Retracement-Resurveys—Court Decisions and Field Procedure

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Of course this system takes time, and no doubt the necessities of the Capital City site did not warrant its adoption.

I was glad to hear the opinion of such an experienced authority as the author on the merits of the percentage theodolite, which has been exercising my mind of late with a view of obtaining one for the use of the University Surveying Department, as now I shall conclude not to add further to the burden of the students by introducing an instrument which gives no greater speed than the tacheometer.

Regarding the instrument for interpolating contours intervening between two known points, it seems to me rather an unnecessary and cumbersome instrument for the purpose, when a piece of tracing paper, ruled with one set of converging lines and another set of parallel lines, is equally efficacious, as per illustration.

I have read the paper with pleasure and profit, and I wish to express my indebtedness to the author for bringing it forward.

Retracement-Resurveys—Court Decisions and Field Procedure.

(By N. B. SWEITZER, *Assoc. M. Am. Soc. C. E.*)

(From the *Proceedings of the American Society of Civil Engineers*, Vol. xxvii., No. 1, January 1912).

To be Presented March 6th, 1912.

OUR early surveys are a mass of errors; and, in order to deal with them intelligently, the surveyor should have an exact knowledge of mathematics, a thorough understanding of the law applicable to boundary lines and old corners, and also a personal equation of adjustment for local conditions.

In the past, many rules have been made for special cases, for retracing old and erroneous surveys, only to be found wanting when applied in general. It is also true that what will hold good for small surveys, in field location, will not be practical when large areas are under consideration.

The present method of retracement-resurvey work, which has been carried on in Nebraska for the last few years, apparently solves the problem, and the following is a synopsis thereof:—

ORIGINAL SURVEYS.

The Act creating the present system of Government surveys of the public lands was passed in 1785; and, although differing in some respects from the present original surveys, the general scheme was practically the same in regard to the establishment of a rectangular system. This Act was followed by the organization of the personnel required to execute these surveys, and the appointment of a Surveyor-General, pursuant to an Act approved May 18th, 1796.

On April 25th, 1812, another Act was passed by Congress, providing:

"That there shall be established in the Department of the Treasury an office to be dominated the General Land Office, the chief officer of which shall be called the Commissioner of the General Land Office, whose duty it shall be, under the direction of the head of the Department, to

superintend, execute, and perform all such acts and things touching or respecting the public lands of the United States, and other lands patented or granted by the United States."

This was followed by several Acts to promote the well-being of the service when conditions required, among others, an Act, approved May 29th, 1830 (Secs. 2412 and 2413, R.S.),—

"provides for the fine and imprisonment of any person obstructing the survey of the public lands, and for the protection of surveyors, in discharge of their official duties, by the United States Marshal, with sufficient force, whenever necessary."

Another Act, approved July 4th, 1836, reorganised the General Land Office and transferred it to the Department of the Interior.

The Act approved May 30th, 1862 (Sec. 2399, R.S.), reads :

"That the printed manual of instructions relating to the public surveys, prepared at the General Land Office, and bearing the date Feb. 22, 1855, the instructions of the Commissioner of the General Land Office, and the special instructions of the Surveyor-General, when not in conflict with said printed manual or the instructions of said Commissioner, shall be taken and deemed a part of every contract for surveying the public lands of the United States."

The last manual was issued under the above authority.

Reference to further Acts of Congress, defining the public lands survey, may be found in Volume 1, 2, 3, 4, 12, 18, and 19, for the years 1796, 1800, 1805, 1820, 1832, and 1875, respectively.

It will thus be seen how, by Acts of Congress and instructions from the Commissioner of the General Land Office, the public lands were authorised to be surveyed.

It will be well to note the following Act, of February 11th, 1805, U. S. Statutes at Large, Vol. 2, p. 313, Sec. 2396, U.S. Revised Statutes :

"All corners marked in the surveys returned by the Surveyor-General shall be established as the proper corners of the sections or quarter-sections which they were intended to designate, and corners of half and quarter-sections not marked shall be placed as nearly as possible equidistant from those two corners which stand on the same line.

"The boundary line actually run and marked shall be established as the proper boundary line of the sections or sub-divisions, for which they were intended, and the length of such lines as returned by either of the surveyors aforesaid shall be held and considered as the true length thereof. Each section, or sub-division of section, the contents whereof shall have been returned by the Surveyor-General, shall be held and considered as containing the exact quantity expressed in such return ; and the half-section and quarter-sections, the contents whereof shall not have been thus returned, shall be held and considered as containing the one-half or the one-fourth part, respectively, of the returned contents of the sections of which they make part."

It will thus be seen that no dispute can arise in regard to the question of the permanency of the original surveys. Once made, and legally accepted, they have to remain for all time the basis for all future deeds and conveyances, the statutes thus reiterating the common law. The original corners and lines, as shown by the monuments on the ground and the original maps and plats, stand as permanent and unchangeable monuments, and, together with the accompanying field notes and the original plats, form a basis, in the case of disappearance of the original corners, by which they may be replaced by proportioning between original corners:

Section 99 of the Act of May 18th, 1796, and R. S. 2395, among other things, provides :

"The public lands shall be divided by north and south lines run according to the true meridian, and by others crossing them at right angles, so as to form townships six miles square : . . .

"Second. The corners of the townships must be marked with progressive numbers from the beginning; each distance of a mile between such corners must be also distinctly marked with marks different from those of the corners.

"Third. The township shall be subdivided into sections, containing, as nearly as may be, six hundred and forty acres each, by running through the same, each way, parallel lines at the end of every two miles; and by making a corner on each of such lines at the end of every mile. The sections shall be numbered, respectively, beginning with the number one in the north-east section, and proceeding west and east alternately through the township with progressive numbers till the thirty-six be completed."

Sec. 100, of the Act of February 11th, 1805 (R. S. 2396), among other things, provides :

"The boundaries and contents of the several sections, half-sections and quarter-sections of the public lands, shall be ascertained in conformity with the following principles :

"Third. Each section or subdivision of section, the contents whereof have been returned, by the Surveyor-General, shall be held and considered as containing the exact quantity expressed in such return; and the half-sections and quarter-sections, the contents whereof shall not have been thus returned, shall be held and considered as containing the one-half or the one-fourth part, respectively, of the returned contents of the section of which they may make part."

From this it will be seen that no authority is given to make more or less than thirty-six sections, containing, "as nearly as may be, six hundred and forty acres each," to a township, or to make any other form of subdivision. However, this is qualified for a special case, by order of the President, as where land borders on rivers, lakes and bayous. (R. S., 2396, Sec. 102.)

It is apparent that persons wishing to obtain Government lands file according to the original Government survey, as prescribed by the above law, the plats on file in the local land office and the boundaries of such lands as located by the original Government corners on the ground, and not according to a valley, stream, or other physical condition of the terrane. Now, until these laws are repealed, no more than thirty-six sections, consisting "as nearly as may be" of "six hundred and forty acres each," can be numbered in a township; and any resurvey, in order to be legal, will have to relocate the original Government corners in their original positions.

RESURVEYS.

Justice Cooley, of the Supreme Court of Michigan, has written a most valuable article on "The Judicial Functions of Surveyors," which has been used by surveyors and engineers for years as one of their guides in retracing old lines. The general principles laid down are accepted without question as good law. However, Justice Cooley contemplated only the wooded districts of Michigan and adjoining States, where only comparatively small areas were in question, and where the footsteps of the original surveyor could be located positively, at no very great distance,

by the remains of old bearing trees, permanent lakes, and well-cut banks of streams and rivers. He did not contemplate the great areas of land on the Western prairies, unmarked by a tree, uncut by lakes or streams—an undulating terrane where one square mile is a *fac simile* of the other, and where no natural object distinguishes one mile from another. The original field notes, for mile after mile, often read “40.00” and “80.00” chairs, “over rolling sand hills.” Nor did he contemplate the fact that vast areas in this region had never been surveyed on the ground, but had been platted, and the plats placed on file, giving varying distances and areas to be filed on by settlers, and they would claim, on the ground, the distances and areas designated by the plats on file. Here, then, was a vast checker-board, as represented by the plats on file, with innumerable squares of varying areas, which should have corresponding area on the ground. Obviously, if some of these checks were accidentally or wilfully misplaced, the whole scheme would be disturbed. A study of the situation will reveal the fact that to be harmonious with, and to fulfil the requirements of, the Court decisions, every claimant, where no original corners exist, is entitled to his lands as designated by the plat thereof, and, if the area on the ground covered by the platted areas contains more land than shown, he is entitled to his proportionate share. Otherwise, the harmony existing between plats and terrane will be disturbed, and some one not entitled to it will secure more than his just share. Likewise, a deficiency will cause an unjust loss of land.

Keeping the justice and equity of the foregoing always in mind, it is also well to remember that adverse possession does not run against the Government.

The following Court decisions in regard to resurveys are quoted from the works of F. Hodgman, Justice Cooley, and the late J. B. Johnson, M. Am. Soc. C. E. :—

“When boundaries mentioned are inconsistent with each other, those are used which best show the intention manifest on the face of the deed.” (Gates *v.* Lewis, 7 Vt., 511.)

“Where one part of the description in a deed is false and impossible, but by rejecting that a perfect description remains, such false and impossible part should be rejected.” (Anderson *v.* Baughman, 7 Mich., 79 ; Johnson *v.* Scott, 11 *id.*, 232.)

“Where boundaries of lands are fixed, known, and unquestionable monuments, though neither courses, distances, nor computed contents correspond, the monuments must govern.” (Perman *v.* Wead, 6 Mass., 131 ; Nelson *v.* Hall, 1 McLean, U. S., 518.)

“Marked lines and corners control course and distance. Surplus lands do not vitiate a survey, nor does a deficiency of acres called for in a survey operate against it. Whenever the boundaries can be established, they must prevail.” (Robinson *v.* Moore, 4 McLean, U. S. C. C., 279 ; Marrow *v.* Whitney, 5 Otto, U. S., 551.)

“A survey must be closed in some way or other. If this can only be done by following the course the proper distance, then it would seem that distance should prevail ; but when the distance falls short of closing, and the course will do it, the reason for observing distance fails.” (Doe *v.* King, 3 How., Miss., 125.)

“A line actually marked must be adhered to, though not a right line from corner to corner. When a line has been marked only part of the way, the remainder of the line must run direct to the corner called for. (Cowan *v.* Perkins, 2 Jones Law Rep., N. Y., 222.)

"Of two overlapping surveys, the one first made has priority, particularly where the second is bounded with express reference to the first." (Van Amburgh v. Hitt, Mo. Sup. 22 S. N. W., 177.)

"The beginning corner of a survey, as given in the field notes, is of no more dignity than any other corner found on the ground." (Cox v. Finks, Tex. Civ. App., 41 S. W., 95.)

"Where original surveys *have been made*, and returned as a block into the land office, the location of each tract therein may be proved by proving the location of the block. Every mark on the ground tending to show the location of any tract in the block is some evidence of the location of the whole block, and therefore of each tract." (Coal Co. v. Clement, 65 Pa. St., 126.)

"Where it is doubtful which of two lines of monuments is the true Government line, other things being equal, that one is to be so taken which most nearly conforms to the field notes." (Hubbard v. Dussy, 22 Cal., p. 214.)

"Where a boundary line is assented to by the owner of a tract of land at the time when there was no dispute concerning such line, and on the supposition that it is the true boundary, he is not estopped, on discovering that such is not the case, from claiming title to the true boundary." (Schraeder Min. & Mfg. Co. v. Packer, 9 S. St., 385.)

"A county surveyor, employed to restore the lines and corners of adjoining tracts of land according to the original Government survey, found township corners only, then (the other quarter and section corners being missing) ran a straight line from one township corner to the other, and on this line placed the quarter and section corners, but did not take any testimony to ascertain the lines or corners of the original survey, did not attempt to prove his lines or corners by re-establishing the missing corners from all the known original corners in all directions, did not sufficiently regard the field notes of the original survey, and did not, where the original monuments had disappeared, regard the boundary lines long recognised and acquiesced in. HELD: That such a survey is incomplete, and cannot be approved as the true and correct determination of the boundaries and corners as originally established by the Government." (Reinert v. Brunt, 21 Kan., p. 807.)

"Lands sold under the U.S. surveys pass according to the description of the legal subdivisions, whether these subdivisions contain the legal quantity or not, more or less." (Fulton v. Doe, 6 Miss., 751.)

"Quarter posts of the Government survey are to be as much respected as the corners of townships or sections, however distant from the center line." (Comphall v. Clark, 8 Mo., 558.)

"If the distance between recognised Government corners, as originally established, over-runs or under-runs that given in the field notes, it should be divided *pro rata* between the intervening sections. The original field notes should be the main guide. Section corners being often deflected, the true corners must be tested by east and west distances from the recognised Government corners yet standing in the same township, as well as by north and south distances." (Martz v. Williams, 67 Ill., 306.)

"Unknown corners must be found by the corroborative testimony of all known corners, with as little departure as may be from the system adopted on the original surveys, without giving preponderance to the testimony of any one monument above another.

"In re-establishing lost corners between remote corners of the same survey, when the whole length of the line is found to vary from the length

deposit of charcoal, but, in practice this was very seldom made. Early surveyors like to tell the story that, as the regulations required the "deposit of a quart of charcoal," a quart of charcoal, well wrapped up in a canvas bag attached to a stout string, was actually deposited in a hole beneath the corner, with appropriate ceremonies, and immediately withdrawn, the same quart of charcoal doing duty for thousands of corners, in fact for a whole season's work. Stakes and posts were more often used. Their ends were frequently charred, and this was sometimes supposed to do duty for the charcoal.

Time has passed since these corners were originally made. The fierce winds of spring and fall, fanning the prairie fires, rapidly filled these pits with black ash and charcoal of burnt grasses and weeds, surface soils, and sands foreign in nature and colour to their sides and bottoms, and soon levelled them, as well as the mounds of fresh earth. After the winter snows had gone and spring arrived, grasses and weeds quickly sprang up, sodding over both pits and mound, and obliterating, to all appearances, the boundaries of some one's home. These marks, however, were not really destroyed, for, with a light mould-board breaking plough, the sod may be turned back, and, as it curls up, a discoloration different from the prevailing colour of the sod appears. Then, with spades sharpened to a bevelled edge by files carried for that purpose, these discolorations may be "shaved," and the outlines of an original pit soon appear, the charred grasses and foreign soils and sands, which filled it, showing plainly in texture and colour against the homogeneous soil of its sides. The remaining pits may soon be disclosed, and the original corner re-established and perpetuated by the cement and brass-capped monument now used by the Land Office.

Thus, after all, the method of finding the original marks on the bearing tree in the forest is practically the same as locating the corresponding corner on the treeless plains of the West.

Having reviewed some of the Court decisions affecting re-surveys and indicated the method of searching for an original corner in the forest and on the plains, the methods of field procedure will be described.

A TOWNSHIP ORIGINALLY PARTLY SURVEYED.

It will be assumed, first, that a township has only been partly surveyed by the deputy surveyor, or that only a portion of his original corners can be found.

First, make a re-survey of the exteriors; find all original corners possible, and proportion in those corners where the original ones cannot be found. Make a closed survey; then find the length and bearing of a line starting from the center of the south town line, or corner to Sections 33 and 34, which will intersect the corner on the north town line, or the corner to Sections 3 and 4, or conversely, or the line nearly at right-angles about six miles long east and west through the township. The former is preferable, as convergency does not enter into the field-work. Run this line, searching for original corners, and placing temporary mile and half-mile points, locating all original corners by rectangular co-ordinates to this line. When the original corners are found, tie them to each other and the exteriors by true course and distance, calculated by this line; continue this process through the township north and south, east and west, until all original corners are found. It will be apparent, from the foregoing method, that the original surveyor, starting from any corner on one side of a township, no matter how he wandered in setting his corners in the central part

of the township, must ultimately arrive at the corner on the opposite side. Therefore, having the calculated course and distance, one has a definite line to run, and must sometime cross his course, or at least arrive at the same corner, and thus have a better chance to find his marks, than any haphazard interior line which may be guessed at as a random.

Now, assume that the south-west nine sections have not been surveyed, or that the original corners cannot be found. One has the three miles of township exterior from the south-west corner of the township north and the three miles east, and the course and distance between the interior section corners, north and south, east and west opposite these lines. Make a complete closure of this area; calculate the distances from the interior section corners to their opposite corners, in this area, on the town and range lines. After these distances have been secured, taking the original plat, proportion in the three miles north, south, east, and west. Now, having the courses and distances of the perimeter of this area, and the proportional distances of every mile of its interior, the courses and distances of all interior miles can be calculated. This will furnish all necessary data to locate on the ground all missing corners in this portion of the township.

A TOWNSHIP NEVER ORIGINALLY SURVEYED.

As in the foregoing illustration, find all original corners on the exterior of the township and relocate all missing exterior corners by proportional measurements from the original plat; then proceed to search for original corners on the interior, as explained in the previous case. Having ascertained that none exist, or that the township was never originally surveyed, proceed as follows: Calculate the distances through the township on section lines north, south, east, and west. Then, taking the original map as a basis, give each mile in the township its proper proportional distance. (Always check a given north area against a south area, an east area against a west area. They will check if the exteriors are an accurate closure.) Now, having all interior lines properly proportioned, the courses are thus secured: Take the center line north and south, the line between Sections 33 and 34; take the sum of the south boundaries of Sections 34, 35, and 36, the course of the east boundary of Section 36 (algebraically), and the sum of the north boundaries of the above sections; then the difference of the easting and westing, not neglecting curvature, will give the course sought. Then, check to the west the north and south boundaries of Sections 33, 32, and 31, with the course of the west boundary of Section 31, which should give the same result as that secured above. The remaining five miles north to the corner of Sections 3 and 4 may be secured in the same way, checking east against west, the courses of all north and south lines being secured in the same manner. The east and west miles are secured by the same method. The course of the line between Sections 13 and 24 is the difference of the east and west boundaries of Sections 1, 12, and 13; get the course of the north boundary of Section 1; then the difference of northing and southing will give the course of the line between Sections 13 and 24. Check by the difference of northing and southing of Sections 24, 25, and 36, and the south boundary of Section 36. The lines between Sections 14 and 23, 15 and 22, 16 and 21, 17 and 20, 18 and 19 are secured in the same manner, as are the remaining east and west miles.

Having, then, the data to place it instrumentally on the ground, commence, if possible, at the corner to Sections 33 and 34 on the township line. Run the calculated courses and distances as a random line to

the corner of Sections 3 and 4, on the opposite town line, setting temporary corners at the calculated corner and quarter-corner positions, and correct back on the true line. Then start, if possible, at the corner to Sections 13 and 24 on the east range line, and run the calculated courses and distances as a random line to the corner of Sections 18 and 19 on the west range line, setting temporary points as above, and correcting back. This will locate the center of the township, and the remaining quarters can be located as above.

Now, this fulfils the requirements of the Court decisions, giving all claimants their proportional part of all excesses, and also divides proportionally all deficiencies, as by this method no excesses are carried into any part of the township.

Checks between standards and parallels affecting the town and range lines are effected in the same manner. Always work from the center towards the exteriors, having first made a closed survey of the exteriors. The method of differences will shorten the proportional method when the differences are not too great.

Appraisement of Land Values, Fair Rentals, the Earned and Un-earned Increment.

By CHARLES J. HARNETT, L.S.

THESE ideas are submitted with the hope that some readers will give the benefit of their criticism.

In order to arrive at the unimproved capital value of land, first compute the average gross income to be derived from it while being improved to the fullest practicable extent. From the gross income deduct working expenses, cost of maintenance and renewals, insurance, rates and taxes, etc. Capitalise the net income thus obtained at a per centage commensurate with the risks pertaining to the locality. From the sum thus arrived at deduct cost of requisite fixed improvements, plant, and live stock, and apply the sentimental constant. The balance will be the unimproved capital value of the land. The sentimental constant is the sum by which the fair selling price is greater or less than the value on a net profit basis, and is due to such factors as aspect, natural beauty, pleasant surroundings, etc., which do not affect the net profits. As a rule, $2\frac{1}{2}$ per cent. on the U.C.V. would be considered by the Crown a fair rental.

It usually happens that when the periodical re-appraisements of rent are made upon alienated lands under leasehold tenure the U.C.V. is found to have increased, and it becomes a question as to whether it is fair for the Crown to charge rental on the whole of the increment. In my opinion, rent can only be charged fairly upon so much of this increment as is unearned—i.e., not directly due to improvements and enterprises carried out by the tenant on the land, and to the natural agencies which have been set in motion by such improvements and enterprises.

In the case of freeholds, the fair value for resumption would be the U.C.V. at date of resumption, minus the *unearned* increment, plus the value of improvements taken over with the land, and plus 10 per cent. for disturbance due to eviction. For example, take a block of mixed farming land of 1000 acres, capable of returning, while being improved under conditions such as might reasonably be expected to prevail during the period