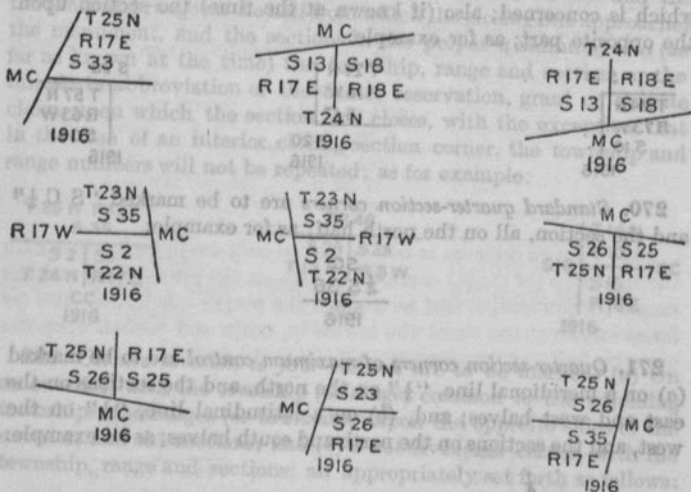
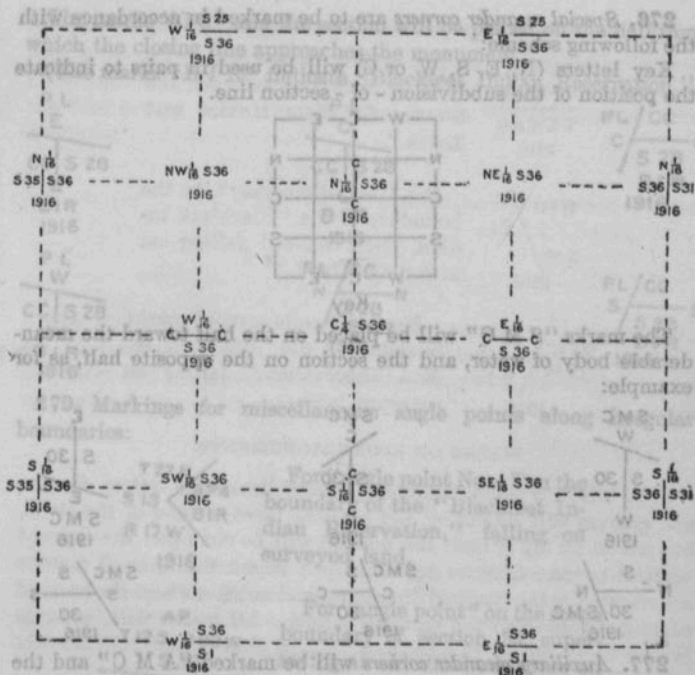


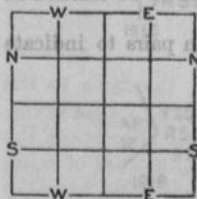
273. *Meander corners* are to be marked "M C" on the half toward the meanderable body of water, and the additional marks (a) on a standard parallel or other line controlling surveys to one side only, with the township, range and section toward the surveyed land; (b) on an exterior, with the township (or range) common to the adjoining townships, the ranges (or townships) upon the opposite sides of the exterior, and the sections; and, (c) on a subdivisional line, with the township, range and sections; all appropriately set forth as follows:



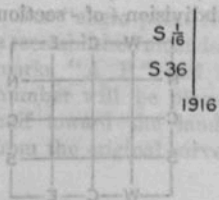
274. *The interior quarter-section and all sixteenth-section corners*, when required by the written special instructions, are to be marked in accordance with the scheme shown in the following diagram:



275. Sixteenth-section corners of minimum control are to be marked with a key letter (N, E, S or W), to indicate the position of the monument, and "1/16" and the section, all on the half toward the particular section which is concerned; as for example:



Key



Key



Key

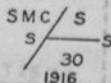
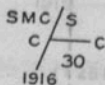
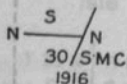
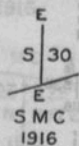
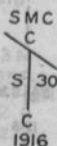
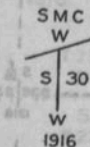
276. *Special meander corners* are to be marked in accordance with the following scheme:

Key letters (N, E, S, W or C) will be used in pairs to indicate the position of the subdivision - of - section line.



Key

The marks "S M C" will be placed on the half toward the meanderable body of water, and the section on the opposite half, as for example:



277. *Auxiliary meander corners* will be marked "A M C" and the township, range and section; as for example:

A M C
T 64 N R 37 W
S 29
1916

278. *Closing subdivision - of - section corners* are to be marked in accordance with the following scheme:

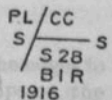
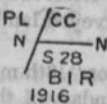
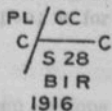
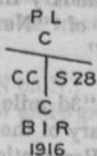
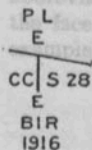
Key letters (N, E, S, W or C) will be used in pairs to indicate the position of the subdivision - of - section line.



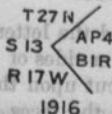
Key

The marks "C C" and the section will be placed on the half from which the closing line approaches the monument.

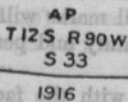
(The marks "B I R" indicate "Blackfeet Indian Reservation.")



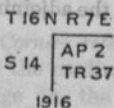
279. Markings for miscellaneous angle points along irregular boundaries:



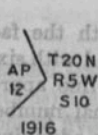
For "angle point No. 4" on the boundary of the "Blackfeet Indian Reservation," falling on surveyed land.



For "angle point" on the south boundary of section 33, superseding an old standard corner on a defective line, not subject to rectification.



For "angle point No. 2" on the boundary of a private claim ("Tract No. 37") falling on surveyed land.



For "angle point No. 12" on a reestablished meander line; the marks "A P" and the serial number will be placed on the half toward the land omitted from the original survey.

280. Markings for intermediate corners along irregular boundaries:

$$\begin{array}{r} 139 \text{ M} \\ \text{N MEX} \\ \hline \text{TEXAS} \\ 1916 \end{array}$$

For "139th mile corner" on the boundary line between the States of "New Mexico and Texas."

$$\begin{array}{r} \text{BIR} \\ \hline 3 \text{ M} \\ 1916 \end{array} \text{ PL}$$

For "3d mile corner" on the boundary of the "Blackfeet Indian Reservation," falling on unsurveyed land.

$$\begin{array}{r} \text{BIR} \\ \hline 13 \text{ M} \\ 1916 \end{array} \begin{array}{l} \text{T 25 N} \\ \text{R 17 W} \\ \text{S 25} \end{array}$$

For "13th mile corner" on the boundary of the "Blackfeet Indian Reservation," falling on surveyed land.

MARKS ON STONE MONUMENTS.

281. Where a stone monument is established the letters, figures, and grooves will be cut on the exposed faces or sides of the stone, but not on its top or end; the notches will be cut upon the exposed vertical edges. Grooves are employed where the faces of a stone are oriented to the cardinal directions, and notches where the vertical edges are turned to the cardinal points. All marks will be made from 1 to 1½ inches in size, and will be plainly and permanently chiseled into the stone.

282. *Standard township corners* (oriented with the faces to the cardinal directions) are to be marked "S C" on the north face, with the township on the same face, and the ranges on the adjoining faces; as for example:

S C 25 N on N.,
18 E " E., and
17 E " W. face.

283. *Closing township corners* (oriented with the faces to the cardinal directions) are to be marked "C C" and with six (or fewer) grooves on the face from which the closing line approaches the monument—the grooves to indicate the normal number of miles (or fractional parts) from the monument to the adjoining township

corner—with the township (or range) on the same face, and the ranges (or townships) on the adjoining faces; also the initials or abbreviation of the State, reservation, grant or private claim, on the face toward such irregular tract as may be closed upon; as for example:

20 N on N.,

C C 120 W and 5 grooves (on line between sections 5 and 32) on E.,

19 N on S., and

UTAH " W. face.

284. *Corners common to four townships* (oriented with the edges to the cardinal points) are to be marked with the townships on the northeast and southwest faces, and the ranges on the southeast and northwest faces; as for example:

23 N on NE.,

18 E " SE.,

22 N " SW., and

17 E " NW. face.

285. *Corners common to two townships only* (oriented with the faces to the cardinal directions) are to be marked with the township (or range) common to both on the face toward the townships, and the ranges (or townships) on the adjoining faces; as for example:

3 N on N.,

2 N " S., and

7 W " W. face.

286. *Corners referring to one township only* (oriented with the edges to the cardinal points) are to be marked with the township and range on the face toward the particular township; as for example:

23 N 7 W on NW. face.

287. *Standard section corners* (oriented with the faces to the cardinal directions) are to be marked "S G" on the north face, and with from one to five grooves on the east and west faces, the grooves

to indicate, respectively, the number of miles from the monument to the adjoining (regular) township corner; as for example:

S C on N.,

1 groove on E., and

5 grooves on W. face (standard corner of sections 35 and 36).

288. *Closing section corners* (oriented with the faces to the cardinal directions) are to be marked "C C" and with from one to six grooves on the face from which the closing line approaches the monument, and from one to five grooves on each of the adjoining faces—the grooves to indicate the number of miles (or fractional parts) from the monument to each of the three (regular) township boundary lines in the same directions, respectively—also the initials or abbreviation of the State, reservation, grant or private claim, on the face toward such irregular tract as may be closed upon; as for example:

2 grooves on E.,

C C and 6 " " S., and

4 " " W. face (on line between sections 2 and 3 closing on a standard parallel).

289. *Corners common to four sections* (oriented with the edges to the cardinal points) are to be marked (a) on an exterior, with from one to five notches each on two opposite edges, north and south on a meridional line, and east and west on a latitudinal line, each to indicate, respectively, the number of miles from the monument to the adjoining (regular) township corner; and (b) a subdivisional corner, with from one to five notches on the east and south edges, each to indicate, respectively, the number of miles from the monument to the (regular) east and south township boundary lines; the subdivisional section corners of a fractional township will be marked with reference to the theoretical position of normal east and south boundaries, whether surveyed or not; as for example:

2 notches on N. and 4 notches on S. edge (for corner of sections 7, 12, 13 and 18 on a range line).

2 notches on E. and 4 notches on W. edge (for corner of sections 2, 3, 34 and 35 on a township line).

2 notches on E. and 4 notches on S. edge (for corner of sections 10, 11, 14 and 15 of a subdivisional survey).

290. *Section corners common to two sections only* (oriented with the edges to the cardinal points) are to be marked with the sections on the faces toward the particular sections to which the corner belongs; as for example:

S 13 on SW., and

S 12 " NW. face (for corner of sections 12 and 13 on the east boundary of a township).

S 11 on NE., and

S 10 " NW. face (for corner of sections 10 and 11 of a subdivisional survey running north from the monument).

291. *Section corners referring to one section only* (oriented with the edges to the cardinal points) are to be marked with the section on the face toward the particular section which is concerned; as for example:

S 17 on NW. face (for southeast corner of section 17).

292. *Standard quarter-section corners* (oriented with the faces to the cardinal directions) are to be marked "S C $\frac{1}{4}$ " on the north face.

293. *Quarter-section corners of maximum control* (oriented with the faces to the cardinal directions) are to be marked (a) on a meridional line, " $\frac{1}{4}$ " on the west face; and (b) on a latitudinal line, " $\frac{1}{4}$ " on the north face.

294. *Quarter-section corners of minimum control* (oriented with the faces to the cardinal directions) are to be marked " $\frac{1}{4}$ " and the section, all on the face toward the particular section which is concerned; as for example:

$\frac{1}{4}$ S 4 on S. face (for quarter-section corner on the north boundary of section 4).

295. *Meander corners* (oriented with the faces to the cardinal directions) are to be marked "M C" on the face toward the meanderable body of water, and with from one to six grooves on each of the other faces, each to indicate the number of miles (or fractional parts) from the monument to the (regular) township boundary line in the same direction, respectively; as for example:

M C on N.,

6 grooves " E.,

4 " " S., and

6 " " W. face (for meander corner of fractional sections

13 and 18, on the south side of a meanderable body of water).

296. *Special and auxiliary meander corners* (oriented with the faces to the cardinal directions) are to be marked "S M C" or "A M C," as the case may be, on the face toward the meanderable body of water, and the section on the opposite face; as for example:

S M C on N., and

S 19 " S. face (for special meander corner on a meridional subdivision-of-section line in section 19, on the south side of a meanderable body of water).

S 20 on E., and

A M C " W. face (for auxiliary meander corner in section 20, on the east side of a meanderable body of water).

MARKS ON TREE MONUMENTS.

297. Where the true point for a corner is found to fall in the position occupied by a sound living tree, which is too large to be removed, the tree will be made the monument. A tree will be removed if it is too small to be marked, and a witness corner will be established in preference to marking an unsound tree, if the latter can not be removed.

298. The species of the tree and its diameter, breast height, will be noted, where a tree is to be made a monument, and the appropriate marks will be made upon the trunk of the tree immediately above the root crown. A series of marks to be made upon a particular side of a tree will be scribed in a vertical line reading downward.

299. In the case of certain trees, including the aspen, beech and locust (smooth, thin and permanently barked from sapling to maturity), the marks may be made preferably by scribing well into the bark and cambium (or live wood tissue) without blazing; the marks thus made will remain and be visible as long as the tree is sound; on the other hand, in the case of practically all rough barked trees, the marks should be scribed into a smooth, narrow, vertical blaze, specially prepared by removing just enough of the outer growth to expose a flat surface of the live wood tissue immediately underneath the bark; the marks thus made will remain as long as the tree is sound, but the blaze and marks will be covered by a gradual overgrowth, showing an outward scar for many years. In regions subject to heavy snowfall it is desirable to make a small additional blaze at a height of 6 or 8 feet above the ground, which will serve to attract attention to the tree during the winter season. The ends

of all blazes should be smoothed off gradually without making a sharp cut into the cambium. The lower end of the blaze upon which the marks are placed should be about 6 inches above the root crown, and its length should be just sufficient to take the marks.

The practice relating to the manner of marking trees, as above outlined, is designed to cause the least possible injury to the tree, by enabling a rapid overgrowth; also, to place the marks in a position where they will remain on the stump if the trunk should be removed. Various practices have obtained in the past in different localities, some of which are objectionable by causing unnecessary injury to a tree, or on account of the marks being placed in a position where there is danger of their removal with the trunk in case the tree is cut down.

300. The above theory applies equally to the marking of bearing trees, and the engineer is advised, when making retracements, re-surveys, etc., not to remove the overgrowth on a tree monument or bearing tree unless it is absolutely necessary to do so in order to identify positively the particular tree. In the case of trees which have been blazed before marking, the number of rings contained in the overgrowth (or its equivalent on the adjoining section of the tree) will furnish an exact count of the number of years (one annual ring for each growing season) from the date of original marking to the date when uncovered. After an old blaze has been uncovered, conditions are favorable for the decaying process to set in, and the engineer should adopt additional means to evidence the position of the corner.

301. *Standard township corners* are to be marked "S C" and the township on the north side, and the ranges and sections on the east and west sides; as for example:

S C T 25 N on N.,
R 18 E S 31 " E., and
R 17 E S 36 " W. side.

302. *Closing township corners* are to be marked "C C" and the township (or range) on the side from which the closing line approaches the monument, and the ranges (or townships) and sections on the adjoining sides; also the initials or abbreviation of the State, reservation, grant or private claim, on the side toward any irregular tract which may be closed upon; as for example:

R 18 E S 6 on E.,
C C T 24 N " S., and
R 17 E S 1 " W. side.

303. *Corners common to four townships* are to be marked with the township and section on the northeast and southwest sides, and the range and section on the southeast and northwest sides; as for example:

T 23 N S 31 on NE.,
 R 18 E S 6 " SE.,
 T 22 N S 1 " SW., and
 R 17 E S 36 " NW. side.

304. *Corners common to two townships only* are to be marked with the township, range and section on the sides toward the particular townships; as for example:

T 2 N R 7 W S 1 on SW., and
 T 3 N R 7 W S 36 " NW. side.

305. *Corners referring to one township only* are to be marked with the township, range, and section on the side toward the particular township which is concerned; as for example:

T 23 N R 7 W S 36 on NW. side.

306. *Standard section corners* are to be marked "S C" and the township and range on the north side, and the sections on the east and west sides; as for example:

S C T 25 N R 17 E on N.,
 S 36 " E., and
 S 35 " W. side.

307. *Closing section corners* are to be marked "C C" and the township and range on the side from which the closing line approaches the monument, and the sections on the adjoining sides; also the initials or abbreviation of the State, reservation, grant or private claim on the side toward any irregular tract which may be closed upon; as for example:

S 1 on E.,
 C C T 24 N R 17 E " S., and
 S 2 " W. side.

308. *Corners common to four sections* are to be marked (a) on an exterior, with the township (or townships), ranges (or range) and sections; and (b) a subdivisive corner, with the township, range and section; all appropriately set forth as follows:

T 25 N S 7 on NE.,
 R 18 E S 18 " SE.,
 R 17 E S 13 " SW., and
 S 12 " NW. side.

T 26 N S 36 on NE.,
 R 17 E S 1 " SE.,
 T 25 N S 2 " SW., and
 S 35 " NW. side.
 T 25 N S 24 on NE.,
 R 17 E S 25 " SE.,
 S 26 " SW., and
 S 23 " NW. side.

309. *Section corners common to two sections only* are to be marked with the township and section and the range and section on the sides toward the particular sections to which the corner belongs; as for example:

T 14 S S 11 on NE., and
 R 20 W S 10 " NW. side.

310. *Section corners referring to one section only* are to be marked with the township, range and section on the side toward the particular section which is concerned; as for example:

T 27 N R 16 W S 17 on NW. side.

311. *Standard quarter-section corners* are to be marked "S C $\frac{1}{4}$ " and the section, all on the north side; as for example:

S C $\frac{1}{4}$ S 36 on N. side.

312. *Quarter-section corners of maximum control* are to be marked (a) on a meridional line, " $\frac{1}{4}$ " and the section on the west side, and the section on the east side; and (b) on a latitudinal line, " $\frac{1}{4}$ " and the section on the north side, and the section on the south side; as for example:

S 18 on E., and

$\frac{1}{4}$ S 13 " W. side.

$\frac{1}{4}$ S 21 on N., and

S 28 " S. side.

313. *Quarter-section corners of minimum control* are to be marked " $\frac{1}{4}$ " and the section, all on the side toward the particular section which is concerned; as for example:

$\frac{1}{4}$ S 7 on E. side (for quarter-section corner on the west boundary of section 7).

314. *Meander corners* are to be marked "M C" on the side toward the meanderable body of water, and the additional marks (a) on a standard parallel or other line controlling surveys to one side only, with the township, range and section on the side toward the sur-

veyed land; (b) on an exterior, with the township (or range) common to the adjoining townships on the side opposite the meanderable body of water, and the ranges (or townships) and the sections on the adjoining sides; and, (c) on a subdivisional line, with the township and range on the side opposite the meanderable body of water, and the sections on the adjoining sides; as for example:

M C on E., and

T 25 N R 17 E S 33 " NW. side (for meander corner on a standard parallel, on the west side of a meanderable body of water).

T 24 N on N.,

R 18 E S 18 " E.,

M C " S., and

R 17 E S 13 " W. side (for meander corner on a range line, on the north side of a meanderable body of water).

T 23 N S 35 on N.,

M C " E.,

T 22 N S 2 " S., and

R 17 W " W. side (for meander corner on a township line, on the west side of a meanderable body of water).

S 23 on N.,

T 25 N R 17 E " E.,

S 26 " S., and

M C " W. side (for meander corner on a latitudinal section line, on the east side of a meanderable body of water).

M C on N.,

S 9 " E.,

T 4 N R 7 W " S., and

S 8 " W. side (for meander corner on a meridional section line, on the south side of a meanderable body of water).

315. Special and auxiliary meander corners are to be marked "S M C" or "A M C", as the case may be, on the side toward the meanderable body of water, and the section on the opposite side; as for example:

S M C on E., and

S 14 " W. side (for special meander corner on a latitudinal subdivision-of-section line in section 14, on the west side of a meanderable body of water).

A M C on N., and

S 9 " S. side (for auxiliary meander corner in section 9, on the south side of a meanderable body of water).

CORNER ACCESSORIES.

316. The purpose of a corner accessory is to evidence the position of the original monument. A connection is made from the monument to fixed natural or artificial objects in its immediate vicinity, whereby the former may be relocated from the latter, thus in the event of the destruction or removal of the corner monument, its original position may be identified as long as any part of the accessories remains in evidence. The accessories consist of three general classes, one or more of which are to be employed at each and every corner established in the public-land surveys, preference being given to the same in the order of their permanency conditional upon the character of the ground in the locality of the monument, as follows:

(a) Bearing trees, or other natural objects such as notable cliffs and boulders; permanent improvements; and memorials; (b) mound of stone; and (c) pits.

317. The engineer can not perform any more important service in connection with his official duties than to employ whatever means may be necessary permanently and accurately to evidence the location of the legal corners established in his survey, and where the usual accessories, or combinations of the same, can not be employed, such other means should be adopted as will best serve the purpose.

318. The accessories for witness corners will be the same as though the corner were established at its true point, but the marks upon the bearing trees or other objects will be preceded by the letters "W C", and the section number will be made to agree with the section in which the tree or object actually stands.

BEARING TREES, BEARING OBJECTS, AND MEMORIALS.

319. Bearing trees, or other natural objects, are to be selected for marking when the same are available within a distance of 5 chains of the corner monument, and where the regular quota, hereinafter described, is not available, one tree or object will be marked in each section affording such accessory. A full description of the tree or object will be embodied in the field notes as a part of the record of the corner monument. One tree, or object, will be marked in each section cornering at the monument, when available, and the true course and horizontal distance from the exact corner point to the center vertical axis of the tree at its root crown, or to the cross (X) upon a marked object, will be carefully determined and recorded with the description of the tree, or object, and its marks. The species of a tree and its diameter, at breast height, will be recorded; and, in the case of a cliff or boulder, the description will embrace such essential details as may be necessary to serve for its ready identification.

320. The marks upon a bearing tree will be made upon the side facing the corner and will be scribed in the manner already outlined for marking tree corner monuments. The marks will embrace the information suggested in the schedule hereinafter given, with such letters and figures as may be appropriate for a particular corner, and will include the letters "B T"; a tree will always be marked to agree with the section in which it stands, and will be marked in a vertical line reading downward, ending in the letters "B T" at the lower end of the blaze approximately 6 inches above the root crown.

321. There is a great difference in the longevity of trees, and in their rate of decay, etc.; trees should therefore be selected, if possible, with a view to the length of their probable life, their soundness, favorable site conditions and size. Sound trees from 6 to 8 inches in diameter, of the most hardy species, favorably located, are to be preferred for marking. Trees less than 4 inches in diameter will not be selected for marking if larger trees are available, and it is generally better to avoid marking fully matured trees, especially those showing signs of decay. Trees less than 4 inches in diameter, if no better trees are available, will be marked with the letters "B T" only. The species, size and exact position of the bearing trees are of vital importance, as this data will generally serve to identify a bearing tree without uncovering the marks, or even to identify two or more stumps after all evidence of the marks has disappeared.

322. Generally only one tree will be marked in each section at a particular corner, but in certain instances, hereinafter described, two trees are required in a section. In such cases it is better to select trees of different species, or of widely different size, direction or distance, if the trees are of the same species, in order that confusion may be avoided in the future identification of a remaining tree where the companion tree has disappeared.

323. A cross (X) and the letters "B O" and the section number will be chiseled into a bearing object, if it is of rock formation, and the record should be such as to enable another surveyor to determine where the marks will be found.

324. A connection to any permanent artificial object or improvement may be included in this general class of corner accessories. The field notes should be explicit in describing such objects, and should indicate the exact point to which a connection is made, as "southwest corner of foundation of Smith's house," "center of Smith's well," "pipe of Smith's windmill," etc. No marks will be made upon private property.

325. In every case where it is impossible to make a single connection to a bearing tree or other bearing object, as above described, and where a mound of stone or pits are impracticable, a suitable memorial will be deposited at the base of the monument. A memorial may consist of any durable article which will serve to identify the location of the corner in case the monument is destroyed. Such articles as glassware, stoneware, a marked (X) stone, a charred stake, a quart of charcoal, or pieces of metal will constitute a suitable memorial. A full description of such articles will be embodied in the field notes wherever they are employed as a corner accessory.

MOUND OF STONE.

326. Where native stone is available and the surface of the ground is favorable, a mound of stone will be employed as an accessory to a corner monument, provided that a full quota of trees or other bearing objects can not be utilized. A mound of stone erected as a corner accessory will be built as stably as possible, will consist of not fewer than five stones, and will be not less than 2 feet base and 1½ feet high. In stony ground the size of the mound will be sufficiently increased to make it conspicuous. The position of the mound will be as shown in the schedule hereinafter stated, and the nearest point on its base will be separated about 6 inches distant from the monument. The field notes will show the size and position of the mound.

327. Where it is necessary to support a monument in a stone mound, no additional mound will be employed as an accessory; and, if bearing trees or other objects are not available, a marked (X) stone or other memorial will be deposited at the base of the monument.

PITS.

328. Where the full quota of trees or other bearing objects are unavailable for marking, the position of the monument will, under certain favorable conditions, be evidenced by pits. No pits should be dug in a roadway, or where the ground is overflowed for any considerable period, or upon steep slopes, or where the earth will wash, or in a loose or light soil, or where there is no native sod, or where suitable stone for a mound is at hand.

A firm soil covered with a healthy native sod is most favorable for a permanent pit. Under such conditions the pits will gradually fill with a material slightly different from the original soil, and a new species of vegetation will generally take the place of the native grass; these characteristics, under favorable conditions, make it possible to identify the original location of the pits after the lapse of many years.

329. All pits will be dug 18 inches square and 12 inches deep, with the nearest side 3 feet distant from the corner monument, oriented with a square side (and not a corner) towards the monument, arranged as shown in the schedule hereinafter given; the earth removed will be scattered in such a way that it will not again fill the pits. A description of the pits will be embodied in the field notes, and will include, in every instance, a statement of their size and position; this is particularly important in view of the fact that the practice herein outlined differs materially (in the interest of simplicity) from that set forth in earlier editions of the Manual.

ARRANGEMENT AND MARKING OF CORNER ACCESSORIES.

330. *Standard township corners.*

Standard section corners.

Two bearing trees, one in each section north of the standard parallel, each marked "S C" and the township, range and section; as

T 25 N R 18 E S 31 S C B T.

Mound of stone, north of corner.

Three pits, one each on line north, east and west.

331. Closing township corners.*Closing section corners.*

Two bearing trees, one in each section to the right and left of the closing line, each marked "C C" and the township, range and section; as

T 24 N R 18 E S 6 C C B T.

Mound of stone, on the closing line.

Three pits, one on the closing line and one each to the right and left on the line closed upon.

332. Corners common to four townships.

Four bearing trees, one in each section, each marked with the township, range and section; as

T 22 N R 17 E S 1 B T.

Mound of stone, south of corner.

Four pits, one each on line north, east, south and west.

333. Corners common to two townships only.

Two bearing trees, one in each section cornering at the monument, each marked with the township, range and section; as

T 2 N R 7 W S 1 B T.

Mound of stone, on the line between the two townships cornering at the monument.

Three pits, one each on the three lines connecting at the monument.

334. Corners referring to one township only.

Two bearing trees, both in the township cornering at the monument, each marked with the township, range and section; as

T 23 N R 19 W S 36 B T.

Mound of stone, in the township cornering at the monument, at 45° from cardinal direction at the monument.

Two pits, one each on the two lines connecting at the monument.

335. Corners common to four sections.

Four bearing trees, one in each section, each marked with the township, range and section; as

T 26 N R 17 E S 35 B T.

Mound of stone, west of corner.

Four pits, one in each section northeast, southeast, southwest and northwest.

336. Section corners common to two sections only.

Two bearing trees, one in each section cornering at the monument, each marked with the township, range and section; as

T 14 S R 17 E S 12 B T.

Mound of stone, on the line between the two sections cornering at the monument.

Two pits, one in each section at 45° from cardinal direction at the monument.

337. *Section corners referring to one section only.*

Two bearing trees, both in the section cornering at the monument, each marked with the township, range and section; as

T 27 N R 16 W S 17 B T.

Mound of stone, in the section cornering at the monument, at 45° from cardinal direction at the monument.

Two pits, one 3 feet and one 6 feet distant, both in the section cornering at the monument, at 45° from cardinal direction at the monument.

338. *Standard quarter-section corners.*

Two bearing trees, both north of the standard parallel, each marked " $\frac{1}{4}$ " and "S C" and the section; as

$\frac{1}{4}$ S 36 S C B T.

Mound of stone, north of corner.

Two pits, one each on line east and west.

339. *Quarter-section corners of maximum control.*

Two bearing trees, one in each section, each marked " $\frac{1}{4}$ " and the section; as

$\frac{1}{4}$ S 16 B T.

Mound of stone: (a) On a meridional line, west of corner; and, (b) on a latitudinal line, north of corner.

Two pits, one in each direction on the line passing through the monument.

340. *Quarter-section corners of minimum control.*

Two bearing trees, both in the particular section which is concerned, each marked " $\frac{1}{4}$ " and the section; as

$\frac{1}{4}$ S 7 B T.

Mound of stone, in the particular section which is concerned, in a cardinal direction from the monument.

Two pits, one in each direction on the line passing through the monument.

341. *Meander corners.*

Two bearing trees: (a) On a standard parallel or other line controlling surveys to one side only, both in the particular section which is concerned; and (b) on all other lines, one in each section

to the right and left of the line; all marked "M O" and with the township, range and section; as

T 25 N R 14 E S 32 M C B T.

Mound of stone, on the surveyed line on the opposite side of the monument from the meanderable body of water.

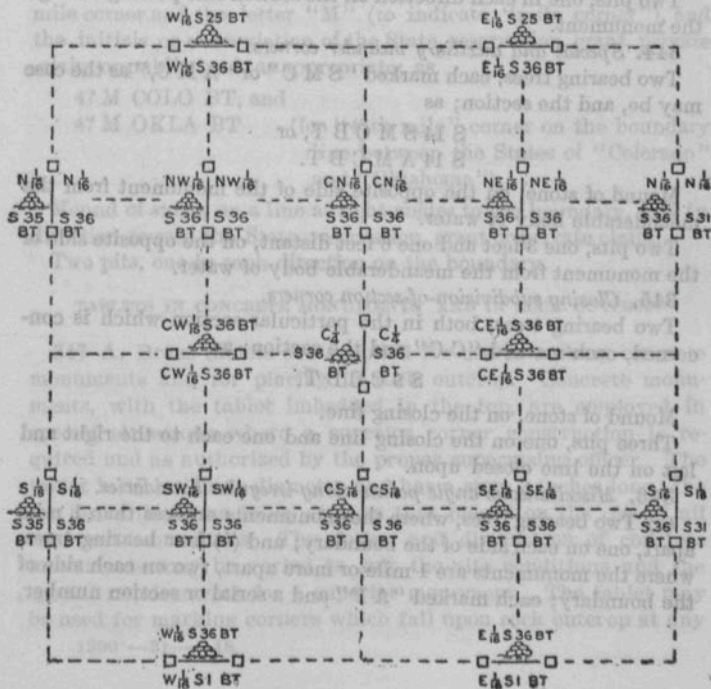
Two pits, one 3 feet and one 6 feet distant, on the surveyed line on the opposite side of the monument from the meanderable body of water.

342. The interior quarter-section and all sixteenth-section corners, when required by the written special instructions.

Two bearing trees, marked (with letters and figures ending in "B T") as shown in the following diagram:

Mound of stone, in a cardinal direction from the monument, as shown (with symbol "☸") in the following diagram:

Two pits, in a cardinal direction from the monument, as shown (with symbol "□") in the following diagram:



343. Sixteenth-section corners of minimum control.

Two bearing trees, both in the particular section which is concerned, each marked with a key letter (N, E, S or W) to indicate the position of the monument, and " $\frac{1}{16}$ " and the section; as



N $\frac{1}{16}$ S 18 BT

Mound of stone, in the particular section which is concerned, in a cardinal direction from the monument.

Two pits, one in each direction on the section line passing through the monument.

344. Special and auxiliary meander corners.

Two bearing trees, each marked "S M C" or "A M C," as the case may be, and the section; as

S 14 S M C B T, or

S 14 A M C B T.

Mound of stone, on the opposite side of the monument from the meanderable body of water.

Two pits, one 3 feet and one 6 feet distant, on the opposite side of the monument from the meanderable body of water.

345. Closing subdivision-of-section corners.

Two bearing trees, both in the particular section which is concerned, each marked "C C" and the section; as

S 9 C C B T.

Mound of stone, on the closing line.

Three pits, one on the closing line and one each to the right and left on the line closed upon.

346. Miscellaneous angle points along irregular boundaries.

(a) Two bearing trees, where the monuments are less than 1 mile apart, one on each side of the boundary; and (b) four bearing trees, where the monuments are 1 mile or more apart, two on each side of the boundary; each marked "A P" and a serial or section number,

or both, also the initials or abbreviation of the State, reservation, grant, private claim or public land, as appropriate; as

A P 2 TR 37 B/T, and
A P S 14 B T (for "angle point No. 2" on the boundary of a private claim "Tract No. 37" falling on surveyed land).

Mound of stone, on the medial line between the boundary lines intersecting at the monument, and in the direction toward the State, reservation, grant or private claim.

Two pits, one in each direction on the lines intersecting at the monument.

347. Intermediate corners along irregular boundaries.

(a) Two bearing trees, where the monuments are less than 1 mile apart, one on each side of the boundary; and (b) four bearing trees, where the monuments are 1 mile or more apart, two on each side of the boundary; each marked with the number of the mile or half-mile corner and the letter "M" (to indicate "mile corner"), and the initials or abbreviation of the State, reservation, grant, private claim or public land, as appropriate; as

47 M COLO BT, and

47 M OKLA BT (for "47th mile" corner on the boundary line between the States of "Colorado" and "Oklahoma").

Mound of stone, on a line at right angles to the boundary, and in direction toward the State, reservation, grant or private claim.

Two pits, one in each direction on the boundary.

TABLETS IN CONCRETE MONUMENTS AND IN ROCK OUTCROP.

347-A. Brass tablets are supplied for use in making concrete monuments and for placing in rock outcrop. Concrete monuments, with the tablet imbedded in the top, are employed in special situations where a superior corner construction is required and as authorized by the proper supervising officer. The tablet is $3\frac{1}{2}$ inches in diameter and has a stem 3 inches long; the top bears the same inscription as that placed on the cap of all iron-post monuments. The design and dimensions of concrete monuments may be varied to suit the site conditions and the special requirements for a superior monument. The tablet may be used for marking corners which fall upon rock outcrop at any

time without special authorization in lieu of an iron post supported by a stone mound and on slopes where a mound would be impracticable; a drill hole is made to receive the stem and a recess is made for the top so that the tablet may be securely cemented in place and sealed against moisture entering below the top. All cementing and concrete construction to be permanent must be done with clean first-class materials, carefully proportioned. The corner marks to be made upon the tablet, and the selection and marking of the accessories will be the same as for iron-post monuments.

Two pits, one in each direction on the line, shall be dug along the boundary line, where the monuments are less than 1 mile apart, one on each side of the boundary; and (5) four bearing trees, where the monuments are 1 mile or more apart, two on each side of the boundary, each marked with the number of the mile or half-mile corner and the letter "M" (to indicate "mile corner") and the initials or abbreviation of the State, Territory, Grant, Private claimer, public land, as appropriate.

47 M OJOJO HT, and
47 M OKIA HT
for "M" (to indicate "mile corner") and "OKIA" (to indicate "Oklahoma")

Mound of stone, on a line at right angles to the boundary, and in direction toward the State, Territory, Grant, Private claim, or public land, as appropriate.

Two pits, one in each direction on the boundary line, shall be dug along the boundary line, where the monuments are less than 1 mile apart, one on each side of the boundary; and (5) four bearing trees, where the monuments are 1 mile or more apart, two on each side of the boundary, each marked with the number of the mile or half-mile corner and the letter "M" (to indicate "mile corner") and the initials or abbreviation of the State, Territory, Grant, Private claimer, public land, as appropriate.

CHAPTER V.

RESTORATION OF LOST CORNERS.

IDENTIFICATION OF EXISTENT CORNERS.

348. It is the purpose of this chapter of the Manual to outline the guiding principles which are to be observed in the identification of existent corners, and thereafter to set forth the particular rules which are to be applied in the recovery of the position of lost corners originally established in the execution of the United States rectangular surveys.

All surveyors, whether employed by the United States or not, are cautioned to note the difference between the regulations pertaining to the establishment of the original surveys of the public lands and those relating to the subsequent identification of said official surveys and the replacement of missing monuments thereof.

In the extension of the rectangular surveys it devolves upon the United States surveyor to identify the initial lines of his group and to replace all lost corners thereof. On the other hand in the subdivision of sections and in the location of property lines generally, it falls to the county or other local surveyor to identify the official corners, and where a required corner is missing the local surveyor will be called upon to recover the point. Thus it will be seen that local as well as United States surveyors are constantly called upon to search for existing evidence of original monuments, and in this work the surveyors will be guided by the same general methods. Should the search for a monument result in failure, the appropriate restorative surveying process to be observed by either surveyor will be based upon the same rules as hereinafter outlined. The text that follows draws no distinction between the duties of the two classes of surveyors.

349. The terms "corner" and "monument" are used largely in the same sense, though a distinction should be noted to clarify the subject matter of this chapter. The term "corner" is employed to denote a point determined by the surveying process, whereas the "monument" is the physical structure erected for the purpose of marking the corner point upon the earth's surface.

350. An existent corner is one whose position can be identified by comparing the evidence of the monument or its accessories on the ground, with the record contained in the field notes of the original survey, or where the point can be determined otherwise by suitable testimony.

351. The process of again bringing to light the physical evidence of an original monument is founded on the principle of intelligent search for the calls of the field notes of the original survey, guided by the controlling influence of known points. The problems incident to the search are vastly simplified whenever a retracement may be projected from known points, and the final search for a monument should cover the zone surrounding one, two, three or four temporary points as may be determined by connections with known corners in one, two, three or four directions, according to the number of points which will ultimately control the relocation in case the corner in question should be declared lost.

352. The character of the original monument is the most important factor in regard to its lasting qualities, and the search should be directed to an examination for such evidence as may reasonably be expected to remain. The evidence is bound to range from that which is least conclusive to that which is unquestionable, and the requisite support of corroborative evidence is necessary in direct proportion to the uncertainty of any feature regarding whose authenticity there may be danger of dispute.

A stone, wooden post, tree corner, deposit corner, and the modern iron post monument are all subject to more or less deteriorating changes through various influences, depending upon the character of the original monument, its local site conditions, and the lapse of time, and all such factors should be taken into consideration when comparing the particular evidence in question with the description contained in the original field notes.

353. If the evidence of the monument is not fully conclusive, the engineer's attention will be directed at once to the record accessories; this step is so generally necessary that it should be considered simultaneously with the search for the monument; in fact, in their broader significance the accessories are a part of the monument.

The underlying principles relating to the identification of the corner accessories, subject to the changes which may be expected in the period intervening after the date of the original survey, have already been fully outlined in Chapter IV. It will suffice to state

that the evidence of the accessories should agree with the record contained in the field notes of the original survey, subject only to such changes as may reasonably be expected.

354. In case of material disagreement between the particular evidence in question and the record calls, the process of elimination of those features regarding which there may be doubt, after making due allowance for natural changes, will serve a most useful purpose, as follows:

(a) The character and dimensions of the monument in evidence should not be widely different from the record;

(b) The markings in evidence should not be inconsistent with the record; and,

(c) The nature of the accessories in evidence, including size, position and markings, should not be greatly at variance with the record.

A certain measure of allowance for ordinary discrepancies should enter into the consideration of the evidence of a monument and its accessories, and no definite rule can be laid down as to what shall be sufficient evidence in such cases. Much must be left to the skill, fidelity and good judgment of the engineer in the performance of his work, ever bearing in mind the relation of one monument to another, and the relation of all to the recorded natural objects and items of topography.

355. A corner will not be considered as lost if its position can be recovered satisfactorily by means of the testimony and acts of witnesses having positive knowledge of the precise location of the original monument. The expert testimony of surveyors who may have identified the original monument prior to its destruction and thereupon recorded new accessories or connections, etc., is by far the most reliable, though landowners are often able to furnish valuable testimony. The greatest care is necessary in order to establish the bona fide character of the record intervening after the destruction of an original monument. Full inquiry may often serve to bring to light various records relating to the original corners, and memoranda of private markings, etc., and the engineer should make use of all such sources of information. The matter of boundary disputes should be carefully looked into in so far as adverse claimants may base their contentions upon evidence of the original survey, and if such disputes have resulted in a boundary suit, the record testimony and the court's decision should be carefully examined.

relative to any information which may shed light upon the position of an original monument.

The testimony of individuals may relate to knowledge of the original monument or the accessories, prior to their destruction, or to any other marks fixing the locus of the original survey, and the value of such testimony may be weighted in proportion to its completeness and agreement with the calls of the field notes of the original survey, also upon the steps taken to preserve the location of the original marks. All such evidence should be put to the severest possible tests by confirmation relating to known original corners and other calls of the original field notes, particularly to line trees, blazed lines and items of topography.

It is impossible to outline a definite rule for the acceptance or non-acceptance of the testimony of individuals. Corroborative evidence becomes necessary in direct proportion to the uncertainty of the particular statements advanced by the individual who testifies. It will be well for the engineer to bear in mind that conflicting statements and contrary views of interested parties are fruitful of boundary disputes.

356. In those cases where witness corners were established in the original survey, the true point for the corner will be controlled by such witness corner, when the latter can be identified, by reference to the record in accordance with the general plan of the survey. The usual diligent search will be made for witness corners, but where the same can not be identified the position of the true point for the corner will usually be of major importance, rather than the point for the witness corner, and in such instances the engineer will proceed directly to the re-determination of the true corner position, adopting the particular methods which should govern the case in hand. Should it become necessary to restore a lost witness corner the general principles hereinafter outlined will be observed.

357. In the absence of an original monument, a line tree, or a definite connection to natural objects, or to improvements, which can be identified, may each fix a point of the original survey for both latitude and departure. The mean position of a blazed line, when identified as the original line, may sometimes help to fix a meridional line for departure, or a latitudinal line for latitude. Other calls of the original field notes in relation to various items of topography may assist materially in the recovery of the locus of the original survey. Such evidence may be developed in an infinite variety.

It may be only such as to disprove other questionable features, or it may guide the engineer in a general way in arriving at the immediate vicinity of a line or corner, or in its best phases may be such as to fix the position of a line or corner beyond any doubt.

358. A certain measure of allowance should be made for ordinary discrepancies in the calls relating to items of topography. Such evidences should be considered more particularly in the aggregate, and when they are found to be corroborative an average may be secured to control the final adjustment, which will be governed largely by the evidences nearest the particular corner in question, giving the greatest weight to those features which agree most harmoniously with the record, and to such items as afford definite connection. A careful analysis will generally reveal the merits of authentic evidences as opposed to unreliable features bearing resemblance to the calls of the field notes, and in this matter the engineer will find an opportunity to exercise his skill to the fullest capacity.

359. It is a matter of utmost importance to determine where an identified call of the original field notes shall operate to control for both latitude and departure, or for either coordinate by itself, and finally as to the necessity for applying the rules for proportionate measurement where the distance between the identified points is considerable.

RESTORATION OF LOST CORNERS.

360. A lost corner is a point of a survey whose position can not be determined, beyond reasonable doubt, either from original traces or from other reliable evidence relating to the position of the original monument, and whose restoration on the earth's surface can be accomplished only by means of a suitable surveying process with reference to interdependent existent corners.

361. 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.

362. The preliminary retracements furnish the only possible means of arriving at the discrepancies of the courses and distances of the original survey as compared with those derived in the process of re-running the lines, and the whole problem of proportionate measurement is one involving the adjustment of said discrepancies. The restoration of the lost corners can not proceed until the retracement of the original survey has been completed. The retracement will be based upon the courses and distances returned in the field notes of the original survey, or the equivalent by calculation, initiated and closed upon known original corners. Temporary stakes for future use in the relocation of all lost corners may be set when making the retracements.

363. As has been observed, existing original corners can not be disturbed; consequently discrepancies between the new and the original record measurements of the line connecting the identified original corners will not in any manner affect measurements beyond said corners, but the differences will be distributed proportionally within the several intervals embraced in the line in question.

364. A proportionate measurement is one resulting in concordant relation between all parts of an original record length of a line and the new distances given to the several parts as determined by the re-measurement, in such a manner that the new distance given to any part of a line shall bear the same relation to the original record length of that part of the line as the new measurement of the whole line bears to the original record length of said line. The ordinary field problem consists in distributing the excess or deficiency determined by comparing the new measurement with the record distance between two original existent monuments, in such a manner that the amount of excess or deficiency given to each interval shall bear the same proportion to the whole difference as the record length of the interval bears to the whole record distance. After having applied the proportionate difference to the record length of

each interval the sum of the adjusted lengths will equal the new measurement of the whole distance.

365. The term "single proportionate measurement" is applied to a new measurement made on a single line to determine the position thereon for restoring a lost corner, for example, a quarter-section corner on line between two original section corners. The term "double proportionate measurement" is employed to signify new measurements made between four original corners on intersecting meridional and latitudinal lines for the purpose of fixing by relation to both lines the position of a lost corner, for example, a corner common to four sections or four townships.

366. It will almost invariably happen that discrepancies will be developed between the new measurements and the original measurements recorded in the field notes. When these differences occur the engineer will generally be required to adopt a proportionate measurement based upon a process conforming to the method followed in the original survey. The principle of the preponderance of one line over another of less importance is recognized, in order to determine upon the procedure relative to single or double proportionate measurement, or other rule to be adopted in order to limit the control and at the same time harmonize the restorative process with the method followed in the original survey. Thus standard parallels will be given precedence over other township exteriors, and the latter will be given precedence over subdivisinal lines; section corners will be relocated before the position of lost quarter-section corners can be determined.

PRIMARY METHODS.

(a) DOUBLE PROPORTIONATE MEASUREMENT.

367. The method of double proportionate measurement is generally applicable to the restoration of lost corners of four townships and of lost interior corners of four sections. It is the best example of the basic principle that monuments north and south should control the latitudinal position of a lost corner, and monuments east and west should control the longitudinal position of a lost corner, upon a plan by which the influence of one identified original corner is balanced by the control of a corresponding original corner upon the opposite side of a particular missing corner which is to be restored, each identified original corner being given a controlling weight inversely proportional to its distance from the lost corner.

368. In order to restore a lost corner of four townships where all of the connecting lines have been established in the field, a retracement will first be made between the nearest identified original corners on the meridional line, north and south of the missing corner, upon which line a temporary stake will be placed at the proper proportionate distance. This will determine the latitude of the lost corner. Next, the nearest original corners on the latitudinal line will be connected and a point thereon will be determined by proportionate measurement in a similar manner, independent of the temporary stake on the meridional line. The second temporary point will determine the position of the lost corner in departure. Then through the first temporary stake run a line east or west, and through the second temporary stake a line north or south, as relative situations may determine. The intersection of the two lines last run will define the position of the restored corner by "double proportionate measurement."

369. In the accompanying diagram the points "A," "B," "C" and "D" (on the small scale) represent four original corners; and (on the large scale) "E" represents the proportional point between "A" and "B," for measurement only, and similarly, "F" represents the proportional point between "C" and "D." The point "X" satisfies the first control for latitude, and the second control for departure.

370. The plan of double proportionate measurement will be applied to the restoration of lost corners of four townships where all the lines therefrom have been run. Lost interior corners of four sections, where all the lines therefrom have been run, will also be reestablished by double proportionate measurement, after first relocating the required lost section corners on the township exteriors. When a number of corners of four sections, and the intermediate quarter-section corners, are missing on all sides of the one sought to be reestablished, the entire distance must, of course, be re-measured between the nearest identified corners both north and south, and east and west, in accordance with the rule laid down.

371. Where one of the connecting lines has not been established in one direction from the missing township or section corner, the record distance to the nearest identified corner in the opposite direction will prevail in lieu of a proportional measurement. Thus, in the same diagram, if the latitudinal line in the direction of the point "D" had not been established in the original survey, the

position of the point "E" in distance would have been main-
 tained by reference to the record distance from the point "A"
 where the point "E" would have been fixed by a similar offset
 from the point "B" as before. A distance of distance,
 where the intersecting line has been previously established
 relative of the observation, would distance to the corner iden-
 tified corners on the record line was control the position of the tem-
 porary points from which the original offset was in the record line.
 all other points on the record line are to be measured.
 and all other points on the record line are to be measured.
 372. The method of this proportionate measurement is gener-
 ally applicable to the restoration of a corner of a regular polygon
 and other cases where the record distance is to be extended in
 one direction only. In such cases the record distance extends
 and other corners of the polygon which are to be included in the case.
 373. In order to restore a lost corner of a regular polygon
 measurement, a temporary line will be made connecting the nearest
 identified regular corners of the polygon line in question. The
 record of which shows no deviation in distance a temporary stake
 will be set on the preliminary line at the original record distance;
 the total distance will be measured, also the falling at the opposite
 corner. The temporary stake will then be adjusted for the pro-
 portional part of the difference between the record distance and
 the measurement, also for the proportional part of the falling.

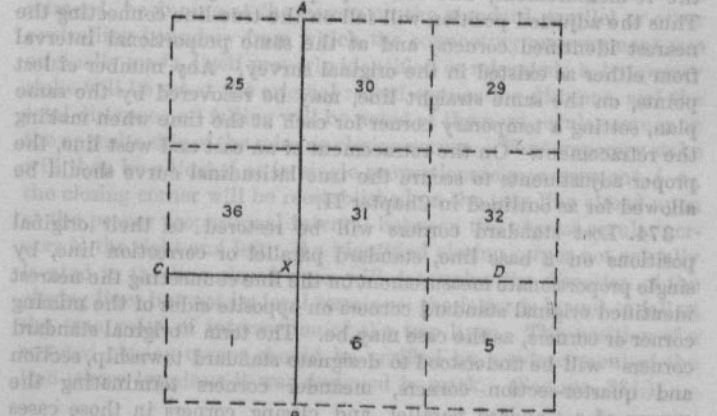


Fig. 67.

where they were originally fixed during the survey of a standard parcel and being corners in those cases

position of the point "F" in departure would have been determined by reference to the record distance from the point "C," whereupon the point "X" would have been fixed by cardinal offsets from the points "E" and "F" as before. Again, in rare instances, where the intersecting lines have been originally established in only two of the directions, the record distances to the nearest identified corners on the two lines will control the position of the temporary points from which the cardinal offsets are to be made.

(b) SINGLE PROPORTIONATE MEASUREMENT.

372. The method of single proportionate measurement is generally applicable to the restoration of lost corners on standard parallels and other lines established with reference to definite alinement in one direction only. Intermediate corners on township exteriors and other controlling boundary lines are to be included in this class.

373. In order to restore a lost corner by single proportionate measurement, a retracement will be made connecting the nearest identified regular corners upon the particular line in question, the record of which shows no deflection in alinement; a temporary stake will be set on the preliminary line at the original record distance; the total distance will be measured, also the falling at the objective corner. The temporary stake will then be adjusted for the proportional part of the difference between the record distance and the re-measurement, also for its proportional part of the falling. Thus the adjusted position will fall on the true line connecting the nearest identified corners, and at the same proportional interval from either as existed in the original survey. Any number of lost points, on the same straight line, may be recovered by the same plan, setting a temporary corner for each at the time when making the retracement. On the retracement of an east and west line, the proper adjustments to secure the true latitudinal curve should be allowed for as outlined in Chapter II.

374. Lost standard corners will be restored to their original positions on a base line, standard parallel or correction line, by single proportionate measurement on the line connecting the nearest identified original standard corners on opposite sides of the missing corner or corners, as the case may be. The term "original standard corners" will be understood to designate standard township, section and quarter-section corners, meander corners terminating the survey of a standard parallel, and closing corners in those cases where they were originally established during the survey of a

standard parallel as corners from which to project surveys to the south. No other meander or closing corners along a standard parallel will control the restoration of lost standard corners.

375. All lost exterior section and quarter-section corners will be restored by single proportionate measurement between the nearest identified corners on opposite sides of the missing corner, north and south on a meridional line, or east and west on a latitudinal line, *after* the township corners have been identified or relocated. An exception to this rule will be noted in the case of any exterior the record of which shows irregularities in alinement between the terminal township corners. (See sec. 380.)

376. All lost interior quarter-section corners will be restored by single proportionate measurement between the adjoining section corners, *after* the section corners have been identified or relocated.

377. Lost meander corners, originally established on a line projected across the meanderable body of water and marked upon the opposite side thereof will be relocated by single proportionate measurement, *after* the section or quarter-section corners upon the opposite sides of the missing meander corner have been duly identified or relocated.

(c) CLOSING CORNERS.

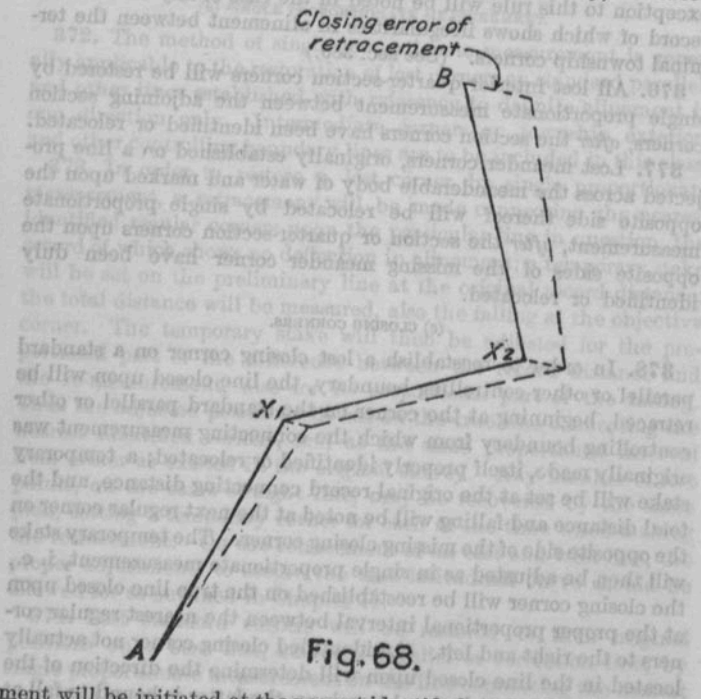
378. In order to reestablish a lost closing corner on a standard parallel or other controlling boundary, the line closed upon will be retraced, beginning at the corner on the standard parallel or other controlling boundary from which the connecting measurement was originally made, itself properly identified or relocated; a temporary stake will be set at the original record connecting distance, and the total distance and falling will be noted at the next regular corner on the opposite side of the missing closing corner. The temporary stake will then be adjusted as in single proportionate measurement, i. e., the closing corner will be reestablished on the true line closed upon at the proper proportional interval between the nearest regular corners to the right and left. An identified closing corner not actually located in the line closed upon will determine the direction of the closing line, but not its legal terminus; the latter is bound to fall at the true point of intersection of the two lines. The position of a restored closing corner should be verified by a retracement of the line whose terminus it was designed to mark. (See sec. 384.)

SECONDARY METHODS.

379. The following methods involve special applications of the general rules of proportionate measurement for adoption in unusual cases where the ordinary control can not be obtained.

(d) BROKEN BOUNDARIES.

380. In order to restore one or more lost corners on a broken or irregular township exterior, or other controlling boundary, a retracement



ment will be initiated at the nearest identified original corner on the boundary, following out the record courses and distances, or the equivalent by calculation, setting a temporary stake for each missing corner or angle point, until the next identified original corner has been attained, where a final temporary stake will be set at the record distance of the last course of the retracement. The closing error will

then be determined for course and distance from the last temporary stake to the objective original corner, and each temporary stake will thereafter be adjusted on the bearing of the closing error, a proportional amount of the length of the closing error equal to the proportional part of the distance of the temporary stake from the initial point of the retracement, i. e., the particular distance to be measured at any temporary stake, on the bearing of the closing error, is to the whole length of the closing error as the distance of the particular temporary stake from the initial original corner is to the whole length of the retracement. Angle points and intermediate corners will be treated alike.

(e) ORIGINAL CONTROL.

381. Where a line has been terminated with reference to a measurement in one direction only, a lost corner will be restored by reference to the original record bearing and distance, counting from the nearest regular corner, the latter having been duly identified or restored. Examples will be found where lines have been discontinued at the intersection with large meanderable bodies of water, or at the border of what was classed as impassable ground.

(f) INDEX CORRECTION FOR AVERAGE ERROR IN ALINEMENT AND MEASUREMENT.

382. In unusual cases where a retracement has been made of many miles of the original lines, between identified original corners, and there has been developed a definite surplus or deficiency in measurement, or a definite variation in alinement, characterizing the original survey, it will be proper to make allowance for such average "index error." Such adjustment will be taken care of automatically in all cases where there exists a suitable basis for proportional measurement, but in any case where such control is lacking, an index error, if conclusive, will be made use of by applying the determined correction to the record courses and distances. If there is not conclusive evidence of such index error the record courses and distances will be allowed to prevail.

SPECIAL CASES.

383. Examples of special cases could be set forth almost indefinitely, but without bringing out important new principles. In some respects the treatment of a large number of special examples would serve to confuse the subject by seeming to warrant certain procedure as a general rule which in fact would not be proper were

the conditions altered; the latter occur in an infinite variety. Ample provision has been made for the United States surveyor to call upon a supervising officer for advice in difficult cases, and where necessary the latter is in a position to direct the surveyor to proceed with additional retracements in order to develop any data which should be considered before a decision is rendered. In trials of boundary suits the court will generally consider many additional questions besides those concerned in the technical problem, and in such instances an academic study of hypothetical examples might serve to cloud the real issue. It would be beyond the purpose of the Manual to invade the realm of non-technical matter while attempting to lay down the general principles involved in the restoration of lost corners.

384. In all unusual instances, where on account of manifest distortion, or through extensive obliteration resulting in great distances between existing corners, or otherwise, the evidence of a survey can not be identified with sufficient certainty to enable a suitable application of the various rules relating to the restoration of lost corners, the engineer is again advised to report the facts to the proper supervising officer. In the same connection, it is important that the engineer should not be confused with the notion that he is required, or has any authority, to revert to the principles relating to the establishment of original surveys as an alternative in such cases. The methods incident to resurveys, as outlined in the next chapter, are designed to rectify unusual conditions which are widely at variance with the representations of the original approved plat and field notes.

(9) MISCELLANEOUS CONTROL.

385. It will be apparent to the experienced engineer that actual field conditions do not always furnish the basis for the application of the rules heretofore set forth, and while developing a consistent theory to apply in unusual cases the engineer will at once note that the first consideration relates to a more or less arbitrary limitation of the control to be adopted. No definite rule can be laid down, except that there should be the closest possible adherence to the basic examples already given in the text. The methods heretofore outlined readily harmonize surveying practice with legal decisions concerning the restoration of lost corners. A strictly consistent mathematical recovery of a lost corner, not based upon any known legal decision, may be obtained by allowing every known corner within a reason-

able radius to enter into the control, each original corner being given a weight inversely proportional to its distance from the missing corner, and though the principle will lead to the same result in some cases as by the methods previously outlined, it will yield a slightly different result under other regular circumstances. For the latter reason a miscellaneous control based upon such mathematical principle will not be adopted except as specifically approved by the proper supervising officer after due consideration of the facts in regard to the applicability of the method in the absence of a suitable basis for a regular control.

386. Having thus safeguarded the application of the following method, the problem in the field will be developed by a series of retracements each beginning at an accepted corner, thence following out the record courses and distances, each retracement terminating at a temporary stake in the vicinity of the objective lost corner. Each stake will be given a weight inversely proportional to the distance from the accepted corner to which it is related. The several temporary stakes will then be combined; the first two to be resolved into a point on the line between them, dividing the whole distance into two parts that will make the interval from either stake inversely proportional to the weights previously assigned, and the latter point will be given their combined weights. The last point will then be correlated with the third temporary stake on a similar plan. Three or more original corners will thus exercise their influence upon the final resultant position for the corner which is to be restored. The result will be the same no matter what the order of connecting the temporary stakes may be, but the omission of any element of the control or the introduction of an additional original corner will alter the final position. The field of influence should accordingly be selected with a view to obtaining a resultant balanced position which can not be materially changed by the introduction of other known points of control.

able to enter into the control each original corner being given a weight inversely proportional to its distance from the missing corner and though the principle will lead to the same result in some cases as by the methods previously outlined it will yield a slightly different result in other special circumstances. For the latter reason a miscellaneous control based upon such mathematical principle will not be adopted except as specifically approved by the proper supervising officer after due consideration of the loss in regard to the applicability of the method in the absence of a suitable basis for a regular control. It should be noted that where 1888. Having thus regarded the application of the following method, the problem in the field will be developed by a series of treatments each beginning at an accepted corner, these following out the record courses and distances, each treatment terminating at a temporary stake in the vicinity of the objective lost corner. Each stake will be given a weight inversely proportional to the distance from the accepted corner to which it is related. The several temporary stakes will then be combined, dividing the whole distance into a point on the line between them, dividing the whole distance into two parts that will make the ratio of the two parts inversely proportional to the weights previously assigned, and the latter point will be given their combined weight. The last point will then be correlated with the third temporary stake on a similar plan. These or more original corners will thus exercise their influence upon the final resultant position for the corner which is to be restored. The result will be the same no matter what the order of connecting the temporary stakes may be, but the omission of any element of the control or the introduction of an additional original corner will alter the final position. The field of influence should accordingly be selected with a view to obtaining a resultant balanced position which can not be materially changed by the introduction of other known points of control.

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The foregoing will serve as a basis for the application of the method to the restoration of lost corners which have been destroyed or destroyed by accident. It should be noted that the method here shown is not in any way a radical improvement upon the method previously shown, but it is a method which will give a more accurate result in the restoration of lost corners than the method previously shown. It should be noted that the method here shown is not in any way a radical improvement upon the method previously shown, but it is a method which will give a more accurate result in the restoration of lost corners than the method previously shown.

CHAPTER VI.

RESURVEYS.

JURISDICTION.

387. Certain important considerations are involved in the execution of Government resurveys of an entirely different character from those relating strictly to the making of original surveys; these considerations present matters not referred to in Chapter V. There is a twofold object of a resurvey: First, the adequate protection of existing rights acquired under the original survey in the matter of their location on the earth's surface, and, second, the proper marking of the boundaries of the remaining public lands.

388. As already noted in Chapter I, the Congress has authorized, under certain conditions, the re-marking of the public-land surveys. The acts relating to resurveys contemplate a restoration of the corners of the original surveys in those townships, (a) where the obliteration of the original monuments or other evidence of the position of the original lines has become so advanced that the land boundaries can be identified only through extensive retracements by experienced engineers of the General Land Office, and (b) where field investigation shows that conditions on the ground disagree with the representations upon the original plat to such an extent that the land boundaries can not be identified positively in one position to the exclusion of another, in consequence of which said plat should be disqualified as a basis for the disposal of remaining public land. While the Government may initiate a resurvey in the absence of any application therefor, as a rule, the steps preliminary to the authorization of a resurvey will be taken by the settlers interested in the land, through a showing of facts made to the proper supervising officer, setting forth the existing conditions with respect to the original survey and status of ownership of the lands.¹

¹ See current circular governing applications for resurveys.

389. The engineer is advised to bear in mind the fact that in localities where resurveys are necessary the occasion for boundary disputes is ever present; he should accordingly exercise the greatest care in his technical work in the field and in the record thereof, so that the result of the resurvey shall relieve existing difficulties as far as possible without introducing new complications. As in the case of original surveys, the records of all resurveys must form an enduring basis upon which depends the security of the title to all lands acquired thereunder, and the field notes should be so prepared that under the test of the closest possible scrutiny at all times, present and future, the record can be regarded as conclusive in the matter of the location of such rights.

390. The General Land Office has exclusive jurisdiction over all matters pertaining to surveys and resurveys affecting the public lands; as between private owners of lands the title to which has passed out of the United States, final determination in the matter of fixing the position of disputed land boundaries rests with the local court of competent jurisdiction. The rules of procedure laid down by the General Land Office to guide its engineers in the re-marking of lines of previous surveys are intended to be in harmony with the leading court decisions in suits involving boundary disputes, and said rules should be so applied that the courts may, with security, accept without question the boundaries thus determined in so far as they represent the true location of a particular tract intended to be conveyed by a patent. Government resurveys are undertaken only by duly appointed United States surveyors acting under the authority of the Secretary of the Interior through the Commissioner of the General Land Office and under the immediate direction of subordinate supervising officers.

LIMIT OF AUTHORITY OF ENGINEER.

391. There are certain questions of a purely judicial nature involved in resurveys of every description where the decision is to be reserved to the General Land Office, particularly those relating to compliance with the general laws in respect to the entry of the public lands. Thus it comes within the realm of the surveying process to identify and mark out on the ground the various legal subdivisions of the public domain, but it is a judicial question beyond the function of the engineer to determine whether or not specified lands have been duly earned under a certain entry. In

the resurvey process the engineer will determine whether or not lands embraced within a claim as occupied have been correctly related in position to the original survey, and where the demonstration of this question may be one involving more or less uncertainty, as is often the case, the engineer will examine and weigh the evidence relating strictly to the surveying problem involved, and he will interpret the evidence in respect to its effect upon the manner in which the resurvey shall be executed looking to the protection of the valid rights acquired under the original survey. The engineer has no authority to enter into any agreements looking to the exchange of one subdivision for another, or to bind the General Land Office in this particular.

BONA FIDE RIGHTS OF CLAIMANTS.

392. In order to carry out the provisions of the laws relating to resurveys, the engineer should understand fully the meaning of the words "bona fide rights" and under what circumstances it will be held that such rights have been impaired by a resurvey. In this connection attention is again directed to the clause contained in the act of March 3, 1909 (35 Stat., 845), as amended by joint resolution approved June 25, 1910 (36 Stat., 884), which reads as follows:

"That no such resurvey or retracement shall be so executed as to impair the bona fide rights or claims of any claimant, entryman, or owner of lands affected by such resurvey or retracement."

The rights of claimants are to be given similar protection under the provisions of the act of September 21, 1918 (40 Stat., 965).

393. It will be understood that bona fide rights are those acquired in good faith under the law. Rights of this character can be affected by a resurvey only in the matter of POSITION or LOCATION on the earth's surface, and the engineer will be concerned only with the question as to whether lands covered by such rights have been actually LOCATED in good faith. Other questions of good faith, such as priority of occupation, possession, continuous residence, value of improvements, and cultivation, when considered apart from the question of the position of the original survey, do not in any manner affect the problem of resurvey.

It is evident that the resurvey must afford adequate protection to bona fide rights vested in both improved and unimproved lands. In the final determination of the true position of all lands, whether

improved or unimproved, in the absence of original corners, the necessity for more or less flexibility of method must be recognized, as the value of both of these classes of lands *may* be vitally affected by an arbitrary process of resurvey which is rigid in its application. Unimproved lands, however, where no apparent attempt has been made on the part of the owner to identify the same under their original descriptions (and where the inherent value of the lands in question is the same), are not *necessarily* affected in the same manner, and such unimproved lands may be adjusted to a position found by the engineer to be conformable to adjoining or near-by tracts, where all may be held to qualify under the rule of acceptable location.

394. The question arises whether the technical rules for the restoration of lost corners are to be rigidly applied in all cases regardless of their effect on the position of improvements, or whether the position of all improvements is to be accepted without question regardless of the relation or irrelation of such improvements to the existing evidence of the original survey and to the description contained in the entry. Manifestly these opposite extremes are equally unacceptable. Somewhere between them, therefore, will be found the basis for a determination of the question as to when lands so improved are to be regarded as having been *LOCATED* in good faith or otherwise. It is clear that no definite specific set of rules can be laid down in advance for the determination of this question. This is a problem the solution of which must be found on the ground by the engineer; it is upon his judgment primarily that the responsibility for a determination of the question of good faith as to *LOCATION* must rest. The engineer may err in his judgment, but once this question is settled to his own satisfaction, the *procedure* to be adopted in the matter of the application of resurvey rules is no longer in doubt.

395. It may be held generally that an entryman has located his lands in good faith (referred to herein as an acceptable location of a claim or of a local point), when it is evident that his interpretation of the record of the original survey as related to the nearest existing corners at the time the lands were located (as defined by his fencing, culture, or other improvements) is indicative of such a degree of care and diligence upon his part, or that of his surveyor, in the ascertainment of his boundaries, as might be expected in the exercise of ordinary intelligence under existing conditions. From this it

follows that lack of good faith is not necessarily chargeable against an entryman if he has not located himself according to a rigid application of the rules laid down for the restoration of lost corners, where complicated conditions involve a double set of corners, both of which may be regarded as authentic; or where the nearest existing corners in one or more directions are an excessive distance away; or are improperly related to each other to an extraordinary degree; or where all evidences of the original survey which had been adopted by the entryman as a basis for his location have been lost before the resurvey is undertaken. Furthermore, the extent of recognition given by neighboring claimants to a local point used for the control of the location of claims very often carries with it the necessity for a consideration by the engineer of its influence in the matter of the acceptability of such locations under the foregoing rule of good faith.

396. In cases involving extensive obliteration at the date of entry, the entryman or his successors in interest may be charged with the knowledge that the boundaries of the claim will probably be subject to more or less adjustment in the event of a resurvey, and that in the process of fixing the boundaries of groups of claims a general control applied to all must be favored as far as possible in the interest of equal fairness to all and of simplicity of resurvey. Even in the presence of extensive obliteration of the original survey, a claim which manifestly shows that no attempt has been made to relate the same in some manner to the original survey can not generally be regarded as having been located in good faith.

397. Cases will arise where it may be evident that lands have been occupied in good faith, but whose boundaries as occupied are clearly in disagreement with the demonstrated position of the legal subdivisions called for in the description. Obviously the rule of good faith as to location can not apply, and relief must be sought through the process of amended entry (act of Feb. 24, 1909, 35 Stat., 645) to cover the legal subdivisions actually earned, rather than through an alteration of the position of established lines. This is a process of adjudication rather than one of resurvey. A case of this character should be regarded as an "erroneous location," in precisely the same manner as would obtain if the question of resurvey were not involved.

398. The recognition of the principle that the restoration of a corner may be influenced by the position of one or more existing claims

warrants, within suitable limits, the acceptance of an unofficial determination, in the manner hereinafter stated, which would not necessarily agree with that resulting from a rigid application of arbitrary rules laid down for the restoration of lost corners.

GENERAL FIELD METHODS.

399. There are two recognized methods of making Government resurveys—DEPENDENT and INDEPENDENT—and in general, any field condition that may arise can be taken care of by the application of one or the other method.

400. The DEPENDENT resurvey is designed to accomplish a restoration of what purports to be the original conditions according to the record, based, first, upon identified existing corners of the original survey and other recognized and acceptable points of control, and, second, upon the restoration of missing corners by proportionate measurement in harmony with the record of the original survey. This type of resurvey is applicable to those cases showing fairly concordant relation between conditions on the ground and the record of the original survey. Titles, areas and descriptions should remain absolutely unchanged in the typical dependent resurvey.

401. The INDEPENDENT resurvey provides methods adapted to considerable areas of public land where the original survey can not be identified with any degree of certainty in accordance with the representations of the approved plat and field notes, and where the prevailing conditions are such that strictly restorative processes, when applied as an inflexible rule between existing monuments or adopted corner positions, are either inadequate or lead to unsatisfactory results. This type of resurvey provides for the segregation of individual tracts when necessary, or a conformation of individual tracts to the subdivisions of the resurvey if suitable. These processes are found to be more flexible in their application than those of the strictly dependent type, but at the same time they duly protect all private rights which have been acquired upon the basis of the original approved survey and plat. With respect to the identification and description of the public lands involved, the independent type of resurvey supersedes the record of the original survey. This will be made apparent by the representations of the approved resurvey plat.

402. The basic principle, with respect to the protection of bona fide rights, involved in one type of resurvey is identical with that of the other type, whether dependent or independent; they are both

to be regarded as a demonstration, on the part of the General Land Office, in the light of the *best evidence available*, by means of the legal subdivisions of a dependent resurvey or by the tract segregations of an independent resurvey, of the *original* position of entered or patented legal subdivisions or lots included in the *original* description when related to the *original* survey. There is no legal authority for the substitution of the methods incident to an independent resurvey in disregard of identified evidence of the original survey.

403. The necessity for both types of resurvey is encountered in the field; the applicability of one or the other method is altogether a question depending upon local conditions, such as extent of obliteration, relative harmony of identified and recognized points, and extent of disposals by the Government. These questions should not be judged in advance of a comprehensive field examination.

404. In general, a preliminary field examination will be required and authorized before the resurvey is to be undertaken.

The purpose of an investigation is to develop the extent of the obliteration of the evidence of the original survey, the extent of settlement, the agricultural possibilities of the township, and any other information from which the necessity for, and the propriety of, the proposed resurvey may be determined.

A second purpose to be subserved by an investigation is the assembling of sufficient data concerning the local survey conditions to permit a proper type selection; and with this end in view the examining engineer should investigate and report upon the relative position of the evidence of the original survey; the degree to which identified points are concordant or the reverse; the extent to which corners discordantly related have been made the basis of claim locations; the presence of one or more systems of unofficial local surveys which have been recognized and adopted by the claimants in fixing their boundaries; and the degree to which conflicts are to be anticipated.

405. The proper supervising officer will provide the examining engineer with suitable instructions in which the scope of the examination will be indicated and attention will be directed to the particular considerations which should receive attention. During the progress of the investigation interested parties should be informed, upon inquiry, that the work then in progress is merely preliminary and only for the purpose of gaining information, and that if resurvey is ultimately authorized all valid rights will then be protected as required by law.

406. The examiner's report should contain definite recommendations concerning the type of resurvey which, in his judgment, should properly be applied in view of the prevailing conditions.

When the report and recommendations of the examiner, with those of the supervising officer, have been received by the General Land Office, the situation will be considered, the appropriate type of resurvey will be determined, and the preparation of special instructions for the resurvey will be authorized.

407. The special instructions, which must of necessity be based largely upon the data provided by the examination, will indicate the scope of the work, and, regardless of whether the lands are to be dependently or independently resurveyed, the necessary retracements will be made to fix the outboundaries of the township or townships designated for resurvey. With the limiting boundaries once restored so as to protect under the rules already laid down all existing property rights in the adjoining lands not to be resurveyed, the plan of procedure outlined in the instructions should, under the known conditions, produce satisfactory results, and adherence thereto is expected. If, however, unforeseen conditions are developed in the progress of the resurvey, which may apparently render the special instructions inapplicable or likely to produce inconsistent or unsatisfactory results, it is of the utmost importance that the engineer suspend further monumentation of the corners; and after such additional retracement and investigation as may be necessary to a proper understanding of the situation, he should report the facts to the proper supervising officer and request further instructions.

408. During the progress of the resurvey the engineer should advise all interested parties, as occasion and opportunity may offer, that the resurvey is not to be regarded as official or binding upon the United States until duly accepted by the Commissioner of the General Land Office, as provided by law, and that no contemplated alteration in the position of improvements or claim boundaries should be made in advance of the official acceptance of the resurvey.

THE DEPENDENT RESURVEY.

GENERAL CONTROL.

409. A dependent resurvey is an official re-marking of the original lines upon a plan whereby existing evidence of the original survey is given primary control over the position of the lines to be reestablished. A certain amount of flexibility (as hereinafter described)

is allowable in the dependent resurvey when necessary for the protection of bona fide rights of claimants, particularly in those cases where no objection is found to adopting a point acceptably located under the rule of good faith already laid down, when only slightly at variance with the theoretical position of the same.

410. In theory the process consists, first, in the retracement and reestablishment of the township exteriors; second, the identification of all existing interior corners or other evidence of the original survey; and, third, the determination, by a *suitable field procedure*, of the theoretical position of all missing corners as indicated by a proper interpretation of the record of the original survey in relation to such existing evidence. The actual field process may be varied to some extent in order to meet local conditions or to suit the convenience of the engineer, but the theoretical position finally determined must be identical with that which would result from a strict application of the principles of proportional measurement. When this has been accomplished, attention should be given to the adoption, as an integral part of the resurvey system, of corner positions determined by the evidences, of whatever character, of acceptable claim location. Such evidences may, for convenience, be termed "collateral evidence" as distinguished from direct evidence of the original survey.

411. The process of the dependent resurvey differs in scope from that applied for the usual restoration of one or more lost corners, and the rules governing a resurvey bring into consideration in a more comprehensive manner the position of recognized land boundaries, in the absence of evidence of the original corners. The engineer has noted the detailed instructions set forth in Chapter V looking to the identification of existing evidence of the original survey and the application of the rules of proportionate measurement for the determination of the theoretical position of lost corners. These rules will be applied in the dependent resurvey generally with respect to the township as a unit, wherein the means of identification of each and every existent corner will be exhausted and the theoretical position determined for each lost corner. The former are to be considered as fixed points (except in most unusual cases) and may be monumented at any time; the latter will be subjected to the possible influence of points which may afterwards be determined to be acceptably located under the same rule of good faith, and will be marked only as temporary points until this question has been disposed of.

412. A complete retracement of the original survey will be made, based upon known corners, it being assumed that the exterior boundaries of the township to be resurveyed have been identified or restored under the rules already laid down in Chapter V, and under those relating to the acceptability of a local point or claim location. It is not usually possible to follow the method and order of procedure shown in the record of the original survey (owing to missing corners), but the complete system of lines will be run out by preliminary retracement, usually beginning with the meridional lines between known corners, followed by the latitudinal lines between known corners, noting the intersections with the said meridional lines. The engineer must be supplied with a complete copy of the record of the original survey, and temporary reference stakes may be set on the meridional lines at the record measurement for each corner point.

413. The preliminary retracements will lead at once to the identification of the prominent evidence of the original survey and a trial calculation will follow as to the latitudinal and longitudinal adjustments at each missing corner, to suit the proportions which may be derived when based upon these known corners. A second and more exhaustive search will then follow within the zone of the probable location of each missing corner for the more obscure evidence of the original survey. At this stage of his field work the engineer should exhaust every possible means of identifying the existent corners of the original survey. In many respects, the engineer will be compelled to devise his own methods as the actual field conditions seem to warrant, and his skill and judgment as an engineer should function to the fullest capacity.

If additional evidences of the original survey are found by this process, a second trial calculation will then be made as to the latitudinal and longitudinal adjustments of the temporary reference stakes previously set at each missing corner, to suit the proportional measurements derived from all of the known original corners—exactly as outlined in Chapter V. These calculated adjustments will determine the theoretical location of each lost corner with reference to all existing evidence of the original survey.

In the absence of other considerations, the theoretical points thus determined by proportionate measurement, based upon existing original corners, are fixed to a mathematical certainty, and when these points have been determined, the evidence of the original

survey and the record thereof have served their primary purpose. Then, and not until that time, is the engineer prepared to consider the weight of such collateral evidence as may be available.

414. The question now to be determined is whether the position of the lands claimed, occupied or improved is to be adopted under the rule of good faith as to location, and whether, if so adopted, the claims thus acceptably located can all be properly protected by the dependent plan of resurvey. If the position of any claim fails to qualify under the said rule of good faith it may be disregarded as to the effect produced thereon by the plan of dependent resurvey. On the other hand, if these claims are held to be acceptably located under the same rule, they may be adopted as the determining factor in the position of the missing corner or corners; and if the claims are in such concordant relation to each other and to the identified evidences of the original survey as to receive full protection by the dependent plan of resurvey, the engineer may proceed with full assurance of the adequacy of the plan. Otherwise, the question of other processes analogous to those of an independent resurvey (as hereinafter explained) must be considered.

If two or more claims are acceptably located, but are discordantly related to each other to a considerable degree (by virtue of irregularities in the original survey), it will be clear that the general plan of dependent resurvey may not afford protection to such claims; whereupon the influence thereof must be rejected in favor of the theoretical point previously determined by proportional measurement. In this case, as before stated, some other process must be adopted to protect the acceptably located claims.

415. These acceptably located points for the missing corners will receive all the authority and significance of an identified original corner, and when the influence thereof on the dependent plan of resurvey has been combined with that of the existing original corners previously identified, the latitudinal and longitudinal adjustments of the temporary points on the meridional lines may be made accordingly.

416. In cases of distortion, if the distorted lines are to be adopted in the plan of dependent resurvey, it should be remembered that the lengths of lines, when subject to double proportion, are comparable only when reduced to cardinal equivalents or to equivalents along the direct lines between the nearest existing corners.

417. Many situations will arise where it will be manifest to the engineer that it is better to accept a position based upon local interpretation rather than to disturb satisfactory existing conditions. The engineer will endeavor to avoid disturbing the position of locally recognized lines when such action may adversely affect improvements, and at the same time extreme caution will be exercised in the matter of adopting local points of control, which when accepted must be given, as above stated, a significance similar to that of an original corner and be allowed to function on an equality therewith. The acceptance of duly qualified and locally recognized points of control should aid materially in obtaining simplicity of resurvey and avoid the need for special metes-and-bounds surveys (as hereinafter described), which would differ only slightly in position from the regular lines of the resurvey. In this manner a flexibility will be introduced in the application of a dependent resurvey, at least to the point of protecting satisfactory local adjustments.

418. The engineer should fully understand that the field of influence to be exercised by any acceptable location must be restricted to that already covered in a larger way by the existing evidences of the original survey, and that the adjustive process is of more or less local application. In this connection, it should be noted that the record of the original survey can not be abandoned in favor of an *indiscriminate* adoption of property corners, all or a portion of which fail to qualify as aforesaid, nor is it to be assumed that because a large number or all of the claims within a township are consistently related among themselves to an arbitrary system of control which is itself altogether unrelated to the original survey, that such system is qualified for adoption as the basis of a dependent resurvey.

419. Thus where bona fide rights, as defined hereinbefore, are found to have been definitely established with reference to the location of lands the position of which can not otherwise be fully demonstrated by existing evidence of the original survey, the engineer engaged in the resurvey will reject the theoretical point determined by the primary control in favor of a near-by *duly qualified* corresponding point, the position of which has been agreed upon by the adjoining property owners. Such a point may be recognized as the best available evidence of the true position for a corner; as previously stated its acceptance by the engineer confers upon the

point a significance similar to that of an original corner position, and thus avoids disturbing satisfactory local adjustments. Chief among this class of evidence forming the basis of the recognized position of land boundaries are recorded monuments established by local surveyors, duly agreed upon by the interested property owners; the position of boundary fences determined in the same manner; and the center lines of public roads and drainage or irrigation ditches, when intended to be located on the subdivisional lines of the public-land surveys. The local record in these cases, when available, may furnish the connecting link to the previously identified evidence of the original survey, but even in the absence of a conclusive record, if a point qualifies as above outlined, the presumption is strong that its position bears satisfactory relation to the original survey and that its correctness can not be successfully disputed. Points which actually qualify as aforesaid may be accepted as the best available evidence of the true position of the original survey.

420. The technical record of the resurvey should clearly set forth the reasons for the acceptance of a local point, where unofficial determinations of the above character do not represent actual marks of the original survey. Such recognized and acceptable local marks will be preserved, and described in the record of the resurvey. New monuments will be established as required, in addition to, but without destroying the evidence of, the local marks.

REESTABLISHMENT OF TRUE LINES.

421. As already stated, with the combined control of the dependent resurvey fully determined, the final calculation will be made as to the latitudinal and longitudinal adjustments of the temporary reference stakes previously set at the remaining missing corners. The final calculations will be based upon the known position of the corners of the general control as thus adopted, upon the plan of proportionate measurement, all as provided in Chapter V. The result of this process balances in regular proportion the differences between the measurements shown in the record of the original survey and those derived in the retracement. Thus the true lines of the dependent resurvey are finally determined through the influence exercised by the identified existent corners of the original survey and every other identified call of the record thereof, and

such other collateral evidence of the position of recognized land boundaries as may be properly adopted for such influence.

422. The field procedure incident to the running and measurement of the true lines of the dependent resurvey will conform to the requirements of Chapter II, while the marking of lines between corners and the notation of objects to be recorded will conform to the provisions of Chapter III, and the monumentation of the survey will comply with Chapter IV. The technical record of the resurvey will be broadened to show the relationship between the original survey and its reestablished lines.

423. The field note description of an identified or accepted corner will be introduced into the technical record of the resurvey at the place in the true line notes where the position for the corner is indicated as having been attained. The record will embrace:

- (a) A complete description of the remaining evidence of the original monument;
- (b) A complete description of the new monument;
- (c) A complete description of the original accessories as identified;
- (d) A complete description of the new accessories;
- (e) A concise statement relating to the recovery of a corner based upon identified line trees, blazed lines, items of topography, or other calls of the field notes of the original survey, in the absence of evidence of the monument or its accessories; and,
- (f) A statement of fact relating to the relocation of an obliterated monument; or a statement of the determining features leading to the acceptance of a recognized local corner.

424. General titles (in addition to the regular page heading) will be inserted in the field notes of dependent resurveys to indicate the character of the resurvey, the technical record of which follows. Such titles will be inserted in the body of the field notes, as appropriate, and will show the name of the original surveyor and the year in which the original survey was executed; as, for example:

"Reestablishment of the surveys executed by John B. Smith, U. S. Surveyor, in 1842,"

and additional memoranda will be added as appropriate, explanatory of the method of control adopted in the restoration of one or more lost corners.

425. In addition to the usual showing of data upon the township plat, the plat of a dependent resurvey should carry a memorandum

for the information of the public to the effect (modified as special circumstances may warrant) that—

"This plat of the resurvey of T. —, R. —, delineates a retracement and reestablishment of the lines of the original survey as shown upon the plat approved — (date), in their true original position according to the best available evidence of the position of the original corners; all differences between the measurements shown on the original plat and those derived in the retracement have been distributed proportionally between accepted corners in accordance with surveying rules; reference will be made to the original plat for the showing of the areas and more detailed descriptions of the various smaller subdivisions."

ADDITIONAL METHODS FOR THE PROTECTION OF BONA FIDE RIGHTS.

426. In the execution of a dependent resurvey there may possibly arise rare cases where locally established corners controlling valuable improvements are so discordantly related to the existing authentic evidences of the original survey that such local corners can not qualify for adoption as acceptable collateral evidence (secs. 414 and 417), there being no legal authority for a disregard of the identified evidence of the original survey (secs. 395, 397, and 402). The usual appropriate treatment of this situation, where possible of application, consists in an amendment of the entry (sec. 397) from the entered to the occupied legal subdivisions in terms of the original survey. These cases are decidedly exceptional in any township where regular control has been developed by careful retracement and thorough search. No general remedy has been devised other than that of amendment of entry, and where such method appears to be impracticable the engineer will submit a detailed report of the conditions found, with recommendation for procedure suited to the particular situation to be dealt with and designed for protection to the claimant's improvements, but on a plan that will not disturb those who have acquired legal rights in the matter of consistent location.

EXAMPLE.

427. A hypothetical example of a dependent resurvey follows in the text, wherein a showing of typical conditions will be presented. In this connection it will be observed that the application of the rules for the execution of a dependent resurvey is generally made with respect to the township as a unit. In this hypothetical case it is presumed that a sufficient number of original corners can be identified to enable the restoration of the township exteriors resulting in a satisfactory closure. Upon retracement of the interior lines, some evidence of the original survey is developed, also certain

recognized and acceptable corners. All claims are found to be conformable.

The engineer will proceed with the complete retracement of the interior section lines. In this process he will employ instrumental methods and make the measurements as provided in Chapter II. He will be guided by the suggestions given in Chapter V in regard to the search for evidence of the original survey, and beyond that he will devise his own methods in the search as the actual field conditions seem to warrant. Temporary reference stakes will be set where the original corners are not at once identified (though the use of local reference points will be unobjectionable). It will be assumed that a single system of reference stakes has been employed, as this scheme lends itself more readily to theoretical discussion, as well as practical utility in the field, and allows the utmost freedom as to the order in which the retracements are made.

Having completed the reestablishment of the township exteriors and the retracement of the interior lines, the engineer will be concerned with the two primary considerations, heretofore discussed, which it is his duty to harmonize: First, the restoration of what the record purports to be original conditions; and, second, the protection of the bona fide rights of claimants in the matter of location. The first requirement must be fulfilled with reference to the evidence of the original survey, and the discovery and identification of actual original corners is paramount, bearing in mind that the development of a single additional original corner adds manifest conclusiveness to the work. These identified points when combined with those acceptably located constitute the general control. The second item, which does not directly affect the technical procedure, has been fully discussed hereinbefore.

KEY TO DIAGRAM, FIG. 69.

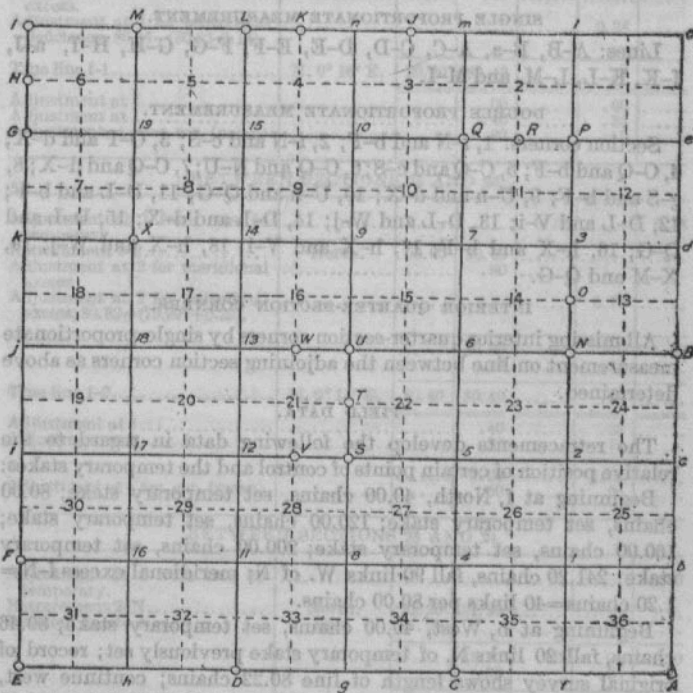
- A. Identified original corner.
- B. Intersection of center lines of public crossroads, intended to be located at section corner and generally so recognized; accepted as best available evidence of corner.
- C and D. Identified original corners.
- E. Corner established by local surveyor; record shows proper application of the method of double proportionate measurement; generally recognized as correct position of corner; accepted on an equality with an identified original corner.
- F-M, inclusive. Identified original corners.
- N. Same as B.
- O. Identified original corner.
- P. Intersection of mean position of meridional and latitudinal blazed lines through virgin timber; age count on overgrowth qualifies for date of original survey.
- Q. Restored corner based upon control furnished by latitudinal position of blazed line as above and fixed in departure by distance to original line tree.
- R. Identified original corner.

S. Same as E.

T. Position determined by location of improvements; point agrees approximately with the theoretical position and it is recognized by adjoining claimants; improvements would be adversely affected by change of point.

U. Same as E.

V and W. Same as T.



o Employed for general control.

+ Theoretical position.

Fig. 69.

X. Identified original corner.

a. Duly restored by double proportionate measurement and thereafter employed for general control on an equality with an identified original corner.

b-n, inclusive. Theoretical true line position, duly restored by single proportionate measurement.

The adjustments of the temporary stakes to true line and the determination of the bearings and lengths of the restored lines, are calculated as follows:

METHOD.

After completing all retracements and having determined upon the general control to be adopted, as indicated in the diagram and accompanying key, the true lines of the dependent resurvey, beginning at the southeast corner of the township, will be reestablished as follows:

SINGLE PROPORTIONATE MEASUREMENT.

Lines: A-B, B-a, A-C, C-D, D-E, E-F, F-G, G-H, H-I, a-J, J-K, K-L, L-M, and M-I.

DOUBLE PROPORTIONATE MEASUREMENT.

Section corners: 1, f-N and b-F; 2, f-N and c-S; 3, O-P and d-X; 4, C-Q and b-F; 5, C-Q and c-S; 6, C-Q and N-U; 7, C-Q and d-X; 8, g-S and b-F; 9, U-n and d-X; 10, U-n and Q-G; 11, D-L and b-F; 12, D-L and V-i; 13, D-L and W-j; 14, D-L and d-X; 15, D-L and Q-G; 16, h-X and b-F; 17, h-X and V-i; 18, h-X and W-j; 19, X-M and Q-G.

INTERIOR QUARTER-SECTION CORNERS.

All missing interior quarter-section corners by single proportionate measurement on line between the adjoining section corners as above determined.

FIELD DATA.

The retracements develop the following data in regard to the relative position of certain points of control and the temporary stakes:

Beginning at f, North, 40.00 chains, set temporary stake; 80.00 chains, set temporary stake; 120.00 chains, set temporary stake; 160.00 chains, set temporary stake; 200.00 chains, set temporary stake; 241.20 chains, fall 90 links W. of N; meridional excess f-N=1.20 chains=40 links per 80.00 chains.

Beginning at b, West, 40.00 chains, set temporary stake; 80.46 chains, fall 20 links N. of temporary stake previously set; record of original survey shows length of line 80.22 chains; continue west, etc., to F; latitudinal deficiency b-F=84 links=14 links per 80.00 chains.

Beginning at 2 (temporary stake), East, 40.00 chains, set temporary stake; 80.82 chains, fall 44 links S. of c; record of original survey shows length of line 79.90 chains; run west from temporary stake at 2 on similar plan; latitudinal excess c-S=66 links=22 links per 80.00 chains.

CALCULATIONS.

The adjustments of the temporary stakes to true line position, and the determination of the bearings and lengths of the reestablished true lines, are calculated as follows:

BETWEEN SECTIONS 35 AND 36.

Memo.	Course.	Dis- tance.	N.	S.	E.	W.
Retracement f-1.....	North.	80.00	80.00			
Adjustment at 1 for meridional excess.....			.40			
Adjustment at 1 for latitudinal deficiency, 80.46—(80.22-0.14).....					0.38	
True line f-1.....	N. 0° 16' E.	80.40	80.40		.38	
Adjustment at f.....			.00		.00	
Adjustment at 1.....			.40		.38	
Adjustment at $\frac{1}{2}$ sec. cor. (mean).....			.20		.19	

BETWEEN SECTIONS 25 AND 26.

Adjustment at 1 from true to temporary.....				0.40		0.38
Retracement 1-2.....	North.	80.00	80.00			
Adjustment at 2 for meridional excess.....			.80			
Adjustment at 2 for latitudinal excess, 80.82—(79.90 +0.22).....					0.70	
			80.80	.40	.70	.38
			.40		.38	
True line 1-2.....	N. 0° 14' E.	80.40	80.40		.32	
Adjustment at 1.....			.40		.38	
Adjustment at 2.....			.80		.70	
Adjustment at $\frac{1}{2}$ sec. cor. (mean).....			1.20		1.08	
			.60		.54	

BETWEEN SECTIONS 23 AND 24.

Adjustment at 2 from true to temporary.....				0.80		0.70
Retracement 2-N.....	North.	81.20	81.20			
Random line to N.....	East	.90			0.90	
			81.20	.80	.90	.70
			.80		.70	
True line 2-N.....	N. 0° 9' E.	80.40	80.40		.20	
Adjustment at 2.....			.80		.70	
Adjustment from 80.00 ch. point on random to N.....			1.20		.90	
Adjustment at $\frac{1}{2}$ sec. cor. (mean).....			2.00		1.60	
			1.00		.80	

BETWEEN SECTIONS 25 AND 36.

Memo.	Course.	Distance.	N.	S.	E.	W.
Retracement b-1.....	West.	80.46				80.46
Random line to temporary stake at 1.				0.20		
Adjustment at 1 temporary to true.			0.40		0.38	
			.40	.20	.38	80.46
			.20			.38
True line b-1.....	N. 89° 51' W.	80.08	.20			80.08
Adjustment at b.....				.00		.00
Adjustment from 80.00 ch. point on random to temporary stake at 1.				.20		.46
Adjustment at 1 temporary to true.			.40		.38	
			.40	.20	.38	.46
			.20			.38
Adjustment at $\frac{1}{2}$ sec. cor. (mean).			.20			.08
			.10			.04

BETWEEN SECTIONS 24 AND 25.

c to random line.....				0.44		
Retracement c-2 (reversed).....	West.	80.82				80.82
Adjustment at 2 temporary to true.			0.80		0.70	
			.80	.44	.70	80.82
			.44			.70
True line c-2.....	N. 89° 45' W.	80.12	.36			80.12
Adjustment from 80.00 ch. point on random to c.			.44		.82	
Adjustment at 2 temporary to true.			.80		.70	
			1.24		1.52	
Adjustment at $\frac{1}{2}$ sec. cor. (mean).			.62		.76	

THE INDEPENDENT RESURVEY.

428. An independent resurvey is an official re-subdivision of the public lands distinct from the original survey which it is designed to supersede. The independent resurvey is accomplished by three distinct steps:

(a) The reestablishment of the outboundaries of the lands subject to resurvey, following the method of a dependent resurvey;

When true lines, are calculated as follows:

(b) The segregation of lands embraced in any valid claim where the initial steps have been taken looking to the disposal of the title of the United States based upon the former approved plat; and,

(c) New exterior, subdivisional and meander lines as necessary, established upon a new regular plan, which, for every purpose of identification and description of the public lands involved, becomes the prevailing survey.

REESTABLISHMENT OF OUTBOUNDARIES.

429. The limiting boundaries of the lands subject to independent resurvey must agree with the previously established and identified exterior or subdivisional lines of the approved original surveys. In order to qualify as a suitable limiting boundary as aforementioned, a line of the accepted established surveys will be selected which can be conclusively identified (by existing original or properly restored corners) in one position to the exclusion of all others and which by its known position adequately protects all rights (located in good faith as hereinbefore defined) based upon any township plat showing subdivisions of the public lands adjacent to said boundary. Such outboundaries of the lands to be resurveyed by the independent process must necessarily be retraced and reestablished in their true original position. The lands upon one side of such outboundary are to be re-subdivided upon a new plan, while upon the opposite side of such line the original subdivisions are to be strictly maintained and none of the original conditions are to be disturbed.

430. The outboundaries are generally selected along the locus of the previously established township exteriors where the existing evidence gives positive proof of the location of the original survey, and where conditions on the ground are harmoniously related to the record of said original survey. In special cases certain section lines may fully qualify as suitable lines to mark the limit of the independent resurvey; such section lines will then be duly retraced and reestablished in their true original position. Particular attention will be given to this very important subject at the time when the field examination is made with a view to maintaining the original survey as far as consistent.

431. In those cases where a proper limiting boundary can not be secured without involving the necessity for the inclusion in the group of a greater number of townships than administratively practicable to execute in one assignment, the necessity may arise for the

extension of tract segregations (as hereinafter outlined) into a township ungrouped for resurvey. In such cases, under specific authority of the General Land Office, any tract found to extend across such group outboundary will be segregated in full, whether or not the tract was originally described as in the township to be resurveyed, and the necessary steps will thereupon be taken by the General Land Office in the matter of suspension of the lands in the adjoining township from further disposal and of additional investigations with a view to a resurvey of all or a portion of the said adjoining township. (See second rule, sec. 445.)

432. The special instructions will show specifically what lines have been selected to limit the independent resurvey, and the engineer engaged in the execution of such resurvey will proceed with the retracement and reestablishment of said outboundaries as a condition precedent to beginning the independent resurvey.

433. Where the new lines of the independent resurvey are not to be initiated or closed upon the restored original corners of the reestablished outboundaries of the independent resurvey, said restored corners will be marked only with reference to the township, range and section to which they will thenceforth relate, and new regular corners of minimum control will be established as necessary to govern the lines of the independent resurvey, all as provided in sec. 164, Chapter III. During the preliminary stages of the resurvey there will often be more or less doubt as to whether an old corner will retain its former control or will have to be altered, and until this uncertainty has been removed the marking of a corner and its accessories should be deferred. The monumentation will follow the final determination of the future significance of each point. Where an old point is to be perpetuated merely to control the former alinement, but not the corner of a subdivision, its future significance will be that of an "angle point" only and the monument and its accessories will be marked accordingly.

METES-AND-BOUNDS SURVEY OF PRIVATE CLAIMS.

434. After the reestablishment of the outboundaries of the lands subject to independent resurvey has been accomplished in accordance with the requirements of the special instructions, the engineer's attention will be directed to the segregation or marking out of all duly entered, selected, reserved (in certain cases), granted, or patented

lands whose description may be based upon the former approved plat, and which can not be conformed to the lines of the resurvey.

435. A status diagram will be furnished to the engineer showing all patented lands, valid entries, school sections, and other land grants, and all other disposals, reservations, or selections of lands whose position and description are based upon the original survey and plat, and whose boundaries can not legally be disturbed. In every case the various tracts shown upon the status diagram will be protected either by individual "metes-and-bounds" survey or by the assignment of appropriate subdivisions of the resurvey in case the latter lines (new section lines, or center lines of sections or quarter sections) are found to coincide or approximately agree with the boundaries of said tracts.

436. It is not to be understood that the metes-and-bounds survey of private claims must be completed before beginning the projection of the new lines of the independent resurvey. It has merely been deemed logical to consider the subject of the tract segregations in advance of the question of the establishment of new lines. The fact is that engineers will find it expedient to carry both branches of the survey along together in the locality of the camp or other field headquarters.

437. The jurisdiction of the General Land Office, the limit of the authority of the engineer, and the bona fide rights of claimants, where entered or patented lands are involved, remain absolutely the same whether the resurvey is to be made upon the dependent or independent plan. Thus where the independent type of resurvey has been adopted as more feasible, identified corners of the original survey in the immediate vicinity of lands to be segregated will be employed for the control of the location of such lands. The question of the good faith of the entryman will in every case be fully considered, as previously outlined in this chapter, and where the evidence of the original survey is so obliterated that a charge of a lack of good faith can not be brought against an entryman whose claim boundaries may differ from a theoretical location determined by more rigid surveying rules, the available collateral evidence is to be regarded as the best indication of the original position of the claim, and the same will be employed as far as consistent for the control of the location of the boundaries of such claim. (See sec. 395.)

438. Where there is sufficient evidence of the original survey, the identification of the areas to be segregated, resulting from the sub-

division of the original sections, will proceed in accordance with the provisions of Chapters III and V, and every corner or angle point of each tract as thus located will be marked upon the ground.

439. Where the engineer can not point out, by suitable identification of the original surveys, the definite location of an entry based upon the former approved plat, the claimant or owner of such lands will be consulted as to the position of his boundary lines. The boundaries of the private claim, so determined, will be fixed, as between the private and public lands, subject to the official acceptance of the resurvey. Where dispute is encountered in regard to the adjustment of the line between adjoining patented tracts, each acceptably located under the rules already laid down, which can not be reconciled or suitably disposed of by surveying process, the tracts will be surveyed in conflict, as hereinafter provided, and so shown on the resurvey plat; the questions arising out of such conflict will be given administrative review with the field notes of the resurvey.

440. The owner of an unidentified claim will be called upon to indicate the boundary lines thereof if possible, and in this connection, should occasion arise, the engineer will explain the manner of adjusting differences between adjoining claims and what will constitute an acceptable location of a claim. The latter condition demands a form agreeing with the original entry, approximately regular boundaries, an area not widely inconsistent with that shown upon the original plat, and a location as nearly correct as may be expected from the existing evidence of the original survey, without overlapping into an adjoining township not subject to resurvey, except as provided in section 431. In every case where the out-boundaries of the lands subject to "independent resurvey," have been reestablished by the "dependent" or "restorative" plan, the subdivisions of a tract situated and originally described as along or upon the opposite sides of such outboundary must agree with the line reestablished and harmonize in relative position.

441. In the execution of an independent resurvey, therefore, the identity of each tract to be segregated therein or indicated by conformation to the lines of the resurvey, whether patented or unpatented, must be maintained, and the engineer will not be allowed to change materially the configuration of a tract as shown by its original description in order to indemnify the owner thereof against deficiencies in area, to eliminate conflicts between entries,

or for any other purpose. If improvements have been located in good faith, the segregation survey should be so executed, or the conformation to the lines of the resurvey so indicated, as to cover as nearly as possible these improvements and at the same time maintain substantially the form of the entry as originally described. No departure from this rule will be allowed.

442. The question of amendment of entries for the purpose of permitting adjustments in terms of the resurvey involving lands not included within the original tract is a matter for the adjudication of the General Land Office after the resurvey has been accepted and the plats thereof filed in the district land office.

443. In case of absentee owners an attempt should be made to establish communication, if necessary, in order that the claimant may point out the lands subject to a metes-and-bounds survey. If the owner can not be found and there is no visible indication, such as a boundary fence, of the location of the limits of a claim, the engineer will exercise the alternative of locating the claim from the nearest original point of control or from a point of a neighboring claim, or of assigning to the entered or patented lands the appropriate subdivisions of the resurvey, all subject to the principles hereinbefore set forth. The controlling factors in such locations will be based upon the individual and neighborhood improvements (such as buildings, wells, springs of water, cultivated lands, public roads, fences, corners of recognized private surveys, etc.) which may indicate the evident intention of the entryman or patentee as to the position of his land.

444. Each non-conformable valid claim in a township will be given a serial tract number, commencing with No. 37 in the smallest numbered and entered section of the original plat, progressing through the township in the order in which lots and sections are numbered. A tract number will be used but once in a township, and if any tract lies partly in two or more townships subject to resurvey the number applied to the tract in the first township resurveyed will not be used for other tracts in the adjoining township.

445. The following rules will be observed in the execution of the metes-and-bounds survey of all specially designated tracts:

1st. Each claim, acceptably located, but at variance with the lines of the resurvey, will be surveyed and monumented at each angle point.

2d. Where a portion of a claim is originally described as in a township not subject to resurvey, such portion of the claim will not be surveyed by metes and bounds, provided the limiting boundary is found to qualify as set forth in sec. 429. The portion of the claim originally described as in the township to be resurveyed should ordinarily be defined in a position (either by segregation or conformation to the lines of the resurvey) which is properly related to the identified or restored corners on the limiting boundary. (See sec. 431.)

3d. Where the boundaries of a claim are unacceptably located as pointed out by the claimant, the engineer will proceed with a proper survey of the tract in accordance with rules already stated which will result in a suitable relation to the original survey, and the corners of the tract as thus located will be monumented. If the claimant protests against such location, the engineer will request that the protest be made in writing (to be submitted with the returns of the resurvey), and will thereupon make an accurate connection with the corners of the claim as unacceptably located, to be made the subject of a complete report by the engineer in his field notes, reviewing the facts with reference to the question of location. As a further protection to an entryman thus unacceptably located see sec. 455.

4th. Where, through a compliance by the engineer with the general rules above laid down, the metes-and-bounds segregation of a claim (or the conformation thereof to the lines of the resurvey) within the field of an independent resurvey (or the related subdivisions within the field of a dependent resurvey) fails to cover any or all of the lands, occupied, improved, or claimed by the entryman, patentee, or present owner, and the latter indicates a desire to amend his entry, that fact will be stated in the field notes, and a separate full report will be submitted describing the subdivisions actually occupied and sought to be acquired under the amended entry, but which are not covered by the tract as surveyed, all looking to the protection of the title to the lands actually earned.¹

5th. Where it so happens that the regular quarter-quarter sections embraced within a claim fall in approximately the same position as the regular quarter-quarter sections of the resurvey, and the entryman or patentee indicates a desire to conform his claim to the resurvey, and no apparent objection is found by the engineer, the facts will be stated in the field notes, and the claim will be so indi-

¹ See current circular relating to amendment of entries.

cated upon the resurvey plat. Under this circumstance the metes-and-bounds survey of the tract will be omitted. However, where any tract whose original description includes *any fractional lot*, or where any part of a tract falls upon *any fractional lot* of the resurvey, the tracts will be segregated as a whole by metes-and-bounds survey, even though some or all of the lines of the tract may coincide with certain subdivisional lines of the resurvey.

6th. Conflicting tracts, each acceptably located, will be surveyed and monumented, and conflict shown upon the resurvey plat. Each intersection of conflicting boundaries will be determined upon the ground and recorded in the field notes, and the latter will show the number of acres in conflict with each other tract.

7th. The angle points of a tract will be designated by serial numbers beginning with No. 1 at the northeast corner, and proceeding around the claim, running westerly from the initial corner. An angle point may be common to one, two, three, or four tracts, and will be monumented and marked as provided in Chapter IV; as for example:

AP 4	AP 3	T 26 N R 17 E	T 26 N R 17 E
TR 38	TR 37	S 14	S 14
AP 1	AP 2	AP 1	AP 2
TR 45	TR 46	TR 38	TR 37
1919	1919	1919	1919

8th. No accessories will be required with the monuments at the angle points of the metes-and-bounds survey.

446. The proper supervising officer will furnish the engineer with an abstract of the valid entries, selections, reservations, patents, and grants, based upon the original plat of any township (or portion thereof) subject to resurvey, and the said resurvey can not be regarded as complete until each and every claim described in said abstract of entries (and shown on the status diagram) as in the township to be resurveyed has received full protection in the matter of location. Aside from those disposals described as in the township to be resurveyed, there will also be furnished to the engineer, as a matter of information, the status of all claims in the adjacent sections of all adjoining townships ungrouped for resurvey. The abstract will be included with the other data to accompany the written special instructions providing for a resurvey.

447. The field notes of the metes-and-bounds survey of each valid claim will be preceded by a copy of the abstract of entry thereof. A brief statement will then follow in each instance (or

with suitable reference), concerning the principal factors controlling the location of the particular tract, and whether or not the claimant was consulted, or communicated with, in the matter of the identification of the boundaries of his claim. The statement should be clear as to whether the location of a claim, shown either as a tract segregation or as conforming to the lines of the resurvey, was controlled by collateral evidence, or by one or more identified corners of the original survey, nearby or remotely located, or by its relation to adjoining tracts. In case all of the tract segregations within a township can be covered by one general statement, the same should appear at the beginning of the field notes of the metes-and-bounds surveys. The field notes should be made to account for each and every tract shown upon the status diagram.

448. All claims should be accounted for on the resurvey plat, and all will be shown either as segregated tracts or as conforming to the lines of the resurvey, as the case may be, with outline indicated by heavy black lines. An exception to this rule will be made in those rare cases where all the claims within a township have been conformed to the lines of the resurvey *under their original description*, in which event a statement may be made on the margin of the plat that—

“All claims originally described as in this township are intended to conform to the lines of the resurvey under their original description.”

449. As a further safeguard that the returns of independent resurveys may be conclusive in the matter of the significance of the tract segregations, the plats thereof will show a statement that—

“All tract segregations shown hereon represent the position and form of said tracts under the original description as referred to the original survey, located as such on the ground according to the best available evidence of their true position.”

450. The above statement will be modified if one or more of all the claims shown on the status diagram are conformed to the lines of the resurvey, either under the original description or by different legal subdivisions, as follows:

“All tract segregations shown hereon and all other claims shown to conform to the lines of the resurvey, whether by the original or new legal subdivisions, represent the position and form of said tracts under the original description as referred to the original survey, located as such on the ground according to the best available evidence of their true position.”

451. The projection and measurement of the lines of the metes-and-bounds survey and the technical record in respect to the same will conform to the usual practice in regular surveys. While the mapping of important items of topography and valuable permanent improvements will be given attention with regard to this feature of the resurvey plat, yet it will be apparent that the amount of data to be shown in connection with the metes-and-bounds surveys makes it impossible, at the usual scale, to show objects of little relative importance. This class of memoranda taken during the progress of the work will *not* be required in the field notes of metes-and-bounds surveys.

452. At least one angle point of each tract survey will be definitely connected with one of the regular corners of the resurvey, and where lines of claims are intersected by lines of the resurvey a connection will be made from the point of intersection to the nearest claim corner and recorded in the field notes of the regular section line. The latter will be considered a satisfactory connection to all adjoining claims located within the interior of either section. Where an extensive system of tract segregations has been surveyed, the interior tracts of the block will not require individual reference connections. The establishment of closing corners on the regular line when entering or leaving public land will conform to the general practice in this respect as provided in sec. 191, Chapter III.

THE PROJECTION OF NEW LINES.

453. The peculiar conditions of the situation which necessitate an independent resurvey render it impossible to formulate general rules suited to all cases. Experience has demonstrated the necessity for giving deliberate attention to the unique problems of subdivision which are to be found in each definite example. The general practice is to secure an engineer's report of the actual conditions involved in a particular independent resurvey, upon consideration of which there may be devised the best plan for a re-subdivision of the vacant public lands, and the latter will be set forth in the special instructions. The possibility of placing the regular lines of the independent resurvey so as to obtain maximum agreement with the position of the boundaries of conformable claims will be fully considered with a view to eliminating or reducing the necessity for tract segregations, if possible, where this can be accomplished in harmony with the rules previously outlined. The examiner's

recommendations in these matters should be explicit and responsive to his special advantages in the opportunity of working out the technical problem while on the ground.

454. A problem involving the re-subdivision of vacant public lands, as in an independent resurvey, should be approached in the same way as practically all problems in fragmentary subdivision, though the independent resurvey may at times involve the re-subdivision of a group of many townships wherein all conditions, except perhaps with relation to the tract segregation surveys, may be comparatively regular. First attention will be given to completing the new township exteriors which are to be independently resurveyed after having reestablished the outboundaries of the group on the dependent plan. The new exteriors will be carried forward and completed in harmony with the rules set forth in Chapter III for the establishment of original surveys. The new section lines will be run out and marked as in regular or fragmentary subdivision as the situation may be and new meander lines will be run as required. The new exterior and subdivisional lines will usually be extended across small blocks of tract segregation surveys, noting connections as previously stated, and in such cases the new lines and corners will be fully monumented regardless of the fact that some points will fall within the tract segregation surveys. The latter points are required in their usual function to determine the subdivision of the public lands affected.

455. A general exception to the rule of extending the lines of the independent resurvey across the tract segregations will be made in those townships or portions thereof so densely covered by private claims that the remaining parcels of public lands may be as well or better identified and described for expediency with reference to isolated tract numbers. In such cases closing corners will be required on the regular lines when entering or leaving public land. The regular lines may or may not be extended as blank lines across the tract segregations, according to the plan of running the new section lines of the resurvey. Where this method is employed it will be necessary to assign tract numbers to the vacant parcels of public land and to mark the angle points thereof accordingly. Where a parcel of vacant public land is to be identified on this plan, such vacant tracts will be surveyed by metes and bounds in accordance with the usual rules. Rare cases may arise where it will be deemed expedient to segregate by metes-and-bounds survey certain quarter-

quarter sections of vacant lands in accordance with the system of the original survey as indicated by adjoining tract segregations for the purpose of affording a better basis of disposal or for amendment of entries. Such segregations will not be made unless it is conclusively shown by the engineer that the fractional lots and regular quarter-quarter sections of the resurvey are inadequate as a basis of disposal under existing conditions of occupancy on the part of settlers or of entrymen who may propose to amend. The special instructions will be made as explicit as possible in these details, which will be determined upon when the plan of the resurvey is under consideration by the supervising officer.

456. Where a section of the resurvey is invaded by patented tract segregations, but not by unpatented entries or selections, the lotting of the public lands will be carried out in accordance with the usual plan of lotting within fractional sections as outlined in Chapter III. The numbering of the fractional lots will begin with the number next higher than the highest number employed in the section of the original survey which bears the same township, range and section number. This plan is intended to avoid any possible confusion which might arise from a duplication in the use of the same lot numbers.

457. A departure from the usual rule for lotting is necessary in order to provide suitable descriptions within unpatented entries and selections where such tract segregations may be subject to relinquishment or cancellation, also in other cases, to facilitate a subdivision of isolated tracts of public lands surveyed by metes and bounds. Two methods have been found available, each one better suited to particular situations. Neither method involves any change in the instructions for the field procedure heretofore laid down. The discussion of the merits of the two methods and the examples of their use are better adapted to the text of Chapter IX, where the subject will be found in connection with other details to be shown upon the resurvey plats.

458. The general requirements of Chapters II, III and IV will be fully observed in every respect throughout the execution of the independent resurvey and in the technical record thereof. General titles (in addition to the regular page heading) will be inserted in the field notes to indicate clearly the character of the independent resurvey, the technical record of which follows; such titles will be

inserted in the body of the field notes, as appropriate, and will show the full significance of all lines; as for example:

(a) "Metes-and-bounds survey of private claims as originally located in accordance with the survey executed by John B. Smith, U. S. Surveyor, in 1842;" and

(b) "Independent resurvey, superseding the survey executed by John B. Smith, U. S. Surveyor, in 1842."

459. All monuments of the original survey, not otherwise reported upon, when traces thereof have been found, will be connected by course and distance with a corner of the resurvey, and such connection and a description of the traces of the original corner as identified will be recorded in the field notes of the resurvey. A useless monument will be destroyed after the point is found to be no longer needed for the survey of a claim of any kind whose location may in any way depend upon such monument. (See sec. 163, Chapter III.)

460. Further exemplification of the approved practices incident to the successive field steps and preparation of the field notes and resurvey plats will be found in the chapters that follow.

CHAPTER VII.

SPECIAL SURVEYS AND INSTRUCTIONS.

SPECIAL INSTRUCTIONS.

461. The detail of the work to be accomplished in any survey assignment is set out in written special instructions which are issued to guide the chief of field party. The special instructions are prepared subject to the approval of the Commissioner of the General Land Office, by or under the advice of the ranking supervisory officer in direct administrative charge of the work to be done. The special instructions may give emphasis to any provision of the Manual which may be more or less unusual in application, but the purpose is more especially to set out the extent of the work intended, and the method and order of procedure in the survey. The special instructions will ordinarily be written in the third person, and, coupled with the Manual, will contain all necessary specifications for the survey. At the proper time the execution of the field work will be assigned to a selected chief of field party.

462. The special instructions are an important unit of the record relating to the survey, and it is exceedingly desirable that certain information bearing upon it be set out both for immediate and future reference. The following arrangement of the subject matter will be adhered to so far as may be appropriate, in order that there may be a similarity of practice throughout the several surveying districts:

1. Title: Special Instructions; Group No. _____, _____ (State); nature of survey, and location by township, range, and meridian.
2. Preliminary statement (bearing no address): In the execution of the surveys included under Group No. _____, _____ (State), the chief of field party is authorized and directed to make the described examination, retracements, reestablishment of points of control, surveys, and resurveys hereinafter set out, and will be guided by the Manual of Surveying Instructions, the provisions of the following special instructions, and such supplemental instructions as may be issued pursuant to the

report of complications developed during the progress of the work or by reason of additional authorization.

3. Office authority to proceed with the described field work is contained in letter "E," _____ (number), dated _____, based upon the application of _____. A brief statement of the nature of and the names of the parties who subscribed to the application will be set out, together with a reference to any appropriate citation of departmental instructions or authorization, or to any special act of Congress relating to the survey.

4. Appropriation: The costs of the field and office work incurred in the execution of the surveys herein directed, within approved official regulation, are payable from the appropriation for "Surveying public lands" (if the nature of the survey is such as to come within the provisions of the general act). Where a special appropriation has been made, its exact title will be given, or if the cost is chargeable to a special deposit the exact title of the latter will be given, together with a citation of the act of Congress under which such deposit has been received.

5. Limit and character of work: Under this heading there will be described by township, range, and meridian the lines which are to be surveyed, together with designation by section numbers where parts of townships are intended. If the work involves other than original surveys, the statement here will be extended to indicate the character of the fragmentary survey, or the type of resurvey, or the nature of the field examination, according to what has been authorized and what is expected of the engineer. It will be desirable generally, except in the case of strictly original surveys, to supply whatever supporting statements there may be needed, taken from the authorization or elsewhere in the record, for an understanding of the technical or legal questions relating to the work. Where private rights may be involved, which is often the case, the facts as known should be clearly brought out, and a statement made of such rules of practice as may require consideration in the field.

6. History of earlier surveys: Every new survey and all retracements and resurveys are predicated upon what has been previously accepted, and to the end that the engineer may proceed with the new work understandingly, a review of the established surveys will be carried into the special instructions.

Full explanations will be given in the event of known or presumed complications.

7. Method and order of procedure: If the work to be done is primarily the extension of the original surveys, the statement of it will follow Manual principles and will be taken up in the following order:

- (a) Standard parallels and guide meridians;
- (b) Township exteriors; and,
- (c) Subdivisions, including a reference to the running of meander lines if this class of work is expected, and to the subdivision of sections if required in whole or in part.

The instructions for each township should be completed separately, and so far as practicable the work should be set out in the order in which it is to be followed in the field. If there is any reason to anticipate complications, a statement of the treatment of the problem will serve both to inform the engineer as to what may be expected and to indicate the approved method that would be applied on the assumed hypothesis. Where helpful to call attention to the Manual rules, the references may be made by chapter and section numbers, but the engineer is charged with the responsibility of an understanding of all regular practice and familiarity with the Manual as a reference guide in unusual cases, and the burden of this is not to be transferred to the special instructions.

If the work involves other than original surveys, the responsibility for a statement of the situation and for the formulation of detailed specifications for the execution of whatever examinations, fragmentary surveys, resurveys, topographic surveys, or special monumentation may be required will pass to the author of the special instructions. There follows in this chapter a discussion of a number of the more usual types of special surveys, including subjects not appearing heretofore.

8. Diagrams: In the case of original surveys a blue-print diagram to accompany the special instructions will generally be desirable. Ordinarily the diagram will be constructed on a scale of at least 80 chains to an inch, and should indicate the record surveys within 2 miles of the limiting boundaries of the group. The directions and lengths of the established lines should be shown, together with the principal topographical

features. The new work will be shown distinctively, and the method of procedure should be indicated where that will be helpful. All areas returned as surveyed will be clearly represented, together with the status of any outlying areas which the previous plats may show protracted as though surveyed. The author of the special instructions will give attention to the matter of any known claims, or improvements, or monuments of other official surveys, as indicated in paragraphs 5 and 13, section 236, Chapter III, and will bring this out in the special instructions. (See sec. 435, Ch. VI, for the requirement that a status diagram be furnished with the instructions for independent resurveys.)

9. Field notes, plats, and reports: The special instructions should point out what will be expected in connection with the preparation of the returns, with a view both to the specific understanding of what will be required and to the noting of the subjects which are to be given attention in the field. If anything is required in the way of a preliminary report or diagram to be sent in during the progress of the work, or if special lotting or other unusual matters are to be given consideration at the time of the preparation of the final returns, attention will be given to the same in the special instructions. There will also be noted the necessity for returning, for official use, the original copy of the special instructions, and all other papers which belong with the office record, and the data that may be added in the field, including the field computation sheets.

10. Modification of the instructions: The special instructions will ordinarily be signed by the ranking supervising officer in direct administrative charge of the work to be done, and will close with the advice that should conditions arise appearing to demand additional instructions, or require an interpretation of the instructions as issued, or which apparently make the special instructions inapplicable as prepared, the chief of field party will be expected promptly to submit a report of the situation, with such recommendations for office consideration as may be responsive to the authorization.

SUBDIVISION OF SECTIONS.

463. If there is need for the subdivision of sections the subject will be brought out in the special instructions, and if any un-

usual methods are required the same will be noted. The most frequent examples are those of Indian allotment surveys, subdivisions within reclamation projects, and in various types of fragmentary surveys where needed in order to mark the boundaries of the public land remaining undisposed of. Subdivisions of sections are occasionally required to avoid a possibility of incorrect local survey, and sometimes in lieu of a remonumentation of disputed section or quarter-section corner positions affecting patented lands. Wherever so intended the subdivision-of-section lines will be run out in accordance with the adopted sectional lottings, and the monuments established.

464. The customary lottings are not to be found on many plats of the very old surveys, and the information about the recognized or adopted parts of the sections can be secured only by reference to the record of the disposals. The latter will more frequently show a disposal by aliquot parts, except within fractional sections, but often without the usual complement of quarter-section corners regularly established as under the practices set out in the several Manual editions. An inquiry into the assigned areas will sometimes be the only means of arriving at the intended disposals. In some very old surveys the usual quarter-section corners were not established on all true lines of survey, but the record will show instead that "half-mile" points were marked on the random line and not corrected to the true-line mid-point position. All such unusual problems should be brought out in the special instructions, as the diversity of the questions arising on the subject and the very limited applicability of many of the answers precludes Manual treatment.

465. Where special methods are unavoidable the steps should be made to conform as nearly as may be with the rules for the subdivision of sections as based upon the acts of Congress approved February 11, 1805, and April 5, 1832, already fully exemplified in Chapters I and III.

INDIAN ALLOTMENT SURVEYS.

466. The special requirements of Indian allotment surveys are few. The surveys are made in order to mark the boundaries of individual allotments. It is the practice to run out all the bounding lines, and to monument all of the corners. Generally

the awarded allotments conform to legal subdivisions, and in such cases the lines are run in accordance with the rules for the subdivision of sections.

467. All regular corners are marked in the usual manner, and ordinarily there is added the letter A (standing for allotment) and the allotment number, in each of the several quadrants, as appropriate. Allotment numbers are employed serially with the various Indian tribes or families, assigned by the Bureau of Indian Affairs, when making an award of tribal lands. In some cases, as when two or more Indian tribes have rights within the same reservation, a designating letter is used to precede the allotment number, dropping the letter A as suggested, and substituting the first letter of the name of the Indian tribe, as K 191 (for Kiowa allotment No. 191), or C 242 (for Comanche allotment No. 242), or A 367 (for Apache allotment No. 367). Status diagrams which show the allotment awards are furnished with the special instructions for the survey.

468. If a section is to be subdivided, the center quarter-section corner will always be monumented whether or not it may be the corner of an allotment, and likewise if a quarter section is to be subdivided the sixteenth-section corners on the quarter-section boundaries and at its center will always be monumented. No other monuments of lower order will be established except at the determined allotment corners. The latter will be marked only with the designating letter and proper allotment number or numbers in the several quadrants, as appropriate.

469. As complete plat designations are usually a necessity for the allotment work, the awarding of Indian lands is rarely performed at the time of making the subdivision of the township, but the marking of the allotment corners at some subsequent time will not assume the characteristics of a resurvey except as the intervening years have served to bring about an advanced state of obliteration of the monuments. In the latter case, the rules for making a limited dependent resurvey are usually applied, and a resurvey plat is required in order to show the resulting data. Figure 70 is an illustration of this type of plat. It is always essential to furnish a field-note record to support the allotment survey, and to supply the descriptions of the established monuments.

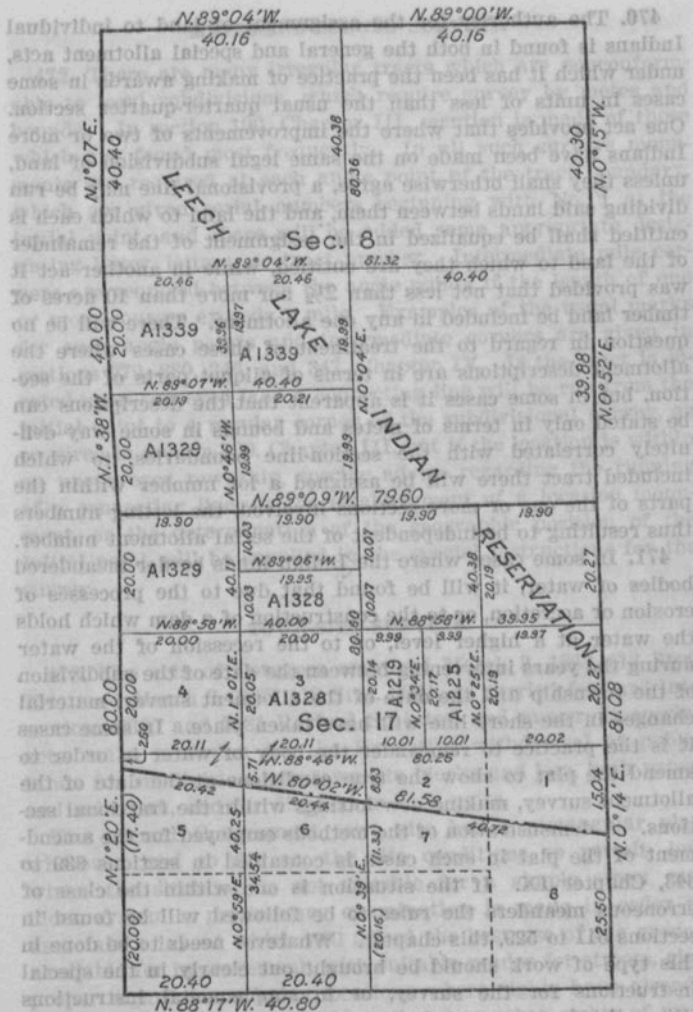


Fig. 70.—Indian allotment surveys.

This includes a limited dependent resurvey of the section-line boundaries, a subdivision of the sections as needed, and the marking of all corners of the several Indian allotments.

470. The authority for the assignment of land to individual Indians is found in both the general and special allotment acts, under which it has been the practice of making awards in some cases in units of less than the usual quarter-quarter section. One act provides that where the improvements of two or more Indians have been made on the same legal subdivision of land, unless they shall otherwise agree, a provisional line may be run dividing said lands between them, and the land to which each is entitled shall be equalized in the assignment of the remainder of the land to which they are entitled, while in another act it was provided that not less than $2\frac{1}{2}$ nor more than 10 acres of timber land be included in any one allotment. There will be no question in regard to the treatment of those cases where the allotment descriptions are in terms of aliquot parts of the section, but in some cases it is apparent that the descriptions can be stated only in terms of metes and bounds in some way definitely correlated with the section-line boundaries, to which included tract there will be assigned a lot number within the parts of the one or more sections involved, the lotting numbers thus resulting to be independent of the serial allotment number.

471. In some cases where the Indian lands border meandered bodies of water, it will be found that due to the processes of erosion or accretion, or to the construction of a dam which holds the water at a higher level, or to the recession of the water during the years intervening between the date of the subdivision of the township and the date of the allotment survey, material changes in the shore line will have taken place. In some cases it is the practice to remeander the body of water in order to amend the plat to show the true conditions at the date of the allotment survey, making new lottings within the fractional sections. A demonstration of the methods employed for the amendment of the plat in such cases is contained in sections 639 to 643, Chapter IX. If the situation is one within the class of erroneous meanders the rules to be followed will be found in sections 511 to 529, this chapter. Whatever needs to be done in this type of work should be brought out clearly in the special instructions for the survey, or in supplemental instructions where the facts were unknown in the first instance.

METES-AND-BOUNDS SURVEYS.

472. There are many irregular tracts which are nonconformable to legal subdivisions, which require survey by metes and bounds. In section 190, Chapter III, mention is made of those which are found most frequently. In all such surveys monuments are required at each angle point of the tract boundary, which are given serial numbers beginning with No. 1 at the initial point, and there will be added some appropriate designating letter, letters, or tract number. Intermediate mile corners are required between the angle points if the length of one or more courses exceeds 1 mile. Examples of the usual marks for such angle points and intermediate corners are given in sections 279, 280, 346, and 347, Chapter IV. If the tract is located upon surveyed land a connecting line will be run from the initial point to a regular corner of the subdivisional survey, as required in section 190, Chapter III, but if the location is within an unsurveyed township, specific advice regarding the running of a connecting line, or the establishment of a location monument, or the determination of the geographic position of the initial point will be supplied in the special instructions for the survey.

TOWN-SITE SURVEYS.

473. The acts of Congress approved March 3, 1863 (12 Stat. 754), and March 3, 1877 (19 Stat. 392), as carried forward into sections 2380 and 2381 Revised Statutes, and numerous special acts, make provision for the Executive withdrawal of public lands for subdivision into town-site blocks and lots, both urban and suburban, and for disposal in such units.

The normal Government town site has a rectangular plan wherever, and so far as, the site conditions so permit, but where the situation is not suitable for a simple street and block system a preliminary examination is made in order to ascertain a layout which will afford the best use of the ground available for improvement, with suitable grades for streets, give proper regard for existing locations where rights have already been acquired, and provide for railroad or other rights of way, station grounds, lake-shore frontage, natural park areas, and other important conditions which should have consideration.

474. Only the fundamental requirements of town-site surveys can well be presented here as the character of the area, the topography, its location, and whether it is a new town site or an addition to an old one, will to a large extent determine the detail of the street and block system. A preliminary field examination and topographic survey will be of the greatest value as an aid to ascertaining the layout best suited to the situation, and the special instructions will call for a preliminary report of the proposed plan where this can be done, otherwise much of the responsibility for the detail of the survey will have to be passed to the chief of the field party.

475. In the typical town site the blocks may be made 300 feet square, and usually not over 320 feet by 400 feet, with a 20-foot alley running the long dimension of the block. The principal streets are usually made 80 feet in width, though frequently as much as 100 feet where the greater width appears to be needed or desirable, and the less important intersecting streets are seldom given a width of less than 60 feet. An alley is usually placed in each block, 20 feet in width and paralleling the principal street system. The normal frontage of the lots is 50 feet, which run back in rectangular form to the alley. Where conditions are suitable the whole system is laid out on cardinal, and in all town sites the blocks are given serial numbers, usually beginning with the northeast block and proceeding with the numbers alternately to the west and to the east. The lots are given serial numbers within the block.

476. It will be noted that the foot unit is employed on all town-site surveys, and long steel tapes graduated in that unit are furnished for the purpose. In most cases the necessary accuracy can be secured only with the use of a spring balance for the maintenance of the proper tension, and with allowance for temperature corrections to the degree at which the tape is standard.

477. In making the town-site survey the greatest care will be exercised to identify the original section-line boundaries and to execute the subdivision of the section or sections in the proper legal manner for the ascertainment of the assigned town-site boundaries. Permanent monuments will be placed at each turning point of the town-site boundary lines. These may be the

3-inch iron post, or a tablet seated in a concrete block as large as 8 inches square and 36 inches long, marked with the usual subdivisional identification marks, the capital-letter initials of the town-site name, and the letters "T S," in the appropriate quadrant. The boundary streets, and the other streets, blocks, and lots are then laid out, permanent control monuments established, and connecting line measurements made, as may be necessary to afford an exact relocation of any point; and to secure all data respecting true bearings and deflection angles, both for the center lines of the streets and for the block lines, the connecting lines to the permanent monuments, and the dimensions of all streets, blocks, and lots. All of this sort of data is carried to the town-site plat, and its sufficiency may be tested by the ability to readily ascertain the position of any given point, and to calculate the area of any individual lot.

478. A number of permanent monuments will be placed at the intersections of the street center lines and connections made to the block corners so as fully to insure a complete and ready restoration of any block corner. The 2-inch iron post, or a tablet seated in a concrete block as large as 6 inches square and 24 inches long, may be employed for this purpose. These should be subsurface monuments, placed as much as 1 foot below the probable grade line of the street, and marked only for the point of intersection.

479. In ordinary cases hardwood stakes are employed for the block corners, and to mark the front corners of each lot, also to mark the intersections of the alley side lines with the block lines. The points here called for are always to be monumented, and a more durable marker, such as a galvanized-iron pipe will be employed where the site conditions are unfavorable to the preservation of a wooden stake. The block corner and alley stakes are usually made 2 inches square and 24 inches long; the lot corners 1 by 2 by 24 inches; the latter are set only on the block lines and not on the alley lines. The block corners only are marked with the appropriate numbering.

480. The field traverse of the town-site boundaries will ordinarily be made to close within an error of not to exceed $\frac{1}{1000}$, and never to exceed $\frac{1}{2000}$. The determined lengths of lines and their bearings will be balanced, so as to secure a perfect closure

for the data which are to be carried to the plat. The required accuracy can always be secured by the method of repetitions for the turning of angles, and by the method of measurement herein authorized, due regard being given to the reduction of lengths of lines to the true horizontal distances. This class of data, as well as that hereinafter mentioned, should be such as to leave no discrepancy whatever in any calculated position, whether working from one permanent monument to another, or between any two points.

481. Lengths of lines and all angles or bearings will be determined in the field for all irregular blocks and lots; and the side lines of the lots, and their back lines, will always be measured in the field, and the dimensions carried to the plat, wherever needed, as when said lines can not readily be located by the method of intersections.

482. The field notes of the town-site survey will show the retracement of the old section-line boundaries, the restoration of any needed corners, and the subdivision of the sections, all complete as may be needed for the ascertainment of the town-site boundaries, and for the description of the controlling monuments. All important connecting lines and measurements between the boundary monuments and the corners of the block lines, or to the permanent monuments marking the street center lines adjacent to the boundaries, will be given in the field notes. The plan followed in the town-site survey will be explained, and a general statement made as to the monumentation; beyond this it will be noted that the further detail of all directions and lengths of lines has been carried to the plat, but is omitted in the field-note record. If there are any improvements unavoidably left in conflict with the town-site layout the information will be brought out in the field notes, but omitted from the plat.

483. The town-site plats are usually published at a scale of 200 feet to an inch, but they are frequently drawn at a somewhat larger scale, subject to reduction when published. A marginal diagram is usually supplied in order to show the relation of the town-site boundaries to the local section-line control, with directions and lengths of lines here given in the chain unit; tenths of links will be supplied where appropriate for making

a precise reduction to the lengths of lines shown on the main drawing.

484. On the main drawing all lengths of lines will be shown in the foot unit, with tenths where needed. All directions and lengths of lines, intersection angles, and connecting lines to monuments will be given on the plat with a view to the ready location of any point by calculation from the points of permanent control, and for the ascertainment direct from the plat of the area of any individual lot.

485. The block and lot numbers will be shown, areas of all lots to the nearest square foot, and the streets will be given designating letters, or numbers, or names. In the drafting of the data for the regular blocks some of the figures which would be applied in each lot of the block may be omitted if it is left clear within the block that the lottings are regular for dimension and area.

486. All permanent monuments will be shown on the main drawing and connecting data supplied. The widths of the streets and alleys will be plainly shown, but not repeated needlessly. Where all of the lots in any block are of the same dimensions, it will be sufficient to show the measurements only along the block lines, as the depth of each lot will be indicated by the length shown from the block corner to the alley corner. A memorandum will be supplied to note the general plan of monumentation, with an outline description of the monuments.

487. If there are reservations for public-school grounds, or of ground for other public buildings or parks, the provision therefor will be stated in the special instructions. The designated blocks will be shown upon the plat, numbered regularly and titled, but not subdivided.

488. References will be made to Chapter IX for the usual requirements regarding the title and the certificates which are to appear on the town-site drawing.

SURVEY OF PARTS OF SECTIONS.

489. In section 252, Chapter IV, there is a statement of conditions where portions of the section boundaries are inaccessible, impassable, or so insecure that acceptable monumentation is impracticable, which if found to prevail will necessitate the

elimination of parts of sections. The situations thus assumed are so rare, if allowance is made for increase of cost of survey where warranted, that general rules can not well be announced. The questions to be considered are more particularly administrative, and ordinarily will be given attention in the special instructions. The subject matter here set out pertains only to the technical processes which are new to the survey of rectangular boundaries of parts of sections. Figures 71, 72, 73, and 74 show examples.

490. The west boundary of section 27 (fig. 71) is shown discontinued at the regular place for the south sixteenth-section corner, which is monumented, and the north boundary at 40.00 chains, established parallel to the south boundary. The subdivision-of-section lines are run random on theoretical courses and distances, and closing error distributed, with final results (assumed) as shown on the drawing. The several interior sixteenth-section corners on the lines run are all to be monumented, including the one on the east and west center line of the section.

491. The south boundary of section 9 (fig. 72) is shown discontinued at the east sixteenth-section corner, and the north boundary at the west sixteenth-section corner, both of which are monumented, both lines having been established parallel to the nearest completed latitudinal line southward in that range of sections. The subdivision-of-section lines are run random on theoretical courses and distances, and closing error distributed, with final results (assumed) as shown on the drawing. Here the center quarter-section corner and the two sixteenth-section corners on the east and west center line are all to be monumented.

492. In the illustration showing section 3 (fig. 73) the process is similar, excepting that the closing error in latitude is all placed in the west line of lot 2. All of the turning points are monumented, also the south sixteenth-section corner on the north and south center line, and the west sixteenth-section corner on the east and west center line.

493. In section 18 (fig. 74) the closing error in departure is all placed in the south line of lot 3, it having been assumed that (a) the corner of sections 7, 8, 17 and 18 was fixed by survey

FIG. 71.

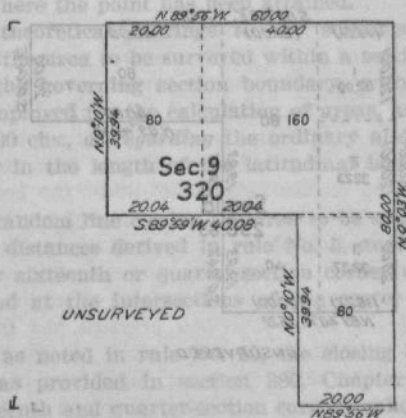
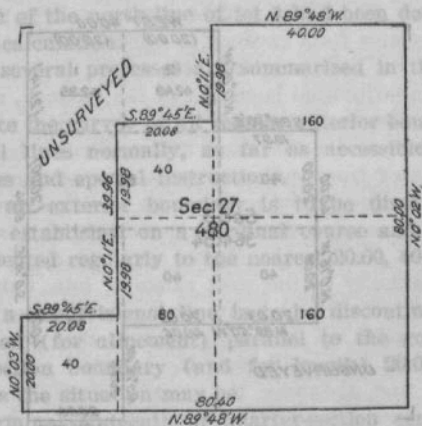


FIG. 72.—Rectangular boundaries of parts of sections.

A random subdivision-of-section line is run closing the area to be surveyed, each course parallel to the governing section boundary, with lengths in multiples of 20-chains; the closing error is then distributed, and monuments established.

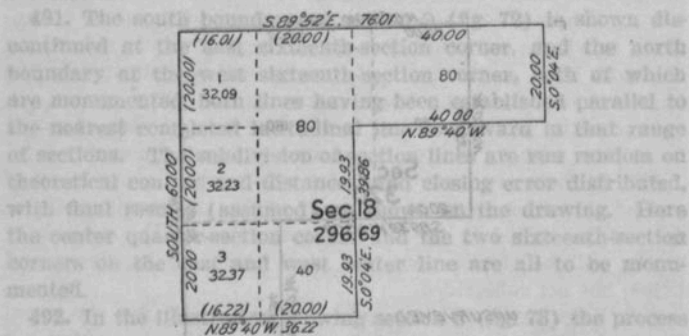
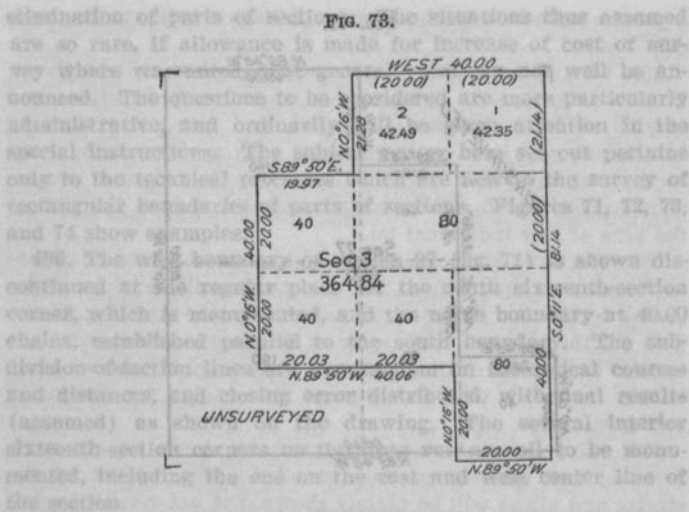


Fig. 74.—Rectangular boundaries of parts of sections.

Fractional lottings are shown. In Figure 73 the whole closing error in latitude is placed as normally in the north tier of lots, and in Figure 74 the whole closing error in departure is placed as normally in the west range of lots.

from the east or north, or (b) if from the west, that the fractional length of the north line of lot 1 had been determined by appropriate calculation.

494. The several processes are summarized in the following rules:

1. Complete the survey of all regular exterior boundaries and subdivisional lines normally, as far as accessible under the Manual rules and special instructions.

2. Where an exterior boundary is to be discontinued the line will be established on a cardinal course and on the last mile monumented regularly to the nearest 20.00, 40.00, or 60.00 ch. point.

3. Where a subdivisional line is to be discontinued, it will be established (for alinement) parallel to the governing exterior or section boundary (and for length) 20.00, 40.00, or 60.00 chs., as the situation may be.

4. The terminal sixteenth or quarter-section corner will be monumented; the quarter-section corner will be monumented in every case where the point has been attained.

5. Assign theoretical bearings to the subdivision-of-section lines closing the area to be surveyed within a section, each line parallel to the governing section boundary, with the lengths ordinarily employed for the calculation of areas, as 20.00, 40.00, 60.00, or 80.00 chs., *disregarding* the ordinary allowable excess or deficiency in the length of the latitudinal boundary of the section.

6. Run a random line closing the area to be surveyed, on the courses and distances derived in rule No. 5, and set a temporary interior sixteenth or quarter-section corner at each turning point and at the intersections of the center lines of the section.

7. Except as noted in rule No. 10, the closing error will be distributed as provided in section 380, Chapter V, and the interior sixteenth and quarter-section corners called for in rule No. 6 will be monumented.

8. The interior sixteenth and quarter-section corners thus established, together with the usual points on the regular section boundaries, will be employed to control the position of the center lines of the section and of the several quarter sections.

9. If the length of a boundary of any resulting quarter-quarter section differs from 20.00 chs. in excess of $12\frac{1}{2}$ lks., or if its direction deviates from cardinal in excess of $21'$ (by reason of disregarding the ordinary allowable excess or deficiency in the length of the latitudinal boundary of the section), a lot number will be assigned to such quarter-quarter section; the lot area will be derived under the usual rule applicable to the calculation of areas of fractional quarter-quarter sections.

10. In the north tier of sections the closing error in *latitude* will be placed as normally in the north tier of lots, and in the west range of sections the closing error in *departure* will be placed as normally in the west range of lots, unless the subdivisional survey may be made from north to south or from west to east under the rules which permit that procedure.

495. The field notes will show the complete random and true line courses and distances, the usual topography on the true lines, the description of all monuments, and a description of the difficulties which warranted an elimination of parts of the section or sections.

496. Reading the act of Congress approved February 11, 1805, wherein it is stated that "all the corners marked in the public surveys shall be established as the proper corners of sections, or subdivisions of sections, which they were intended to designate, and that corners of half and quarter sections not marked shall be placed as nearly as possible equidistant from those two corners which stand on the same line," and "the boundary lines which shall not have been actually run and marked as aforesaid shall be ascertained by running straight lines from the established corners to the opposite corresponding corners," it is apparent that to complete the subdivision-of-section lines in any section where the above-described practice has been invoked, leaving the section-line boundaries more or less uncompleted, the position of the said remaining subdivision-of-section lines within the surveyed area will be determined first by running straight lines between the nearest established control for the sectional center lines, with the position for the center quarter-section corner at the intersection of the latter lines, unless previously marked, placing the remaining interior sixteenth-section corners on the sectional center lines at mid-points between the exterior quarter-section corners and the center quar-

ter-section corner, except within the sections normally fractional; and, second, the center lines of the several quarter sections will then be completed separately on a similar plan based upon the control as developed. In all sections normally fractional the usual regard will be given for the placing of the fractional unit in proper relation to the regular or proportional 20-chain units.

497. The running of a traverse line as a boundary along the margin of omitted mountainous areas, and sometimes in the omission of other areas classed as impassable, was frequently practiced at one time, but was later discontinued owing to the large number of fractional lots thus unnecessarily created, as sooner or later, in a large majority of cases, the advance of settlement demanded the completion of the subdivisions across the omitted lands. However, an occasional survey of this type is desirable in order to meet a peculiar situation where the rectangular boundaries can not be completed within the section, but the examples are decidedly infrequent, and the method should be authorized in the special instructions only when supported by ample justification. In such surveys the angle points of the traverse line are given serial numbers in each fractional section, and the points are monumented. The subdivision-of-section lines are protracted only, unless a definition upon the ground should be required for some good reason.

ELONGATED SECTIONS.

498. The rule (sec. 200, Ch. III) for numbering the lots within elongated sections is illustrated by Figure 75. The example shows 12 instead of the 4 normal lots. Cases of this type, though infrequent, are sometimes even more exaggerated. The condition may occur when closing along either the northern or western township boundary, or anywhere within a township on completing fragmentary subdivisions.

499. Additional monuments are required on such section boundaries where the length of the closing line exceeds 85 chains (secs. 161, 177, 178, and 198, Ch. III); these will be placed at intervals of 40 chains counting from the regular quarter-section corner. The plan for the special marking is derived from the resulting lot numbers. It is illustrated in Figure 76. The same

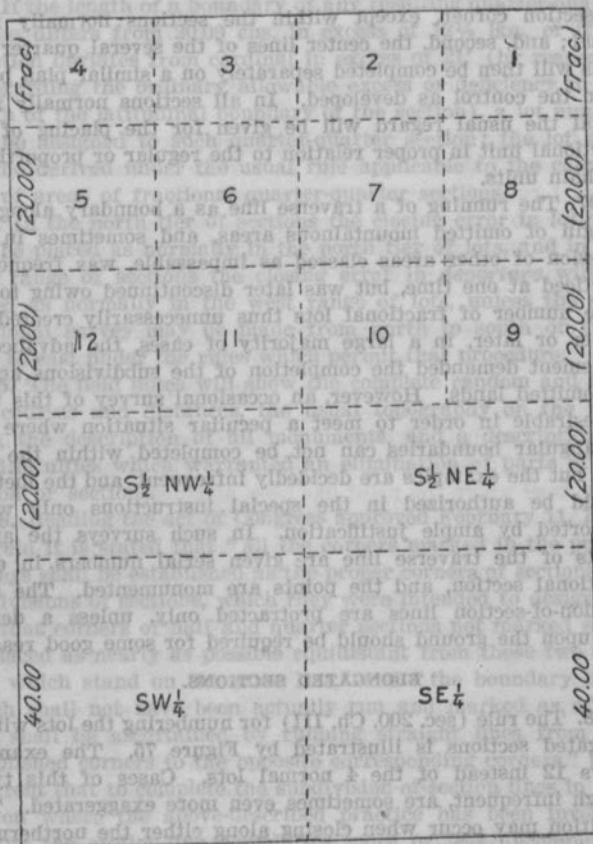


FIG. 75.—Elongated section.

The rule for numbering the lots is given in section 200 Chapter III.

figure shows an example for marking monuments set at intervals of 20 chains, and within the section, where special circumstances call for them.

500. In the very unusual situations where the distance between the regular position for the township boundaries is so

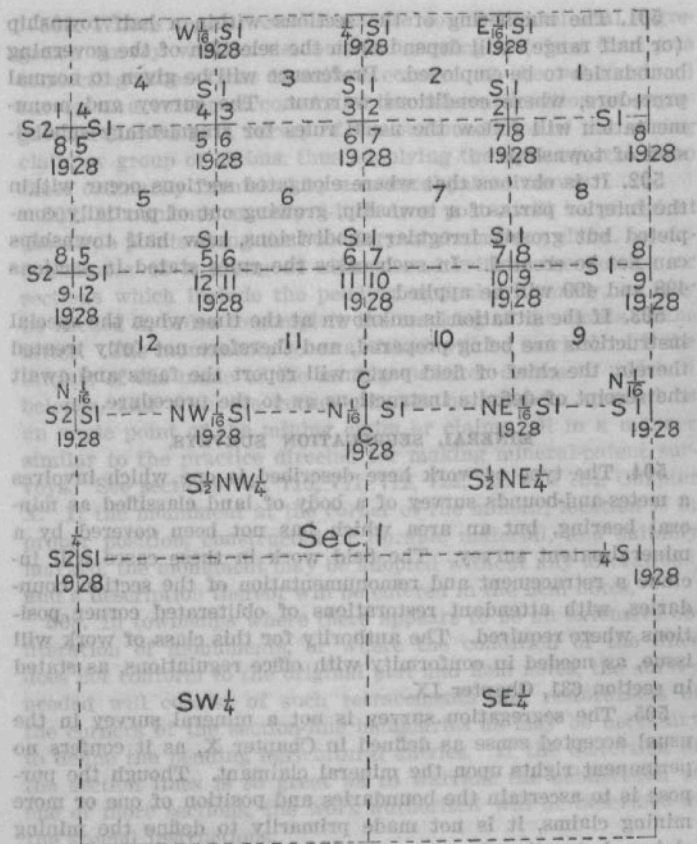


FIG. 76.—Elongated section.

The plan for marking all special monuments here illustrated is derived from the assigned lot numbers.

great that elongated sections in excess of 120 chains would result from the application of the above rules, it is better that new half-township (or half-range) numbers be created in order to cover the area located between a new normal exterior at 480 chains and the next regular township boundary.

501. The numbering of the sections within a half township (or half range) will depend upon the selection of the governing boundaries to be employed. Preference will be given to normal procedure, where conditions warrant. The survey and monumentation will follow the usual rules for fragmentary subdivision of townships.

502. It is obvious that where elongated sections occur within the interior parts of a township, growing out of partially completed but grossly irregular subdivisions, new half townships can not be created. In such cases the rules stated in sections 498 and 499 will be applied.

503. If the situation is unknown at the time when the special instructions are being prepared, and therefore not fully treated therein, the chief of field party will report the facts and await the receipt of definite instructions as to the procedure.

MINERAL SEGREGATION SURVEYS.

504. The type of work here described is one which involves a metes-and-bounds survey of a body of land classified as mineral bearing, but an area which has not been covered by a mineral-patent survey. The field work in these cases will include a retracement and remonumentation of the section boundaries, with attendant restorations of obliterated corner positions where required. The authority for this class of work will issue, as needed in conformity with office regulations, as stated in section 631, Chapter IX.

505. The segregation survey is not a mineral survey in the usual accepted sense as defined in Chapter X, as it confers no permanent rights upon the mineral claimant. Though the purpose is to ascertain the boundaries and position of one or more mining claims, it is not made primarily to define the mining claims, but rather in order to determine the limits and appropriate description of the adjoining agricultural land, where the latter is covered by pending entry. No survey of this kind is required except as needed to supply data for the accomplishment of the necessary fractional lotting, or where a showing has been made of obliteration of monuments, or distortion of lines belonging to the subdivisional survey, or both. The condition of the section-line boundaries will always be verified in this type of survey.

506. Where regular conditions are found the mineral segregation survey will consist only in running not less than two connecting lines from identified corners of the subdivisional survey to a corner or corners of the mineral location as segregated, followed by a survey of the outboundaries of the mining claim or group of claims, thus supplying the data equivalent to those ordinarily furnished by a mineral-patent survey.

507. Monuments, usually 1-inch iron posts, will be placed at the angle points along the boundary of the mining claim, or out-boundaries of a group of claims, and within the section or sections which include the pending agricultural entry, as may be needed in order to complete the marking of the limits of the latter. The monuments so established will be marked with the initials of the name of the mining claim or claims to which it belongs, and with the corner number or numbers counted as an angle point of the mining claim or claims, all in a manner similar to the practice directed for making mineral-patent surveys. See sections 706, 710, 711, 712, 722, 723 and 724, Chapter X. If the monument at the corner of the mineral location is in proper position, constructed of durable material, and suitably marked, the monument may be adopted without any alterations, and a description thereof will be entered in the field notes.

508. In townships where there appears to be an extensive obliteration of monuments, or where the condition of the lines does not conform to the original plat and field notes, the survey needed will consist of such retracements and restorations of the corners of the section-line boundaries as may be necessary to define the pending agricultural entries. If the distortion of the section lines is so great as to warrant the subdivision of one or more sections, the work authorized will be described in the special instructions.

509. The retracement of the lines of the mineral location should be made with the same degree of accuracy which is demanded in a mineral-patent survey. See sections 690, 691 and 704, Chapter X. All measurements are to be returned in the chain unit. It is essential that the requirements regarding the legal length and width of the mineral claims be observed, including parallelism of end lines, that is, to confine the claim to the legal length along the mineral lode, placing the side lines within the legal width as determined from the center of the

vein at the surface, and that the end lines of each claim shall be parallel. The segregated claim is to be made identical with, or be embraced within, the boundaries of its location, as provided in the mining regulations. If not identical, a bearing and distance will be given from each established corner of the survey to the corresponding corner of the location. See sections 696, 698, 699, 701, 702, 703 and 704, Chapter X.

510. All rules for the plat construction will be found in Chapter IX.

ERRONEOUSLY OMITTED AREAS.

511. This title is employed to denominate lands that are not shown upon the original township plat, which are so situated as to have been excluded from the survey by some gross discrepancy in the location of a meander line as given by the field-note record. In the typical cases the unsurveyed land is found to be situated between the actual bank of a lake, stream, or tide water, and the meander line as given by the field-note record, though a considerable number of cases of erroneous meanders have been found in the older surveys of the south where temporarily overflowed lands, or swamp and overflowed lands (strictly classified as such), were mistakenly traversed as if they were permanent meanderable bodies of water; and a few cases have developed where no bodies of water ever existed in fact. All are treated in the same manner as those where the discrepancy is traceable directly to a grossly erroneous position for the record meander line. The converse is found in those cases of areas of water surface that were erroneously included, where the record meander line is found to depart from the actual bank line in the opposite direction so as to extend into the body of water, thus representing an included area to be land instead of water. The term is not applicable where the differences can be traced to changes in the water level, or to erosion or accretion subsequent to survey.

512. The question of the ownership of the marginal areas and of the legal boundaries of the fractional subdivisions that have been disposed of by the United States can be determined only through a consideration of the rights of the proprietors who have acquired title based upon the representations of the original township plat. The marginal discrepancies fall at once into

two classes, those that may be regarded merely as technical differences, and those that constitute *erroneous omission*, as where in the latter class the plat and field notes of the original survey are so grossly in error as to bear no reasonable conformity with the bank line. These principles are laid down in the leading court and departmental decisions on the subject, and have been referred to previously in sections 223, 226, and 229, Chapter III.

The right of the owner of a fractional lot to the possession of the land which fronts upon the actual bank line, in all ordinary cases, is derived from the principle that a meander line is not a boundary in the usual sense, it being the intention of the Government to convey title to the water's edge. If there should be changes in the position of the bank line, as by accretion, or by recession of the water, the ownership may, in many States, include the new land, but this is a claim of an entirely different character, being one that has its origin in the State or common law, and is called a riparian right. The law, in many States, grants additional exercise of authority within the bed of the body of water, with which the text here is not concerned.

The Government conveyance of title to a fractional subdivision fronting upon a nonnavigable stream, unless specific reservations are indicated, either in the patent from the Federal Government or in the laws of the State in which the land is located, carries ownership to the middle of the stream.

The above principles are set out in the syllabus in 50 L. D. 678, as follows:

Public lands—Courts—Vested rights—Statutes: Whenever the question arises in any court, State or Federal, as to whether the title to land, which had once been the property of the United States, has passed, that question must be resolved by the laws of the United States; but when, according to those laws, the title shall have passed, then that property, like other property in the State, is subject to the laws of the State, so far as those laws are consistent with the admission that the title passed and vested according to the laws of the United States.

Navigable waters—Riparian rights: Upon the admission of a State into the Union the title to all lands under the navigable waters within the State inures to the State as an incident of sovereignty, and the laws of the State govern with respect to the extent of the riparian rights of the shore owners.

Public lands—Patent—Riparian rights: With respect to public lands bordering on nonnavigable bodies of water, the Government assumes the position of a private owner, and when

it parts with its title to those lands, without reservation or restriction, the extent of the title of the patentee to the lands under water is governed by the laws of the State within which the lands are situated.

Survey—Fraud—Lake—Boundary—Public lands—Riparian rights: Where a survey was fraudulent or grossly inaccurate in that it purported to bound tracts of public lands upon a body of water, when in fact no such body of water existed at or near the meander line, the false meander line and not an imaginary line to fill out the fraction of the normal subdivision marks the limits of the grant of a lot abutting thereon, and, upon discovery of the mistake, the Government may survey and dispose of the omitted area as a part of the public domain.

513. The first thing to be established, where the principle of erroneous omission is to be set up, is to show affirmatively that the area was *land in place* at the date of the original subdivision of the township and at the date of the admission of the State into the Union, so that if found similar to the surveyed lands the usual inference that the official survey was correct may be set aside, and the conclusion substituted that the land should have been covered by that survey; but, before looking upon a discrepancy as one constituting erroneous omission, or an omission in the contemplation of the controlling decisions on the subject, a convincing showing is needed on the fact that the representations of the original plat and field notes are grossly in error.

514. The applications for the extension of the subdivisional lines so as to include the areas erroneously omitted from the original survey are in most cases initiated either by settlers upon the omitted land or by the owners of the adjoining land. The owner of the surveyed land, or a claimant who has purchased from said owner, may apply for the survey of the omitted area as a preliminary to proceeding with steps to quiet the title. In the latter event the possibility of an adverse claim may or may not be present, but the immediate question is the merit of the application under the acts of Congress which grant relief in these cases. In nearly all cases the points to be determined require a field examination to verify the showing made in the application, and to safeguard the action of the department upon it. It should be understood that it is objectionable in principle to amend a plat in any of these cases except upon the showing of large and unwarranted

discrepancies, or by demonstration of equitable title in the Government, as otherwise the making of the corrective survey is frequently at the hazard of interference with private rights; and it should be understood that no proof is required to show the whys and wherefores of an erroneous meander line, but rather that the line as run and as represented on the plat and in the field notes is in effect grossly in error. The rule is concisely stated in 29 L. D. 521:

It is not necessary to search for the source of the error. The result is the same whether such error arose from mistake, inadvertence, incompetence, or fraud on the part of the men who made the former survey.

515. The general procedure in the survey of lands erroneously omitted is outlined in section 223, Chapter III, and section 380, Chapter V. The angle points of the original record-meander courses are given serial numbers, avoiding duplication of the numbers where there are two or more of such record-meander lines within a section. The adjusted positions for the angle points are monumented, and marked as shown in sections 279 and 346, Chapter IV.

516. The requirements for making the plats to represent this type of survey are outlined in sections 639 to 644, Chapter IX.

517. It is important that the plat should carry a memorandum precisely stating the situation with reference to the survey represented thereon, as:

The position of the original record-meander courses of the so-called Moon Lake is shown by an irregular line with numbered angle points. This line as thus originally reported was grossly in error, and has therefore been marked as a fixed boundary, with the directions and lengths of the several courses adjusted to the record of the original survey.

The position of the original record-meander courses of Ferry Lake fronting along lot 4, section 9, and lots 2, 3, and 4, section 10, is shown by an irregular line with numbered angle points. This line as thus originally reported was grossly in error, and has therefore been marked as a fixed boundary, with the directions and lengths of the several courses adjusted to the record of the original survey.

The position of the original record-meander courses of a lake reported as having been located in section 36 is shown by an irregular line with numbered angle points. This line as thus originally reported was grossly in error, and, with the exception of certain courses fronting along lots 1, 2, and 9, has there-

fore been marked as a fixed boundary, with the directions and lengths of the several courses adjusted to the record of the original survey.

518. A memorandum will also be supplied with reference to the dependent resurvey of the several section-line boundaries, as required in section 425, Chapter VI.

519. If there should be substantial areas of accretion to be dealt with that fact will be brought out in the special instructions, with an outline of the governing procedure, and the surveying work in reference to all accretion areas will be distinctly mentioned in the field notes and so shown upon the plat.

520. Accretion is a term in general use to denote the lands formed by the deposit of material along the bank of a body of water, or to denote land uncovered by the recession of the water as by the lowering of its level, and the right to such newly made land, unless reserved to the State, attaches to the ownership of the ground along which the accretion is formed. Where the title to the original subdivisions along nonnavigable bodies of water is still in the Government, and where there is similar title along navigable waters in those States where there is no legal reservation to the State, such title carries the right of the Government to subdivide the lands formed by accretion, or by the recession of the water, and to dispose of the same under the general land laws. If the original subdivisions were disposed of prior to the formation of the accretion, or if the accretions that are formed along navigable waters are reserved by State law, the Government has no jurisdiction.

521. A few examples of the survey of erroneously omitted areas, with a review of the facts, will serve to illustrate the practice:

522. *Moon Lake case:* The plat of T. 12 N., R. 9 E., fifth principal meridian, Arkansas, approved October 27, 1845, shows a meandered lake occupying the greater part of sections 22 and 27, and extending a short distance into section 26. The field notes of the line between sections 26 and 27 call for an intersection with the southeast side of "Sunk Lake," here classed as impassable and navigable. The surrounding fractional subdivisions as surveyed were all patented to the State under the provisions of the swamp land grant.

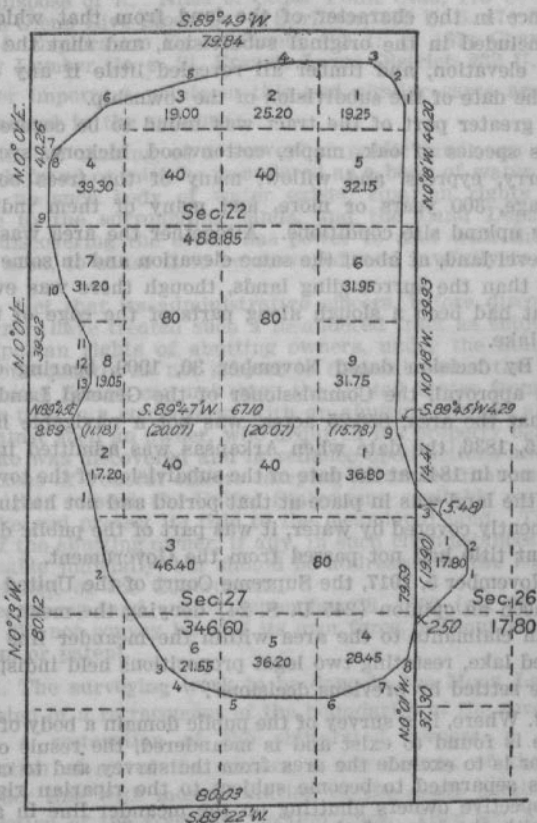


FIG. 77.—The Moon Lake case.

As no such body of water was ever present, riparian rights do not attach (sec. 523).

The case originated on the report of the removal of timber from portions of the area, under the color of title arising through the ownership of the adjoining land, but it was indicated clearly in the report that practically all of the area was high, dry land, covered with a growth of large timber, with no

difference in the character of the land from that which had been included in the original subdivision, and that the topography, elevation, and timber all revealed little if any change since the date of the subdivision of the township.

The greater part of the tract was found to be covered with various species of oak, maple, cottonwood, hickory, sycamore, hackberry, cypress, and willow, many of the trees being of great age, 300 years or more, and many of them indicating strictly upland site conditions. Altogether the area was found to be level land, at about the same elevation and in some places higher than the surrounding lands, though there was evidence of what had been a slough along parts of the edge of the so-called lake.

523. By decision dated November 30, 1909, bearing departmental approval, the Commissioner of the General Land Office held that the area, 853.25 acres, was not a navigable lake on June 15, 1836, the date when Arkansas was admitted into the Union, nor in 1841 at the date of the subdivision of the township, but as the land was in place at that period and not having been permanently covered by water, it was part of the public domain, and that title had not passed from the Government.

On November 5, 1917, the Supreme Court of the United States announced an opinion (245 U. S. 24) denying the merits of the riparian claimants to the area within the meander line of the so-called lake, restating two legal propositions held indisputable because settled by previous decisions:

First. Where, in a survey of the public domain a body of water or lake is found to exist and is meandered, the result of such meander is to exclude the area from the survey and to cause it as thus separated to become subject to the riparian rights of the respective owners abutting on the meander line in accordance with the laws of the several States. *Hardin v. Jordan*, 140 U. S. 371; *Kean v. Calumet Canal Co.*, 190 U. S. 452, 459; *Hardin v. Shedd*, 190 U. S. 508, 519.

Second. But where upon the assumption of the existence of a body of water or lake a meander line is through fraud or error mistakenly run because there is no such body of water, riparian rights do not attach because in the nature of things the condition upon which they depend does not exist and upon the discovery of the mistake it is within the power of the Land Department of the United States to deal with the area which was excluded from the survey, to cause it to be surveyed and to law-

fully dispose of it. *Niles v. Cedar Point Club*, 175 U. S. 300; *French-Glenn Live Stock Co. v. Springer*, 185 U. S. 47; *Security Land & Exploration Co. v. Burns*, 193 U. S. 167; *Chapman & Dewey Lumber Co. v. St. Francis Levee District*, 232 U. S. 186.

Other important points in this and similar cases are found summarized in the syllabus:

If, in the making of a survey of public lands, an area is through fraud or mistake meandered as a body of water or lake where no such body of water exists, riparian rights do not accrue to the surrounding lands, and the Land Department, upon discovering the error, has power to deal with the meandered area, to cause it to be surveyed, and lawfully to dispose of it.

The fact that its administrative officers, before discovery of the error, have treated such a meandered tract as subjected to the riparian rights of abutting owners, under the State laws, and consequently as not subject to disposal under the laws of the United States, can not estop the United States from asserting its title in a controversy with an abutting owner; and even as against such an owner, who acquired his property before the mistake was discovered and in reliance upon actions and representations of Federal officers carrying assurance that such riparian rights existed, the United States may equitably correct the mistake and protect its title to the meandered land. The equities of the abutting owner, if any, in such circumstances are not cognizable judicially, but should be addressed to the legislative department of the Government.

The swamp land act of September 28, 1850 (ch. 84, 9 Stat. 519), did not convey land of its own force, without survey, selection, or patent.

524. The surveying work to be done in the Moon Lake case consisted of a retracement of the boundaries of the several sections, a restoration of the obliterated corners, a remonumentation of all of the corners, a retracement of the record meander line with monumentation of the angle points, and a completion of the fractional section lines. (See sec. 515.)

525. *Ferry Lake case*: The plat of T. 20 N., R. 16 W., La. Mer., Louisiana, approved August 31, 1839, shows the north boundary of the township discontinued on the bank of Ferry Lake. The line between sections 10 and 11, in harmony with the remaining subdivisions, was discontinued on the lake bank, but the line between sections 3 and 10, instead of being extended to the main lake front was stopped on an arm or bay of the lake. The meander line through section 3 could be, and was run with

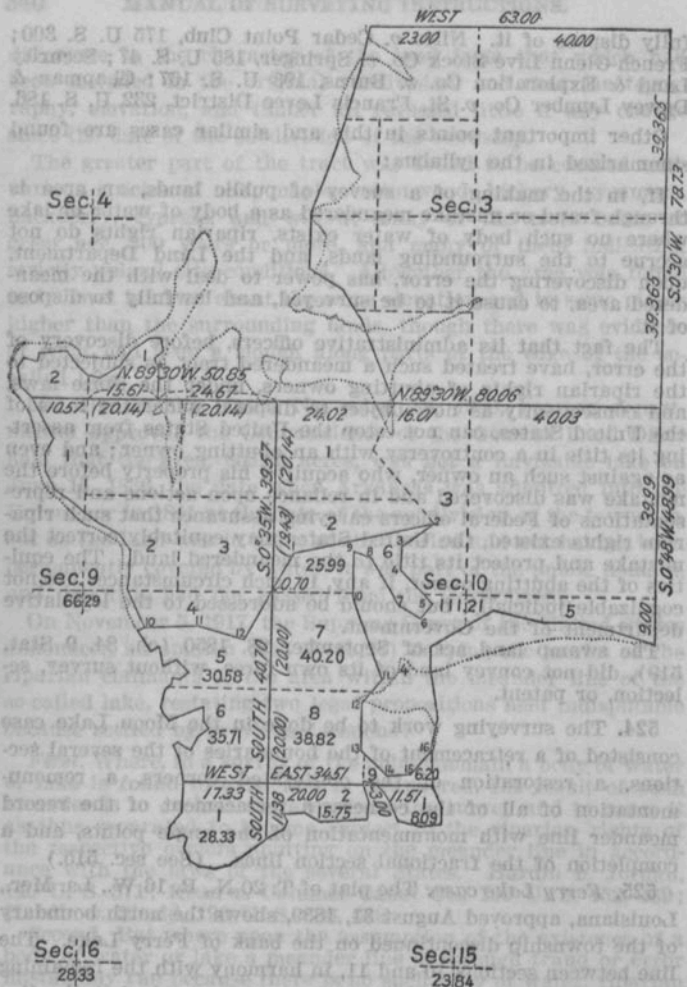


FIG. 78.—The Ferry Lake case.

The contour representing the mean high-water elevation of the lake in the year 1812, when Louisiana was admitted into the Union, and in 1839, when the township was subdivided, is shown thus: The circumstances, as well as the extent and character of the lands, necessitate the conclusion that the omission was of deliberate purpose or the result of such gross and palpable error as to constitute in effect a fraud upon the Government (sec. 526).

reasonable conformity, but in section 10, owing to the failure to extend the northern section boundary to the main lake front, there was no possibility of running a true meander line; and, excepting the end courses, the record line, as developed, bears no proper relation to the actual bank.

The plat of fractional sections 4, 9, and 10 of the same township, approved August 18, 1871, represents an extension of the lines between sections 3 and 10, and between sections 4 and 9, to the main lake front. The corner of sections 3, 4, 9, and 10 was established in this survey, also a meander corner on the west side of a narrow bayou which drains out of the north part of section 9; but again, for no apparent reason, in running south on the line between sections 9 and 10 the survey was terminated at a point more than 3,400 feet north of the bank of Ferry Lake. A part of the meander courses in sections 4 and 9 were accurately run, but the remaining courses, particularly those which connected with the terminal point on the line between sections 9 and 10, were merely a traverse line through the woods, though represented in the field notes and shown on the plat to be the bank of the lake.

Such was the situation in this township until oil and gas were discovered in large quantities, when in the years 1909 and 1910 applications were filed with the department to make mineral locations, not only on the areas that had been erroneously omitted from the official surveys, but within the bed of the lake, it being alleged that large errors had been made in the running of the meander lines, that the lake itself was merely a temporary body of water, and that it had not been in existence as a navigable lake, such as would belong to the State by right of sovereignty, and reserved to the State on admission into the Union on April 30, 1812. In 1910 all of the fractional lots adjoining the omitted area had been disposed of by the United States.

The report of the field investigation included a review of considerable historical data, expert studies of the geology of the lake basin, expert examination of the forest trees, and the surveying situation, all leading to corroborative conclusions that Ferry Lake was in fact present in 1812 as a navigable body of water, though there had been a marked recession of the lake by 1910, and that in neither of the surveys made in 1839 and

1871 had the lake been correctly meandered in sections 9 and 10, either as it was at the dates of the surveys or as it was in 1812.

The soil, topography, and timber on the omitted area were identically the same as found on the surveyed land, and for the greater part of the length of the record meander line there was not the slightest indication of there ever having been a lake bank or water-washed escarpment of any kind. The forest growth on the omitted land, which in the one body in sections 9, 10, 15, and 16 amounted to 229.67 acres, included overcup oak, sweet gum, and red gum on the lower levels, and on the remainder post oak, black-jack oak, Spanish oak, hickory, pine, and other varieties, many of them of great age, and clearly the descendants of a mixed forest that had occupied the situation for many centuries. The overcup oak was found to occupy a belt immediately above a belt of cypress timber principally, but with some other varieties, which were found occupying the plain terraces above and below an escarpment, easily traceable, which had been made by the waters of Ferry Lake, and which continued, without interruption, around the entire basin. A contour survey showed the elevations in the omitted area in sections 9 and 10 to range up to 17 feet above the former lake level.

526. Upon a review of the record, the Attorney General of the United States, in a letter to the Secretary of the Interior, dated September 11, 1916, concluded—

That no action should be taken to enforce or assert any claim by the Government to that portion of the area involved which is covered by the waters of the lake because if the State's title by virtue of its sovereignty should fail for any reason, I see no way of successfully resisting her claim under the swamp land grant.

However, in so far as concerns the land lying between the old meander line and the waters of the lake, I entirely agree with you that it constitutes unsurveyed public land of the United States, and * * *

On January 2, 1923, the Supreme Court of the United States announced an opinion (260 U. S. 561, 563), denying the claims to the land in sections 9, 10, 15, and 16, adverse to those of the Government, and commented:

The inaccuracy of the plat is plainly apparent upon a like inspection. Why ——— made the survey and returned the plat

as he did is a matter of speculation, but the facts demonstrate that no survey of the large, compact body of land, which includes the tract in controversy, was ever made. The circumstances, as well as the extent and character of the lands, necessitate the conclusion that the omission was of deliberate purpose or the result of such gross and palpable error as to constitute in effect a fraud upon the Government.

527. The surveying work to be done in the Ferry Lake case consisted of the steps already noted in the Moon Lake case (see secs. 515 and 524); also a monumentation of the contour which agreed with the evident mean high-water elevation of the lake as it was in the year 1812. The contour line, owing to the recession of the waters, was needed to mark the boundary of the public land; thus recognizing, in principle, not only the sovereignty of the State over the bed of the lake, but as well the reservation to the State, under her law, of the land uncovered by the recession of the water.

528. *Crooked Lake and Bear Lake case:* The plat of T. 43 N., R. 6 E., 4th Prin. Mer., Wisconsin, approved April 6, 1863, shows a meandered lake in section 36. Meander corners were established regularly on the south and east boundaries of the section. The field notes show the running of meander courses through the section on opposite sides of the lake, and call for high banks, along timbered land. No mention is made of an arm of a lake extending northwesterly into section 25. The fractional lottings were disposed of according to the representations of the plat.

By letter dated April 16, 1923, the Commissioner of the General Land Office advised the Secretary of the Interior of an application to make a forest lieu selection for the NE $\frac{1}{4}$ SW $\frac{1}{4}$ section 36 (lot 15, fig. 79), which according to the representations of the township plat would be located entirely within the bed of the meandered lake as above described. This letter contains a review of the facts as developed by a field examination, and concludes with a recommendation that the land theretofore shown as a meandered lake be surveyed and a proper plat constructed. The proposed action bears departmental approval.

The report of the field examination showed the following facts:

The south and east boundaries of the section cross two lakes instead of one, the lakes being separated by a body of land amounting to 236.90 acres contained within the lines represented on the original plat as the banks of the one meandered lake. This area is rolling upland ranging up to 50

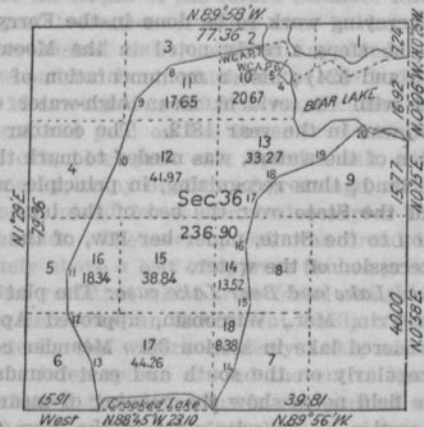


FIG. 79.—The Crooked Lake and Bear Lake case.

The south and east boundaries of the section cross two lakes instead of one, the lakes being separated by a large body of land, ranging up to 50 feet above the level of either lake, and heavily forested, while the shores of the lakes are well defined.

Witness angle points Nos. 6 and 7 are established on the bank in order to show the directions of the lines running from angle points Nos. 5 and 8.

feet above the level of either lake, and forested with pine, hemlock, birch, maple and spruce timber. There was no evidence of any changes in the water level of the lakes, nor of any escarpment along the fictitious meander courses connecting them, these lines having been found to traverse rolling land instead of following a contour, with not the slightest difference between the character of the land, soil or timber on the area

theretofore surveyed and that which had been omitted. The shores of the two lakes were well defined, with banks from three to eight feet high, bordered by a strip of level land from 10 to 30 feet in width, surrounded by rolling hills. The geologic formation, as well as the forest trees, indicated great age.

529. The surveying work to be done consisted of the steps previously outlined in the Moon Lake case. (See secs. 515 and 524.)

SWAMP AND OVERFLOWED LANDS.

TIDE LANDS.

530. References are made in section 3 to the coastal limits of the public domain as defined by mean high tide, and in section 4, Chapter I, to the several acts of Congress which granted to certain States the swamp lands within their respective boundaries. The references are continued in sections 226 to 233, and in paragraph 10, section 236, Chapter III, under the general subjects of the meandering of bodies of water and classification of land.

Tide lands include all coastal areas that are situated above mean low tide and below mean high tide, particularly as such areas are alternately uncovered and covered by the ebb and flow of the ordinary daily tides. Overflowed lands include essentially the lower levels within a stream flood plain as distinguished from the higher levels, according to the characteristic effect of submergence where long continued. Swamp lands include all other marshes and intermittent ponds which do not have effective natural drainage, particularly where such conditions are long continued.

531. The Supreme Court of the United States in *Baer v. Moran Bros. Co.* (153 U. S. 287), states that tide lands are those which are uncovered at low tide and are covered at ordinary high tide. In *Pollard's Lessee v. Hagan* (15 Curtis, 391, 403) the Supreme Court held:

The shores of navigable waters and the soil under them were not granted by the Constitution of the United States, but were reserved to the States, respectively—
and in *Mumford v. Wardell* (6 Wall. 423, 436) the court said:

The settled rule of law in this court is that the shores of navigable waters and the soil under the same in the original States, were not granted by the Constitution to the United States, but were reserved to the several States, and that the new States, since admitted, have the same rights, sovereignty, and jurisdiction in that behalf as the original States possess within their respective borders.

In *San Francisco v. LeRoy* (138 U. S. 656, 671), the court stated:

The lands which passed to the State upon her admission to the Union were not those which were affected occasionally by the tide, but only those over which tide-water flowed so continuously as to prevent their use and occupation. To render lands tidelands, which the State by virtue of her sovereignty could claim, there must have been such continuity of the flow of tidewater over them, or such regularity of the flow within every twenty-four hours, as to render them unfit for cultivation, the growth of grasses or other uses to which upland is applied.

532. In the light of the decisions it is clearly indicated that coastal "salt marshes" that are covered by the daily tide belong to the States by right of sovereignty, and such areas are not subject to survey. Coastal marshes that are not covered by the daily tide are subject to survey, but being low in elevation and usually saturated will be classified as swamp and overflowed within the meaning of the several grants.

533. Riparian rights, as defined by the laws of the several States, which are applicable within the beds of lakes, streams, and tidal waters, are not enforceable over the swamp and overflowed lands granted to the States.

534. Where surveys or field examinations are to be made covering or relating to swamp and overflowed lands, the special instructions should point out the particular questions which are presented, and in general, in aid of the adjustments which are required by the swamp land granting acts, the following rules will be observed:

1. According to section 3 of the swamp land grant of 1850, any legal subdivision the greater part of which is "wet and unfit for cultivation," shall be included in the list, but when the greater part of a subdivision is not of that character the whole of it shall be excluded. The "legal subdivision" mentioned herein is the usual quarter-quarter section or lot as shown by the plat of survey.

2. In order to bring land within the definition of the several swamp land granting acts, the greater part of any quarter-section or any lot must have been so swampy or subject to overflow during the planting, growing, or harvesting season, in the majority of years at or near the date of the grant, as to be unfit for cultivation in any staple crop of the region in which it is located, without the use of some artificial means of reclamation, such as levee protection or drainage ditches.

3. A subdivision which becomes swampy or overflowed at a season of the year when this condition does not interfere with the planting, cultivating, or harvesting of a crop at the proper time and by the ordinary methods, and so not being "made unfit thereby for cultivation," does not pass to the State under the swamp-land grant.

4. Tame grass or hay, when produced by the ordinary methods of preparing the ground, will be considered a staple crop, as well as the cereals, or cotton, or tobacco.

5. In the administration of the several acts granting the swamp lands, the States have been allowed optional methods of preparing the lists of the subdivisions that are to be identified as swamp and overflowed within the meaning of said acts, but in every survey, the duty devolves upon the engineer to determine with accuracy the position and extent of the swamp and overflowed land within the area under survey, regardless of the methods employed by the States in asserting claims.

6. The States of Alabama, Arkansas, Indiana, Louisiana, Michigan, Minnesota (excepting as to lands within the Indian reservations), Mississippi, Ohio, and Wisconsin have elected to base their swamp-land lists on the field-note record, and in these States it is imperative that the field notes of the survey include a specific list of the subdivisions each of which is more than 50 per cent wet and unfit for cultivation, regarding such character as at the date of the passage of the granting act.

7. In California, under the act of July 23, 1866 (14 Stat. 218), the swamp-land lists are based upon the representations of the plat of the survey, and in this State it is imperative that the plats correctly show the conditions in this respect.

8. The selection of the swamp lands within the States of Florida, Illinois, Iowa, Missouri, and Oregon, and within the Indian reservations in the State of Minnesota, is based upon investigations and reports by representatives of the State and of the General Land Office, but this does not set aside the Manual requirements for the usual complete showing of the character of the land.

535. It is always of importance to note any marked changes in the water level and drainage conditions of the region, and to ascertain the situation which obtained at the date of the grant-

ing act, and in all such inquiries it is proper to secure the testimony of persons who have known the lands for the longest periods. The most convincing evidence relative to the character of the land at the date of the granting act will be afforded by the older native forest trees, if any are present, or where their stumps remain, as these will reflect their site conditions with great certainty.

This line of investigation will require an inquiry into the habitat of the forest species which are found, particularly as to whether the usual range of the tree is within low wet ground, as for example the cypress, tupelo, sweet gum, water ash, water locust, and red bay of the southern latitudes, and the tamarack, white cedar, black spruce, swamp spruce, and black ash of the northern latitudes of the United States. The presence of any of the species named indicates the possibility of swamp land, and while conclusive with some of them, others of the species named have a wider range and may be found associated with upland varieties. If upland varieties are present the plain inference will be that the site conditions are that of upland, even though a forest species may favor moist rich soil.

SOIL CLASSIFICATION.

536. The subject of soil classification is referred to in paragraphs 8 and 20, section 236, Chapter III. It is one of considerable importance when related to the development of the public domain, not only to the prospective settler but for the value to be found in this field-note information for use in all general soil surveys and in the administration of forest lands. While it is beyond the purpose of the Manual to go into a subject which belongs properly to another scientific branch, yet it is apparent (R. S. 2395; Manual, sec. 8, subsec. 99, Ch. I) that the general laws require the engineer to note and to report upon the soil types.

537. The objective to be stressed in this line of observation is to report upon the characteristic soil types, which when considered in relation to the normal moisture conditions, including precipitation and drainage, the possibility of irrigation at reasonable cost, the climatic conditions, elevation above sea level, and latitude, will bring out the adaptability of the soil

for farming purposes, grazing or forestry, or whether it is desert or waste rocky land.

538. A layman's outline only is here presented, to the end that it may serve as a guide to the engineer, both in the field and for his inquiry into technical books on the subject as may be needed for an intelligent understanding of the various soil types, their make-up, and their use:

1. Soil types, based on texture: Gravel, coarse and fine; sand, coarse and fine; sandy loam; silt loam; loam; clay, heavy and light; and muck.

2. Structure: Single grained, pulverulent, and lumpy.

3. Color: Surface soil and subsoil, both when dry and when wet.

4. Depth: Surface soil and subsoil.

5. Location: River bottom or flood plain, bench, slope, plateau, prairie, and mountain.

6. Topography: Level, rolling, broken, hilly, and mountainous; and elevation above sea level.

7. Drainage: Direction, depth to water table, and quality, as poor, good, or erosive.

8. Mode of formation: Water laid, glacier laid, wind laid, and residual.

9. Chemical properties: Acidity, alkalinity, and humus content.

10. Geological derivation:

(a) Sedimentary rocks: (1) Formed of fragments of other rock transported from their sources and deposited as conglomerate, sandstone, and shale; and (2) formed by simple precipitation from solution, as limestone, or of secretions of organisms, as some coastal rocks.

(b) Metamorphic rocks: Formed through change in constitution, especially those due to great pressure, heat, and water, and resulting in a more compact or more highly crystalline condition, including, for example, quartzite, marble, slate, and schist.

(c) Igneous rocks: Formed through the action of intense heat, including, for example (first, eruptive rocks), basalt, lava, and volcanic ash; (second, trap rock) felsite and quartz-porphry; and (third, granular rock) granite, diorite, and porphyry.

539. The soil has its origin in the material which comes from the distintegration of the rocks. Roots and other vegetable matter in the soil are by decay gradually converted into humus, which is found only in the surface soil, and in quantities which

vary with the activity and profusion of plant life. Plant food comes from the chemical elements contained within the rock and the humus, one is the product of the inorganic, the other a product of the decomposition of the organic matter. There are four elements that the plants mainly need in soils—phosphorus, potassium, nitrogen, and calcium—the others usually being present in plentiful supply and so of less importance in considering the fertility. The physical properties of the humus are of the greatest importance to the relation of the fertility of the soil, and the humus confers upon the soil the power of absorbing and retaining the moisture.

The soil bacteria thrive best in one which is rich in decaying vegetation, with favorable proportions of lime, air, light, warmth, and moisture, and through their presence much nitrogen is taken from the air for storage in the ground. The relation of these things leads to the notable observation that soils seem to select their plants, or vice versa. There is found in a certain soil type one class of grasses or forest cover, in another soil very different plant life. These are the keys to a study of the soils, and when all are considered in connection with the moisture, climatic, and other conditions of the environment will very largely determine its value for agriculture, stock grazing, or forestry.

540. The following is an illustration of a general description of the land and soil types found within a selected township, designed to bring out rather minute references to the soil structure:

Land, level, and gently rolling plateau, with elevation from 500 to 700 feet above sea level. Soil, fine sandy loam; surface soil dark gray to black, rich in humus, from 10 to 15 inches deep; subsoil, light brown loam, 36 inches deep, resting on gravel bed; sedimentary origin, lake laid. Drainage good, the stream system being the ——— river and its tributaries. The normal precipitation of the region is ordinarily deficient for general farming, but the soil is well adapted to any of the cereals usually grown in this latitude by dry-farming methods, and it produces excellent grasses, both native and tame.

CHAPTER VIII.

FIELD NOTES.

THE GENERAL PLAN.

541. The field notes are the written record of the survey. It is essential that this record show an appropriate identification of the lines previously established from which the survey has been extended, with suitable "calls" referring to the alignment and measurements, description of topography along the lines surveyed, and monumentation of the work. All new subdivisions to be platted and the quantity of land in each unit are derived from the field notes, and this record will be, in turn, the basis for the identification of the boundaries. The early laws on public-land surveys comprehended the importance of the field notes, and this chapter of the Manual is devoted to outlining the requirements, with examples of the various forms of record.

542. The initial notes are kept in pocket field tablets. The final field notes for filing are transcribed from the field tablets, and are typewritten upon regulation field note paper. It is desirable that the final field notes be made to conform to the general arrangement and phraseology set out in the Manual. It is obvious, for practical reasons, that a large part of the final field notes must be extended from an abbreviated field record, and equally apparent that much of the minute detail of the initial notes may be appropriately summarized into a form of record which will refer directly to the completed survey. This distinction in the two stages of the record is carried through the text. The subject in hand is that of the final field notes, the record that is extended from the field tablets; this record is termed the "*field notes*."

543. There will be entered in the *field tablets* all appropriate notes of the method and the order of the procedure; the dates will be shown when engaged upon each part of the work; and the division will be noted if the work is divided between two or more parties. These notes will also show the minute detail

of all observations for time, latitude, and azimuth; the resulting directions of the lines run; the measurements; and all necessary descriptions. The preceding chapters contain explicit instructions on these subjects which do not need to be repeated. It suffices to state that the record made in the field tablets should supply, along the plan already laid down in the preceding chapters, all information which may be needed for a complete verification of the final transcript record.

544. The need for choice of methods in handling the great variety of survey types makes it desirable that judgment be exercised as to whether part of the work of entering the initial record in the *field tablets* shall be allotted to one or more assistants, and how the notes are to be arranged. The chief of field party is necessarily charged with responsibility for the accuracy and sufficiency of this record, all subject to the approval of the proper supervising officer. The work of transcribing the record usually receives the personal attention of the engineer, but as that is not always the case, it is important that the arrangement of the notes in the tablets and the use of abbreviations be such as to be readily understood by others who are familiar with the technical processes. It follows that due regard should be given to the Manual requirements and form, though it is intended that set forms of expression be used flexibly and modified when necessary to conform to the survey procedure. The work of the reviewing officers will be directed to the fundamental requirements of the Manual and the written special instructions, and the comments, if any, as to the form of the final field notes, will be based upon broad grounds.

545. The *field notes* will be compiled in "books" as directed by the proper supervising officer. A separate book will be employed for the subdivisinal notes of each township. Exteriors may be combined in the same book with the subdivisinal lines in the survey of a single township, but in extensive surveys the standard parallels and guide meridians will be separated from the township exteriors, and the latter will be separated from the subdivisinal and meander lines in such a way as the proper supervising officer may deem appropriate for the permanent filing of the record. The several books of the same series will be given designating letters, as A, B, C, etc.

TITLES.

546. Each book of field notes will be included in a regulation cover, with appropriate title setting out general information as follows:

1. The description of the lines recorded in that book;
2. The principal meridian to which the survey refers;
3. The State in which the survey is located;
4. The name or names of the engineers by whom the work was executed;
5. The date of the special instructions, with serial group number, and date of approval;
6. The date of the assignment instructions; and,
7. The dates of the beginning and completion of the work included in that book.

EXAMPLES OF TITLES.

Field Notes
Of the Survey of the
Tenth Standard Parallel North,
Along the South Boundary of Township 41 North,
Through Ranges 13, 14, 15, and 16 West;
Fourth Guide Meridian West,
Through Townships 41, 42, 43, and 44 North,
Between Ranges 16 and 17 West.

(Or)

East and North Boundaries of
Townships 41 and 42 North,
Ranges 15 and 16 West.

(Or)

Subdivisional and Meander Lines of
Township 41 North, Range 15 West.

(Or)

West and North Boundaries
and
Subdivisional and Meander Lines of
Township 41 North, Range 13 West.

(All)

Of the Sixth Principal Meridian
In the State of Wyoming,
Executed by
Wm. C. Jones, U. S. Cadastral Engineer.

(Or)

John B. Smith and Fred A. Brown,
U. S. Cadastral Engineers.

(All)

Under special instructions dated June 30, 1927, which provided for the surveys included under Group No. 156, bearing

the approval of the Commissioner of the General Land Office under date of July 10, 1927; and assignment instructions dated July 15, 1927, addressed to the above-named engineer (or engineers).

Survey commenced July 25, 1927.

Survey completed October 10, 1927.

547. The descriptive portion of the title will be appropriately modified if there is a fractional portion of a township included in a survey, and for all resurveys and fragmentary surveys, as for example:

Field Notes
Of the Survey of
A portion of the Subdivisional Lines
Completing (or continuing) the
Subdivision of
Township 39 South, Range 18 East.

(Or)

Field Notes
Of the Survey of
Four Islands in Burntside Lake,
In Sections 13, 20, and 29,
Township 63 North, Range 13 West.

(Or)

Field Notes
Of the Survey of
Fiddlers Island in Venice Bay,
In Section 1,
Township 39 South, Range 18 East.

(Or)

Field Notes
Of the Dependent Resurvey of the
Exterior and Subdivisional Lines of
Township 18 South, Range 59 West.

(Or)

Field Notes
Of the Dependent Resurvey of the
Eleventh Standard Parallel North,
Along the South Boundary of Township 45 North,
Through Range 79 West;
The East Boundary of
Township 45 North, Range 80 West;
and the
South Boundary of
Township 46 North, Range 79 West.

(Or)

Field Notes
Of the Independent Resurvey of the
East Boundary and Subdivisional Lines of
Township 45 North, Range 79 West,
and
Metes-and-Bounds Survey of Private Claims.

(Or) Field Notes

Of the Dependent Resurvey of the Boundaries of the Anastasia Island Lighthouse and Military Reservations, In Sections 21, 22, 27, and 28, Township 7 South, Range 30 East.

(Or) Field Notes

Of the Dependent Resurvey and Extension of Lines Subdividing the so-called Moon Lake, In Sections 22, 26, and 27, Township 12 North, Range 9 East.

(Or) Field Notes

Of the Dependent Resurvey and Extension of Lines Subdividing Land Bordering Ferry Lake and James Bayou, In Sections 9, 10, 15, and 16, Township 20 North, Range 16 West.

(Or) Field Notes

Of the Retracement and Extension of Lines Subdividing Accretion Area Bordering Red River, Including Riverbed Tracts, In Sections 4, 5, and 8, Township 5 South, Range 14 West.

(Or) Field Notes

Of the Dependent Resurvey of the Section Boundaries, The Subdivision of the Sections, and The Establishment of Corners of Indian Allotments, Sections 9, 10, and 15, Township 143 North, Range 30 West.

(Or) Field Notes

Of the Dependent Resurvey of the Section Boundaries, The Subdivision of the Sections, and The Establishment of the Boundary, Block and Lot Corners, And Street Center-Lines of the Town site of Lac du Flambeau, in Sections 5 and 8, Township 40 North, Range 5 East.

(Or) Field Notes

Of the Dependent Resurvey of the Section Boundaries, And the Metes-and-Bounds Survey of a body of land classified as mineral bearing, included within the Whitmore Quartz and the Monday Quartz Mining Claims, in Section 22, Township 7 North, Range 12 East.

INDEX.

548. Upon the completion of the field notes of each book there will be prepared a small-scale index diagram of the lines included in that book. A form diagram will be employed ordi-

narily, but it is frequently necessary to construct a special diagram to suit the work; in the latter case a sheet of regulation field-note paper, or a sheet of the same size, will be employed, and a scale adopted that is suited to the available space. It is usually preferable to orient the diagram with north to the top of the page, though sometimes the outline of the work is such that it is better to orient the diagram with north to the left-hand (or binding) edge. The index diagram should show all of the lines the record of which is included within the book, with page numbers referring to such record to be shown upon the lines of the diagram. Meanders and other irregular lines will be drawn and indexed. The index sheet will be inserted in the book on the inside of the front cover, to appear on the right-hand side, without page number; no field notes will be written on the index sheet.

PAGE HEADINGS.

549. Each page of the field notes will be given a heading. Such heading will be a 1-line summary of the title of the field notes to be found on that page. New headings will be employed within the body of the field notes where changes are made to a new division of the survey; this will become the heading of the pages that follow. Examples will be found in the specimen field notes.

ABBREVIATIONS.

550. The following abbreviations, especially suited to field notes of surveys and designed for brevity, are permitted in the final transcript record, and are employed generally in the field notes where repetitions in the form of the record and the expressions used are such as to make the abbreviations readily understood. These abbreviations are employed in the field-note record in addition to those shown in Chapter II for analytical notation of observations, and those shown in Chapter IV for marks upon monuments. Some of these abbreviations, as appropriate, are employed upon the township plat. An extended explanation of the use of the trigonometric formulas frequently employed is contained in Tables 24 and 25, Standard Field Tables. All abbreviations will be given capital or lower-case letters the same as would be proper if the spelling were to be completed.

TABLE OF ABBREVIATIONS.

A.	for acres.	mer.	for meridian.
alt.	for altitude.	mkd.	for marked.
a. m.	for forenoon.	M. S.	for mineral survey.
ang.	for angle.	nat.	for natural function.
app. noon.	for apparent noon.	N.	for north.
app. t.	for apparent time.	NE.	for northeast.
asc.	for ascend.	NW.	for northwest.
astron.	for astronomical.	No.	for number.
B. M.	for bench mark.	obs.	for observe.
bet.	for between.	obsn.	for observation.
bdy., bdrs.	for boundary, boundaries.	p. m.	for afternoon.
ch., chs.	for chain, chains.	pt.	for point.
cor., cors.	for corner, corners.	Prin. Mer.	for principal meridian.
corr.	for correction.	$\frac{1}{4}$ sec.	for quarter section.
decl.	for declination.	R., Rs.	for range, ranges.
dep.	for departure.	red.	for reduction.
desc.	for descend.	rev.	for reverse.
diam.	for diameter.	s.	for second, seconds.
diff.	for difference.	sec., secs.	for section, sections.
dir.	for direct.	S.	for south.
dist.	for distance.	SE.	for southeast.
E.	for east.	SW.	for southwest.
e. e.	for eastern elongation.	sq.	for square.
elev.	for elevation.	Stan. Par.	for standard parallel.
elong.	for elongation.	sta.	for station.
ft.	for foot, feet.	tele.	for telescope.
frac.	for fractional.	temp.	for temporary.
Gr.	for Greenwich.	t.	for time (and hour angle).
G. M.	for guide meridian.	T., Tp., Tps.	for township, townships.
hor.	for horizontal.	tri.	for triangulation.
h.	for hour, hours.	u. c.	for upper culmination.
h. a.	for hour angle.	U. S. L. M.	for United States location monument.
in., ins.	for inch, inches.	U. S. M. M.	for United States mineral monument.
lat.	for latitude.	vert.	for vertical.
lk., lks.	for link, links.	w. corr.	for watch correction.
l. m. noon.	for local mean noon.	w. t.	for watch time.
l. m. t.	for local mean time.	W.	for west.
log.	for logarithmic function.	w. e.	for western elongation.
long.	for longitude.	x.	for separating dimension values.
l. c.	for lower culmination.		
in.	for minute, minutes.		
meas.	for measurement.		

THE DETAILED FIELD-NOTE RECORD.

551. Coming now to the body of the field notes, attention is again directed to those sections of the preceding chapters which deal with the preliminaries of the field work and to the Manual requirements in regard to the field-note record.

552. The purpose of the record, in reference to the introductory statements, is to qualify the survey structure; the data to be supplied are as follows:

1. A description of the instruments employed, and the adjustments and tests (a reference to where the record will be found may be supplied if it is contained in another book of field notes of the same series);
2. A description of the measuring tapes, and their test for accuracy;
3. A description of any special methods employed;
4. A description of the point of beginning and its geographic position; and,
5. The observed magnetic variation.

553. The following *list* will assist in locating many *specific requirements* in regard to the field-note record, with examples of forms of record:

Measurements: Descriptions required, sections 16, 23, 35, 141, 142, 575; examples, sections 18, 20, 27, 29, 32, 33, 38.

Instruments, and requirements as to their adjustment: Descriptions required, sections 41, 42, 43, 44, 45, 46.

Observations for time: Descriptions required, section 91; examples, sections 51, 55, 70, 71, 75.

Observations for latitude: Descriptions required, section 73; examples, sections 74, 75, 76, 82, 133-A.

Observations for azimuth: Descriptions required, sections 40, 81; examples, sections 81, 87, 88, 97, 98, 108, 112, 120.

Standard lines: Sections 141, 142, 143, 146.

Township exteriors: Sections 151, 154, 160, 163, 167.

Subdivisional lines: Sections 180, 187, 190, 192, 215, 228, 230, 232, 233, 235, 236.

Monuments: Sections 238, 241, 254, 324, 325.

Resurveys: Sections 420, 422, 423, 424, 445, 447, 452, 458, 459.

Indian allotment surveys: Section 469.

Town-site surveys: Section 482.

Rectangular boundaries of parts of sections: Section 495.

Mineral segregation surveys: Section 507.

Erroneously omitted areas: Section 519.

554. A full description of all monuments belonging to the established surveys, upon which the new lines are to be initiated or closed, will always be furnished with the written

special instructions. Upon the identification of such monuments, if in good condition, the new field-note record may take the form, "which is a ———, firmly set, marked and witnessed as described in the official record"; but if a monument does not conform to the record, or if it is found to be in poor condition, a complete description will be supplied; a description of the monument as reconstructed will always be entered if any changes are made.

555. The complete description of a monument will be entered once only. In subsequent notes the expression "heretofore described" may be employed when referring to a point of a previous survey already occupied in the new survey; all new corners recorded will be referred to by name only, without repeating the description of the monument, as for example: "the cor. of secs. 2, 3, 10, and 11"; or "the standard cor. of secs. 33 and 34"; or "the cor. of secs. 5, 6, 31, and 32, on the S. Bdy. of the Tp."

556. The character of the land, soil, and forest cover upon the lines surveyed will be summarized at the conclusion of the field notes of each mile. The record of the mile will be closed by a line drawn across the page. A general description of a township as a whole, with regard to topography, soil, forest cover, merchantable timber, native grasses, water supply and drainage, minerals, settlement, and improvements, will be supplied at the conclusion of the subdivisional notes.

557. The record of the names of the assistants and the certificates of the engineer and supervising officer will take the forms given in the specimen field notes.

SPECIMEN FIELD NOTES.

558. In the specimen field notes (appendix) there are shown the several forms of description of the approved types of corner monuments. The types that are employed ordinarily are given prominence, but those that are used in exceptional circumstances are included in order to supply a form of description. The indicated departures from the usual type of monumentation (iron post corners) are not to be construed as an authorization to disregard the standard practice which is outlined in

Chapter IV, as such authorization, if any, will be found in the special instructions, or will be contained in a formal letter from the proper supervising officer.

In the specimen field notes some page headings are shown in italics in order to conform with printing style, and in the paragraph entries which give the descriptive calls along the lines surveyed the second and following lines are indented one space to conform with printing style; the italics as mentioned will not be indicated in the typewritten field notes, nor will the indentation referred to be made. Descriptions of bearing trees and other accessories will be indented as indicated. In the ordinary descriptive style as printed the proper names of the principal meridians are not capitalized unless abbreviated. In tabulations no period is shown after an abbreviation if the latter is followed by a leader. A comma is inserted preceding the conjunction "and," as in "the corner of sections 3, 4, 9, and 10." Such differences in printing from the approved typewritten style employed in writing field notes are noted here as unavoidable.

559. Other specimen field notes as needed to show the miscellaneous forms of record which relate to the general and specialized class of surveys and resurveys to be found in the usual work of a surveying district will be supplied by the proper supervising officer. A liberal assortment of such specimen field notes, with their accompanying plats, all carefully considered, should be at hand for reference purposes.

560. The specimen field notes are carried in the Manual appendix, beginning on page 463. Below the title is an index of the *forms of record* that are to be found in the specimen field notes; the appropriate graphic indexes are supplied on pages 467 and 491.

In the specimen field notes (appendix) there are shown the several forms of description of the approved types of corner monuments. The types that are employed ordinarily are given prominence, but those that are used in exceptional circumstances are included in order to supply a form of description. The indicated departures from the usual type of monumentation (iron post corners) are not to be construed as an authorization to disregard the standard practice which is outlined in

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CHAPTER IX.

PLATS.

THE IMPORTANCE OF THE PLAT.

561. The term "*plat*," as employed technically, refers to the drawing which represents the lines surveyed, established, re-traced, or resurveyed, showing the direction and length of each of such lines; the relation to the adjoining official surveys; the boundaries, description, and area of each parcel of the land subdivided; and, as nearly as may be practicable, a delineation of the topography of the region, including a representation of the culture and improvements within the limits of the survey. The purpose of the plat and its relation to the survey have been pointed out in sections 193, 194, and 210, Chapter III. Upon the approval of the field notes and plat by the proper supervising officer, and the acceptance of the same by the Commissioner of the General Land Office, the survey may be termed officially established or completed, and it follows that the survey does not attain official or legal status until thus completed.

562. It is a well-settled principle of law that a plat becomes a part of every Government land patent that refers to any subdivisions whose descriptions are to be found upon such plat, and that the legal significance of the plat in this respect is fully as important as though a copy of such plat had been incorporated into such patent. The same applies to any subsequent deeds of transfer. The public land is not to be regarded as "surveyed" until it has been duly shown upon an approved plat, and no subdivisions are to be "disposed of" until so identified.

563. As ordinarily conceived, an original survey of public lands does not *ascertain* boundaries; it *creates* them. Hence, the running of lines in the field and the laying out and platting of townships, sections, and legal subdivisions are not alone sufficient to constitute a survey. Until all conditions as to approval have been complied with, the public lands are to be regarded as unsurveyed and not subject to disposal. It follows that although a survey may have been physically made, if it be disapproved by the duly authorized administrative officers, the public lands which were the subject of the survey are still to

be classed as unsurveyed. In other words, to justify the application of the term "surveyed" to a body of public land something is required beyond the completion of the field work and the consequent laying out of the boundaries, and the thing that is required is the approval of the work of the engineer. If, pending such approval, and still more, if after disapproval of the survey, the public lands in contemplation of law are unsurveyed, it may follow that when the survey originally approved and platted is subsequently annulled, as to the unappropriated public lands, because the lines and marks established have become obliterated, such public lands may revert to an unsurveyed status for all purposes of settlement and sale. A purpose thus to annul such survey may be disclosed by an act of Congress or by departmental order directing a resurvey to supersede the original, plainly based upon the fact of such obliteration. With the disappearance of the physical evidences a survey survives only as an historical event. As a tangible, present fact it ceases to exist, and a new survey may become necessary to reestablish the status of the area over which it had extended as surveyed lands of the United States.

564. Entries and disposals are based upon and are defined by the monuments or other evidences of the controlling official survey, and so long as these evidences are in existence the plat of the survey is an official exhibit from which certain information and record data are obtainable. It is presumed that such plat correctly represents the actual field conditions, but if there are discrepancies the indications of the plat must give way to the evidence of the corners in place, as it is with reference to the monuments on the ground that the lands are identified, and the affidavit of the entryman is made that he is well acquainted with each and every legal subdivision thereof.

565. The foregoing reference to the superiority of the controlling monuments must not be confused with those cases wherein resurvey procedure is involved, as in the absence of visible evidences of the original survey, the field notes and plat are the best means of identification of the areas disposed of, and being the sole subsisting record, the field notes and plat will retain this purpose until the entries have been redefined, whereupon the plat of the resurvey becomes in turn the exhibit of the true conditions on the ground.

566. The requirements of the plat and the process of its production, the ascertainment of areas, amounts, or quantities shown, and the use of conventional symbols employed to delineate the topography will be set forth in this chapter.

SPECIMEN TOWNSHIP PLAT.

567. This is a revision of the specimen township plat which accompanied the Manual of 1902. (See Insert No. 1.) An effort has been made to secure maximum clarity of the essential features of the subdivisional survey with a standardization of the lettering which refers to section numbers, lot numbers, areas, and lengths and directions of lines, in suitable styles and gages, all in conformity with relative importance. The style of lettering which has been selected is intended to combine the greatest possible simplicity of execution with minimum liability of loss of definition on reproduction.

568. There has been added the detail of lengths of lines appertaining to fractional subdivisions in order to reveal the basis of the computation of all areas in harmony with the plan of subdivision of each section as shown. The distances noted in parentheses are those regular and fractional portions of lines between established monuments which constitute the boundaries of the quarter-quarter sections and fractional subdivisions bounded thereby; the parentheses are employed where the record is not supplied by the field notes; the lengths indicate what was used in the calculation of areas. The same lengths are to be adopted proportionately whenever there is a need for an establishment of sixteenth-section corners on the section boundaries, and for control points for the subdivision of sections.

569. The base drawing and all important improvements, works, or structures, and all names, where required, are in black. (See Insert No. 2.) The term "base drawing" as here employed refers to the lines showing all section boundaries, subdivisions of sections, and any other lines of segregation, such as mineral or private claim boundaries, meander lines (unless to be shown in blue), together with all lettering referring to title, names, memorandum, certificates, section numbers, lot numbers, areas, and lengths and directions of lines. The base drawing is one stripped of every detail nonessential to the identification of the subdivisions shown upon the plat. It is this

definition, with the descriptions suitable for the disposal of title to the land, that characterizes a plat as distinguished from a map. It is intended that the arrangement of data on all base drawings be made as nearly uniform as possible in harmony with the specimen plat, subject only to the unavoidable need for modification where irregular lottings must be made.

570. The specimen township plat shows a number of improvements over former methods of representing map features. These changes have been harmonized with modern practice in so far as adaptable to the plat. A noticeable improvement has been introduced by the use of transparent overprints for representing map data, to be employed on certain types of plats where former methods have proven to be ineffective. In this connection it should be observed that a substantial part of current work is made up of two classes of surveys which present the most important and increasingly difficult questions of mapping: (1) where the remaining original subdivisions are located in rough mountain regions; and (2) where in the execution of re-surveys there is a demand that the reliable topographic data exercise a more important influence in ascertaining the control to be adopted. A growing disappointment in dealing with plats of these types has come about through the inadequate results obtainable by the use of all black map symbols without confusion with or the obscuring of the essential data of the base drawing. This has been overcome by the use of transparent overprints where needed. Colors are not proposed for the general run of simple plats.

DRAFTING THE BASE DRAWING.

571. Township plats are generally drawn on the scale of 40 chains to 1 inch, on sheets 19 by 24 inches when trimmed. The scale is often enlarged to 20 chains to 1 inch, for showing irregular portions of parts of townships; the scale of 10 chains to 1 inch or larger is employed where necessary. The size of the sheets will always be made 19 by 24 inches, regardless of the scale or area to be shown; this is important on account of the need for uniformity in the dimensions of filing devices. A border-line rectangle $16\frac{1}{2}$ by 20 inches is right for the normal township plat; the length may be regulated between 18 and $21\frac{1}{2}$ inches if the subject is correspondingly smaller or larger.

572. The plat subject should be compiled or laid out with a good grade, medium hard drawing pencil, one which will make a clean mark, but not so hard that it will engrave the lines.

573. The township will be drafted as a plane, without allowance for reduction from the spheroid, as is required in the making of small-scale topographic maps showing large areas. All *regular* townships may be laid out as a rectangular grid, with allowance for fractional measurements along the north tier and west range of sections.

574. In the case of *irregular* townships, or those containing meanderable bodies of water, and lines of segregation such as mineral or private claim boundaries, the drawing should be laid out from the field closing sheets, duly balanced. The exteriors should be closed and balanced, then each section, and last the subdivisions within each section. The point of origin is then selected on the drawing, from which point the exteriors are carefully laid out, each salient being accurately located by scaling, from the point of origin, the balanced values of the total latitude and departure of that salient. The section boundaries are then laid out similarly from suitable points of origin on the exteriors. Finally the subdivisions of each section, including the necessary lines of segregation and meander lines, are accurately scaled by the method of total latitudes and departures from an origin on the section boundary. On this plan the work may be laid out without introducing accumulative errors of scaling.

575. Elements of triangulation figures and offset lines will not be shown on the plat when the field procedure results in duly ascertaining, indirectly, the course and length of the line sought to be established. Such diagrams should be shown in the field notes if needed for a clear understanding of the procedure, but are not required on the plat.

576. Township plats will show the complete condition of all their exteriors, including all closing and standard township and section corners, and connecting courses and distances. A line common to two townships will be drawn with equal completeness for both, as far as approved surveys will permit. The relative position of and data for near-by corners of one or two townships and closing township corners, if established, will be shown. Corners common to four townships will be shown only

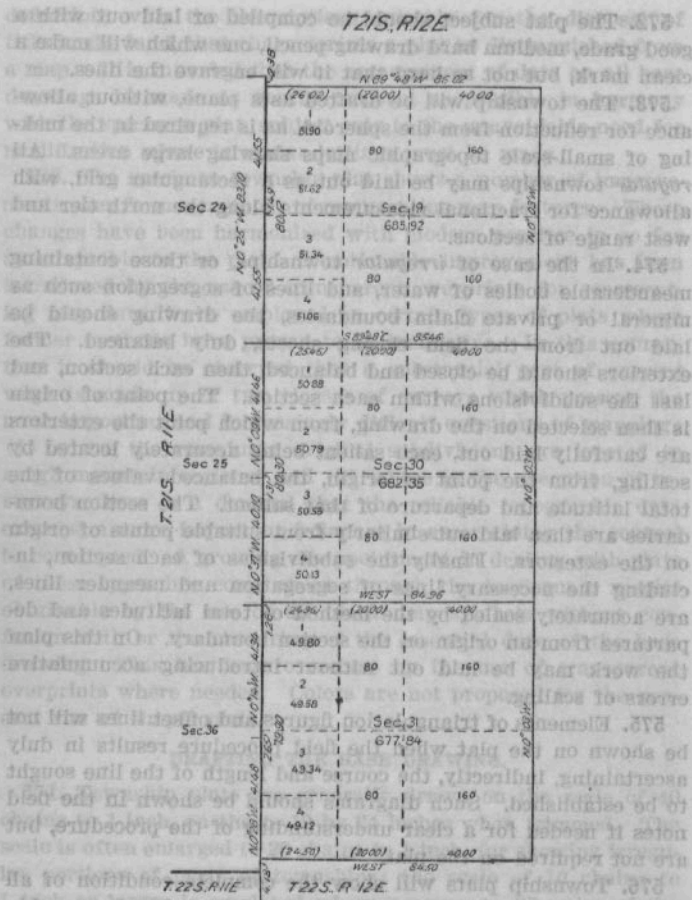


FIG. 80.—Two sets of corners on an irregular township boundary.

The directions and distances along a line common to two townships will be shown with equal completeness for both, as far as approved surveys will permit.

as referring to the subdivisional survey on that plat. Separate diagrams of township exteriors are not required.

577. A township made fractional by an adjacent reservation or private land grant, will have the intervening boundary properly lettered, and the mile posts and connecting distances shown. The proper designation of the area omitted will be shown.

578. Where a fractional portion of a township is surveyed, the condition of adjacent areas will be shown clearly by words lettered thereon, such as: "Unsurveyed," "U. S. National Forest," "Rancho San Luis," "Surveyed by John Smith, 1877," "Waste Lava Bed," or other explanation.

579. On plats of fragmentary surveys areas previously surveyed will have the sections and lots drawn in blank, to show the relation of old and new work.

580. The line of demarcation between areas previously counted in the total acreage surveyed and the new surveys will be distinctly shown. A light diagonal shading with black ink on the side previously surveyed is recommended to distinguish such a line.

581. Each regular section will show the center lines only and the area as 640 acres. In all other sections where lottings are required each subdivision must be distinctly shown. Where a section contains one or more fractional lots, its regular parts will show the usual areas as 40, 80, or 160 acres; the fractional lots will each show the assigned lot number and quantity computed to the nearest $\frac{1}{100}$ of an acre. The total area of public land within each irregular section will be shown as equal to the sum of the several parts, as identified by the plat, and disregarding parts omitted.

582. The complete technique of laying out the regular and fractional subdivisions of sections and the designations of the same by reference to aliquot parts and serial lot numbers is covered by sections 193 to 233, inclusive, Chapter III.

583. With reference to plats which are to show the completion of remaining parts of sections not previously surveyed, particularly in regard to sections where parts have been shown as outlying areas protracted as surveyed (see secs. 214 to 222, inclusive, Chapter III), it is the practice, where irregular conditions are found on the ground and no entries have been made,

to effect an annulment of the showing on the former plat, in order thus to simplify the execution and platting of the new surveys. Occasionally it may be desirable to resurvey a limited area, including entire sections previously returned as surveyed, where no rights to the land have been acquired, if in so doing a more satisfactory result may be obtained. An order suspending part or all of the previous survey is required in such cases.

COMPUTATION OF AREAS.

584. The deficiency in area which results from the convergency of meridians is placed normally in the fractional lots adjoining the west boundary of the township. Here sections 7, 18, 19, 30, and 31, each usually contains lots 1 to 4, inclusive, whose meridional dimensions are all an even 20.00 chains; the dimensions of the latitudinal boundaries of these lots are computed proportionately from the fractional measurements ascertained on the section lines. The area, in acres, of each lot is then found simply by adding the lengths, in chains, of its north and south boundaries.

585. For example, taking section 30, shown on the specimen plat, the dimensions of the latitudinal boundaries, and the areas are found as follows:

	(1)	(2)	(3)	(4)
N. boundary	18.21	18.245	18.28	18.315 chs.
S. boundary	18.245	18.28	18.315	18.35 "
	36.455	36.525	36.595	36.665 acres
	36.45(+)	36.53(-)	36.59(+)	36.67(-) "

586. The areas of lots 5, 6, and 7, section 6, are ascertained similarly, making due allowance, when calculating the length of the north boundary of lot 5, for any material variation from 20.00 chains in the meridional dimension of lot 4.

587. The surplus or deficiency in area which results from the discrepancy in the meridional measurements between the exterior boundaries and the subdivisive lines is placed normally in the fractional lots adjoining the north boundary of the township. Here sections 1 to 5, inclusive, each usually contains lots 1 to 4, inclusive, whose dimensions on their latitudinal boundaries are all treated as an even 20.00 chains; the meridional dimensions of these lots and their areas are computed on the

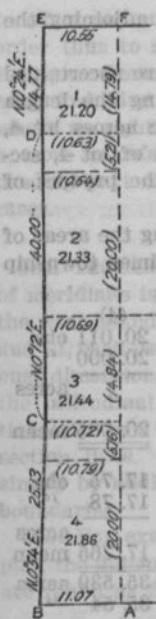
plan heretofore described for the fractional lots adjoining the west boundary of the township.

588. The areas of lots 1, 2, and 3, section 6, are ascertained similarly, making due allowance when calculating the length of the west boundary of lot 3, for the departure across lot 4, where more or less than 20.00 chains. The area of lot 4, section 6, in acres, may be ascertained by taking the product of its mean dimensions in chains, divided by 10.

589. The following is an example of ascertaining the areas of the fractional lots in section 6, shown on the specimen township plat:

	(1)	(2)	(3)	(4)	
E-----	20.05	20.037	20.024	20.011	chs.
W-----	20.037	20.024	20.011	20.000	"
	<u>40.087</u>	<u>40.061</u>	<u>40.035</u>		acres
	40.09	40.06	40.03 (+)		"
				<u>20.005</u>	mean
	(5)	(6)	(7)		
N-----	17.78	17.81	17.84	17.75	chs.
S-----	17.81	17.84	17.87	17.78	"
	<u>35.59</u>	<u>35.65</u>	<u>35.71</u>		acres
				17.765	mean
				<u>35.539</u>	acres
				35.54	"
	2.0005 × 17.765 =				

590. For purpose of computation of areas, where three sides of a section are regular and only one side irregular, the irregular boundary may be treated as a straight line if there is no break in alinement in that boundary in excess of 21' of arc; in such sections, if the field notes show that the cardinal length of the irregular boundary is within the usual limit of 50 links in 80.00 chains, the regular dimensions will be treated as having values in multiples of 20.00 chains. In the event that portions of the irregular boundary differ in course by more than 21' of arc, the break in alinement will be recognized and such adjustment of the lengths of lines which form the basis for the computation of the areas will be made as to bring all dimensions to a proper closing with the field measurements, taking into consideration the direction of the opposite governing boundary with respect to the areas of the regular portions of the section. The elements which enter into the computation of the areas will be derived from the balanced closure.



591. Example, Figure A-B-E-F. As the section is otherwise regular, the areas of the $E\frac{1}{2}$ and $E\frac{1}{2}W\frac{1}{2}$ are based on the assumption that the line A-F is 80.00 chains in length and parallel to the governing east boundary, disregarding the allowable error in closure. The lengths of the lines A-B and E-F are given by the field measurements; the intervening dimensions are obtained by the following calculations:

	N.	E.	W.
Westing A-B-----			11.07
N.0° 54' E-----	25.13	25.16	.39
N.0° 12' E-----	40.00	40.05	.14
N.0° 24' E-----	14.77	14.79	.10
Easting E-F-----			10.55
		79.90	
Add to B-E-----		.10	
		80.00	11.18
			11.07
Line A-F-----		80.00	.11

	N.	E.	W.	
Line A-B---			11.07	11.07 S. bdy. lot 4.
	20.00	.31	-.31	+.03 .03 For line A-F.
Line B-C---			10.79	10.79 S. bdy. lot 3.
	5.16	.08	-.08	+.01 .01 For line A-F.
	25.16	.39	10.72	10.72 Lot 3 at C.
	14.84	.05	-.05	+.02 .02 For line A-F.
Line C-D---			10.69	10.69 S. bdy. lot 2.
	20.00	.07	-.07	+.02 .02 For line A-F.
	5.21	.02	10.64	10.64 S. bdy. lot 1.
			-.02	+.01 .01 For line A-F.
Line D-E---			10.63	10.63 Lot 1 at D.
	40.05	.14	-.10	+.02 .02 For line A-F.
	14.79	.10		
Line E-F---		10.55	10.55	10.55 N. bdy. lot 1.
	80.00	11.18	11.07	.11

The areas are then computed as follows:

Lot 1: $\begin{array}{r} 10.55 \\ \hline 10.63 \end{array}$

$\begin{array}{r} 21.18 \times 14.79 = 313.25 \\ \hline \end{array}$

$\begin{array}{r} 10.63 \\ \hline 10.64 \end{array}$

$\begin{array}{r} 21.27 \times 5.21 = 110.82 \\ \hline \end{array}$

$\begin{array}{r} 424.07 \text{ to be divided by } 20. \\ \hline = 21.20 \text{ acres.} \end{array}$

Lot 2: $\begin{array}{r} 10.64 \\ \hline 10.69 \end{array}$

$\begin{array}{r} = 21.33 \text{ acres.} \\ \hline \end{array}$

Lot 3: $\begin{array}{r} 10.69 \\ \hline 10.72 \end{array}$

$\begin{array}{r} 21.41 \times 14.84 = 317.72 \\ \hline \end{array}$

$\begin{array}{r} 10.72 \\ \hline 10.79 \end{array}$

$\begin{array}{r} 21.51 \times 5.16 = 110.99 \\ \hline \end{array}$

$\begin{array}{r} 428.71 \text{ to be divided by } 20. \\ \hline = 21.44 \text{ acres.} \end{array}$

Lot 4: $\begin{array}{r} 10.79 \\ \hline 11.07 \end{array}$

$\begin{array}{r} = 21.86 \text{ acres.} \\ \hline \end{array}$

592. In all irregular sections and in sections that are invaded by meanderable bodies of water, or by lines of segregation, the center lines of the section and the center lines of each quarter section in turn are given calculated values based upon the balanced field closing sheets. Points of intersection of the center lines with the meander lines or other lines of segregation are then computed in order to complete the boundaries of each fractional lot. With the results of these computations at hand

the area of each fractional lot may be most readily computed by the method of "double meridian distances."

593. In order to proceed with a computation by double meridian distances, the closing error of the figure is first to be eliminated, or the traverse of its boundary to be balanced, by the most applicable rule. The general rule is that the correction to be applied to the $\left\{ \begin{array}{l} \text{latitude} \\ \text{departure} \end{array} \right\}$ of any course is to the total error in $\left\{ \begin{array}{l} \text{latitude} \\ \text{departure} \end{array} \right\}$ as the length of the course is to the perimeter of the figure. Another method of balancing the closing error will be applicable if the purpose is to apply a uniform correction to the directions and lengths of lines.

The double meridian distances of the several courses, or D.M.D.'s, are then computed by the following rules:

(1) The D.M.D. of the first course equals the departure, or the increment in easting or westing, of the course itself;

(2) The D.M.D. of the second course, and each of the succeeding courses in turn, is ascertained by taking the D.M.D. of the preceding course, plus the departure of the preceding course, plus the departure of the course itself; and,

(3) The D.M.D. of the last course is numerically equal to its departure, but with opposite sign, thus verifying the value of each preceding D.M.D.

For convenience in making the computations, the differences in $\left\{ \begin{array}{l} \text{latitude} \\ \text{departure} \end{array} \right\}$ to the $\left\{ \begin{array}{l} \text{north} \\ \text{east} \end{array} \right\}$ are treated as of positive sign, to the $\left\{ \begin{array}{l} \text{south} \\ \text{west} \end{array} \right\}$ as of negative sign. The point of beginning is taken at the westernmost salient of the figure, and the direction of the traverse is run counterclockwise. On this plan each D.M.D. and the algebraic sign of the final result are of positive sign.

The next step in the process is to multiply the latitude of each course by the double meridian distance of the course; the positive products are arranged in a column for "north areas," and the negative products in a column for "south areas." The sum of the negative products is to be subtracted from the sum of the positive products. The area, corresponding to the unit of measurement that is employed, is ascertained by taking one-half of the last result. Where the unit of measurement is the chain, the area in square chains is to be divided by 10 to give the area in acres.

The field closing sheets may be readily adapted to the calculation of areas by the method of double meridian distances; two examples follow:

594. Tabling and calculations of T. 15 N., R. 20 E., Diamond Rock, in Lins Lake, in section 18:

No.	Course.	Distance.	Latitudes.		Departures.		D.M.D.'s.	N. areas.	S. areas.	Totals.	
			North.	South.	East.	West.				Lat. N.	Dep. E.
Tie	N. 71° 30' E.	21.44	6.80	-----	20.33	-----	-----	-----	-----	6.80	20.33
5	S. 86° 46' E.	3.19	-----	0.18	3.18½	-----	4.73	.85	-----	6.62	23.52
4	N. 33° 00' E.	2.20	1.84½	-----	1.20	-----	9.12	16.83	-----	8.46½	24.72
3	N. 48° 30' W.	3.50	2.32	-----	-----	2.62	7.70	17.86	-----	10.78½	22.10
2	S. 61° 15' W.	2.90	-----	1.39½	-----	2.54	2.54	-----	3.54	9.39	19.56
1	S. 16° 30' E.	2.70	-----	2.59	.77	-----	.77	-----	1.99	6.80	20.33
			4.16½	4.16½	5.15½	5.16	-----	34.69	6.38	-----	-----
					-----	-----	-----	6.38	-----	-----	-----
		14.49	4.16½	4.16½	5.16	5.16	-----	28.31	Double area.	-----	-----

				D.M.D.'s		14.15 Square chains.
Begin total lats. and deps. at	(1)	0.77	9.12	(4)		1.41 Acres.
M. C. on W. bdy. sec. 19, for		+ .77	+ 1.20			
purposes of platting.		+ 3.19	- 2.62			
		-----	-----			
Numbering of courses as	(5)	4.73	7.70	(3)	Begin D.M.D.'s at angle	
taken from field notes, order		+ 3.19	- 2.62		point of meanders farthest	
reversed to counterclockwise.		+ 1.20	- 2.54		west, end of course No. 2	
		-----	-----		running SW., or end of	
	(4)	9.12	2.54	(2)	course No. 1 running NW.	

595. Tabling and calculations of T. 15 N., R. 20 E., right bank of Yellowstone River, in section 25:

No.	Course.	Distance.	Latitudes.		Departures.		D. M. D's.	N. areas.	S. areas.	Totals.	
			North.	South.	East.	West.				Lat. N.	Dep. E.
	S. 0° 01' E.	5.36		5.36	0.00		0.00			0.00	0.00
	S. 89° 56' E.	79.96		.09	+ .04		80.00		7.20	-.09	80.00
	North	23.20	23.20		79.96		160.00	3,712.00		23.11	80.00
1	S. 85° 00' W.	13.00		1.13		12.95	147.04		164.68	21.99	67.04
2	S. 72° 00' W.	7.10		2.19		6.75	127.33		278.85	19.80	60.29
				-.01		+.01					
3	S. 64° 30' W.	13.00		5.60		11.73	108.84		608.42	14.21	48.55
4	S. 40° 30' W.	5.40		4.11		3.51	93.59		384.65	10.10	45.04
				-.01		+.01					
5	S. 77° 45' W.	7.00		1.49		6.84	83.24		123.20	8.62	38.20
			+.01								
6	N. 76° 00' W.	7.40	1.79			7.18	69.22	124.60		10.42	31.02
			-.01								
7	S. 80° 00' W.	12.00		2.08		11.82	50.22		103.96	8.35	19.20
				-.01		+.01					
8	S. 81° 08' W.	19.43		3.00		19.19	19.20		57.41	5.36	0.00
			24.99	25.05	79.96	79.97		3,836.60	1,728.37		
			+.01	-.05	+.04	+.03		1,728.37			
		84.33	25.00	25.00	80.00	80.00		2,108.23	Double area.		

Begin traverse and D.M.D's at M. C. on W. bdy. of sec. 25.

Begin total lats. and deps. at point for S. $\frac{1}{8}$ sec. cor. on W. bdy. of sec. 25, for purposes of platting.

Numbering of courses as taken from field notes.

By the traverse is run counterclockwise.

On this plan each D.M.D. and the algebraic sign of the final result are of positive sign.

The next step in the process is to multiply the latitude of each course by the double meridian distance of the course; the positive products are arranged in a column for "north areas," and the negative products in a column for "south areas." The sum of the negative products is to be subtracted from the sum of the positive products. The area, corresponding to the unit of measurement that is employed, is ascertained by taking one-half of the last result. Where the unit of measurement is the chain, the area in square chains is to be divided by 10 to give the area in acres.

1,054.11 Square chains.

105.41 Acres, sum of lots 5 to 8, incl.

Tabling and calculations of T. 15 N., R. 20 E., section 25, lots 5 and 6:

No.	Course.	Distance.	Latitudes.		Departures.		D.M.D's.	N.areas.	S.areas
			North.	South.	East.	West.			
	South	19.73		19.73					
	S. 89° 56' E	20.00		.02	20.00		20.00		0.40
	North	23.20	23.20				40.00	928.00	
1	S. 85° 00' W	13.00		1.12		12.96	27.04		30.28
2	S. 72° 00' W	7.10		2.19		6.75	7.33		16.05
3	S. 64° 30' W	.33		.14		.29			.04
			23.20	23.20	20.00	20.00		928.00	46.77
								46.77	
								881.23	
								44.06	Lot 5.
	South	9.06		9.06					
	S. 89° 56' E	20.00		.02	20.00		20.00		0.40
	North	19.73	19.73				40.00	789.20	
3	S. 64° 30' W	12.67		5.45		11.45	28.55		135.60
4	S. 40° 30' W	5.40		4.11		3.51	13.59		55.85
5	S. 77° 45' W	5.16		1.09		5.04	5.04		5.49
			19.73	19.73	20.00	20.00		789.20	217.34
								217.34	
								571.86	
								28.59	Lot 6.

and the ink should never be diluted. The drafting work should be sharp and clear, uniform in density of color, and the lettering standardized as to size and style. It is important to bear in mind that if the drafting is done with a diluted ink or otherwise left gray in appearance, it will be lost in varying degrees during the process of reproduction.

537. The drafting work should be open, making reasonable allowances for needed separation of detail. This will help to avoid a tendency for work to close across narrow spaces during reproduction. Where necessary, the detail of improvements, works or structures should be discontinued in order to avoid overlapping or obscuring the more essential features of the plat. The arrangement of some of the more minute data on the specimen township plat illustrates the minimum to which the work may be condensed safely. Attention is directed to the space allowed between the lettering and the adjacent lines;

Tabling and calculations of T. 15 N., R. 20 E., section 25,
lots 7 and 8:

No.	Course.	Distance.	Latitudes.		Departures.		D.M.D.'s.	N.areas.	S.areas
			North.	South.	East.	West.			
	S. 0° 01' E	8.51		8.51					
	S. 89° 56' E	20.00		.03	20.00		20.00		0.60
	North	9.06	9.06				40.00	362.40	
5	S. 77° 45' W	1.84		.39			1.80	38.20	14.90
6	N. 76° 00' W	7.40	1.80				7.18	29.22	52.60
7	S. 80° 00' W	11.19		1.93			11.02		21.27
			10.86	10.86	20.00	20.00		415.00	36.77
								36.77	
								378.23	
								18.91	Lot 7.
	S. 0° 01' E	5.36		5.36					
	S. 89° 56' E	20.00		.02	20.00		20.00		.40
	N. 0° 01' W	8.51	8.51				40.00	340.40	
7	S. 80° 00' W	.81		.14			.80	39.20	5.49
8	S. 81° 08' W	19.43		2.99			19.20	19.20	57.41
			8.51	8.51	20.00	20.00		340.40	63.30
								63.30	
								277.10	
								13.85	Lot 8.

INKING THE DRAWING.

596. The best *black* drawing ink should always be employed, and the ink should never be diluted. The drafting work should be sharp and clear, uniform in density of color, and the lettering standardized as to gage and style. It is important to bear in mind that if the drafting is done with a diluted ink or otherwise left gray in appearance, it will be lost in varying degrees during the process of reproduction.

597. The drafting work should be *open*, making reasonable allowance for needed separation of detail. This will help to avoid a tendency for work to close across narrow spaces during reproduction. Where necessary, the detail of improvements, works, or structures should be discontinued in order to avoid overlapping or obscuring the more essential features of the plat. The arrangement of some of the more minute data on the specimen township plat illustrates the minimum to which the work may be condensed safely. Attention is directed to the space allowed between the lettering and the adjacent lines;

this is never less than the space between the upper two points of the gage for the lettering; this is the rule where the drawing is to be reproduced at the same scale; proportionately more space should be allowed on special drawings where a reduction of scale is to be made on reproduction. The same safeguards should be applied in spacing the adjoining letters, and it will be noted that the spacing between letters bears a definite relation to the gage employed.

598. An experienced draftsman will endeavor to keep the drawing as clean as possible, so as to avoid needless erasing. A cover sheet, with an opening, is recommended. The sharp, black lines must be preserved in their original clear-cut effect, or else, unless carefully retouched, there will follow a certain loss in the process of reproduction.

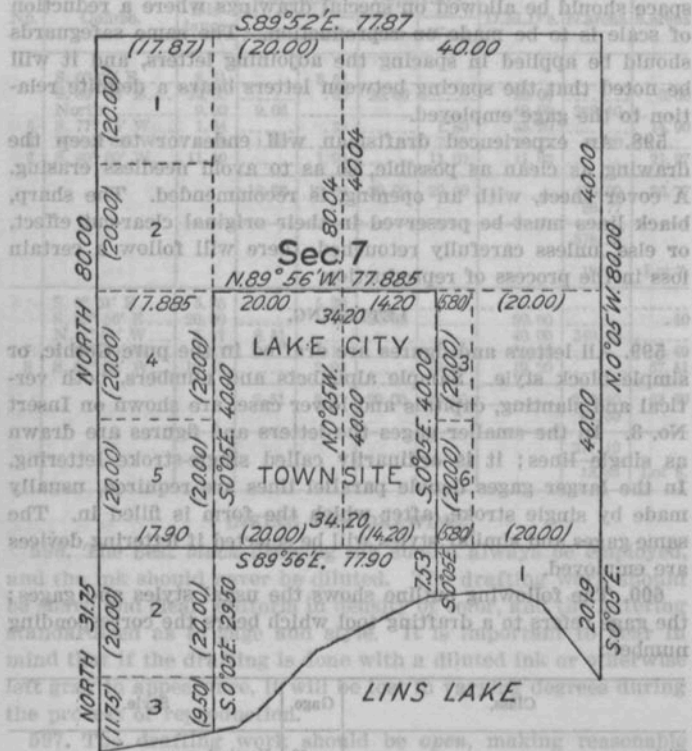
LETTERING.

599. All letters and figures are drafted in the pure Gothic, or simple block style. Sample alphabets and numbers, both vertical and slanting, capitals and lower case, are shown on Insert No. 3. In the smaller gages the letters and figures are drawn as single lines; it is ordinarily called single-stroke lettering. In the larger gages double parallel lines are required, usually made by single stroke, after which the form is filled in. The same gages and similar styles will be selected if lettering devices are employed.

600. The following outline shows the usual styles and gages; the gage refers to a drafting tool which bears the corresponding number:

Class.	Gage.	Style.
Title.....	60	Vertical, caps.
Sections.....	20	Vertical, cap. and l. c.
Total areas.....	15	Vertical.
Lot numbers and areas, usually.....	12	Do.
Proper names of land objects, towns, villages, works, and structures, and tabular data.	20-10	Vertical, caps., or cap. and l. c.
Proper names of water areas and streams.	20-10	Slanting, caps., or cap. and l. c.
Directions and lengths of lines and other technical data.	15-10	Slanting, caps.
Explanatory notes, kinds of timber, designation of roads, and similar data.	15-10	Slanting, cap. and l. c.
Certificates.....	15	Do.

601. At this stage of the drafting work attention should be given to the showing of the directions and lengths of all necessary connecting lines, in addition to the data which ordinarily



Sec.18

FIG. 81.—Boundaries of Lake City town site.

Additional sheets, drawn to a larger scale, are employed in order to show the detail of complicated situations.

appears on the section boundaries. The requirements are set out in sections 163, 190, 232, 233, and 254, Chapters III and IV. Additional sheets, drawn to a larger scale, are employed in order to show the detail of complicated situations.

TOPOGRAPHY.

602. Coming now to a consideration of the *map features* of the plat, it is thought best to point out first that generally only the most essential topographic data need be shown upon the plat. All classes of topography are encountered in practice. Some plats may not require the showing of any topography, others may require the showing of many different features, where the drawing in addition to being a plat may be a complete topographic map. Whatever may be the requirements of the situation, it is intended that the important map features be delineated by the standard symbols adopted by the Board of Surveys and Maps of the Federal Government. A summary of what is required is contained in section 236, Chapter III.

603. In the preparation of the drawing the first question to be considered, after the completion of the base and before adding the topography, is how the important map features are to be shown without obscuring the base data. In simple cases all work may be done readily in black ink on the base drawing. In the difficult cases several overprints in transparent colors will be required. Good judgment should be exercised regarding what is essential, and how the essential things may be shown without unwarranted cost.

604. If the situation requires a transparent overprint of a certain conventional color all of the group of map features which are usually shown in that color will be included. The specimen plat is intended as an example where all map features, with the exception of certain improvements, works, or structures are shown in conventional transparent overprints.

605. Where colors are not required, as in the more simple cases, all map features or groups of features will be delineated upon the base drawing in black ink, following the conventional symbols, and with the exercise of the greatest care that the map features do not interfere with or overlap, or too closely approach the base data. In all such simple cases the topography will be shown as in the following outline:

SIMPLE DRAWINGS, ALL BLACK.

Low relief.....	Black hachure.
Wagon roads and highways.....	Black lines, parallel.
Pack trail.....	Black line, broken.
Culture.....	Black pattern.
Alkali flats.....	Black depression-contour and pattern.
Sand dunes.....	Black pattern.
Water surface, large rivers and lakes.....	Black meander line, without water lines.
Minor drainage.....	Black line, or broken line and dots.
Ponds.....	Black pattern.
Marsh.....	Do.
Timber on level and gentle slopes.....	Do.

606. Where groups of important map features are extensive or complicated, or are of such a character that it is impracticable to execute the drawing in black without detriment to the base, transparent overprints will be employed as shown in the following outlines:

BROWN OVERPRINT.

Low relief where important, and all heavy relief.....	Brown hachure.
Wagon roads and highways.....	Brown lines, parallel.
Pack trail.....	Brown line, broken.
Culture.....	Brown pattern.
Alkali flats.....	Brown depression-con- tour and pattern.
Sand dunes.....	Brown pattern.

BLUE OVERPRINT.

Water surface, large rivers and lakes.....	Blue meander line and blue water lines.
Minor drainage.....	Blue line, or broken line and dots.
Ponds.....	Blue pattern.
Marsh.....	Do.

GREEN OVERPRINT.

Timber on level and gentle slopes..... Green pattern.

Timber on steep slopes..... Kind, lettered in black, or green pattern (to be transferred from a special overlay.) (See secs. 608, 609, 612, and 616.)

607. In making the drawing, where overprints are required, a separate sheet is employed, known as the overlay, upon which will be drawn in *black ink* all natural features which are to be shown by overprint. (See Insert No. 3.) It is important that this sheet be of the same quality, well-seasoned drawing paper as that used for the base, using the same exact scale and making provision for exact "register" when combined with the base drawing.

Before cutting large sheets of drawing paper the draftsman should mark parallel pencil lines on each unit to be cut, on the proper face, and thereafter execute all work on the face of the paper, and see that companion sheets are not turned at right angles. This will avoid much trouble in registration of companion sheets through unequal expansion or contraction due to moisture conditions or changes of temperature.

608. Usually it will be best to transfer the section boundaries accurately from the base drawing to the overlay, by carefully pricking through, then showing the lines in pencil only, excepting that for purposes of assembling the positions of a few section corners should be indicated by very short intersecting fine black lines. The township corners and the center point of the township will generally serve best for purposes of registration. Additional points may be employed if the work is complicated. The several groups of map features as may suit the situation will then be drawn on the overlay, all to be in black ink. Only a single overlay is required ordinarily as the several colors are separated in the process of reproduction.

609. On the specimen plat there has been no overlapping of natural features, and therefore no occasion for difficult separation of colors. It is recommended that this practice be observed generally. Ordinarily the important map features do not over-

lap, excepting timber and relief. Where both occur and both should be shown, the presence of the timber may be indicated by appropriate lettering, but this practice will not give the margin of the forested areas, so that if it is a matter of importance the color plan may be secured by the drafting on a second overlay, in black ink, of the appropriate timber pattern, with its true outline, this special sheet to furnish the green overprint.

610. Ordinarily, the hachure is utilized to show abrupt changes in elevation within level and gently rolling regions, such differences as the eye would quickly note on the ground and readily follow. The hachure is also employed to show all important mesas, peaks, ridges, spurs, and heavy slopes, in such a manner as to portray the bold relief without attempting to show unimportant and minor detail. Only the most important slopes will be shown in a gently rolling country, and care will be needed in drafting to avoid giving a rolling mountainous region the appearance of abrupt or high mountainous slopes.

611. The blue overprint is intended only where there are streams and lakes of major importance, or where the drainage features, if shown in black, would tend to obscure the base, as where there are numerous lakes and streams, or extensive ponds or marshes to be shown in areas of swamp and overflowed lands.

612. The green overprint is likewise intended for use only where numerous distinctions must be shown between forested and nonforested areas and where the cost of the overprint is justified, as in the case of important forest areas.

FIELD SKETCH.

613. Preference should be given to the use of form lines on the field sketch plat to show heavy relief. The form lines are intended to be approximate contours, but are largely sketched without an exact interval or precise elevation above sea level. The form lines carry a much better portrayal of heavy relief than can possibly be shown by the hachure alone, and readily indicate to the engineer and draftsman the position and outline of abrupt changes in slope and the extent of ascents and descents. The hachure is fundamentally dependent upon the approximate contour line for relative slopes and forms. All available data for elevation above sea level and extent of ascents

and descents along the surveyed lines may be incorporated in the form-line sketch. To most engineers after practice, the form lines are more readily, uniformly, and accurately secured than to draw the hachure initially on the field sketch without that guide. Where this is done the draftsman will transfer the form lines to the overlay, in pencil only, then supply the artistic hachuring to bring out the true forms.

614. A well-executed and reasonably accurate field sketch plat is a necessity, if the draftsman is to obtain a representative result, and the engineer is expected to exercise good judgment in doing what is required in the field. A choice of methods is available for ascertaining the map data within the interior of sections, to be accomplished always with regard for the practical value of the work for the purpose of the plat and the economic manner of obtaining the data. The crest or divide forms, slope forms, stream or drainage lines, and meander lines of the larger bodies of water, together constitute the natural skeleton of the map, and when carefully drawn may be readily and correctly interpreted.

615. The proper supervising officer will outline, in the special instructions for each survey, any exceptional methods which are to be employed in the field in the ascertainment of the topographic data, and how the data are to be shown upon the field sketch or map, particularly where the situation requires special consideration, and where it can be foreseen that one or more groups of map features so predominate the situation that overprints will be required on the completed plat, as heretofore described. The field sketch becomes the draftsman's guide, and together with the field notes, the record to be followed. It suffices to state that such record should be truly representative of the situation on the ground, with an accuracy in its various details which will reflect the practical relative importance.

616. Occasionally, in connection with resurveys, for example, the development of the map data of the region may even precede other parts of the survey work, for its great value in making restorations of lost or obliterated monuments, and for ascertaining the location of roads, improvements, and cultivated tracts upon patented and entered lands. Additional examples of the enlarged importance of the map features of the plat will be

and for instructions at 11 (1) 30 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

to be signed by Supervising Officer and not by Draftsman
2. Plat to be on hard paper to be signed by
has not been referred to this in all

found in certain classes of surveys within Indian and forest reservations, coal fields, mineral areas, water-power sites, reservoir sites, irrigation projects, and other regions of relatively large prospective value. In these cases, which frequently embrace regions of extremely bold relief, coordinated cadastral and topographic surveys are made if and when deemed to be advisable for administrative purposes. The relief is shown by brown contour lines, and the timber by green pattern, as conventional for topographic maps.

617. The names of natural features will be correctly given according to accepted usage. Engineers are not authorized to report names of their own selection, but in case of doubt will submit the question through official channels for reference to the United States Geographic Board.

TITLE.

618. Every plat will be given a title similar to that on the specimen plat. This shows the position, the principal meridian, and the State in which the township is located. Fractional portions of townships showing original subdivisive surveys may usually be given the same title without confusion, and it is usually desirable to do so in order to identify the plat in the simplest possible manner. Where supplemental plats and fragmentary subdivisive surveys are necessary, and for all re-survey plats, some appropriate subheading, to qualify the nature of the survey, is usually desirable. The subject is again referred to in section 668. The title and date of approval usually suffice to identify a plat; the subheading, if employed, will explain the special purpose of the plat.

TABULAR DATA.

619. The purpose of the tabular data shown on the specimen township plat is to consolidate the record of the subsisting surveys. The form may be modified to suit special requirements.

CERTIFICATES.

620. The administrative act of surveying the public lands is confided to the Commissioner of the General Land Office under the direction of the Secretary of the Interior. (R. S. 453; Manual, sec. 8, subsec. 32, Ch. I.) It is competent for the

commissioner, acting within this authority, to direct how surveys shall be made and plats constructed, and to require that both field notes and plats be subject to examination, approval, and acceptance.

621. All surveying returns are now prepared for the approval of the Supervisor of Surveys, and when so approved will be forwarded to the Commissioner of the General Land Office, for consideration and acceptance, when satisfactory. The administrative details of the technical examination of the work prior to the approval and acceptance of surveys are prescribed by departmental regulations. The forms of approval and acceptance are shown on the specimen township plat.

DISPOSITION OF THE ORIGINAL, DUPLICATE, AND TRIPPLICATE PLATS, AND ADDITIONAL COPIES.

x 622. The usual practice, where no overprints are required, is to secure a photolithographic edition of the original plat, one copy of which is filed in the General Land Office as the official duplicate, and one transmitted to the proper United States district land office as the official triplicate. A small supply, printed on map paper, is held in the General Land Office for other official use and for sale to the public. Certified copies are secured from this source. The original plat is returned to the proper public survey office to be permanently filed with the field notes of the survey.

623. The original returns of current surveys within those States where the public survey offices have been discontinued are filed in the General Land Office. The duplicates of the plat and field notes of such surveys are furnished to the proper State office, noted in section 1, Chapter I.

x 624. In the types of plats where overprints are required, the certificates will be completed as usual on the base drawing. One photolithographic copy, with all map features supplied, will be taken from the press without the signatures. New autograph signatures will be made on this plat, which then becomes the official original. The base drawing and overlay, and a copy of each color overprint will be returned to the proper public survey office to be filed for such subsequent use as may be required.

Amended by Order No. 171 dated Sept. 5, 1944-195929

*base plats and overlays considered work sheets;
to be signed by Supervisor but not by Asst. Comm.*

*3 Photolitho on hard paper to be signed " " "
base plats + overlays to be returned to Public Sur. Off.*

SUPPLEMENTAL PLATS.

625. A supplemental plat is one designed to show a revised subdivision of one or more sections without change in the section boundaries, and usually without other modification of the original survey excepting where necessary for the segregation of lands to be eliminated.

626. A distinction is needed between plats designed to show a revised subdivision of certain sections and those required to show additional fragmentary areas that were omitted from the previously approved plats of the same fractional sections. Excluding now the plats which involve parts of sections that were not completed in the first instance, supplemental plats are most frequently required in order to show the segregation of mineral lands from adjoining agricultural lands, where the former are included in mineral claim surveys made subsequent to the original subdivision of the township, or where the mineral claims were overlooked at the time of the approval of the original township plat.

627. Similar supplemental plats are required for the lotting of public lands surrounding private claims of every description where the latter were not segregated at the time of the original subdivision of the public lands. Supplemental plats are frequently required for the segregation of forest homestead surveys, and also to facilitate allotments of Indian lands in small fractional units. Occasionally a supplemental plat is required for the entry of public lands where the original plat failed to provide units suitable for disposal, and in other cases where special laws or regulations permit the entry of public lands in fractional units not provided by the original plat.

628. All supplemental plats should show a proper reference to the original approved plat, the purpose of and the authority for its preparation, and all additional technical data, without unnecessary duplication of that carried by the original plat. It is usually desirable to furnish the directions and lengths of the section boundaries, and to show data derived by retracements. The scale of the supplemental plat may be enlarged to 20 or 10 chains to an inch as appropriate. The new fractional lots will

be numbered as required in sections 199 and 224, Chapter III, and proper quantities shown. No revision of the total area within the section is required, and there is generally no occasion for showing topography.

629. The computation of the areas of the several fractional lots will be based upon the subsisting record, including the data derived by retracements where field work is required. The results of the computations will ordinarily require some proportionate adjustment to secure a sum of the several parts within each original quarter-quarter section or fractional lot, equal to the area returned on the original plat. If the retracements show an excessive discrepancy in the record, as defined by section 661, the areas derived by exact calculation will be employed.

630. A few additional considerations will be applied to supplemental plats which are to show a segregation of mineral land. The revised lotting will be designed to accommodate only the pending entry, as there is generally no way of foreseeing the type of entry that may be made subsequently on the vacant areas. The lengths of lines given by the record of a mineral patent survey are in the foot unit; a conversion to the chain unit is required to the extent that the data are needed in the computation of areas to be shown on the supplemental plat. The equivalent distances will be shown to the nearest tenth of a link. The scale of the mineral segregation plat will be expressed in both units, but the values on the face of the drawing will be given in the chain unit only.

631. The authority for the preparation of supplemental plats issues only from the General Land Office and as may be necessary to accommodate pending entries. In every case the status of the surrounding subdivisions must be examined in the General Land Office and care exercised that no changes are contemplated which will affect any adjoining entry or patent. If additional field work is required, the public survey office will request authority to issue the usual special instructions.

632. The certificates of approval and acceptance will take the forms shown in the illustrations, modified as may be appropriate.

1990°—31—26

(Signed)

Assistant Commissioner

633. Illustration on opposite page.

A modified form of lotting to accommodate an unusual entry, based entirely upon the public land survey record on file in the public survey office, and without additional field work.

Title: Township No. 8 North, Range No. 20 West, of the San Bernardino Meridian, California. Supplemental Plat of Section 19.

Scale: 20 chains to an inch.

Certificates:

PUBLIC SURVEY OFFICE,

San Francisco, Calif., April 30, 1926.

The above supplemental plat of section 19, Township No. 8 North, Range No. 20 West, of the San Bernardino Meridian, California, based upon the plat approved October 8, 1880, showing a subdivision of original lots 3 and 4, to accommodate homestead entry Los Angeles 035503, prepared in accordance with instructions contained in the Commissioner's letter "E" dated April 20, 1926, is hereby approved.

(Signed)

Office Cadastral Engineer.

DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE,

Washington, D. C., May 14, 1926.

The amended lottings represented by this supplemental plat having been correctly made in accordance with the regulations of this office, the plat is hereby accepted.

(Signed)

Assistant Commissioner.

634. Illustration on opposite page.

A fractional lotting made subsequent to two forest homestead entry surveys, based entirely upon the public land and forest homestead entry survey records on file in the Washington office, and without additional field work.

Title: Township No. 5 South, Range No. 5 East, of the Black Hills Meridian, South Dakota. Supplemental Plat of Section 15.

Scale: 10 chains to an inch.

Certificate:

DEPARTMENT OF THE INTERIOR,

GENERAL LAND OFFICE,

Washington, D. C., November 23, 1926.

The above supplemental plat of section 15, Township No. 5 South, Range No. 5 East, of the Black Hills Meridian, South Dakota, based upon the plat approved May 23, 1899, showing lottings of fractional areas created by the segregation of forest homestead entry surveys Nos. 263 and 477, to accommodate additional homestead entry Pierre 024993, having been correctly prepared in accordance with the regulations of this office, is hereby approved.

(Signed)

Assistant Commissioner.

FIG. 82.—Explanation on opposite page.

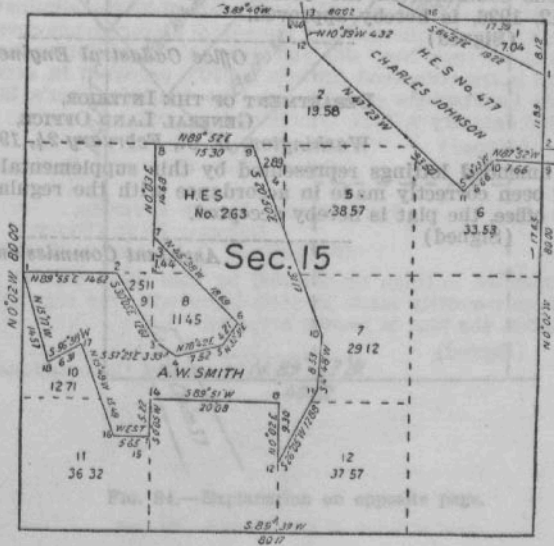
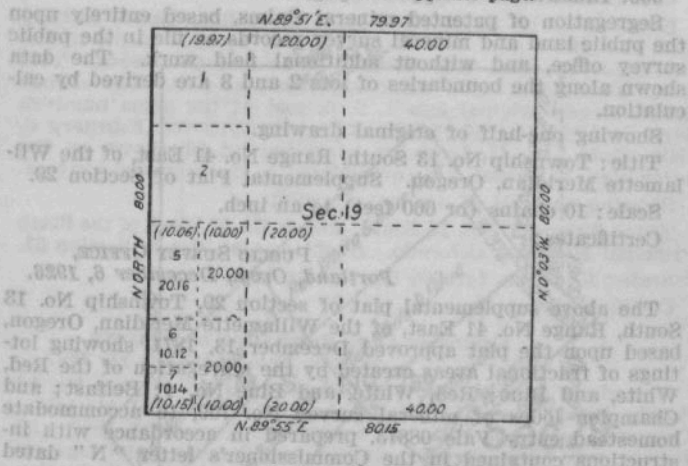


FIG. 83.—Explanation on opposite page.

635. Illustration on opposite page.

Segregation of patented mineral claims, based entirely upon the public land and mineral survey records on file in the public survey office, and without additional field work. The data shown along the boundaries of lots 2 and 3 are derived by calculation.

Showing one-half of original drawing.

Title: Township No. 13 South, Range No. 41 East, of the Willamette Meridian, Oregon. Supplemental Plat of Section 29.

Scale: 10 chains (or 660 feet) to an inch.

Certificates:

PUBLIC SURVEY OFFICE,
Portland, Ore., December 6, 1926.

The above supplemental plat of section 29, Township No. 13 South, Range No. 41 East, of the Willamette Meridian, Oregon, based upon the plat approved December 13, 1871, showing lottings of fractional areas created by the segregation of the Red, White, and Blue; Red, White, and Blue No. 4; Belfast; and Champion lodes of mineral survey No. 759, to accommodate homestead entry Vale 08873, prepared in accordance with instructions contained in the Commissioner's letter "N" dated April 12, 1926, is hereby approved.

(Signed)

Office Cadastral Engineer.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., February 24, 1927.

The amended lottings represented by this supplemental plat having been correctly made in accordance with the regulations of this office, the plat is hereby accepted.

(Signed)

Assistant Commissioner.

Title: Hills Mendocino, South Dakota.

Scale: 10 chains to an inch.

Certificate:

The above supplemental plat of section 29, Township No. 5 South, Range No. 5 East, of the Willamette Meridian, Oregon, based upon the plat approved May 22, 1871, showing lottings of fractional areas created by the segregation of forest homestead entry surveys Nos. 262 and 477, to accommodate additional homestead entry Pierce 021951, having been correctly prepared in accordance with the regulations of this office, is hereby approved.

(Signed)

Illustration on opposite page.

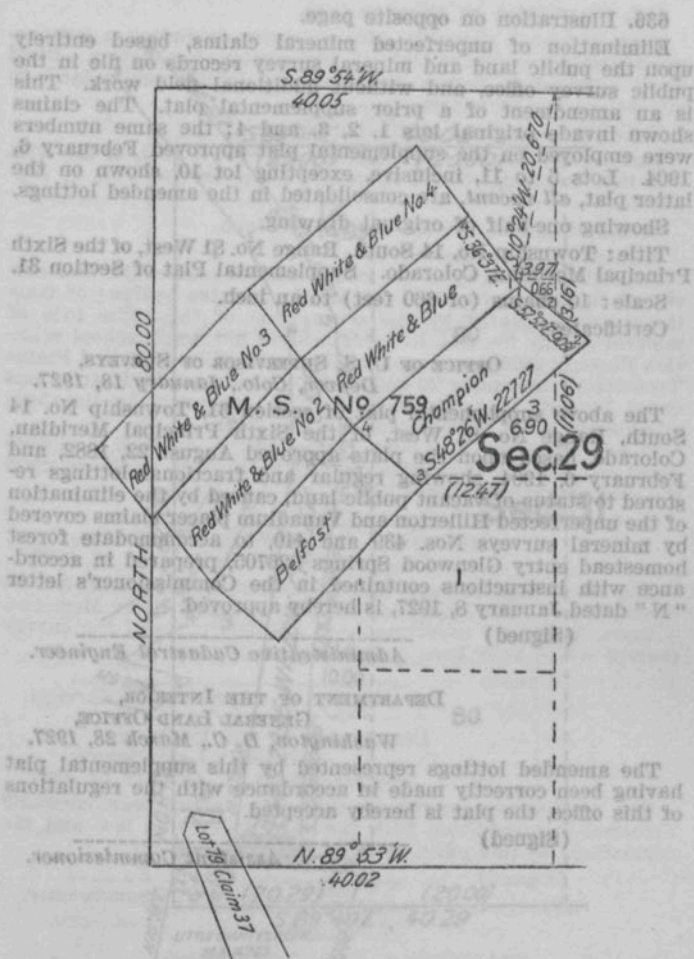


FIG. 84.—Explanation on opposite page.

636. Illustration on opposite page.

Elimination of unperfected mineral claims, based entirely upon the public land and mineral survey records on file in the public survey office, and without additional field work. This is an amendment of a prior supplemental plat. The claims shown invade original lots 1, 2, 3, and 4; the same numbers were employed on the supplemental plat approved February 6, 1904. Lots 5 to 11, inclusive, excepting lot 10, shown on the latter plat, *all vacant*, are consolidated in the amended lottings.

Showing one-half of original drawing.

Title: Township No. 14 South, Range No. 81 West, of the Sixth Principal Meridian, Colorado. Supplemental Plat of Section 31.

Scale: 10 chains (or 660 feet) to an inch.

Certificates:

OFFICE OF U. S. SUPERVISOR OF SURVEYS,
Denver, Colo., January 18, 1927.

The above supplemental plat of section 31, Township No. 14 South, Range No. 81 West, of the Sixth Principal Meridian, Colorado, based upon the plats approved August 22, 1882, and February 6, 1904, showing regular and fractional lottings restored to status of vacant public land, caused by the elimination of the unperfected Hillerton and Vanadium placer claims covered by mineral surveys Nos. 439 and 440, to accommodate forest homestead entry Glenwood Springs 026705, prepared in accordance with instructions contained in the Commissioner's letter "N" dated January 8, 1927, is hereby approved.

(Signed)

Administrative Cadastral Engineer.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., March 28, 1927.

The amended lottings represented by this supplemental plat having been correctly made in accordance with the regulations of this office, the plat is hereby accepted.

(Signed)

Assistant Commissioner.

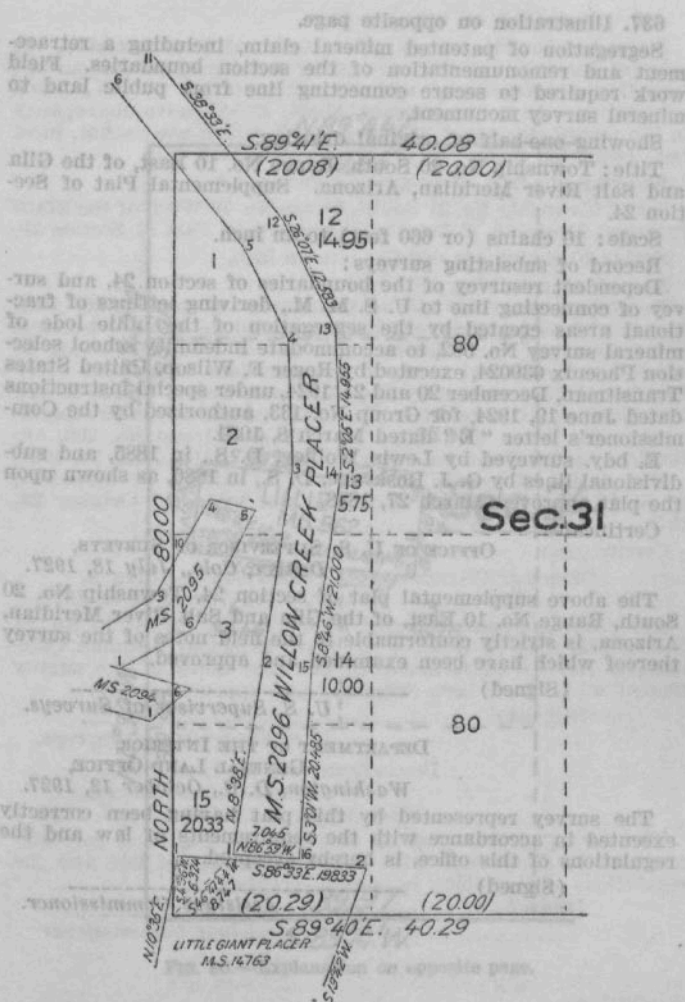


Fig. 85.—Explanation on opposite page.

637. Illustration on opposite page.

Segregation of patented mineral claim, including a retracement and remonumentation of the section boundaries. Field work required to secure connecting line from public land to mineral survey monument.

Showing one-half of original drawing.

Title: Township No. 20 South, Range No. 10 East, of the Gila and Salt River Meridian, Arizona. Supplemental Plat of Section 24.

Scale: 10 chains (or 660 feet) to an inch.

Record of subsisting surveys:

Dependent resurvey of the boundaries of section 24, and survey of connecting line to U. S. M. M., deriving lottings of fractional areas created by the segregation of the Lillie lode of mineral survey No. 562, to accommodate indemnity school selection Phoenix 039024, executed by Roger F. Wilson, United States Transitman, December 20 and 21, 1924, under special instructions dated June 19, 1924, for Group No. 133, authorized by the Commissioner's letter "E" dated March 8, 1924.

E. bdy. surveyed by Lewis Wolfley, D. S., in 1885, and subdivisional lines by G. J. Roskruge, D. S., in 1886, as shown upon the plat approved March 27, 1888.

Certificates:

OFFICE OF U. S. SUPERVISOR OF SURVEYS,
Denver, Colo., July 18, 1927.

The above supplemental plat of section 24, Township No. 20 South, Range No. 10 East, of the Gila and Salt River Meridian, Arizona, is strictly conformable to the field notes of the survey thereof which have been examined and approved.

(Signed)

U. S. Supervisor of Surveys.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., October 12, 1927.

The survey represented by this plat having been correctly executed in accordance with the requirements of law and the regulations of this office, is hereby accepted.

(Signed)

Assistant Commissioner.

332. Illustration on opposite page.
 Meter-and-boundary survey of a body of land classified as mineral bearing, but not covered by a mineral patent survey, including a retracement and resegmentation of the section boundaries. As the retracement shows an excessive discrepancy in the retraced areas which are vacant, have

been computed under the provisions of section 601. Showing one-half of original drawing.
 Title: Township No. 21 South, Range No. 70 West of the Sixth Principal Meridian, Colorado. Supplemental Plat of Section 20.
 Scale: 10 chains (or 660 feet) to an inch.

Record of a retracing survey.
 Independent survey of the boundaries of a meter-and-boundary survey which is classified as mineral bearing, and connected lines bearing bearings of true or magnetic bearing, and adjusting mineral land to accommodate same.
 Pueblo 014917 executed by Roy E. Chase, United States Engineer, October 12, 1927. Initials, under special instructions dated 1927.
 Initials in the Commissioner's office by the Commissioner's office, October 23, 1927.

Certification of survey upon which is based the above supplemental plat of section 20 of the Sixth Principal Meridian, Colorado, Township No. 21 South, Range No. 70 West of the Sixth Principal Meridian, Colorado, which have been examined and approved.

U. S. Surveyor General, Department of the Interior, Washington, D. C., December 7, 1927.
 The survey represented by this plat having been correctly executed in accordance with the requirements of law and the regulations of this office is hereby accepted.

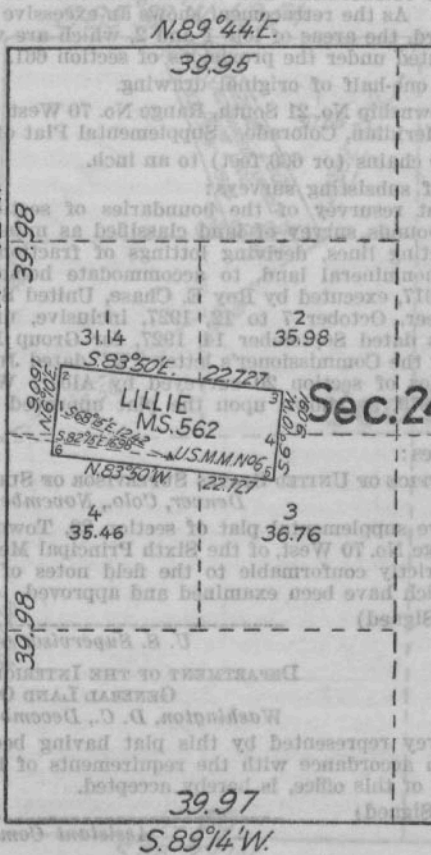


FIG. 86.—Explanation on opposite page.

638. Illustration on opposite page.

Metes-and-bounds survey of a body of land classified as mineral bearing, but not covered by a mineral patent survey, including a retracement and remonumentation of the section boundaries. As the retracement shows an excessive discrepancy in the record, the areas of lots 1 and 2, which are vacant, have been computed under the provisions of section 661.

Showing one-half of original drawing.

Title: Township No. 21 South, Range No. 70 West, of the Sixth Principal Meridian, Colorado. Supplemental Plat of Section 20.

Scale: 10 chains (or 660 feet) to an inch.

Record of subsisting surveys:

Dependent resurvey of the boundaries of section 20, with metes-and-bounds survey of land classified as mineral bearing, and connecting lines, deriving lottings of fractional areas of adjoining nonmineral land, to accommodate homestead entry Pueblo 044617, executed by Roy E. Chase, United States Cadastral Engineer, October 7 to 12, 1927, inclusive, under special instructions dated September 14, 1927, for Group No. 203, authorized by the Commissioner's letter "E" dated June 24, 1927.

Boundaries of section 20 surveyed by Albert W. Brewster, D. S., in 1879, as shown upon the plat approved October 23, 1879.

Certificates:

OFFICE OF UNITED STATES SUPERVISOR OF SURVEYS,
Denver, Colo., November 22, 1927.

The above supplemental plat of section 20, Township No. 21 South, Range No. 70 West, of the Sixth Principal Meridian, Colorado, is strictly conformable to the field notes of the survey thereof which have been examined and approved.

(Signed) _____

U. S. Supervisor of Surveys.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., December 7, 1927.

The survey represented by this plat having been correctly executed in accordance with the requirements of law and the regulations of this office, is hereby accepted.

(Signed) _____

Assistant Commissioner.

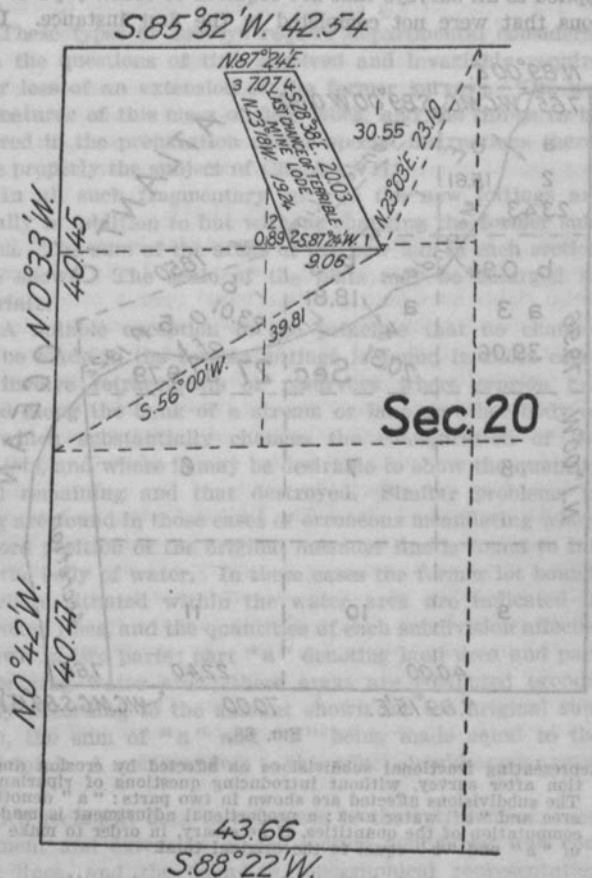


FIG. 87.—Explanation on opposite page.

class may be...
 in...
 place at date of original subdivision situated between a...
 erroneous or fictitious member line and the actual bank of a

PLATS OF FRAGMENTARY SURVEYS.

639. The term "fragmentary survey" may be appropriately applied to all surveys that are required to identify parts of sections that were not completed in the first instance. In this

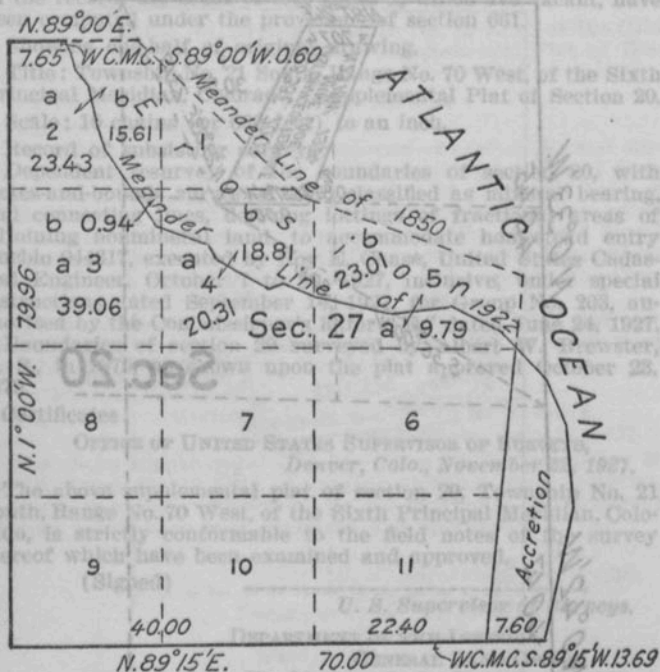


FIG. 88.

Representing fractional subdivisions as affected by erosion and accretion after survey, without introducing questions of riparian rights. The subdivisions affected are shown in two parts: "a" denoting land area and "b" water area; a proportional adjustment is made in the computation of the quantities, if necessary, in order to make the sum of "a" and "b" equal to the original total.

class may be included partially surveyed sections; omitted islands, if title is in the United States; such areas as lands in place at date of original subdivision situated between a grossly erroneous or fictitious meander line and the actual bank of a

stream or lake, where riparian rights do not obtain as under the usual doctrine; and other lands of substantial value and extent, which for various reasons were not included in the original surveys.

640. These types of surveys require departmental consideration on the questions of title involved and invariably require more or less of an extension of the former surveys. The unusual features of this class of field work, and the things to be considered in the preparation of the special instructions therefor, are properly the subject of Chapter VII.

641. In all such fragmentary surveys the new lottings are essentially in addition to but without changing the former subdivisions. The sum of the areas of the new lots in each section will be shown. The scale of the plats may be enlarged as appropriate.

642. A notable exception to the principle that no changes should be made in the former lottings is found in those cases which involve retracements or resurveys where *erosion* has occurred along the bank of a stream or lake or other body of water which substantially changes the configuration of the former lots, and where it may be desirable to show the quantity of land remaining and that destroyed. Similar problems in platting are found in those cases of erroneous meandering where the record position of the original meander line is found to fall within the body of water. In these cases the former lot boundaries where situated within the water area are indicated in light broken lines, and the quantities of each subdivision affected are shown in two parts: part "a" denoting land area and part "b" denoting water area; these areas are computed proportionately according to the amount shown for the original subdivision, the sum of "a" and "b" being made equal to the original total. A memorandum to this effect should appear upon the plat.

643. All technical data in reference to the retracement, reestablishment and extension of the section boundaries and connecting lines, and the complete topographical representation over the additional areas, will be shown upon the plats of fragmentary surveys. If the retracements and remonumentation assume the character of a dependent resurvey of the boundaries

of one or more sections, that fact will be indicated on the plat together with a proper showing of the important map data throughout the entire area surveyed and resurveyed. There will also be shown an appropriate reference to the former approved plats, and a citation of the departmental decision which authorized the extension survey.

644. The certificates of approval and acceptance on plats of fragmentary surveys will take the usual form; the necessary memorandum will be modeled after the examples given for the special cases already explained in Chapter VII.

RESURVEY PLATS.

645. A somewhat different type of plat is required for representing resurveys as defined in Chapter VI. In all cases where valid rights have been acquired based upon a prior subdivision, it is important that the plat of the resurvey clearly identify the lands so involved, and that the plat of the resurvey indicate the descriptions of such lands with reference to the former plat. The subdivision of the remaining public lands may or may not be modified, according to the type of resurvey.

646. A resurvey by the United States after the issuance of a patent does not affect the rights of the patentee under the former survey and plat. The United States, so long as it has not conveyed the title, may resurvey or reestablish boundaries. This is done as may appear necessary, but the resurvey can not affect the rights of owners situated outside of the boundaries of the public lands. The authority to make resurveys is subject to the necessary limitation that the courts may protect the private rights based upon the former survey and plat against interference by the corrective survey. The courts may properly take jurisdiction over matters of interference and hear disputes relating to the position of the former lines.

647. The peculiar requirements of the resurvey plat with respect to indicating the position of the alienated lands are set out in the memorandum forms which appear in sections 425, 448, 449, and 450, Chapter VI. It remains to be shown how the identification is to be accomplished in the case of tract segregations, as required in section 448, Chapter VI, but no new principles are involved.

648. The tract segregations will be laid out on the plats of resurveys as any private land claim would be shown upon an original plat, but in order to show the detail of complicated situations one or more additional sheets are frequently necessary. If a claim is found to be conformable as defined in section 445, fifth paragraph, Chapter VI, its boundaries may be shown by giving greater weight to such parts of the regular subdivision-of-section lines of the resurvey. In every case the outline of all tract segregations is to be shown on the first or principal sheet on the normal plan usually employed to show other types of private land claims.

649. On any of the several sheets as appropriate an index will be supplied to tabulate the description of each tract in terms of the original plat. The following index form is acceptable:

Index to segregated tracts.

No.	Tract. Entry and status.	Original survey.			
		Tp.	Rg.	Sec.	Subdvn.
39	Buffalo 2979.	58	75	29	NW $\frac{1}{4}$ NW $\frac{1}{4}$.
	H. E.	58	75	29	S $\frac{1}{2}$ NW $\frac{1}{4}$.
	W. J. Williams. Patented.	58	75	29	NW $\frac{1}{4}$ SW $\frac{1}{4}$.
41	Buffalo 1567.	58	75	20	SE $\frac{1}{4}$ SW $\frac{1}{4}$.
	D. E.	58	75	20	W $\frac{1}{2}$ SE $\frac{1}{4}$.
	W. J. Williams. Pending.	58	75	29	NE $\frac{1}{4}$ NW $\frac{1}{4}$.
77	Designated school section.	58	75	36	All.
95	Sundance 03186.	58	74	30	Lot 1.
	D. E. C. R. Massey. Final certificate.	58	74	30	Lot 2.
101	Vacant.	58	75	24	Lot 4.
102	Vacant.	58	75	23	NE $\frac{1}{4}$ SE $\frac{1}{4}$.

650. In some cases there is a demand for the description of a tract in terms of its component parts as determined by the original survey; in these exceptional cases, and only as deemed to be appropriate, the several parts may be indicated by letters A, B, C, etc., with the index modified as follows:

Index to segregated tracts.

Tract.		Original survey.				Component parts.	
No.	Entry and status.	Tp.	Rg.	Sec.	Subdvn.	Subtract.	Area.
42	Buffalo 0833.	58	75	20	NE $\frac{1}{4}$ SE $\frac{1}{4}$.	B	40.00
	H. E.	58	75	21	Lot 4.	A	32.00
	Thomas R. Williams.	58	75	21	NW $\frac{1}{4}$ SW $\frac{1}{4}$.	C	40.00
	Pending.	58	75	21	SW $\frac{1}{4}$ SW $\frac{1}{4}$.	D	40.00
46	Buffalo 08642.	58	75	24	Lot 3.	A	28.12
	H. E.	58	75	24	NW $\frac{1}{4}$ SW $\frac{1}{4}$.	B	40.00
	Emmet Cain.	58	75	24	NE $\frac{1}{4}$ SW $\frac{1}{4}$.	C	40.00
	Pending.	58	75	24	SE $\frac{1}{4}$ SW $\frac{1}{4}$.	D	40.00

651. The above method is well adapted to the identification and subdivision of isolated tracts of public lands where said tracts have been surveyed by metes and bounds. In these cases the arrangement of the data carried by the index will be the same, and the status of the tract will be shown as vacant.

652. If there are one or more conformable claims to be identified by amended description in terms of the resurvey, without segregation by metes and bounds, another form of index will be required, as follows:

Index to appropriated subdivisions.

Tract.	Original survey.				Resurvey.			
	Entry and status.	Tp.	Rg.	Sec.	Subdvn.	Tp.	Rg.	Sec.
Buffalo 984.	45	79	12	NE $\frac{1}{4}$ SE $\frac{1}{4}$.	45	79	12	SW $\frac{1}{4}$ SE $\frac{1}{4}$.
T. & S.	45	79	12	NW $\frac{1}{4}$ SE $\frac{1}{4}$.	45	79	12	SE $\frac{1}{4}$ SW $\frac{1}{4}$.
Fred A. Jones.	45	79	12	NE $\frac{1}{4}$ SW $\frac{1}{4}$.	45	79	12	SW $\frac{1}{4}$ SW $\frac{1}{4}$.
Pending.								
Buffalo. I. S. S. List 6. Approved.	45	79	12	SE $\frac{1}{4}$ SE $\frac{1}{4}$.	45	79	13	NW $\frac{1}{4}$ NE $\frac{1}{4}$.

653. The several forms of index may be readily combined into one tabulation, if desirable, in which case it should be given

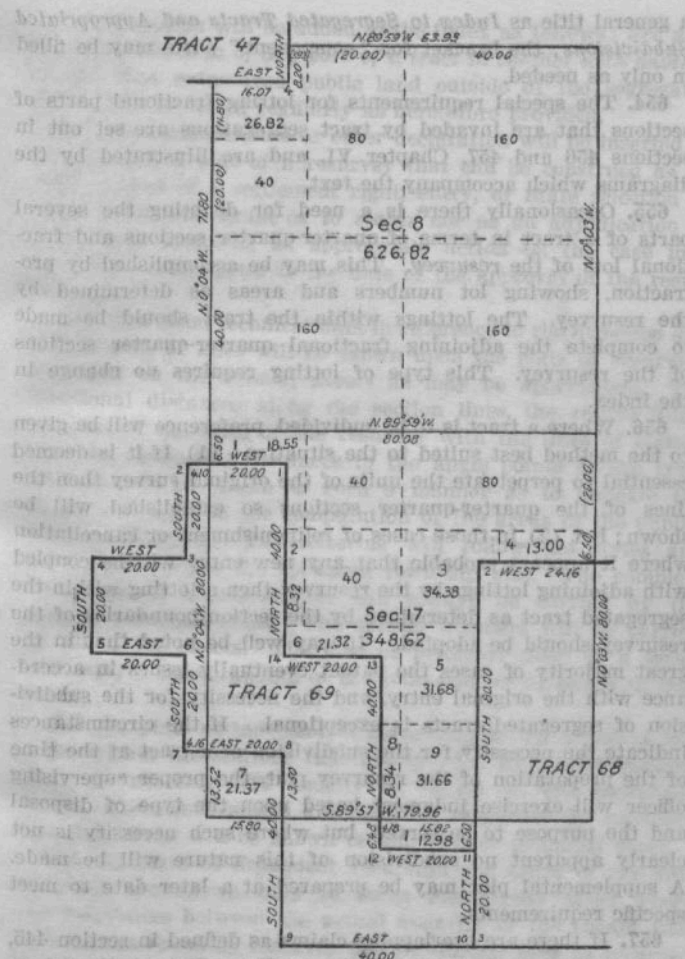


FIG. 89.—Normal tract segregations, with fractional lotting of the adjoining public land. The tract segregations will be laid out on the plats of resurveys as any private land claim would be shown upon an original plat.

a general title as *Index to Segregated Tracts and Appropriated Subdivisions*; the bracket for "component" parts may be filled in only as needed.

654. The special requirements for lotting fractional parts of sections that are invaded by tract segregations are set out in sections 456 and 457, Chapter VI, and are illustrated by the diagrams which accompany the text.

655. Occasionally there is a need for denoting the several parts of a tract in terms of quarter-quarter sections and fractional lots of the *resurvey*. This may be accomplished by protraction, showing lot numbers and areas as determined by the *resurvey*. The lottings within the tract should be made to complete the adjoining fractional quarter-quarter sections of the *resurvey*. This type of lotting requires no change in the index.

656. Where a tract is to be subdivided, preference will be given to the method best suited to the situation: (1) If it is deemed essential to perpetuate the units of the original survey then the lines of the quarter-quarter sections so established will be shown; but (2) in those cases of relinquishment or cancellation where it appears probable that any new entry will be coupled with adjoining lottings by the *resurvey* then a lotting within the segregated tract as determined by the section boundaries of the *resurvey* should be adopted. It may well be noted that in the great majority of cases the patent eventually issues in accordance with the original entry, and the necessity for the subdivision of segregated tracts is exceptional. If the circumstances indicate the necessity for the subdivision of a tract at the time of the preparation of the *resurvey* plat, the proper supervising officer will exercise judgment based upon the type of disposal and the purpose to be served, but where such necessity is not clearly apparent no subdivision of this nature will be made. A supplemental plat may be prepared at a later date to meet specific requirements.

657. If there are overlapping claims as defined in section 445, sixth paragraph, Chapter VI, the conflict will be indicated on the plat of the *resurvey*; the component parts will be protracted, but no new lot numbers will be assigned nor quantities shown within the segregated tracts that are involved in the conflict.

A memorandum will be added to the index as follows: *See field notes for the area of any part of a tract in conflict with another tract.* The uninvolved public land outside of the segregated tracts will be lotted regularly as heretofore provided.

658. No memorandum or other declaration will be inserted or shown upon a plat of a resurvey that can be construed as an adjudication of a settlement right, entry, or State selection or right under any grant *as to status* nor as an adjudication of a conflict, excepting as appropriate action on the case may have been taken prior to the date of the approval of the resurvey plat.

659. The usual technical data in reference to the direction and lengths of lines will be shown upon the plats of resurveys arranged on the several sheets as may be appropriate. The fractional distances along the section lines, the record intersections of the lines of the resurvey with the lines of claims, and the connecting distances to the angle points of the tract surveys will be shown in such a manner as to indicate the values employed in the computation of the areas of the public-land subdivisions. The lettering will follow the styles and gages shown upon the specimen township plat. The complete topographical representation will always be carried by the first or principal sheet. The section numbers will be carried on all of the sheets. The first or principal sheet of a series will carry a memorandum of the total number of sheets in that series.

660. On plats of independent resurveys the lot numbers and areas within the sections that are invaded by nonconformable tract segregations will usually be shown on the additional sheets, where such sheets are required, otherwise the lot numbers and areas will be shown on the first or principal sheet.

661. On plats of dependent resurveys the areas of the subdivisions are shown only in those exceptional cases where the differences between the actual quantity of the vacant subdivisions as found by resurvey and the former area as returned on the original approved plat are so great as to warrant revision. In that case the question of a revision should rest upon the element of *quantity* rather than upon that of *distortion*, and for practical purposes a variation of as much as 2.00 acres to the quarter-quarter section has been found advisable before

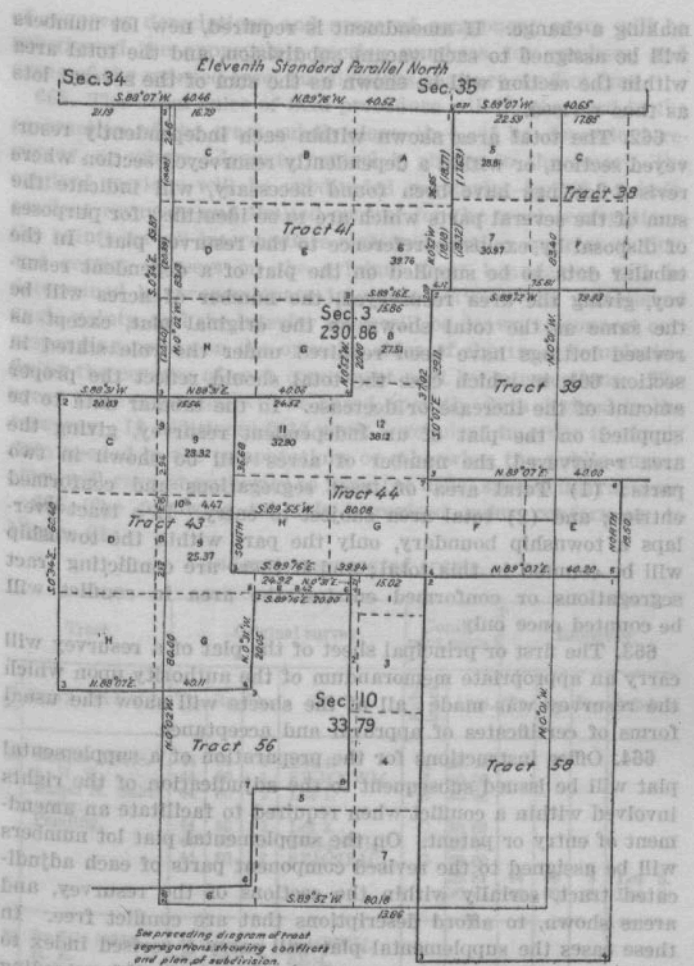


Fig. 91.—Tract segregations, with revised form of conflict-free lottings; applicable after the adjudication of the rights. A supplemental plat will be issued subsequent to the adjudication of the rights involved within a conflict.

making a change. If amendment is required, new lot numbers will be assigned to each vacant subdivision, and the total area within the section will be shown as the sum of the several lots as thus revised.

662. The total area shown within each independently resurveyed section, or within a dependently resurveyed section where revised lottings have been found necessary, will indicate the sum of the several parts which are to be identified for purposes of disposal by exclusive reference to the resurvey plat. In the tabular data to be supplied on the plat of a dependent resurvey, giving the area resurveyed, the number of acres will be the same as the total shown on the original plat, except as revised lottings have been required under the rule stated in section 661, in which case the total should reflect the proper amount of the increase or decrease. In the tabular data to be supplied on the plat of an independent resurvey, giving the area resurveyed, the number of acres will be shown in two parts: (1) Total area of tract segregations and conformed entries; and (2) total area subject to entry. If a tract overlaps a township boundary, only the part within the township will be counted in this total; and if there are conflicting tract segregations or conformed entries, the area in conflict will be counted once only.

663. The first or principal sheet of the plat of a resurvey will carry an appropriate memorandum of the authority upon which the resurvey was made; all of the sheets will show the usual forms of certificates of approval and acceptance.

664. Office instructions for the preparation of a supplemental plat will be issued subsequent to the adjudication of the rights involved within a conflict when required to facilitate an amendment of entry or patent. On the supplemental plat lot numbers will be assigned to the revised component parts of each adjudicated tract, serially within the sections of the resurvey, and areas shown, to afford descriptions that are conflict free. In these cases the supplemental plat will carry a revised index to the segregated tracts shown and a reference to the preceding plat. In the index the descriptions in terms of the original survey of those tract subdivisions that are found reduced by reason of the previous conflict will be omitted, and in the columns

of resurvey descriptions and areas of component parts will be substituted the appropriate section numbers, lot numbers, and areas of the reduced tract subdivisions that are conflict free.

665. The usual rules of field procedure will be observed in the protraction of the tract subdivisions—i. e., if by dependent resurvey, or where adequate control is shown in the record, the original sections will be subdivided regularly—but if by independent resurvey and limited control for the tract segregations, the points for all intermediate sixteenth-section, quarter-section, and section corners on the original tract boundaries will be determined by proportionate intervals between the established angle points, and the interior lines will be drawn to connect corresponding points on the opposite sides of the tract boundaries, fixing the corners of each component part by intersections. The areas to be computed will be based upon the data derived in the resurvey. If additional field work is required in order to supply data needed in the computations or otherwise, the public survey office will request authority to issue the usual special instructions.

666. The following table is a revised index conforming to Figure 91:

Index to segregated tracts.

No.	Tract. Entry and status.	Original survey.				Component parts. ¹		Resurvey.			
		Tp.	Rg.	Sec.	Subdvn.	Sub-tract.	Area.	Tp.	Rg.	Sec.	Subdvn.
38	Buffalo 010118.	44	80	1	Lot 4.	A	35.16				
	A. H. E.	44	80	1	SW $\frac{1}{4}$ NW $\frac{1}{4}$.	H	40.00				
	Ralph R. Baldwin.	44	80	2	Lot 1.	B	35.86				
	Pending.	44	80	2	Lot 2.	C	36.06				
		44	80	2	SW $\frac{1}{4}$ NE $\frac{1}{4}$.	F	40.00				
		44	80	2	SE $\frac{1}{4}$ NE $\frac{1}{4}$.	G	40.00				
							28.81	44	80	3	Lot 5.
						30.97	44	80	3	Lot 7.	
39	Buffalo 09382.	44	80	1	W $\frac{1}{2}$ SW $\frac{1}{4}$.						
	H. E.	44	80	2	SE $\frac{1}{4}$.						
	Ralph R. Baldwin.	44	80	2	E $\frac{1}{2}$ SW $\frac{1}{4}$.						
	Patented.										

¹ See sec. 650.

Index to segregated tracts—Continued

No.	Tract.	Original survey.				Component parts.		Resurvey.			
		Entry and status.	Tp.	Rg.	Sec.	Subdvn.	Sub-tract.	Area.	Tp.	Rg.	Sec.
41	Buffalo 09311.	44	80	3	Lot 1.	A	36.66				
	H. E.	44	80	3	Lot 2.	B	36.85				
	Henry J. Brun-	44	80	3	Lot 3.	C	37.00				
	ning.	44	80	3	SE $\frac{1}{4}$ NW $\frac{1}{4}$.	D	40.00				
	Pending.	44	80	3	SW $\frac{1}{4}$ NE $\frac{1}{4}$.	E	40.00				
		44	80	3	NW $\frac{1}{4}$ SE $\frac{1}{4}$.	G	40.00				
		44	80	3	NE $\frac{1}{4}$ SW $\frac{1}{4}$.	H	40.00	44	80	3	Lot 6.
43	Buffalo 011734.	44	80	3	SW $\frac{1}{4}$ SW $\frac{1}{4}$.	C	40.00				
	H. E.	44	80	10	NW $\frac{1}{4}$ NW $\frac{1}{4}$.	D	40.00				
	Henry Barnes.	44	80	10	SE $\frac{1}{4}$ NW $\frac{1}{4}$.	G	40.00				
	Pending.	44	80	10	SW $\frac{1}{4}$ NW $\frac{1}{4}$.	H	40.00				
							28.32	44	80	3	Lot 9.
							4.47	44	80	3	Lot 10.
							2.94	44	80	4	Lot 9.
							0.41	44	80	4	Lot 10.
							2.12	44	80	9	Lot 8.
							8.42	44	80	10	Lot 8.
						25.37	44	80	10	Lot 9.	
44	Buffalo 07532.	44	80	10	NE $\frac{1}{4}$ NE $\frac{1}{4}$.	H	40.00				
	H. E.	44	80	11	NW $\frac{1}{4}$ NE $\frac{1}{4}$.	E	40.00				
	Antoine Faure.	44	80	11	NE $\frac{1}{4}$ NW $\frac{1}{4}$.	F	40.00				
	Pending.	44	80	11	NW $\frac{1}{4}$ NW $\frac{1}{4}$.	G	40.00				
							27.51	44	80	3	Lot 8.
						32.90	44	80	3	Lot 11.	
						38.12	44	80	3	Lot 12.	

667. A word of caution to the engineers and draftsmen who are engaged upon the platting of *resurveys* is needed in order to guard against a possible misinterpretation of the rules on that subject, to the effect that it is not expected that the different cases can all be brought into a similar treatment. The contributing factors to be dealt with appear in considerable variety, and the methods suited to those situations which may not be involved in a particular case should be promptly set aside, so as to avoid the introduction of unnecessary complications. The normal resurvey may be brought within a fairly definite, standardized drafting practice, but each unusual case

needs a special analysis with the purpose that the proper supervising officer may exercise discretion as to how the detail may be most suitably platted.

TITLE SUBHEADINGS.

668. The various types of special plats will be given the usual title by township, range, meridian, and State (page 60), with appropriate subheading (pages 30-15) modeled after one of the following forms:

- (1) Supplemental Plat of Section 15.
- (2) Plat of Four Islands in Burntside Lake.
- (3) Plat of Fiddlers Island in Venice Bay.
- (4) Dependent Resurvey.
- (5) Independent Resurvey with Tract Segregations.
- (6) Independent Resurvey with Tract Segregations,
Sheet No. 2
- (7) Anastasia Island Lighthouse and Military Reservations,
Dependent Resurvey.
- (8) Dependent Resurvey and Extension of Lines Subdividing
Land Bordering Ferry Lake and James Bayou.
- (9) Dependent Resurvey and Extension of Lines Subdividing
the so-called Moon Lake.
- (10) Retracement and Extension of Lines Subdividing Accre-
tion Area Bordering Red River, Including Riverbed
Tracts.

be made a special analysis with the purpose that the proper supervising officer may examine the same as to how the detail may be most suitably placed.

TITLE SUBDIVISIONS	
100	Part of Four Islands in Paradise Lake
101	Part of Fishers Island in Venice Bay
102	Independent Resurvey
103	Independent Resurvey with True Bearings
104	Independent Resurvey with True Bearings
105	Sheet No. 2
106	Augusta Island Lighthouse and Military Reservations
107	Independent Resurvey
108	Independent Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
109	Independent Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
110	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
111	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
112	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
113	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
114	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
115	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
116	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
117	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
118	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
119	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou
120	Resurvey and Extension of Lakes Redviding and Herberly Ferry Lakes and James Bayou

now contained and arranged out of order in box A. 195
 some in order of survey in which the same pages are
 so set out to correspond to the original drawing of
 the survey and it is to be noted that the
 the following table is a list of the
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CHAPTER X.

MINERAL SURVEYS.

APPOINTMENT OF MINERAL SURVEYORS.

669. There is set out in this chapter all matters relating to the duties of a United States mineral surveyor, and to the field and office procedure to be observed in the execution of mineral surveys and the filing of the returns.

670. The act of March 3, 1925, Manual, section 9, Chapter I, necessitated a detailed revision of the regulations governing the administration of mineral surveys, but the field operations are fixed by former legal requirements and long continued practice. A full statement of the administrative control of the general public land surveys, with citations of the authorities, is contained in Chapter I, and in section 1 there is a list of the several public survey offices. The citations which refer specifically to the making of mineral surveys will be found in the following sections, where closely related to the subject matter.

671. Under section 2334 of the Revised Statutes of the United States, as amended by the act of March 3, 1925, the United States Supervisor of Surveys may appoint as United States mineral surveyor, in each land district or State where mineral lands are located, as many competent surveyors as shall apply.

672. Application for appointment as United States mineral surveyor should be addressed to the public survey office in the district for which appointment is desired. An examination will be made there of the applicant's technical qualifications, and if found to be satisfactory, that office will forward the application to the chief of field division, General Land Office, for report regarding the applicant's general reputation and fitness for the position. If favorable, recommendation for appointment will be made to the supervisor of surveys, who will issue an appointment, addressing the same through the public survey office, and

calling upon the appointee to file the required bond (sec. 679). The bond will be forwarded to the supervisor of surveys for approval; the papers will then be forwarded to the Commissioner of the General Land Office for acceptance. Notice of the acceptance will be mailed to the public survey office, with copy to the supervisor of surveys, and the former will advise the mineral surveyor. In the event of adverse recommendation, the chief of field division will report direct to the General Land Office, and at the same time will notify the public survey office.

673. Mineral surveyors may, at the same time, hold appointments in more than one State or district. (20 L. D. 163.)

674. In the matter of reappointments, notice should be given the mineral surveyor 60 days prior to the expiration of his bond, with request that he signify his intentions regarding its renewal. If answered in the affirmative, the chief of field division will be called upon for the customary report. Favorable report will be followed by notice to file renewal bond, the approval and acceptance of which will follow the procedure for original bonds.

675. A biennial report will be submitted by each public survey office to the General Land Office on the sufficiency of the surety for each mineral surveyor on the roll for the district.

676. In case of failure to file renewal bond, or in the event of resignation or death, the name of the mineral surveyor will be dropped from the roll, and the General Land Office will be notified of the action through the office of the supervisor of surveys.

677. The supervisor of surveys has authority to suspend or revoke for cause the appointments of mineral surveyors, but the latter will be allowed the right of appeal. An appeal will be filed with the supervisor of surveys, who will at once transmit it, with a full report, to the General Land Office. (20 L. D. 283.)

678. The appointment of a mineral surveyor is not for any fixed period, the continuation thereof depending upon the character of the service. The supervisor of surveys will therefore not appoint mineral surveyors for a specified term. While under the act of March 2, 1895, (28 Stat. 807), mineral surveyors' bonds are examined every two years as to their suffi-

ciency, and new bonds required every four years from the dates of their acceptance, the latter requirement is not because the term has then expired.

679. A mineral surveyor is not authorized to perform any work under his appointment until his official bond shall have been accepted by the Commissioner of the General Land Office. The bond shall be in the sum of \$5,000, and will become effective, and the liability of the principal and surety will begin with its acceptance by the Commissioner of the General Land Office.

680. Bonds can not be canceled, nor can the surety thereon withdraw so as to relieve the liability during the time the principal performs official duties thereunder. The most that may be done is to relieve the surety of future responsibility through formal notice from the Commissioner of the General Land Office of the acceptance of a new bond or of the resignation of the principal.

681. The claimant is required in all cases to make satisfactory arrangements with the mineral surveyor for the payment for his services; the United States will not be responsible for the settlement. Neither the supervisor of surveys nor the Commissioner of the General Land Office has jurisdiction in the settlement of differences relative to the payment of charges made by mineral surveyors. These are matters of private contract, to be enforced in the ordinary manner—i. e., in the local courts. The department has, however, authority to investigate allegations regarding the official actions of mineral surveyors, including combinations to fix prices for survey work, and on sufficient showing of cause will suspend or revoke an appointment.

682. A mineral surveyor is precluded from acting, either directly or indirectly, as attorney in mineral claims. His duty in any particular case ceases when he has executed the survey and returned the field notes and preliminary plat with report to the public survey office, but he may be called upon to verify, or correct if necessary, any part of the field work or the record thereof, pending the approval of the survey. He will not be allowed to prepare for the mineral claimant application papers for patent or otherwise perform the duties of an attorney before the district land office.

683. The mineral surveyor will be held to a strict accountability for the faithful discharge of his duties, and will be required to observe fully the requirements and regulations in force affecting mineral surveys. If found incompetent, careless in the discharge of his duties, or willfully guilty of a violation of the regulations, his appointment will be subject to revocation.

684. A mineral surveyor is within the purview of section 452, Revised Statutes, which prohibits officers, clerks, and employees of the General Land Office from directly or indirectly purchasing or becoming interested in the purchase of any of the public lands, upon penalty of forfeiture of official position. (36 L. D. 61.)

GENERAL INSTRUCTIONS.

685. No return by a mineral surveyor will be recognized as official unless it is over his signature as a United States mineral surveyor and made in pursuance of a special order from the proper public survey office. After he has received an order, he is required to make the survey and return the prescribed field notes and preliminary plat thereof without undue delay.

686. Application for the survey of a mining claim, accompanied by a certified copy of the location certificate and requisite deposit of the estimated cost of the office work (sec. 687) should be made to the public survey office for the district in which the claim is located. This office will receipt for the deposit, issue an order for the survey, if appropriate, administer all office work in connection therewith, approving plat and field notes of such survey, and otherwise perform the duties prescribed by the mining regulations, including certification as to expenditure made upon the claim.

687. The public survey office will furnish the applicant an estimate of the cost of the final platting and other office work in connection with the survey, and the applicant will forward this amount in the form of cash, money order, or certified check, for which receipt will issue. Office work will be charged at actual cost, and if the original deposit is found insufficient a further deposit will be called for, or if found excessive or the survey abandoned before approval, a refund of the unearned

amount may be obtained. The claimant will be notified of any excess amount upon the approval or abandonment of the survey, and blank application for refund will be furnished.

688. A mineral surveyor should not combine the duties of surveyor and notary public in the same case by administering oaths to the parties in interest. It is preferable that the oaths of his field assistants be taken before some officer duly authorized to administer oaths. In cases, however, where great delay, expense, or inconvenience would result from a strict compliance with this rule, the mineral surveyor is authorized to administer the necessary oaths to his assistants, but where this is done he will submit a full written report of the circumstances which required this action; otherwise he is required to have nothing to do with a case except in his official capacity as a mineral surveyor.

689. Claimants, their attorneys, or parties in interest are not to be employed as assistants in making mineral surveys.

690. All lengths of lines are to be returned as their true horizontal equivalents in the foot unit, as determined by the general methods of measurement prescribed in sections 16, 17, 35, 36, and 37, Chapter II. The high degree of accuracy required in the making of mineral surveys calls for careful steel-tape measurements; and if needed in order to secure acceptable results, a spring balance may be used and temperature corrections applied.

691. All mineral surveys are to be made with an instrument by which the meridian may be determined independently of the magnetic needle, and the directions of all lines are to be referred to the true meridian. An engineer's transit with or without a solar attachment may be employed and any method described in Chapter II may be used. The true course of at least one line of each survey is to be ascertained at the time of the survey by observation either upon the sun or Polaris by one of the methods given in sections 84 to 124, inclusive, Chapter II, with proper verification of the time and latitude; the methods so employed and the results will be recorded in the field notes of the survey.

692. The magnetic variation is to be noted at each corner of the survey; if it is the same at the several corners one state-

ment to this effect, and the value of the declination will be given in the field notes. The variation will be noted and recorded at each corner of the survey where differences are found.

REQUIREMENTS OF FIELD WORK.

693. The term "survey" as here employed includes the usual technical procedure, and also all examinations required for the preparation of the affidavits of an expenditure of \$500 for development purposes, descriptive reports on placer claims, and any other reports to be made by the mineral surveyor.

694. In every case the survey made and reported is to be an actual survey on the ground in full detail, made by the mineral surveyor in person after the receipt of the order, and without reference to any knowledge he may have previously acquired by reason of having made the location survey or otherwise, and the record will show the actual facts existing at the time. This precludes a calculation of the connections to corners of the public survey and to mineral monuments, or of any other lines of the survey, through prior surveys, unless it is satisfactorily shown in his report that he has retraced such lines and found them to be correct. (6 L. D. 718; 7 L. D. 81.)

695. The survey of a mining claim may include several contiguous locations owned in common, but in conformity with statutory requirements such survey record will distinguish the several locations and exhibit the boundaries of each. (5 L. D. 199; 6 L. D. 808; 29 L. D. 585.)

696. The survey will be made in strict conformity with, or be embraced within, the lines of the location upon which the order is based. If the survey and location are identical that fact will be clearly stated in the field notes. If not identical, a bearing and distance will be given from each established corner of the survey to the corresponding corner of the location. The lines of the location as found upon the ground will be laid down upon the preliminary plat in such manner as to contrast and show their relation to the lines of survey. (1 L. D. 581.)

697. The survey will be given but one number. A location under the mining laws can legally be made only of a tract or piece of land embraced within one set of boundary lines; and

two or more tracts merely cornering with each other can not legally be embraced in a single location. (33 L. D. 560; 35 L. D. 485.)

698. In accordance with the principle that courses and distances must give way when in conflict with fixed objects and monuments, the mineral surveyor will not under any circumstances change the corners of the location for the purpose of making them conform to the description in the record. If the difference from the location certificate is slight, it may be explained in the field notes, as indicated in the specimen field notes.

699. The act of Congress of May 10, 1872, expressly provides that "the location must be distinctly marked upon the ground so that its boundaries can be readily traced," and "that all records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located, by reference to some natural object or permanent monument, as will identify the claim." (R. S. 2324.)

700. A single discovery working can not support more than one location. (16 L. D. 1.)

701. These provisions of law must be strictly complied with in each case to entitle the claimant to a survey and patent, and should a claimant under a location made subsequent to the passage of the act of May 10, 1872, who has not complied with said requirements in regard to marking the location upon the ground and recording the location certificate, apply for a survey, the mineral surveyor will decline to make it. (1 L. D. 581.) He will report the facts to the public survey office and await further instructions.

702. If after having obtained an order for survey the applicant should find that the record of location does not practically describe the location as staked upon the ground, he should file a certified copy of an amended location certificate, correctly describing the claim, and obtain an amended order for survey.

703. Should the survey be applied for under a location made prior to May 10, 1872 (R. S. 2332), the mineral surveyor will be governed by the special instructions accompanying the order for survey.

704. No mining claim located subsequent to May 10, 1872, should exceed the statutory limit in width on each side of the center of the vein, or 1,500 feet in length. All surveys must close within 0.50 feet in 1,000 feet, and the error must not be such as to make the claim exceed the statutory limit. In the absence of proof to the contrary, the discovery point is held to be the center of the vein on the surface. The course and length of the lode line or presumed course of the vein should be marked upon the plat and specifically described in the field notes.

LODE LINE AND END LINES.

705. It was held in 35 Land Decisions, 22 (syllabus), that—

There is no warrant in the mining laws for extending, arbitrarily and without any basis of fact therefor, the vein or lode line of a location in an irregular and zigzag manner for the purpose of controlling the length or situation of the exterior lines of the location to suit the convenience, real or imagined, of the locator.

The end lines of a lode location must be straight and parallel to each other and when at right angles with the side lines may not exceed 600 feet in length.

The mining laws contemplate that the end lines of a lode claim shall have substantial existence in fact, and in length shall reasonably comport with the width of the claim as located.

METHOD AND ORDER OF PROCEDURE.

706. In making the official survey, corner No. 1 of each location embraced in the claim will be established at the angle nearest the public survey corner or mineral monument to which connection is made. If connection is made both to a corner of the public survey and to a mineral monument, corner No. 1 should be placed nearest the corner of the public survey.

707. Connect corner No. 1 of each location by course and distance with the nearest corner of the public survey or with a United States mineral monument if the claim lies within 2 miles of such corner or monument. If both are within the required distance, it will be connected with the nearest corner of the public survey. (7 L. D. 475; par. 135, Mining Circular, April 11, 1922.)

708. When the corner tied to is not the nearest *record* corner, a statement should be made that it is the nearest or most accessible corner that could be found after diligent search.

709. When a mining claim is situated within the limits of a township the survey of which is in good standing, but where no corner of the survey can be found within 2 miles of the claim, after diligent search, connection may be made with a mineral monument, which in turn will be connected with an established public survey corner.

710. From corner No. 1 the successive boundaries of each location will be run in regular manner, numbering the remaining corners in consecutive order.

711. A lode and a mill site embraced in one survey will be distinguished by the letters A and B, respectively, following the number of the survey. The corners of the mill site will be numbered independently of those of the lode. Corner No. 1 of the mill site will be connected with a corner of the lode claim as well as with a corner of the public survey or mineral monument.

712. When a placer claim includes lodes, or when several contiguous placer or lode locations are included as one claim in one survey, the corners of each location will be given a separate consecutive numerical designation, beginning with corner No. 1 in each case. In the former case, describe the placer claim first in the field notes.

CONFLICTS.

713. When the exterior lines of a claim conflict with the survey of another claim, the distances to the points of intersection and the courses and distances along the line intersected from an established corner of such conflicting claim to such points of intersection should be reported in the field notes: *Provided*, That where a corner of the conflicting survey falls within the claim being surveyed, this corner should be selected from which to give the tie. When the same line of a conflict is intersected by two lines of the survey, the tie will be given from the same corner of the conflicting survey at both intersections.

714. When the lines of two locations of the survey intersect, only the point of intersection will be given on the line being described.

715. Conflicts with unsurveyed locations will not be reported unless excluded from the net area claimed.

716. Surveyed claims owned by the applicant, in conflict with or contiguous to the survey, will be reported in the field notes.

717. A connecting line should be run from some corner of the survey to a corner of each conflicting survey, also to a corner of each conflicting unsurveyed location that is to be excluded.

718. Connection will also be given to any survey, the record position of which is within 100 feet of the lines of the survey being executed; also to any other neighboring survey, the location of which is not definitely fixed by the record. Such connections will be made and conflicts shown according to the boundaries of the neighboring or conflicting claims as each is marked, defined, and actually established upon the ground. The field notes will fully and specifically state how and by what visible evidence the several conflicting surveys were identified on the ground, as well as those which appear to conflict, according to their returned tie or boundary lines, and report all material errors or discrepancies found in such surveys. In the survey of a group of contiguous claims where any corners are common to two or more claims of the group, bearings should be mentioned but once and the corner described as a common corner in the claim first mentioned in the field notes.

MINERAL MONUMENTS.

719. When a survey is situated in a district where there are no corners of the public survey and no other monuments within 2 miles, a mineral monument will be established. The site, when practicable, should be some prominent point, giving good visibility from every direction, and the site should be so chosen that the permanency of the monument will not be endangered by snow, rock, or land movements or other natural causes. Its position with reference to latitude and longitude should be recorded as accurately as the known data and the instruments used will afford.

720. The monument should consist of a stone not less than 30 inches long, 20 inches wide, and 6 inches thick, set two-thirds in the ground, with a conical mound of stone 4 feet high and 6 feet base alongside. The letters "U S M M" followed by the number of the survey in connection with which it is established will be plainly chiseled upon the stone. The exact reference point

will be indicated on the monument by a cross (x) chiseled on the top. Any necessary departure from the prescribed material and size of monument is to be explained.

721. From the monument the precise course and distance will be taken to two or more bearing trees or rocks, and to any well-known and permanent objects in the vicinity, such as buildings, shafts, mouths of adits, prominent rocks, or the confluence of streams. Bearing trees will be properly scribed "B T" and the bearing rocks chiseled "B R" together with the number of the mineral monument; the exact point on the tree or stone to which connection is made to be indicated by a cross or other unmistakable mark. Bearings should also be taken to prominent mountain peaks, and the approximate distance and direction ascertained to the nearest town or mining camp. A detailed description of the mineral monument, with a topographic map of its location, will be furnished.

CORNER MONUMENTS.

722. Corner monuments may consist of the following material, given in the order of preference:

(A) Tubular iron posts with flaring base, cement core, and brass cap for marking with steel dies, of the type adopted for public land surveys;

(B) A stone at least 24 inches long, set 16 inches in the ground, with a conical mound of stone, $1\frac{1}{2}$ feet high, 2 feet base, alongside; or,

(C) A rock in place.

If none of the foregoing material is available, a concrete post, 24 inches long, 6 inches square, set 16 inches in the ground, or hardwood post at least 3 feet long by 4 inches square, set 24 inches in the ground, and surrounded by a substantial mound of stone or earth, may be used. Should it become necessary to vary from these instructions, the returns will contain a full statement of the reason therefor.

723. All corners will be established in a permanent and workmanlike manner, and the distinguishing initial letter or letters, corner, and survey numbers will be neatly chiseled or scribed on the side facing the claim. The precise corner point will be permanently indicated on the monument. When a rock in place

is used, its dimensions above ground will be stated, and a cross chiseled at the exact corner point. Corners common to two or more locations will bear the initial letter and corner number of each location.

724. In case the point for the corner is inaccessible or unsuitable, a witness corner will be established, which will bear the letters "W C" in addition to the regular markings. When practicable the witness corner should be located upon a line of the survey and as near as possible to the true corner point, with which it must be connected by course and distance. The reason for the establishment of a witness corner will be stated in the field notes.

725. The position of all corners should be recorded by course and distance to bearing trees, rocks, and other permanent objects, as prescribed in the establishment of mineral monuments, and when no objects are available the field notes should so state.

TOPOGRAPHY.

726. Note carefully all topographic features of the claim, taking distances on the lines to intersections with all streams, gulches, ditches, ravines, mountain ridges, roads, trails, etc., with their widths, courses, and other data that may be required for mapping purposes. If the claim is situated within a town site, all important municipal improvements, and the street and block system, will be located for mapping purposes.

FIELD NOTES.

727. Field notes and other reports must be typewritten in black-record ink, and upon the proper blanks, which will be furnished by the public survey office upon application. No interlineations or erasures are permissible, and no abbreviations or symbols may be used excepting those shown in section 550, Chapter VIII, and as employed in the specimen field notes, appendix, page 517.

728. The mineral surveyor will prepare and file a preliminary plat on tracing cloth, drawn on a scale of 200 feet to an inch, if practicable, in conformity with the specimen plat herewith, the lines of the claim surveyed being shown heavier in contrast

with conflicting claims. A copy of such calculations of areas as are made by double meridian distances and of all triangulations or traverse lines will also be furnished.

729. In order that the results of the survey may be reported in a uniform manner, the field notes and preliminary plat will be prepared in strict conformity with the specimen field notes and plat, which are made part of these instructions. They are designed to furnish all needed information concerning the manner of describing the boundaries, corners, lode lines, connections, intersections, conflicts, and improvements, and of stating the magnetic variation, area, location, and other data connected with the survey of mineral claims, and to prescribe certain forms of affidavits for the surveyor and his assistants.

730. Throughout the description of the survey, after each reference to the lines or corners of a location, give the name thereof, and if unsurveyed state the fact. If reference is made to a location included in a prior official survey, the survey number will be given, followed by the name of the location.

731. The total area of each location in a group embraced by its exterior boundaries, and also the area in conflict with each intersecting survey or claim, should be stated. When locations of the survey conflict with each other, such conflicts should be stated only in connection with the location from which the conflicting area is excluded.

732. The field notes and plat of survey should not show exclusions, or attempt to specify the net area of the claim. These are matters for the applicant to state in connection with his application for patent, and the notices posted and published. The field notes should merely show the total and net areas of conflict, so that any exclusion desired may be readily made.

733. If any prior conflicting survey is not to be excluded by the claimant in his application for patent, the fact should be stated in a separate report filed with the survey returns, so that the statement of area can be properly examined.

734. The field notes should state specifically whether the claim is upon surveyed or unsurveyed public lands, giving in the former case the quarter section, township, and range in which it is located, and in the latter the township and range as

nearly as can be determined by the information at hand. When upon surveyed lands, the section boundaries should be indicated by full lines and quarter sections by broken lines.

735. The title-page should contain the post-office address of the claimant or his authorized agent.

IMPROVEMENTS.

736. In Revised Statutes, 2325, it is directed that at least \$500 shall be expended upon a mineral claim as a prerequisite to patent.

737. In preparing the certificate of the value of the improvements, the form shown in the specimen field notes will be followed.

738. Only actual expenditures and mining improvements made by the claimant or his grantors, having a direct relation to the development of the claim, are to be included in the estimate. Labor or improvements, within the meaning of the statute, are deemed to have been had on a mining claim, whether it consists of one location or several, when the labor is performed or the improvements are made for its development—that is, to facilitate the extraction of the metals it may contain. (6 L. D. 222.)

739. The expenditures required may be made on the surface or in running a tunnel, drifts, or crosscuts for the development of the claim. Improvements of any other character, such as buildings, machinery, or roadways, will be excluded from the estimate unless it is clearly shown that they are associated with actual excavations, such as cuts, tunnels, and shafts, and are essential to the practical development and to actually facilitate the extraction of mineral. Mills for ore treatment, or roadways, tramways, or trails built for transporting the extracted ore from the mine, are not to be included.

740. All mining and other improvements on the claim will be located by course and distance from corners of the survey, or from points on the indicated lode line, specifying with particularity the dimensions and character of each. The improvements upon each location should be numbered consecutively, the point of discovery always being No. 1. Improvements made by a former locator who has abandoned his claim are not to be included in the estimate, but should be described by separate statement in the field notes and shown on the plat.

741. The field notes will show in detail the value of each mining improvement included in the estimate of expenditures, and when a tunnel or other improvement has been made for the development of other claims in connection with the one for which survey is made, the name, ownership, and survey number, if any, of each claim to be credited, and the value of the interest credited to each will be stated.

742. When a lode and mill site are included in the same survey, an expenditure of \$500 is required upon the lode claim only.

743. When a survey embraces several locations held in common, constituting one entire claim whether lode or placer, an expenditure of \$500 for each location embraced in the group will be required.

744. It is held in 35 Land Decisions, 361 (syllabus), that—

Where several contiguous mining claims are held in common and expenditures are made upon an improvement intended to aid in the common development of all of the claims so held, and which is of such character as to redound to the benefit of all, such improvement is properly called a common improvement.

Each of a group of contiguous mining claims held in common and developed by a common improvement has an equal, undivided interest in such improvement, which is to be determined by a calculation based upon the number of claims in the group and the value of the common improvement.

There is no authority in law for an unequal assignment of credits out of the cost of an improvement made for the common benefit of a number of mining claims, or the apportionment of a physical segment of an improvement of that character to any particular claim or claims of the number, such an arbitrary judgment of credits as the exigencies of the case may seem to require being utterly at variance with the essential idea inherent in the term "a common improvement."

In any patent proceedings where a part of a group of mining claims is applied for and reliance is had upon a common improvement, the land department should be fully advised as to the total number of claims embraced in the group, as to their ownership, and as to their relative situations, properly delineated upon an authenticated map or diagram. Such information should always be furnished in connection with the first proceeding involving an application of credit from the common improvement, and should be referred to and properly supplemented in each subsequent patent application in which a like credit is sought to be applied.

745. It is also held in 36 Land Decisions, 551 (syllabus), that—

A common improvement or system, offered for patent purposes, although of sufficient aggregate value and of the prerequisite benefit to all the mining claims of a group, can not be accepted as it then stands in full satisfaction of the statutory requirement as to such of the claims the location of which it preceded, the law requiring that an expenditure of at least \$500 shall succeed the location of every claim.

If the requisite benefit to the group is shown, or to the extent of such of the claims as are so benefited, and the elements of contiguity and common interest in the claims concerned appear; if the improvement represents a total value sufficient for patent purposes for the number of claims so involved; if for each claim located after the partial construction of the improvement the latter has been subsequently extended so as to represent an added value of not less than \$500, each is entitled under the law to a share of the value of the common improvement in its entirety, no claim receiving more or less than another from that source, participating therein without distinction or difference, and as to each the statutory requirement is satisfied.

746. The explanatory statement in such cases should be given in the field notes or affidavit at the conclusion of the description of the improvements included in the estimate of expenditure, and should be as full and explicit as the facts in the case warrant, dealing only with improvements, conditions, and circumstances as they actually existed at the time of survey or examination.

747. If the value of the labor and improvements upon a mineral claim is less than \$500 at the time of survey, authority is given to file thereafter supplemental proof showing \$500 expenditure made prior to the expiration of the period of publication. The information on which to base this proof must be derived by the mineral surveyor, who makes the actual survey, from a careful examination upon the premises.

748. Only improvements made by the claimant or his grantors subsequent to the location of the claim are available under the statutes for patent expenditure. The public survey office certifies to this fact and as the certificate is based on the report of the mineral surveyor, the latter should exercise special care to see that such improvements only are reported.

included in the estimate, but should be described by separate statements in the field notes and shown on the plat.

DESCRIPTIVE REPORTS ON PLACER CLAIMS.

749. By General Land Office circular approved April 11, 1922, paragraph 167, the mineral surveyor is required to make a full examination of all placer claims at the time of survey, and to file with his field notes a descriptive report, under oath, duly corroborated by one or more disinterested persons and covering the following items:

(A) The quality and composition of the soil, and the kind and amount of timber and other vegetation;

(B) The location and size of streams, and such other matter as may appear upon the surface of the claims;

(C) The character, extent, and position of all surface and underground workings for mining purposes;

(D) The proximity of centers of trade or residence;

(E) The proximity of well-known systems of lode deposits or of individual lodes;

(F) The use or adaptability of the claim for placer mining, including the availability of water in sufficient quantity for practical operations;

(G) Works or expenditures made by the claimant or his grantors for the development of the claim; and,

(H) The true position of all known mines, salt licks, salt springs, and mill sites. When none is known to exist on the claim, the fact will be so stated.

AMENDED SURVEYS.

750. Amended surveys are ordered only by the General Land Office, and inasmuch as the conditions and circumstances peculiar to each separate case and the object sought by the required amendment are set forth in the instructions from that office, and alone govern all special matters relative to the manner of making such surveys and the form and subject matter to be embraced in the field notes thereof, but few general rules can be laid down.

751. The amended surveys are to be made in strict conformity with, or be embraced within, the lines of the original survey. If the amended and original surveys are identical, that fact will be distinctly stated in the field notes. If not identical, the

bearing and distance are to be given from each established corner of the amended survey to the corresponding corner of the original survey. The lines of the original survey, as found upon the ground, are to be laid down upon the preliminary plat in such manner as to contrast and show their relation to the lines of the amended survey.

752. The field notes of the amended survey are to be prepared on the same size and form of blanks as are required for the field notes of the original survey, and the abbreviation "Am." will be used after the survey number wherever it occurs.

PLATS.

753. The order of approval of surveys of mineral claims is prescribed by General Land Office circular dated April 11, 1922:

The mining survey first applied for shall have the priority of action in all stages of office procedure, including the delivery thereof, over any other survey of the same ground or any portion thereof. The survey of a claim which conflicts with one previously applied for will not be approved until the survey first applied for has been completed, examined, platted, and approved.

754. Chapter IX is devoted to the subject of plat making and in so far as applicable will be followed. In addition, the following instructions relating especially to mineral plats will be observed. The returns of the survey when filed in the public survey office will be carefully examined and compared with the records to determine that all conflicts with prior approved surveys are correctly shown, that all connecting lines given are in harmony with the record, that all material errors found in prior surveys are fully reported, and that the calculations of intersections and of conflicting areas are correct. The final plat will be prepared on the standard form, drawn on a scale of 200 feet to an inch when practicable. (See Specimen Mineral Plat, Insert No. 4.) The scale should be large enough to illustrate clearly the field notes, showing the improvements, conflicts, and physical features described therein, together with all courses and distances of intersecting lines and connecting lines, where space will permit. Any topographic features described in the field notes tending to confuse or obscure the plat may be omitted, but as the copy of the plat

posted on the claim is a notice to the public of the ground applied for, all wagon roads, streams, and other objects that may aid in locating the surveyed ground should be shown. In case the entire survey can not be shown on the form plat on a scale large enough to be clear, two or more sheets may be used and numbered consecutively, each sheet bearing the inscription, "Survey No. -----, Sheet No. -----." The last sheet, carrying the certificate of approval, should be on the form plat and the extra sheets on blank sheets of the same width, and not longer than the form plat.

755. The approval of a mineral survey is final, no acceptance being required as in the case of the public land subdivisinal surveys. When approved, the plat will be forwarded to the General Land Office for reproduction, and upon its return two copies will be mounted; one for filing with the district land office, and one for the claimant, together with a transcript of the field notes, to accompany his application for patent. One unmounted copy will be furnished the claimant for posting, and an extra copy when a mill site is included in the survey.

753. The approval of a mineral survey is final, no objection being required as in the case of the public land subdivisional survey. When approved the plat will be forwarded to the General Land Office for recording and upon its return two copies will be mounted, one for filing with the original in office and one for the claimant, together with a transcript of the field notes to accompany his application for patent. An unmounted copy will be furnished the claimant for posting and an extra copy when a bill file is included in the survey.

754. Chapter IX is devoted to the subject of the making and the making of a plat to be shown in addition to the plat to be filed in the office of the Surveyor General. The return of the survey when the public surveys are completed and examined and compared with the original survey with proper corrections. The return of the survey when the public surveys are completed and examined and compared with the original survey with proper corrections.

755. The approval of a mineral survey is final, no objection being required as in the case of the public land subdivisional survey. When approved the plat will be forwarded to the General Land Office for recording and upon its return two copies will be mounted, one for filing with the original in office and one for the claimant, together with a transcript of the field notes to accompany his application for patent. An unmounted copy will be furnished the claimant for posting and an extra copy when a bill file is included in the survey.

756. Chapter X is devoted to the subject of the making and the making of a plat to be shown in addition to the plat to be filed in the office of the Surveyor General. The return of the survey when the public surveys are completed and examined and compared with the original survey with proper corrections. The return of the survey when the public surveys are completed and examined and compared with the original survey with proper corrections.

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