or of which they have knowledge, to the grand jury or to the prosecuting attorney of the county in which the violation occurs."

Despite these provisions of the state and the United States laws, few, if any, witness trees can be found today, and a large percentage of Government corner stones or other monuments have either been moved or disappeared entirely. Such monuments were most inconveniently located just where farmers would want to set their corner post. Then, too, it has not been difficult to move or obliterate a monument for dishonest purposes or through ignorance or carelessness. Even when a monument is found, as in *Clark v. McAtee*,<sup>26</sup> there should be some check made as to *whether it is still in the place where originally set.*

Chapter 446, *Missouri Revised Statutes*, 1949, sets out certain *statutory rules for preserving land boundaries in Missouri*. Any land-survey corner "in a decayed or perishable condition", shall be reset by the county surveyor when required by any person interested in the tract.<sup>27</sup> The county surveyor shall note particularly in his field notes the "corner

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26. *Supra* n. 23.

27. MO. REV. STAT. § 446.010 (1949).

from which he starts the survey and to which he traces the lines, . . . the condition of the corner (witness) trees, if any, . . . every object of note, over or by which the lines may pass; also the falling off distance,<sup>28</sup> and the (magnetic) variation at which said lines shall have been surveyed."<sup>29</sup> He shall cause to be planted a stone or post at each corner to be established (re-established); mark and describe witness trees, if any within a reasonable distance; note the names of his chainman, flagman, and other persons present at the planting of the corner stone or post; certify, and record, in a book to be kept in the office of the county surveyor,<sup>30</sup> a copy of the field notes; and deliver other certified copies to anyone desiring them (for a charge of 15c per 100 words).<sup>31</sup>

Any corner "*destroyed or obliterated* by time or accident" may be re-established by any person whose title to land may be thereby affected. He may call on a magistrate of the county to take testimony.<sup>32</sup> A 30-day notice of the time and place of taking such testimony must be given in writing to every person interested in the lands adjoining any corner in question, or to nonresidents of the state by publication three weeks consecutively (the last insertion being 20 days before the day of taking testimony) in some newspaper in the county.<sup>33</sup> The magistrate shall summons the county surveyor and such witnesses as any interested party may request.<sup>34</sup> Witnesses are examined in the presence of the magistrate and county surveyor "touching the existence or situation of such de-

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28. "The falling is the distance on the normal (at right angle) by which a line falls to the right or left of a corner on which the random line was intended to close." MANUAL OF INSTRUCTIONS FOR THE SURVEY OF THE PUBLIC LANDS OF THE UNITED STATES, p. 176.

29. Mo. REV. STAT. § 446.020 (1949).

30. Mo. REV. STAT. § 60.340 (1949) requires every county and city surveyor in Missouri to "(1) Keep a fair and correct record of all surveys made by himself and his deputies, in a well-bound book, with a convenient index, . . . the property of such county or city, . . . known as the 'record of surveys', . . . and such books shall be preserved by the recorder of deeds . . . subject to inspection by any person interested therein. . . ; (2) In surveying town lots, he shall give the distances to the points or lines from which he establishes the lines of the lots, and perpetuate the same by measuring the distances to houses standing in the immediate vicinity, or by prolonging the lines to the curbstones and cut notches therein; (3) Number his surveys progressively; (4) . . . note on each plat and in the field notes the magnetic variation under which the lines of the survey were run; and (5) Deliver a copy of any survey to any person" paying the legal fee, so long as said records remain in his possession, or after they are deposited with the recorder he shall upon such payment deliver a duly certified copy of such records, which shall be accepted as evidence as if they were the original notes.

31. *Id.* § 446.030.

32. *Id.* § 446.040.

33. *Id.* § 446.090.

34. *Id.* § 446.050.

stroyed or obliterated corners, or any other matter in relation to the entry or survey of such lands, or of the corners or boundaries of any adjoining lands.”<sup>35</sup> The evidence shall be written out, signed, and sworn to by the respective witnesses, signed and certified by the magistrate, and delivered to the county surveyor.<sup>36</sup> The county surveyor shall, upon request of any interested person, make a survey and cause a stone or post to be planted at each decayed or obliterated corner, being governed by the testimony so delivered to him,<sup>37</sup> and shall make, certify, and record a copy of a plat in the county surveyor’s record book and deliver the certified original and the testimony taken by the magistrate to the county recorder to be recorded by him, noting on the plat, the corners at which stones or posts were planted, the names of the chainmen, markers, and others present at the planting, and state that all was done in accordance with the testimony taken.<sup>38</sup> The original, or certified copies of the record, may be offered and received in evidence, subject to exceptions for irrelevancy or incompetency.<sup>39</sup>

If section or quarter-section corners are lost (not merely obliterated), Sections 60.290 and 60.300 of the *Missouri Revised Statutes* set out, in order of priority, the requirements of state law for their re-establishment in Missouri.<sup>40</sup> Section 60.250 should be followed in establishing blank quarter-section corners on the west side of irregular sections, and Section 60.260 for blank quarter-section corners on the north side of such sections.

#### WHO SHOULD MAKE THE SURVEY?

Is there any limitation by law as to *who* may make a survey which will be admitted in evidence? It is frequently contended that Section 60.150, *Missouri Revised Statutes*, 1949, sets up such limitations when it says:

“No survey or resurvey, hereafter made by any person, except that of the *county surveyor or his deputy* shall be con-

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35. *Id.* § 446.060.

36. *Id.* § 446.080.

37. *Id.* § 446.110.

38. *Id.* §§ 446.120, 446.130, 446.140.

39. *Id.* § 446.150.

40. See *Cordell v. Sanders*, 331 Mo. 84, 52 S.W. 2d 834 (1932); *Simpson v. Stewart*, 281, Mo. 228, 219 S.W. 589 (1920); *Goltermann v. Schiermeyer*, 111 Mo. 404, 19 S.W. 484 (1892).

sidered *legal evidence* in any court in this state, except such surveys as are made by the authority of the United States or by mutual consent of the parties." (Emphasis mine.)

In *Carter v. Spracklin*,<sup>41</sup> the plaintiff introduced evidence by the county surveyor and also by the city engineer, while the defendant offered evidence of a former county surveyor. As frequently happens, all three surveyors reached different results. Plaintiff contended the trial court erred in not instructing that (1) the present county surveyor's evidence was binding on, and must be followed by the jury, and (2) that the survey made by the county surveyor was "presumptively valid and correct". The supreme court held (1) that Section 60.150 "does not disqualify any surveyor, private or official, from testifying in relation to surveys made by him"; (2) that it makes a survey "by the county surveyors *prima facie* evidence of its correctness, without first establishing its correctness by parol or other competent evidence, which of course could be overthrown or disproved by any competent evidence"; (3) that when such a *prima facie* case was contradicted, a question of fact was presented for the jury to determine; and (4) that it would have been error for the trial court to have selected some evidence (that of the county surveyor) for comment while ignoring the testimony of others.

Likewise in *Hopper v. Hickman*,<sup>42</sup> the court said that Section 60.150 does not prohibit or disqualify any type of evidence which otherwise would have been admissible, "but is rather to be considered as an enlargement of the range from which testimony may be gathered"; it makes certain surveys "legal evidence", but "in no wise attempted to designate what surveyors are competent as witnesses or to what questions their testimony should be limited." (Emphasis mine)<sup>43</sup>

Some states require a license before certain kinds of surveying or engineering services may be performed for pay. In Missouri, Chapter 327, *Missouri Revised Statutes* (1949), makes it a misdemeanor, punishable by fine up to \$500 and/or three months' imprisonment, to render certain

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41. 246 Mo. 116, 151 S.W. 451 (1912).

42. 145 Mo. 411, 46 S.W. 973 (1898).

43. To like effect are *State v. Turpin*, 196 S.W. 2d 798 (Mo. 1946); *Morris v. Nowell*, 180 S.W. 2d 717 (Mo. 1944); *Bowzer v. State Highway Commission*, 170 S.W. 2d 399, 404-407 (Mo. 1943); *Randolph v. Moberly Hunting and Fishing Club*, 321 Mo. 995, 1011, 15 S.W. 2d 834 (1929) (*en banc*); *Von Eime v. Fuchs*, 320 Mo. 746, 752, 8 S.W. 2d 824 (1928); *Jones v. Eaton*, 307 Mo. 172, 180-184, 270 S.W. 105 (1925) (*en banc*); *Clark v. McAtee*, 227 Mo. 152, 127 S.W. 37 (1910).

engineering services without a license. However, Section 327.090 exempts "Land surveyors whose work includes exclusively surveying of areas for their correct determination and description and for conveyancing, or for the establishment or re-establishment of land boundaries and plotting of lands and subdivisions thereof."

#### EVIDENCE WHICH WILL BE ADMISSIBLE IN COURT

The final test of whether a survey is made so as to meet the requirements of law is: Would it be admitted in evidence by a court in a case involving the true location of a property line, or of objects with reference to such lines? We should note incidentally that, even if it meets this test, a further test of the value or quality of the survey must be: How understandable and convincing would it be if presented to a jury of laymen?

It was said in *Goltermann v. Schiermeyer*:<sup>44</sup> "The monuments set by the deputy United States surveyors for the west section corners must control as to the proper location of those corners. The question where they were located, if destroyed, is one of fact, and not of law, for the jury to determine under all the evidence."<sup>45</sup>

The United States Supreme Court said in *Ayers v. Watson*,<sup>46</sup> "Courts have always been liberal in receiving evidence with regard to boundaries which would not be strictly competent in the establishment of other facts. Old surveys, perambulation of boundaries, even reputation, are constantly received on the question of boundaries of large tracts of land. The declarations of surveyors made at the time of making a survey have been admitted; . . ."

Again in *Diehl v. Zange*:<sup>47</sup> "The city surveyor should, therefore, have directed his attention to the establishment of the actual location of the original land marks set by Mr. Campau, and if those were discovered they must govern. If they are no longer discoverable, the question is where they were located; and upon that question the best possible evidence is usually to be found in the practical location of the lines, made at a time when the original monuments were presumably in existence and probably

44. 111 Mo. 404, 19 S.W. 484 (1892).

45. See *McEwen v. Den*, 24 How. 242, 16 L.Ed. 672 (U.S. 1861); *Cordell v. Sanders*, 331 Mo. 84, 52 S.W. 2d 834 (1932); *Hopper v. Hickman*, 145 Mo. 411, 46 S.W. 973 (1898).

46. 137 U.S. 584, 34 L.Ed. 803, 808, 11 Sup. Ct. 201, 205 (1891).

47. 39 Mich. 601, 604 (1878).

well known. . . . As between old boundary fences, and any survey made after the monuments have disappeared, the fences are by far the better evidence of what the lines of a lot actually are, and it would have been surprising if a jury in this case, if left to their own judgment, had not so regarded them."<sup>48</sup>

And in *Henrie v. Hyer*:<sup>49</sup> "Surveyors, in making resurveys or in searching for or relocating or re-establishing lost or obliterated corners, may consider extrinsic and material evidence, as well as the field notes, for the purpose of determining the exact location of lost lines or corners of the original survey."<sup>50</sup>

Of course, a surveyor's conclusions are not binding on a court.<sup>50a</sup>

#### FENCES AND ADVERSE POSSESSION

It should be pointed out that the location of fences over a long period of time is important, not only when it is the only obtainable evidence tending to indicate where an obliterated corner was originally located, but may bear on ownership from adverse possession for the statutory period. There is some confusion as to just when possession is adverse. It was said in *Goltermann v. Schiermeyer*:<sup>51</sup> "Where one of two adjoining proprietors builds a fence upon what he supposes to be the true line, and takes possession of the land so enclosed, without claiming or intending to claim beyond the true line when subsequently ascertained, his possession of a part of his neighbor's land included in the enclosure is not adverse. . . . But, on the other hand, where one of two adjoining land proprietors takes and holds possession up to a fence which he supposes to be the true line, claiming to the fence, his possession is adverse as to all the land within his enclosure. In such a case it makes no difference that

48. For types of evidence offered, see *Schell v. City of Jefferson*, 257 Mo. 1020, 212 S.W. 2d 430 (1948) (*en banc*); *Pioneer Cooperage Co. v. Bland*, 228 Mo. App. 994, 75 S.W. 2d 431 (1934); *Cordell v. Sanders*, 331 Mo. 84, 52 S. W. 2d 834 (1932); *Von Eime v. Fuchs*, 320 Mo. 746, 8 S.W. 2d 824 (1928); *Simpson v. Stewart*, 281 Mo. 228, 219 S.W. 589 (1920); *Clark v. McAtee*, 227 Mo. 152, 127 S.W. 37 (1910).

49. 70 P. 2d 154, 157 (Utah, 1937).

50. *Craven v. Lesh*, 22 Idaho 463, 126 Pac. 774 (1912); *Shell v. City of Jefferson*, 357 Mo. 1020, 212 S.W. 2d 430 (1948) (*en banc*); *Von Eime v. Fuchs*, 320 Mo. 746, 8 S.W. 2d 824 (1928); *Armstrong v. Batterton*, 303 Mo. 220, 260 S.W. 80 (1923); *Hopper v. Hickman*, 145 Mo. 411, 46 S.W. 973 (1898); *Thomsen v. Keil*, 48 Nev. 1, 226 Pac. 309 (1924), interesting because copy of field notes set out.

50a. See *Cordell v. Sanders*, *supra*, n. 22, 48.

51. 111 Mo. 404, 19 S.W. 484, 20 S.W. 161 (1892).

he was mistaken as to the location of the true line; nor does it make any difference that he did not intend to invade his neighbor's rights."

But whether a witness' occupancy was adverse should not be made to depend largely (a) upon whether he will admit a dishonest intention or (b) upon the adroit phrasing of a lawyer's question. One of the best statements of the rule is quoted in *Patterson v. Wilmont*:<sup>52</sup> "The principle, as stated in all of our prior decisions, may be reduced to this: If the possessor *occupies* the land in question *intending* to occupy that particular piece as his own, his occupancy is adverse. . . . It is the *intent to possess*, and not the intent to take irrespective of his rights, which governs." (Boldface mine.)

Generally no legal title can be acquired by adverse possession against *the public*, as pointed out in *Schell v. City of Jefferson*<sup>53</sup> and *Bowze v. State Highway Commission*.<sup>54</sup>

#### START WITH PLATS AND FIELD NOTES

In all cases in which is involved any question as to the correctness of a survey, monuments, or courses, it should be made a rule to start by securing or examining properly certified and admissible copies of such field notes and plats on file as are in the chain of title and bear upon the question—beginning with the government survey under which the land was first conveyed by the United States. These should always be available, not only to the *surveyor* and *lawyer*, but to the *court*... As was said in *Cordell v. Sanders*:<sup>55</sup> "A surveyor's testimony 'is never receivable except in connection with the data from which he surveys, and if he runs lines they are of no value unless the data are established from which they are run, and those must be distinctly proven, or there is nothing to enable anyone to judge what is the proper results.' . . . On another trial, the court should have the benefit of the United States government survey [citing what are now Sections 60.350—60.370, *Missouri Revised Statutes* (1949) ], and also the plat made by the surveyor."

Judge Lamm, whose opinions are always models of literary style as well as legal reasoning, said in *Akins v. Adams*:<sup>56</sup> "We will not go into the

52. 245 S.W. 2d 116, 121 (Mo. 1952).

53. 357 Mo. 1020, 1027, 212 S.W. 2d 430 (1948) (*en banc*).

54. 170 S.W. 2d 399 (Mo. 1943).

55. 331 Mo. 84, 98, 52 S.W. 2d 834 (1932) (see p. — above).

56. 256 Mo. 2, 17, 164 S.W. 603 (1913).

matter or decide the controversy, because the plats used at the trial from which the witnesses testified and to which they referred, were not introduced in evidence. So the testimony of witnesses anent this survey, produced here in narrative form, is so chaotic, so incoherent and unintelligible in vital particulars, that the like of it in court records may be found nowhere so well reported as by Rabelais in the celebrated (and, possibly, imaginary) case of Lord K . . . v. Lord Suckfist, and the wonderful judgment pronounced by Pantegrue therein, a judgment doubtless familiar to the whole Missouri bar. . . . It is impossible for us on this record to pass on the merits of that contention. *Impotentia excusat legem*. No one (not even a judge) is bound to do what is impossible."

#### SURVEY MUST START AT AN ESTABLISHED CORNER

The Missouri Supreme Court has pointed out certain legal requirements to make evidence of a survey admissible, as in *Schell v. City of Jefferson*.<sup>57</sup> "We have said in a number of cases: 'Evidence of a survey which is not definitely shown to have commenced from a corner established by the government or, if lost, re-established in accordance with statutes, is of no probative force.' [Citing cases.]"<sup>58</sup> See also: 'A surveyor who attempts by patrol evidence to establish a survey would have should the same facts by patrol that would have to be shown on the plat.'

#### IF NO EVIDENCE MEETING LEGAL REQUIREMENTS

The burden of proving his case by sufficient and competent evidence is always upon the plaintiff or moving party in court. If he fails to produce such evidence, the defendant will win, since he has the negative of the question, and no burden of offering or rebutting any proof until the plaintiff has put in sufficient competent evidence to make out the allegations in his pleadings. The court will leave the parties in the position in which it found them. For example, judgment for plaintiff was reversed in *Cordell v. Sanders*.<sup>59</sup> where the opinion said: ". . . defendant is correct in his contention that plaintiff's evidence was insufficient to re-establish the lost quarter section corner and to show in which quarter section the

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57. 357 Mo. 1020, 1027, 212 S.W. 2d 430 (1948) (*en banc*).

58. See also *Klinhart v. Mueller*, 166 S.W. 2d 519 (Mo. 1942); *Pioneer Cooperage Co. v. Bland*, 228 Mo. App. 994, 75 S.W. 2d 431 (1934); *Clark v. McAtee*, 227 Mo. 152, 127 S.W. 37 (1910).

59. 331 Mo. 84, 93, 52 S.W. 2d 834 (1932).

land in controversy was located. It may be that the point at which plaintiff's surveyor commenced to survey is the southwest corner of Section 3, but plaintiff did not prove that it was. . . . If they had other information upon which to base this assumption it was not introduced in evidence. Their testimony is replete with conclusions of fact or of law rather than evidence in regard to facts. . . . A surveyor's testimony 'is never receivable except in connection with the data from which he surveys, and if he runs lines they are of no value unless the data are established from which they are run, and those must be distinctly proven, or there is nothing to enable anyone to judge what is the proper result.'"

The judgment for plaintiff in the second trial of *Clark v. McAtee*<sup>60</sup> was set aside because he had not sustained the burden of proof—"If his measurements are incorrect, or if he started from the wrong beginning point, or course, his survey and his testimony fall, and respondent's case falls with it." Again in *Klinhart v. Mueller*,<sup>61</sup> the court said: ". . . we rule that the Scroggin survey and his evidence were incompetent, and that there is no evidence to support the judgment for plaintiff."

If the amount of area is stated in the description, Title 43 U.S.C.A., Section 752, paragraph 3 provides that ". . . the contents . . . returned by the Field Surveying Service, shall be held and considered as containing the exact quantity expressed in such return. . . ." This is a rule for determining the acreage for which the government is to be paid. It is not conclusive as between private persons. And where the area expressed in any plat or description is in conflict with the monuments and courses, set out as bounding that area, it is generally held that, in order to best arrive at the *true intent*, the area expressed must give way.<sup>62</sup>

We should bear in mind that the area computed from a proper survey may differ from the *actual area of the surface* over which the survey is made. As was pointed out by the Supreme Court of the United States in *McEwen v. Den*,<sup>63</sup> ". . . the mode of measuring will be to level the chain, as is usual with chain carriers when measuring up and down mountain sides, or over other steep acclivities or depressions, so as to approximate, to a reasonable extent, horizontal measurement." Local

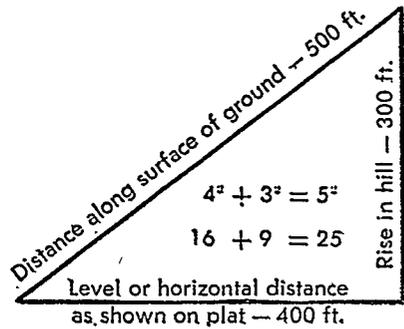
60. 253 Mo. 196, 200, 161 S.W. 698 (1913).

61. 166 S.W. 2d 519, 523 (Mo. 1942).

62. *Hickerson v. Dillard*, 247 S.W. 801 (Mo. App. 1923); *Capps v. Clark*, 196 Iowa 758, 195 N.W. 372 (1923).

63. 24 How. 242, 16 L.Ed. 672 (U.S. 1861).

customs to the contrary cannot change the legal rule. It follows, in effect, that horizontal survey distances may be computed from one or a series of right-angle triangles—the square of the hypotenuse equals the sum of the square of the other two sides—(a) the horizontal or level distance being one side or the base, (b) the distance, at right angle, which the slope arises from the horizontal being the second side, (c) and the distance along the sloping surface of the hill being the hypotenuse. Thus, if a hillside rises 300 feet in a distance of 500 feet, as measured along the ground, the horizontal or survey distance shown on the plat should be 400 feet, not 500 feet.



When surveys are made for the purpose of identifying some area of land by locating the boundary of the land area, unless the boundary line completely circumscribes the area and arrives back at the point of beginning, or “closes”, no area is identified, and the survey is defective.

### THE DESCRIPTION

Land descriptions should (1) identify the particular tract with certainty, so that it can be found on the ground and could not possibly be confused with any other tract, (2) be as condensed, simple, and easily understood as possible, and (3) be in such form that it can be placed in the official land records of the county where the land lies and thus become a link in the record chain of title. The person who prepares it should have the unusual ability of being able to put himself in the shoes of every person who will have occasion in the future to translate the description back into the exact location on the ground, and the ability to make it so clear and concise that no one of ordinary intelligence and experience could fail to understand his intentions. Certainly any description is bad if from it a surveyor could not locate the land without any question.

In *Jones v. Eaton*,<sup>64</sup> the court said that where the plaintiff is successful in ejectment, the writ of possession must describe the land so that the

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64. 307 Mo. 172, 270 S.W. 105 (1925) (*en banc*).

sheriff can determine from it, without consulting any outside information, just what land he is to take from the defendant's possession and give to the plaintiff. This could be by reference to natural or erected monuments, e.g., "the fence now standing on the east line", or "25 feet westerly from the fence". This also applies to the judgment, since the writ must follow the judgment.

A description may be in the form of *words, figures, and/or a plat*.<sup>65</sup> Certain abbreviations in connection with land descriptions are in common use and well understood. Since such abbreviations and Arabic numerals concentrate ideas in a smaller space, and thus enable the mind to get a sharper image of more related ideas in a single eye-span than if spelled out in full, their use tends toward more accuracy and efficiency and should be preferred. A number should not be both expressed in figures and spelled out, since this could not make the meaning any clearer, but only increases the chance of error, contradiction, and confusion creeping in.

In *Ottumwa, C.F. & St. P. R.R. v. Williams*,<sup>66</sup> appellant claimed "that the description, 'sections 22 and 28, Tp. 79, R. 13, Paweskiek County, Iowa', does not describe any land, because 'Tp. 79, R. 13,' does not locate the land any where." The court replied: "It appears to us that there is no uncertainty or indefiniteness in these contractions of words. They are in almost universal use in this State in describing lands, and everybody understands that they mean 'township' and 'range'. It is true the contract does not state whether the range is east or west, but that was wholly unnecessary, as the land was described as in Poweskiek County, and the courts of this State take judicial notice that all of the land in that County is in range west."<sup>67</sup>

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65. *Cragin v. Powell*, 128 U.S. 691, 32 L.Ed. 566, 9 Sup. Ct. 203 (1888); *Ohlson v. Batterson*, 230 S.W. 110 (Mo. 1921).

66. 71 Iowa 164, 167, 32 N.W. 315 (1887).

67. "The word 'east' or 'west' after the range number may be omitted from a description without creating uncertainty if the instrument shows in what county and state the land is situated, and if the county is not one through which a Meridian passes. (Gill on Missouri Titles (3d Ed.) sec. 143.) This court takes judicial notice of land descriptions in the government surveys and of political subdivisions of the State. (*Mayer v. Mayher*, 224 Mo. 631, 123 S.W. 806.) We know that the Fifth Principal Meridian runs north and south many miles west of Stoddard County, Missouri." *Federal Land Bank v. McColgan*, 332 Mo. 860, 867, 59 S.W. 2d 1052 (1953). The court took judicial notice of the instructions of the surveyor-general for Missouri to the deputy surveyors in *Campbell v. Wood*, 118 Mo. 186, 22 S.W. 796 (1893).

In *Akins v. Adams*,<sup>68</sup> the description was: "The southwest quarter of section number thirty-two (32) and east half and southwest quarter of southeast quarter 31, 35, 24, containing 160 acres, and lot 9 N.W. fractional quarter, section 6, township 34, range 24, situate in said county of Polk and state of Missouri." Judge Lamm said: "Appellant contends that the bare numerals, '31-35-24', are meaningless and cannot be judicially held to be a description of any land. . . . Having regard for the statute which permits the use of abbreviations and numerals in land descriptions in tax proceedings, Revised Statutes 1909, Section 11520 (which statute itself is founded on prevailing usages in this State in relation to the use of customary numerals and abbreviations in land descriptions), . . . it is not necessary for us to rule that there is a patent ambiguity which voids the deed. . . ." The statute referred to<sup>69</sup> provides:

"In all advertisements, notices, lists, records, certificates, deeds or other papers, required to be made by or under any of the provisions of this chapter, it shall be lawful to use letters, figures and characters, as follows:

"(1) Letters may be used to denote township, range, boundaries, parts of section, parts of lots or blocks, other subdivisions of real estate, in the following manner: 'T' for township, 'R' for range, 'L' for lot, 'B' for block, 'N' for north, 'E' for east, 'S' for south and 'W' for west, or any combination or combinations of the four last mentioned letters to denote parts of sections, lots, blocks or other subdivisions of real property;

"(2) Figures may be used as may be requisite to state any number required, whether it be of township, range, survey, section, block, lot or part thereof, acres or fractions thereof, date of any kind, amount of taxes, interest or costs, or any other matter or thing which may be stated or given in figures; . . ."

However, abbreviations not in common use, and of uncertain meaning should not be used. It was pointed out in *Sims v. Rolfe*,<sup>70</sup> that "The letter 'R' or 'r' is the proper abbreviation for range within the meaning of government surveys when used with reference thereto. When used otherwise in an attempted description of land it means nothing. . . . The letter 'R' or 'r' in the description before us ('W of R NE $\frac{1}{2}$ , Sec. 8, Tp. 5, north range 4 east') could as well refer to ridge or road or river or to

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68. 256 Mo. 2, 10, 164 S.W. 603 (1914).

69. MO. REV. STAT. § 140.180 (1949).

70. 177 Ark. 52, 5 S.W. 2d 718 (1928).

any natural or artificial monument where such letters were used in spelling the monument in mind.”

#### CONCLUSION

The more general requirements for making land surveys and preparing descriptions which should stand the test of a contest in court, may be summarized as follows:

1. *Before starting* the survey, the former surveys, plats, and field notes, from which preceding descriptions in the chain of title were written, should be consulted.

2. The survey must *start* from corners or monuments actually located on the ground and known to fit into the former surveys in the chain of title.

3. Since the compass used in former, as well as the current survey, cannot be relied upon for accurate bearings, more than one monument should be located, a *base line* established with reference to these points, and *angles* for all courses turned from this *base line*.

4. In the survey, the footsteps of the former surveyors should be located and followed on the ground.

5. In case conflicts or uncertainties are discovered in the plat, field notes, or description of the former survey, then the intention of the person who prepared such plat, notes, or description must be discovered as best one can. Experience has proven that this should generally be done by giving preference to conflicting calls in the following order of priority: (a) natural monuments, (b) artificial monuments, (c) plats, (d) courses, (e) distances, and (f) acreage.

6. Distances should be measured on the slope of the ground, then reduce to the correct horizontal distance, and this latter figure used in descriptions and plats.

7. The survey boundary should close.

8. Field notes (and perhaps a plat) which will convey clear and unequivocal meaning (not only to the surveyor, but to anyone else familiar with surveying usage) should be prepared and preserved.

9. The *description* prepared from the survey should be a definite identification of the specific area on the ground so that there can be no

question of its exact meaning and so it could not possibly be confused with any other area. At least any surveyor should be able to locate the boundaries of the tract on the ground without any difficulty. It should narrow the location of the land down to a specific state, county, city, survey, township, range, sections, subdivision, block, lot, or metes and bounds with reference to fixed monuments (as the facts in the particular case may permit).

As a chain can be no stronger than its weakest link, so the legal chain of record title fails if either the *survey* or the *description* fails to meet all the legal requirements which would be made if involved in a law suit—they are the two mutually dependent links in land identification.