

139-27 139 139-27 139

EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and
SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

Distances from Center of Roadway for Cross-Sectioning
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

| H | 0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 | H |
|----|------|------|------|------|------|------|------|------|------|------|----|
| 0 | 8.0 | 8.1 | 8.2 | 8.3 | 8.4 | 8.5 | 8.6 | 8.7 | 8.8 | 8.9 | 0 |
| 1 | 9.0 | 9.1 | 9.2 | 9.3 | 9.4 | 9.5 | 9.6 | 9.7 | 9.8 | 9.9 | 1 |
| 2 | 10.0 | 10.1 | 10.2 | 10.3 | 10.4 | 10.5 | 10.6 | 10.7 | 10.8 | 10.9 | 2 |
| 3 | 11.0 | 11.1 | 11.2 | 11.3 | 11.4 | 11.5 | 11.6 | 11.7 | 11.8 | 11.9 | 3 |
| 4 | 12.0 | 12.1 | 12.2 | 12.3 | 12.4 | 12.5 | 12.6 | 12.7 | 12.8 | 12.9 | 4 |
| 5 | 13.0 | 13.1 | 13.2 | 13.3 | 13.4 | 13.5 | 13.6 | 13.7 | 13.8 | 13.9 | 5 |
| 6 | 14.0 | 14.1 | 14.2 | 14.3 | 14.4 | 14.5 | 14.6 | 14.7 | 14.8 | 14.9 | 6 |
| 7 | 15.0 | 15.1 | 15.2 | 15.3 | 15.4 | 15.5 | 15.6 | 15.7 | 15.8 | 15.9 | 7 |
| 8 | 16.0 | 16.1 | 16.2 | 16.3 | 16.4 | 16.5 | 16.6 | 16.7 | 16.8 | 16.9 | 8 |
| 9 | 17.0 | 17.1 | 17.2 | 17.3 | 17.4 | 17.5 | 17.6 | 17.7 | 17.8 | 17.9 | 9 |
| 10 | 18.0 | 18.1 | 18.2 | 18.3 | 18.4 | 18.5 | 18.6 | 18.7 | 18.8 | 18.9 | 10 |
| 11 | 19.0 | 19.1 | 19.2 | 19.3 | 19.4 | 19.5 | 19.6 | 19.7 | 19.8 | 19.9 | 11 |
| 12 | 20.0 | 20.1 | 20.2 | 20.3 | 20.4 | 20.5 | 20.6 | 20.7 | 20.8 | 20.9 | 12 |
| 13 | 21.0 | 21.1 | 21.2 | 21.3 | 21.4 | 21.5 | 21.6 | 21.7 | 21.8 | 21.9 | 13 |
| 14 | 22.0 | 22.1 | 22.2 | 22.3 | 22.4 | 22.5 | 22.6 | 22.7 | 22.8 | 22.9 | 14 |
| 15 | 23.0 | 23.1 | 23.2 | 23.3 | 23.4 | 23.5 | 23.6 | 23.7 | 23.8 | 23.9 | 15 |
| 16 | 24.0 | 24.1 | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.8 | 24.9 | 16 |
| 17 | 25.0 | 25.1 | 25.2 | 25.3 | 25.4 | 25.5 | 25.6 | 25.7 | 25.8 | 25.9 | 17 |
| 18 | 26.0 | 26.1 | 26.2 | 26.3 | 26.4 | 26.5 | 26.6 | 26.7 | 26.8 | 26.9 | 18 |
| 19 | 27.0 | 27.1 | 27.2 | 27.3 | 27.4 | 27.5 | 27.6 | 27.7 | 27.8 | 27.9 | 19 |
| 20 | 28.0 | 28.1 | 28.2 | 28.3 | 28.4 | 28.5 | 28.6 | 28.7 | 28.8 | 28.9 | 20 |
| 21 | 29.0 | 29.1 | 29.2 | 29.3 | 29.4 | 29.5 | 29.6 | 29.7 | 29.8 | 29.9 | 21 |
| 22 | 30.0 | 30.1 | 30.2 | 30.3 | 30.4 | 30.5 | 30.6 | 30.7 | 30.8 | 30.9 | 22 |
| 23 | 31.0 | 31.1 | 31.2 | 31.3 | 31.4 | 31.5 | 31.6 | 31.7 | 31.8 | 31.9 | 23 |
| 24 | 32.0 | 32.1 | 32.2 | 32.3 | 32.4 | 32.5 | 32.6 | 32.7 | 32.8 | 32.9 | 24 |
| 25 | 33.0 | 33.1 | 33.2 | 33.3 | 33.4 | 33.5 | 33.6 | 33.7 | 33.8 | 33.9 | 25 |
| 26 | 34.0 | 34.1 | 34.2 | 34.3 | 34.4 | 34.5 | 34.6 | 34.7 | 34.8 | 34.9 | 26 |
| 27 | 35.0 | 35.1 | 35.2 | 35.3 | 35.4 | 35.5 | 35.6 | 35.7 | 35.8 | 35.9 | 27 |
| 28 | 36.0 | 36.1 | 36.2 | 36.3 | 36.4 | 36.5 | 36.6 | 36.7 | 36.8 | 36.9 | 28 |
| 29 | 37.0 | 37.1 | 37.2 | 37.3 | 37.4 | 37.5 | 37.6 | 37.7 | 37.8 | 37.9 | 29 |
| 30 | 38.0 | 38.1 | 38.2 | 38.3 | 38.4 | 38.5 | 38.6 | 38.7 | 38.8 | 38.9 | 30 |
| 31 | 39.0 | 39.1 | 39.2 | 39.3 | 39.4 | 39.5 | 39.6 | 39.7 | 39.8 | 39.9 | 31 |
| 32 | 40.0 | 40.1 | 40.2 | 40.3 | 40.4 | 40.5 | 40.6 | 40.7 | 40.8 | 40.9 | 32 |
| 33 | 41.0 | 41.1 | 41.2 | 41.3 | 41.4 | 41.5 | 41.6 | 41.7 | 41.8 | 41.9 | 33 |
| 34 | 42.0 | 42.1 | 42.2 | 42.3 | 42.4 | 42.5 | 42.6 | 42.7 | 42.8 | 42.9 | 34 |
| 35 | 43.0 | 43.1 | 43.2 | 43.3 | 43.4 | 43.5 | 43.6 | 43.7 | 43.8 | 43.9 | 35 |
| 36 | 44.0 | 44.1 | 44.2 | 44.3 | 44.4 | 44.5 | 44.6 | 44.7 | 44.8 | 44.9 | 36 |
| 37 | 45.0 | 45.1 | 45.2 | 45.3 | 45.4 | 45.5 | 45.6 | 45.7 | 45.8 | 45.9 | 37 |
| 38 | 46.0 | 46.1 | 46.2 | 46.3 | 46.4 | 46.5 | 46.6 | 46.7 | 46.8 | 46.9 | 38 |
| 39 | 47.0 | 47.1 | 47.2 | 47.3 | 47.4 | 47.5 | 47.6 | 47.7 | 47.8 | 47.9 | 39 |
| 40 | 48.0 | 48.1 | 48.2 | 48.3 | 48.4 | 48.5 | 48.6 | 48.7 | 48.8 | 48.9 | 40 |

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be $30.6 + (20 - 16) \div 2$ or 2 ft. added to $30.6 = 32.6$. For slopes of 1 on $1\frac{1}{2}$ see inside of back cover.

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Field Book #1

Index at rear

4290
330
4220

OK

The paper stock of this book is made of a high grade 50% rag paper having a water resisting surface and is sewed with Bing Special Enamel Waterproof Thread.

Made in U. S. A.



Chicago

| H | O |
|----|----|
| 0 | 8 |
| 1 | 9 |
| 2 | 10 |
| 3 | 11 |
| 4 | 12 |
| 5 | 13 |
| 6 | 14 |
| 7 | 15 |
| 8 | 16 |
| 9 | 17 |
| 10 | 18 |
| 11 | 19 |
| 12 | 20 |
| 13 | 21 |
| 14 | 22 |
| 15 | 23 |
| 16 | 24 |
| 17 | 25 |
| 18 | 26 |
| 19 | 27 |
| 20 | 28 |
| 21 | 29 |
| 22 | 30 |
| 23 | 31 |
| 24 | 32 |
| 25 | 33 |
| 26 | 34 |
| 27 | 35 |
| 28 | 36 |
| 29 | 37 |
| 30 | 38 |
| 31 | 39 |
| 32 | 40 |
| 33 | 41 |
| 34 | 42 |
| 35 | 43 |
| 36 | 44 |
| 37 | 45 |
| 38 | 46 |
| 39 | 47 |
| 40 | 48 |

Exam
to be a s
of roadbe
example
30.6 - 32

80 CHS = 5280 FT
 75 CHS = 4950 FT
 65 CHS = 4290 FT
 55 CHS = 3630 FT
 45 CHS = 2970 FT
 40 CHS = 2640 FT
 35 CHS = 2310 FT
 25 CHS = 1650 FT
 15 CHS = 990 FT
 5 CHS = 330 FEET

4950
3300
2640

3630
2970
2640
2310
1650

990
330

B. Ts bear from corner

White birch - 8 - N78E 33

Nor. pine - 20 - N70W 78

Corner post - 2" I.P. in place.

Set 4" squared post with tag.

79.75 N + S line - 49 lks. south of cor. to sec

75.78 Enter Pn - 6-8 25 + 36

56.20 Enter Ss 6-8

47.52 Fence - N + S

43.00 Wagon road - N + S

40.00 Set approximate $\frac{1}{4}$ post

20.00 Enter Ha - II

14.00 Creek 40 lks wide Runs S.W.

12.00 Leave alder N + S & enter H6-IV

8.50 Enter alder N + S

2.50 Left marsh enter mixed brush

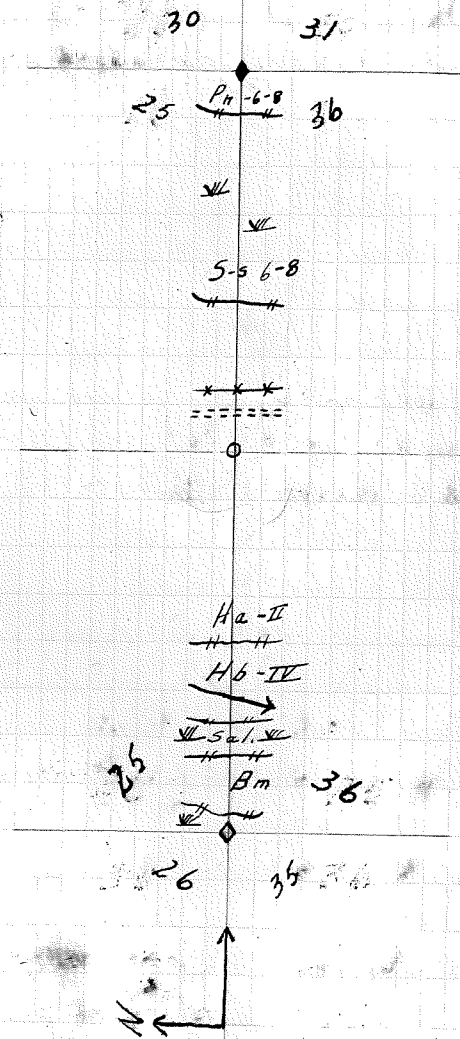
East on a random between S 25 + 36 Var 7° E

SIGNS INSTRUCTIONS 139-27 139 27-28 139-27 139 24-25


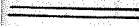
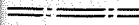
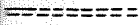


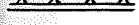


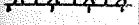
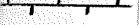

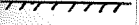
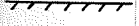




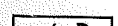




Date: 2/5/37, 2/6/37.

Party: Enter entire crew.

Weather: Clear & cold



Conventional Signs

-  Railroad
-  Class A. All weather road for auto. or truck.
-  Class B. Dry weather " " " " " "
-  Class C. Wagon road. Usually not passable for tr.
-  Foot trail & portage.
-  Firebreak.
-  Firebreak & class A road.
-  Firebreak & class B road.
-  Firebreak & class C road.
-  Firebreak & telephone line
-  Telephone line. Can be used with road or fire br.
-  Ditch.
-  Ditch & class A road.
-  Ditch & class B road.
-  Ditch & class C road.
-  Boundary of timber type.
-  Boundary of secondary timber type.
-  **WT** x Water accessible to truck for fire fighting.
-  **W** x Water not accessible to truck - can use for pump packs.
-  **LD** x Water loading dock.
-  **16-100** x Water table designation - first figure, depth
2nd figure, gal. per hour.
-  Swamp or bog.
-  Lakes or ponds.

























Subdivision of a Township

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

Subdivision of a section.

| | | | |
|----|----|----|----|
| NW | NE | NW | NE |
| NW | NE | NW | NE |
| SW | SE | SW | SE |
| SW | SE | SW | SE |

Conventional Signs

-  Spring.
-  Stream.
-  Intermittent stream or dry gully.
-  Bridge on stream.
-  Dam.
-  Well.
-  Burn - give year of fire.
-  High hill.
-  Ridge.
-  Look out tower.
-  Ranger's headquarters (Includes Pat. & Lookouts).
-  House.
-  House with telephone.
-  Cabin (shack).
-  Summer Resort.
-  Camp ground.
-  Original corner or B.T. found.
-  Doubtful corner found.
-  School.
-  Store or post office.
-  Saw mill.
-  Tool cache.
-  Logging camp.
-  Fence.

Reconnaissance Symbols

P - Upland Conifers

- Pw - White pine
- Pn - Norway pine
- Pj - Jack pine
- Ps - White spruce
- Pba - Balsam
- Pc - Cedar
- Psb - Black Spruce

H - Upland Hardwoods

- Ha - Aspen
- Hb - White birch
- Hm - Mixed elm, basswood, maple, oak, etc.

B - Brush Type

- Bh - Hazel brush predominating.
- Bm - Mixed brush, willow dogwood, fire cherry highland alder, etc.

O - Open Wild Land Type

- Ogr - Upland grass predominating.
- Ost - Sweet fern
- Obh - Lake beach, dry mud flats.
- Obn - Newly burned areas.
- Osl - Slash

S - Swamp Type

- St - Tamarack
- Ss - Black Spruce
- Sc - Cedar
- Shm - Mixed swamp hardwoods

S - Swamp brush type

- Sw - Willow
- Sal - Tag alder
- Sb - Bog or dwarf birch

M - Marsh Types

- Mgr - Wild Hay Meadow
- Mse - Sedges predominating
- Mbl - Bluejoint
- Mlt - Labrador tea
- Mre - Reeds
- Mot - Cat tails

Improved Land

- C - crop land
- P - Stump pasture

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Instructions for

Determining True Declination

Error, falling, alinement, tangential offset are synonymous terms, and are equivalent to a right angle measurement from actual or doubtful corner to point of intersection on random line.

Distance is the chained measurement from the starting point to the point of intersection.

Course is the line of run considering the declination used.

True declination is computed as follows:

1. To find error in degrees.

A.D. = Alinement distance error plus or
D = Departure for \circ at distance = minus in declination.

2. To find true declination.

A random line falling to the LEFT of the true or doubtful corner indicates too great a declination and the error is subtracted from the random declination while a random line falling to the RIGHT requires that the error be added to the declination used.

Left error - Subtract

Right error - Add.

Example:

$$\begin{array}{r} \text{A.D.} = 2.66 \text{ left } 133 \overline{) 2.66} \\ \text{D.} = 1.33 \quad \underline{266} \end{array}$$

$\therefore 2^\circ$ error to the left.

Random declination = 7°

True " = $7^\circ - 2^\circ = 5^\circ$

\therefore T. D. = 5°

Tables.

Departure for 1° at 80 chains = 1.4 ch. or 140 links

" " 1° at 1 chain = $\frac{1.4}{80} = .0175$ ch.

Distance $\times .0175$ = Departure for 1° at that distance.

If the distance chained is more than one mile, the error is found by (1) dividing the total distance by two and (2) dividing the alignment error by two to get the proportions for a distance of one mile (more or less). The results are divided as in example.

The table following gives the offsets for 1° most likely to be used for the determination of the error when tying into a corner:

| $\frac{1}{4}$ Corner. | | Section corner | |
|-----------------------|-----------|----------------|-----------|
| Chains | Offset | Chains | Offset |
| 35 | .6125 ch. | 70 | 1.225 ch. |
| 36 | .6300 | 71 | 1.2425 |
| 37 | .6475 | 72 | 1.2600 |
| 38 | .6650 | 73 | 1.2775 |
| 39 | .6825 | 74 | 1.2950 |
| 40 | .7000 | 75 | 1.3125 |
| 41 | .7175 | 76 | 1.3300 |
| 42 | .7350 | 77 | 1.3475 |
| 43 | .7525 | 78 | 1.3650 |
| 44 | .7700 | 79 | 1.3825 |
| 45 | .7875 | 80 | 1.4000 |
| | | 81 | 1.4175 |
| | | 82 | 1.4350 |
| | | 83 | 1.4525 |
| | | 84 | 1.4700 |
| | | 85 | 1.4875 |
| | | 86 | 1.5050 |

LINE RUNNING EAST BET SEC 28-21 VAR $6\frac{1}{2}$

80.00 SET APP 1 MILE POST COR. TO SEC $\frac{2022}{2021}$

40.00 SET APP $\frac{1}{4}$ POST

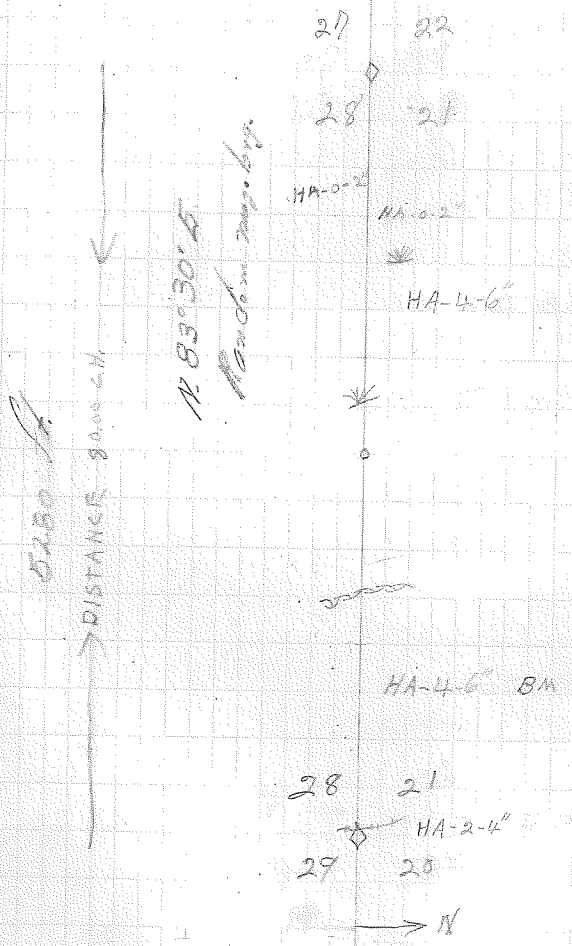
26.00 RIDGE NORTH AND SOUTH

1.00 ENTER HA-4-4'

Time started on line: 9:30

Time finished

TIME 0017.216



T 139N - R 27W

Date: 3/1/37

Party: MCDAY, T.

SIMS
KOSKOVITZ
CUMSTOCK
TOWARD

27 22

28 21

HA-0-2

HA-0-2

HA-4-6

HA-4-6 BM

28 21

HA-2-4

29 20

Start
End

LINE RUNNING WEST BETWEEN

SEC. 29-20 VAR. $6\frac{1}{2}^{\circ}$

$S 83^{\circ} 30' W$

23 CH ENTERED SWAMP

34 CH LEFT SWAMP

39 CH ENTERED SWAMP

40 CH SET APP $\frac{1}{4}$ POST

41-47 CH LEFT SWAMP

52 CH SWAMP 2 CH NORTH OF LINE

76 CH ENTERED SWAMP

80 CH SET APP CR POST SEC 19-30-29-20

T 139 R 20

12/23/37

2

TIME STARTED 9:45 AM

PARTY ROLF

CERKOWITZ

KOSKOVICH

COMSTOCK

SIMS

LEWIS

WEATHER CLOUDY

30 19

SW

29

SB

SB

11-20

SW

SW

SW

29 20

28 21

→ N

5200 ft

DISTANCE 8000 CH. ←

$N 85^{\circ} 30' E$

Running back up road

LINE RUNNING WEST
BETWEEN SEC. 19-30 T4R 68

25 CH ENTERED SWAMP
35 CH LEFT SWAMP
40 CH SET APP 1/4 POST
49.23 CH ENTERED MARSH
53 CH QUIT 2/24/39
53 CH STARTED 2/25/39 -
70.08 CH FOUND IRON PIPE CORNER 30-19-20-24
ALIGNMENT 9.60 CH So.
DISTANCE - 70.08 CH
FOUND IRON PIPE IN WILD HAY MEADOW

139
27-29

139-27 170

3

T-139-R-27

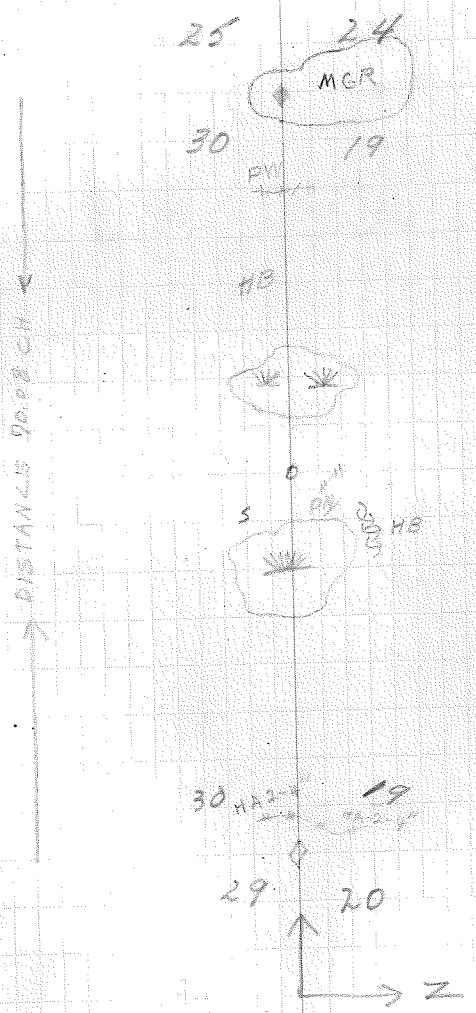
2/24/39

X

TIME QUIT 2.10 PM.

PARTY.

ROLF A
CERKOWNIAK
KOSKOVICH
SIMS
COMSTOCK
EMARD



LINE RUNNING No BETWEEN Sec. 36-31
North on Random line - Var. 6.5°

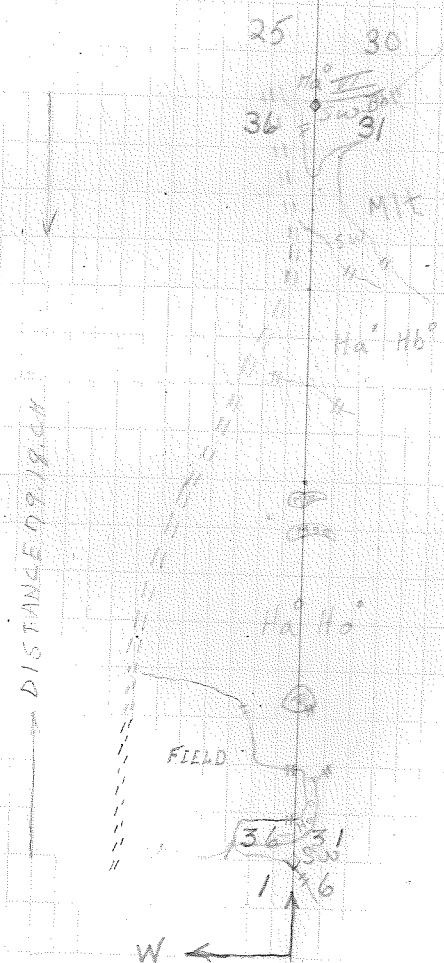
1.90 Enter Mar
9.24 left Mar - Enter Ha^o Ho^o IV
16.10 Enter Swale
18.00 left Swale - Enter Ha^o Ho^o IV
33.90 Enter Msc
35.25 left Msc - Enter Ha^o Ho^o IV
36.96 Enter Msc
38.15 left Msc - Enter Ha^o Ho^o IV
39.32 2" I.P. in place 10 LKs. west of
random line. Set 3" S
stake with tag
50.50 Enter Ha^o Ho^o IV
46.00 Enter Sw
70.00 left Sw - Enter Ha^o Ho^o IV + SW-Bh
73.64 Brushed line 40 LKs W of 75ch
stake
79.18 2" I.P. in place 20 LKs W of
random line - Marked

| | |
|----|----|
| 25 | 30 |
| 36 | 31 |

B.T.s bear from corner
Pn stump - S 30° E - 1/4 LKs
Scribed S 31 B.T.
Road 25 Ch. W. of Cor.

T 139 N. R 28-27 W

MAR. 2, 1937



Line running north bet. S. 25-30
North on random line Var 6.5°

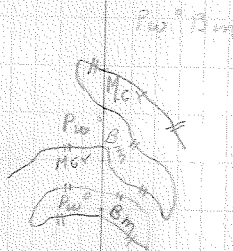
13.48 Enter Mer
15.39 Wagon Road
39.85 Leave Mer - Enter Pw° Bm
40.00 set App 1/4 cor.
42.00 Enter Mer
46.91 Leave Mer - Enter Pw° Bm
50.55 Enter Mer
53.84 Leave Mer - Enter Pw° Bm Ha°
72.00 Enter Mer
77.23 2" I.P. in place 1 ch. west of
random line Marked on cap
24 19
25 30

T. 29 R. 27-28

Mar. 2, 1937

N 6.5° E.
Var - Random line
total distance 5097 feet

24 19
25 Mar 30



DISTANCE 7923 CH



24 30
19

25 30

W. ←

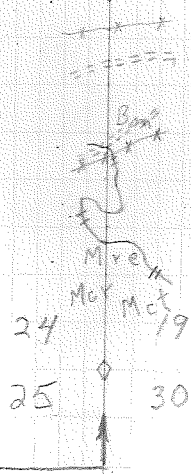
Line running N bet S's. 24-19
Random line run 65° E. var.

13.03 Leave Mrs. Met-Mgr - Enter 40° Bm
16.93 Enter " " "
23.00 Leave " " " Enter Bm
23.92 Fence E-W " " "
24.99 Wagon Road E-W
32.94 Wagon road E-W
36.00 Fence E-W
38.62 3" Squared stake 1.02 Ch. W of
random line

T. 139 R. 29-28

Mar. 2, 1937

6.



LINE RUNNING EAST BET. S'S. 18-19

RANDOM LINE RUN $8\frac{1}{2}^{\circ}$ E. VAR.

| | |
|----------|--|
| 10.90 CH | ENTERED SWAMP |
| 13.35 CH | LEFT " |
| 25 CH | LEFT ASPEN - ENTERED MIXED BRUSH |
| 40 CH | SET APP $\frac{1}{4}$ POST |
| 45 CH | ENTERED ASPEN 4-6" |
| 48 CH | ENTERED SWAMP WILLOW |
| 52.43 CH | " " |
| 53.50 CH | LEFT " |
| 80 CH | SET APP CORNER POST COR. TO SEC. 17-18-19-20 |

T-139 R. 27

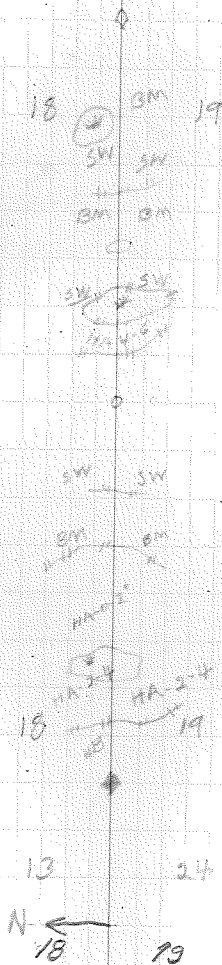
3/3/39

WEATHER LIGHT RAIN

PARTY - ROLF

MORREN
CERROW KIAK
COMSTOCK
EDWARD
KNOWLTON

DISTANCE 3000 CHAINS



LINE RUNNING EAST BET. S₉ 17-20 -139-27
RANDOM LINE RUN 8 1/2° EVAR.

7.50 Enter Shm
15.00 Enter Ha⁰ II - Leave Shm
23.00 Enter Hb⁰ II - Ha⁰ II - Leave Ha⁰ II
27.00 Enter Ha⁰ II Hb⁰ II Leave Hb⁰ II
31.00 Enter Hb⁰ II Leave Ha⁰ II
40.00 Set App. 1/4 cor.
46.50 Enter Ha⁰ II Leave Hb⁰ II
65.96 ENTER WILD HAY MEADOW
78.00 LEFT MEADOW ENTERED BM
80.00 Set App. Sec Cor. 17/16
20/21

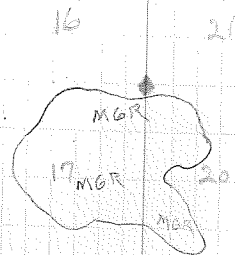
86.29

9.30

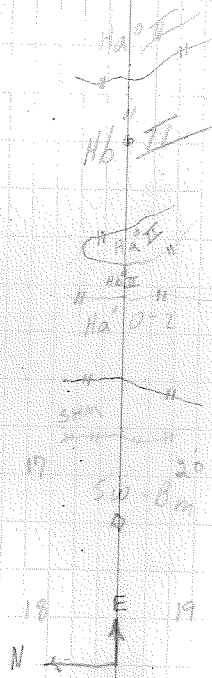
F-139-R 27

3/4/37

PART I
Rolf-chief
Knowlton
Cetowian
Emard
Marken
Comstock



DISTANCE 86.29 CM



137-27

138-139

139

139

139-140

24-25

25

9.

LINE RUNNING NORTH BETWEEN SEC. 9-12

VAR. 6°

LINE RUNNING ON CLASS B ROAD

40 CH SET APP $\frac{1}{4}$ STAKE

55 CH LEFT CLASS B ROAD

80 CH SET APP CORNER POST

5280 $\frac{1}{4}$

T-139-R25-24

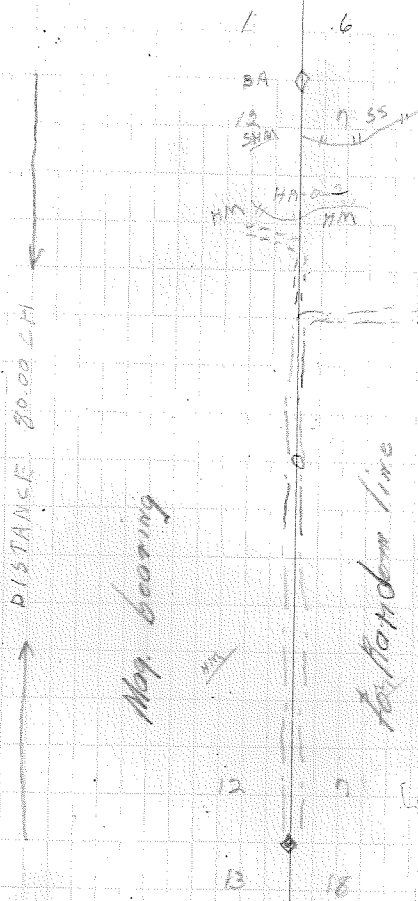
3/15/37

10.

WEATHER LIGHT SNOW

PARTY - ROLF

CERKOWIAK
COMSTOCK
KNOWLTON
MORREN
MARYMAK



LINE RUNNING NORTH BETWEEN SEC. 1-6

VAR 6°

19.49 FOUND 20 CH STAKE 9 LINKS EAST OF LINE

25.50 CAME TO LAKE

42.19 LEFT LAKE

51.00 ENTERED SWAMP WILLOW

69.00 LEFT " "

79.24 FOUND SQUARED STAKE 4 LINKS EAST OF LINE

ALIGNMENT 4 LINKS

5229.8 ft

139-27 138-139 139-2

139-140
25

T. 139-25-24

3/15/37

WEATHER - LIGHT SNOW

PARTY - ROLE

CERKOWIAK
COMSTOCK
MORSEY
KNOX/TOWN
MARRINAK

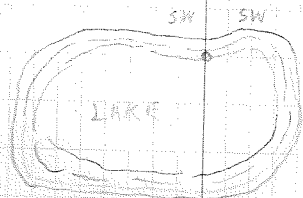
36 N 31

1 6
HA-0-2

PM RM-6-9

HA-0-2

SW SW
HA-0-2
SW



50' from top bearing N 80° 18' E

DISTANCE 09.24 CH

HA-0-2

SS
BA

1 6

12 7

5

LINE RUNNING WEST BETWEEN SEC. 36-1

VAR 2°

ALIGNMENT 2.824 CH FOUND POST 500 FT LINE

79.49 FOUND 5" TAMM POST COR. TO 35-36-2-1

BT. 6" TAMM S 10° W 176.36 RIBING UNBURNED

4 3 80° E 126.11 UNABLE TO READ

YELLOW TAG ON 4" SPRUCE TO MARK SEC. COR.

BT. 6" SPRUCE 15.63 S. 124 CH SCRIBED R25 W T 1395

51.00 CLASS C ROAD

40.70 STREAM 25 CHS. N-S

40.51 FENCE N-S

39.24 FENCE N-S

36.01 CLASS C ROAD

28.05 FENCE N-S

28.05 FOUND 4" ST. STAKE 1.86 CH NORTH

T. 139-N-140-W-R-25

WEATHER - FAIR

3/16/37

12

PARTY: ROLL 1

CERRADOWNIAK

COMSTOCK

MORRIS

EMERSON

KNOWLTON



LINE RUNNING WEST BETWEEN SEC. 35-2

VAR 6'

1115

~~SET WEST LINE 56 LKS. SO. OF COR~~

34/35
34/2

60.01 2ND IMPLACE COR TO - 2-3-34-35

5280.66 BT. PN. STUMP NO. 29TH W 16 LKS SCRIBING

H.

44' UNABLE TO READ

BT. PN. S 22ND W 67TH L. SCRIBING 11

52.95 POINT OF LANE N-S

40.00 SET APP 1/2 DIST

29.00 LEFT MEADOW ENTERED HA-0-2

23.00 ENTERED MEADOW

22.00 TELEPHONE LINE N-S

22.99 CLASS C ROAD N-S

2.00 LEFT SS ENTERED HA-0-2

0100 Start west from survey corner

3536
211

T139, 140 R25 - under post.

T139-N 140-N R25W

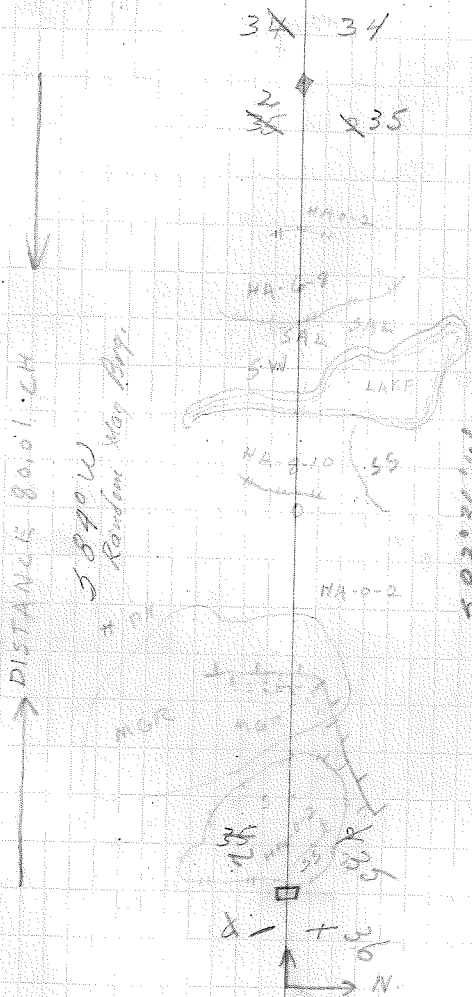
3/19/37

WEATHER - CLOUDY

TIME STARTED - 9:50

TIME FINISHED

PARTY ROLF A
ZERRONWINI
COMSTOCK
MORRIS
KNOLTON
EMARD



DISTANCE 80.01 CH

5890 W
Random Mag. App.

583° 36' W
True Mag. App.

LINE RUNNING EAST BETWEEN SEC. 31-6
VAR $6\frac{1}{2}$

80.00 - 5280.00 SET APP. LOP. POST. COR. T. 32-S-31-6
76.29 FENCE
69.60 SWAMP SE-NW
55.00 ENTERED MLT
40.80 SET APP. POST.
32.68 LEFT HA ENTERED MARSH
27.00 LEFT SWAMP ENTERED HA 4-6
22.00 SWAMP N-S
11.00 ENTERED HA 6-8

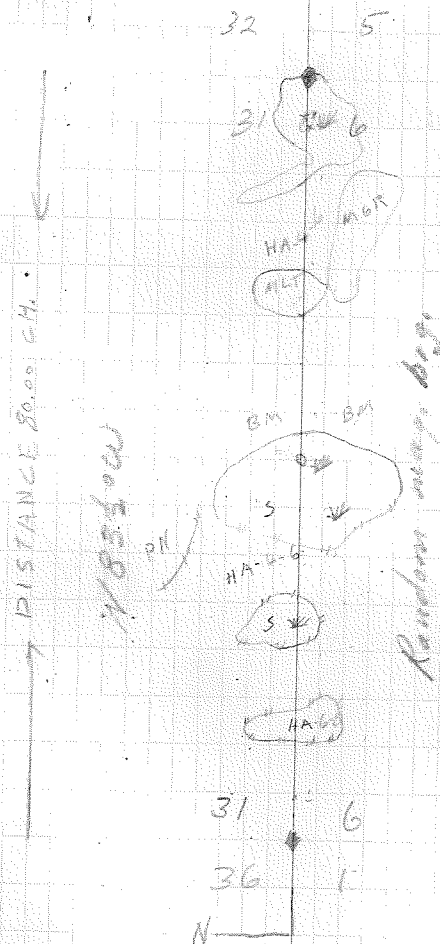
T-139N/140N R25W

WEATHER - CLOUDY
WINDY

3/18/39

14

PARTY - ROLF A.
GERKOWNIAK
LOMSTOCK
KNOWLTON
MORREN
EMARD



LINE RUNNING E. BET SEC 32-5 VAR 6 $\frac{1}{2}$

589.76 → 5380.16 1/2

2" IP IN PLACE
N AND S LINE MARKS 50 OF COR. 32 5

55.00 LEFT HA ENTERED SW
53.00 ENTER HA 0-2"
40.00 SET APP 1/2 POST

19.00 MARCH SE-NW

T. 139-S-140-N R. 25
WEATHER CLOUDY
WINDY

3/14/37

PARTY: BOBE A.
CERKOWIAK
COMSTOCK
MARKER
KROOKER
EMARD

33 4
32 5

SW SW

HA
SW
SW SW
BM
HA 2-0

HA 2-0
HA 2-0

32 5

31 6

DISTANCE 80.06 CH.

LINE RUNNING ^{East} WEST DET. SEC. 20 T. 26 R. 26

80.00 SET APP 1 MILE POST COR. TO SEC. $\frac{346}{325}$
99.90 ENTERED SS
96.00 LEFT HM ENTERED HA-4-6"
61.49 LEAVE SS ENTER HA 4-6"
59.00 ENTER SS
53.30 LEFT HA ENTERED HM
43.00 LEFT HM ENTERED HA 2-4"
40.00 SET APP 1/4 POST
35.00 LEFT HA ENTERED HM
28.00 RIDGE N-S

138-139
25

139-27

138-139
26

39-2

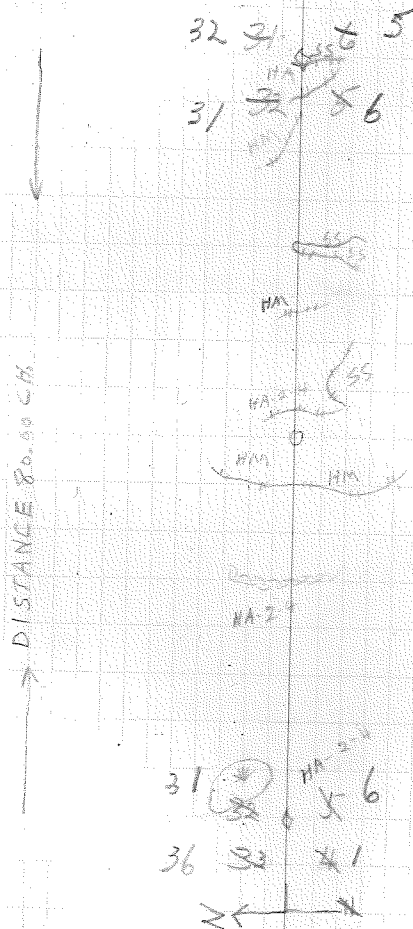
T-139-R 2526

3/19/30

16

WEATHER CLEAR
WARM

PARTY - ROLF
CERKOWNIK
COMSTOCK
MARKIN
SIMS
EMARD



East bet. 32/5 T139-138 R25
Vol. 6° E

Distance 5280 FT.

80.00 SET APP LOR POST LOR TO SEC 32/4
32/5

79.00 LEFT SS ENTERED HA 2-4"

56.00 LEFT MARSH ENTERED SS-0-2"

40.00 SET APP 1/4 POST

9.96 LEAVE SS ENTER MARSH

5.00 SPRUCE SWAMP N-S

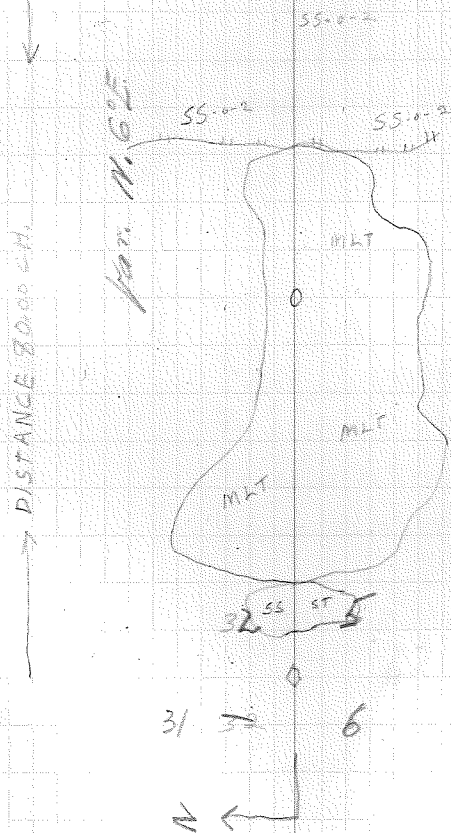
3/23/59

WEATHER CLOUDY

PARTY BOLE &
CERKOWIAK
COMSTOCK
EMARD
MORREN
SIMS

33 36 7 4

32 31 6 5



East bet. 33 1/4 T139-198 R. 25
Var. 6° E

82.59 SET APP COR. POST COR. TO SEG. $\frac{34 \frac{1}{2}}{33 \frac{1}{4}}$

90.20 ENTERED HA-4-6

49.48 TAM. 2-4'

40.00 SET APP 1/4 POST

34.46 ENTER HA 2-4'

23.00 ENTER SS-2-4'

29.00 ENTERED HA-4-6'

14.29 ENTER WILD HAY MEADOW

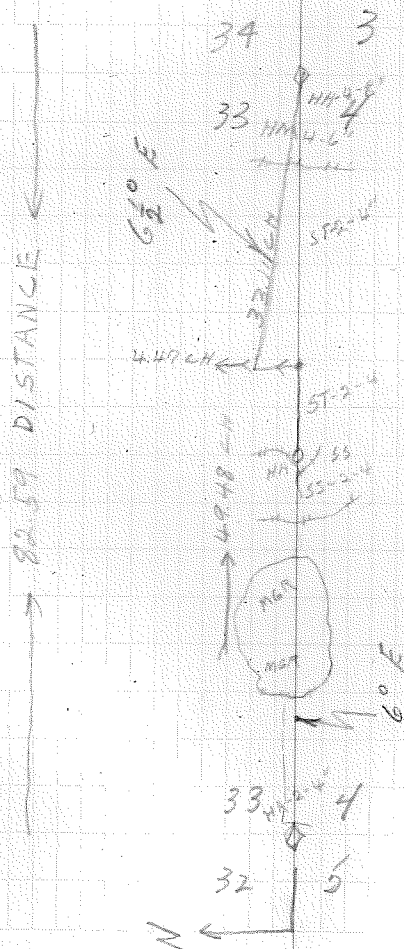
1.88 LINE OF FENCE POST - N-S

3/23/39

18

WEATHER CLOUDY

PARTY - ROLF A
CERKOWNIK
COMSTOCK
EMARD
MORRIEN
SIMS



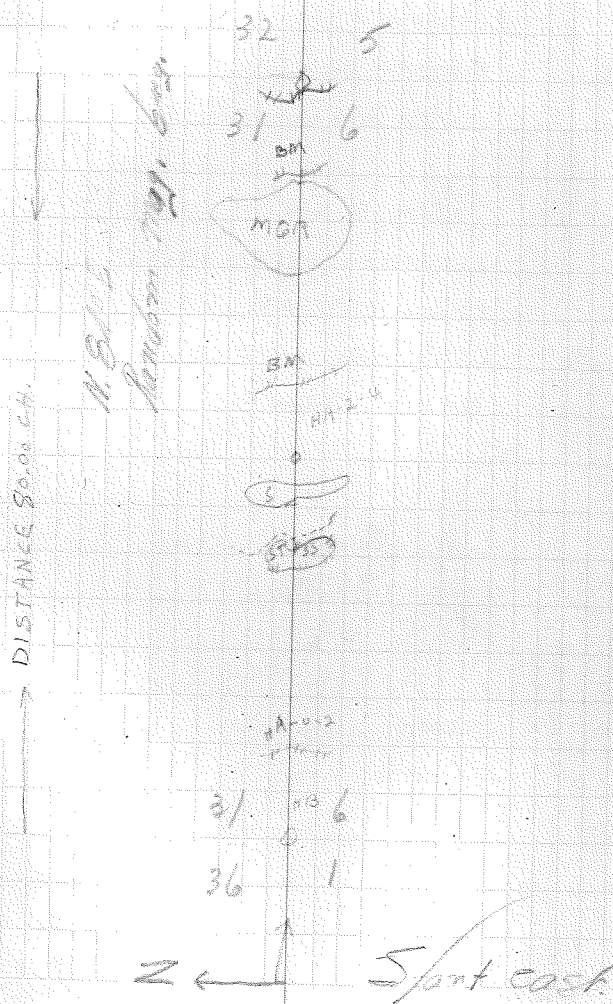
East bet. 3 1/6 T 132N 133N > SW.
 1/4 beam N. E. of C.

| | |
|-------|---|
| 80.00 | SET APP POST. COR. TO SEC. ^{32.5} 31.0 |
| 79.00 | LEFT BM ENTERED HA. 4-6" |
| 69.00 | LEFT HAY MEADOW ENTERED HA 2-4 |
| 59.00 | WILD HAY MEADOW N-S |
| 48.00 | LEFT HA ENTER BM |
| 40.00 | SET APP 1/4 POST |
| 38.00 | LEFT SWAMP |
| 36.45 | SWAMP |
| 31.73 | TRAIL N-S |
| 31.44 | LEFT SWAMP ENTERED |
| 28.09 | FAM SWAMP N-S |
| 9.00 | LEFT HB ENTERED HA |

WIE - FAIR-WARM

3/22/37 19

PARTY ROLF
 CERKOWNIK
 LOMSTOCK
 EMARD
 MORREN
 SIMS



T-139-1929
 LINE RUNNING NORTH BET SEC 34 & 35
 VAR 6 1/2

28.49 EAST-WEST LINE 2.41 CH. E. RECORD SEC
 93.00 ENTER HA-2-4' 20/26
 69.00 ENTER HM-10-12 24/35

59.00 ENTER HA-4-6"
 53.00 LEAVE SAL ENTER HM-8-10
 44.28 TRAIL EAST AND WEST
 40.00 LEFT HM ENTERED SAL
 40.00 SET APP 1/4 POST

24.00 LEFT HA ENTERED HM
 14.00 ENTERED HA-2-4'

9.00 ENTER HB-1-2'

WEATHER CLOUDY WINDY

3/24/37 20 X

PARTY ROLF
 CERRYLOW NIK
 CONN STOCK
 EMARD
 STAMS
 MORRIS

27 26

0
 34 HA 24
 35
 HM-10-12

HM-8-10
 HM-8-10

SAL
 HM-10-12

HM-10-12
 HM-10-12

HM-10-12
 HM-10-12

HM-10-12
 34 HA 24
 35

0
 3 2

5

DISTANCE 78.49 CH

LINE RUNNING NORTH BET. SEC. 27-26. VAR. 62

78.45 EAST AND WEST LINE 56 LKS. E. OF COR. TO SEC.

75.00 ENTER SPRUCE SWAMP N. AND SO. ^{22 23} 27

71.47 ROAD N AND S. CLASS 4.

52.93 STREAM 20 LKS. N-S.

41.29 LEAVE SS ENTER HA 2-4

40.00 SET APP. POST

26.84 ENTER SPRUCE SWAMP E-W - HM

21.00 ENTER SW

T-139 R-29
WEATHER-CLOUDS-CO. 4

3/25/37

PARTY BORN -
CERRILLIAR
COMSTOCK
EMARD
KNOWLTON
MORRIS

N

22 23

27 ^{SS} 26

DISTANCE 18.45 CM

HA 02

HA 24

HA 24

HA 99

SS

SS

HA 24

27 26

34 35

S

LINE RUNNING NO. BETWEEN SEC 22-23 VAR. $\frac{1}{2}$ E

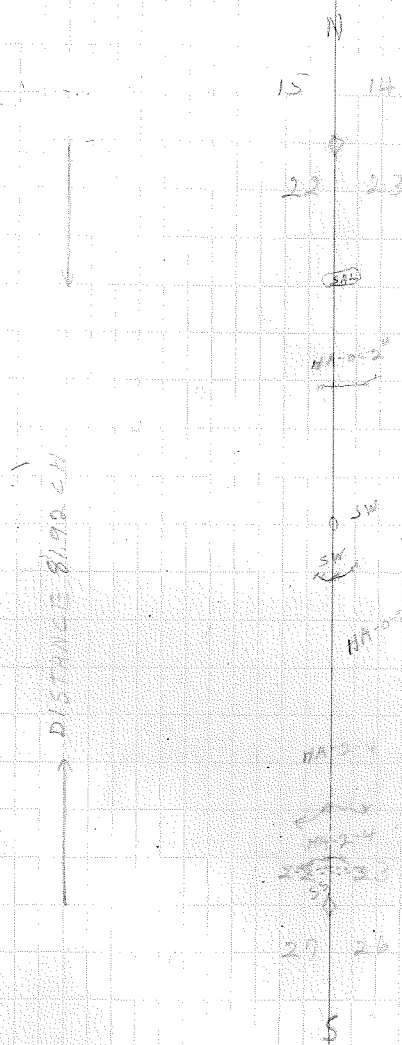
4" SQ. STAKE COR. TO SEC. 14-15-20-23
81.92 EAST AND WEST LINE 1.58 CH. W. OF COR. TO SEC. $\frac{15}{24}$
BT. 14" PN STUMP No. 38° W. 96 LKS. $\frac{24}{23}$
67.00 LEAVE MARSH
65.00 MARSH EAST AND WEST
54.00 ENTER ASPIN - 0-2"
46.00 SET APP. $\frac{1}{2}$ POST
34.00 ENTER SWAMP WILLOW
25.00 QUIT 3/25/39
10.09 STREAM: 11 LKS - E AND W.
5.00 ENTER HA-4-6"
3.56 ROAD No. AND SO.

T-139-R 27

WEATHER - CLOUDS - 60%

22
3/25/39 3/26/39

PARTY: BILL A
GERARD WIAK
COMSTOCK
MORRIS
MORRIS
KNOWLTON



LINE RUNNING NORTH BET SEC 14-15 VAR. $\frac{1}{2}$

77.20 E. AND W. LINE 4.48 CH EAST OF COR TO SEC $\frac{10 \frac{1}{2}}{15 \frac{1}{4}}$

55.00 ENTER ASPIN 2-4"

50.00 ENTER MIXED HARDWOOD

40.00 SET APP. $\frac{1}{2}$ POST

32.00 ENTER ASPIN 2-4"

30.00 MIXED BIRCH-ASPIN

24.48 ENTER HA-2-4" BM

16.48 LEAVE SPRUCE SWAMP ENTER BM

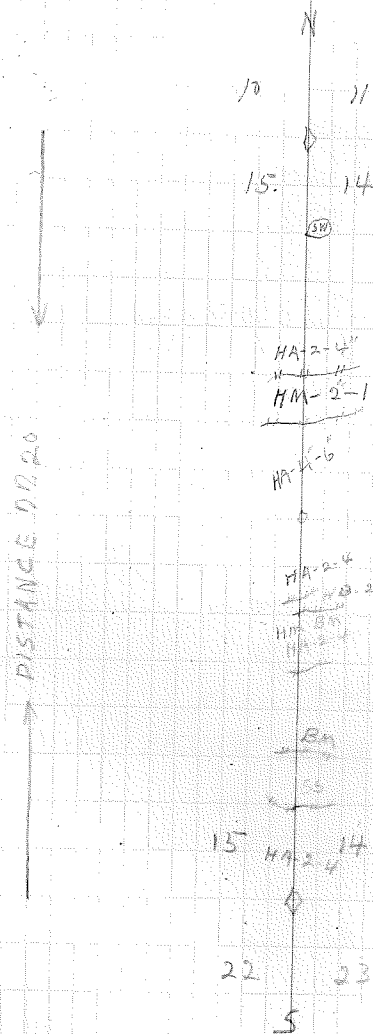
9.69 ENTER SPRUCE SWAMP E. AND W.

T-139-R-27

2/26/37 23
3/29/39

WEATHER-CLEAR
WARM

PARTY: ROBEY &
CERKOWIAK
COMSTOCK
MORRIS
KNOLTON
EMARD



HA-2-4"
HA-2-4"
HA-2-12"

HA-2-6"

HA-2-4"
HA-2-4"
HA-2-4"

BM

HA-2-4"

HA-2-4"

LINE RUNNING NORTH BET SEC 10-11 VAR. $6\frac{1}{2}$ "

97.96 EA. AND W. LINE 379 CH WEST OF COR. TO SEC. $\frac{313}{10111}$
2" I.P. IN PLACE COR. TO SEC 2-3-10-11

60.00 ENTER MIXED HARDWOOD 6-12"

52.00 ENTER HA-0-2" MIXED BRUSH

40.00 SET APP $\frac{1}{4}$ PAST

22.00 ENTER SWAMP WILLOW

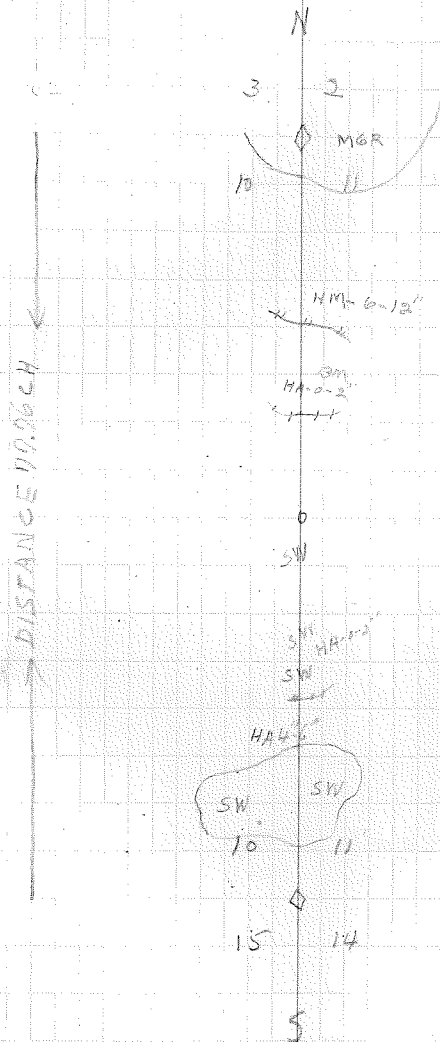
17.00 LEAVE SWAMP ENTER HA-4-6"

6.25 ENTER SWAMP WILLOW

T-139 R 27

WEATHER - CLEAR - WARM

24
3/29/39 3/30/39
PARTY - ROLF A
CERKOWNIAK
COMSTOCK
EMARD
MORREN
SIMS



LINE RUNNING NO. BET SEC 3-2 VAR 62

88.78 EA AND W. LINE 26 LKS. V. OF CO. TO SEC. ²⁴³⁵ 312

78.00 ENTER S.T. 0-2

69.00 ENTER SPRUCE SWAMP EA. - W.

66.48 BLAZED LINE RUNNING EA AND W.

43.00 LEAVE MARSH ENTER HA-4-6

40.00 SET APP $\frac{1}{4}$ POST. 4" OAK

39.00 ENTER MARSH

29.89 ENTER HA-4-6"

24.00 ENTER SWAMP WILLOW

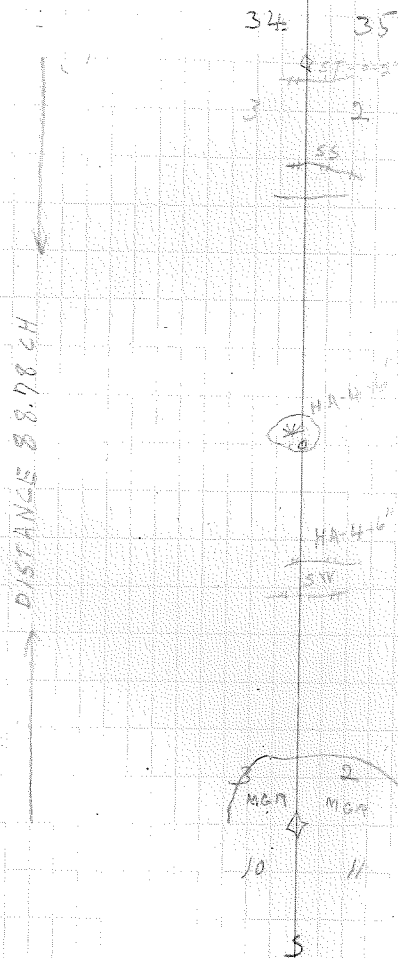
7.00 LEAVE SWAMP ENTER HA-4-6" AND BM

T-139-R 211

3/30/37 25

WEATHER - CLOUDY.
LIGHT SNOW

PARTY ROLF I.
CIEKOWIAK
COMSTOCK
MORKEN
SIMS
EMARD



LINE RUNNING No. BET. SEC. 32-33 N. 6° 36' W.

75.87 E. AND W. LINE 5.97 CH. E. OF COR. TO SEC. $\frac{2988}{3233}$

49.00 ENTER HA 4-6"

40.00 SET APP. POST

T-139 R. 27
WEATHER - CLEAR - WINDY

4/2/37 26

PARTY - ROLF T
CERKOWNAK
COMSTOCK
EMARD
SIMS
SCULLY

DISTANCE 15.80 CH.

4A 4-6"

Bm

Bm

32 33

5 4

5

LINE RUNNING No. BET SEC 28-29 N. 6° 30' W.

77.09 E AND W LINE 2.59 CH EAST OF COR TO SEC. ²⁰29

40.63 ROAD CLASS G - MIXED BRUSH
40.00 SET APP 1/4 POST
39.00 LEAVE MARSH ENTER HA-1-2
38.00 ENTER MARSH E AND W

18.00 LEAVE MARSH ENTER HA 2-6
12.00 ENTER MARSH N-E-SW

T 139 R 29

4/5/39 27

WEATHER. CLOUDY - WARM

PARTY - ROLF R
CARMANNIA
COMSTOCK
S/M S
EMARD
KINGWATON

20 21

◇

29 28

BM

BM

DISTANCE 77.09 CH

HA 2-6
HA 0-6
29 28

32 33

S

LINE RUNNING NO. BET. SEC 20-21 N 6° 30' W

82.99 EAST AND WEST LINE 13.21 CH W OF COR. TO SL $\frac{4.16}{27}$

99.00 ROAD CLASS G EAST AND WEST

67.00 LEAVE SWAMP ENTER BM

54.00 ENTER SWAMP

50.40 LEAVE SWAMP ENTER BM

44.00 ENTER SWAMP E AND W

34.00 SET APP. POST

29.00 LEAVE MARSH ENTER N.A. 0-2" BM

26.00 MARSH N-E-S-W

T 139 R 27

WEATHER - CLOUDY - WARM

4/6/37 28

PARTY: POLES
CERKOWIAK
COMSTOCK
KNOWLTON
SIMS
EMARD

476628 DISTANCE

17 16

20 21

BM

SW

BM

BM

20

21

29

28

LINE RUNNING NO. BET. SEC. 15-16 N. 6° 30' W.

74.04 EAST AND WEST LINE 13.16 SE EASE OF CUR. TO SEC. $\frac{819}{1716}$

54.00 ENTER HA 2-0" BM
48.00 ENTER SW
43.00 ENTER MLT
41.00 LEAVE SWAMP ENTER HA 2-2"
40.00 SET APPX 1/2 POST

18.00 ENTER SWAMP

STARTED FROM 3' ASPIN STAKE

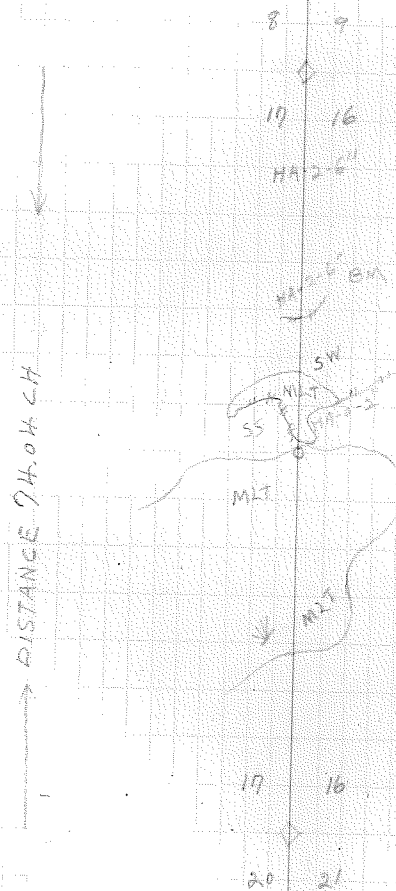
T 139-R 29

4/7/39

29

WEATHER - KLUDDY & WINDY

PARTY ROLLS A
GERRITMAN
COMSTOCK
KNOLTON
EMARD
SIMS



LINE RUNNING EAST BET SEC 6-31 N. 83° 36' E

85.00 SET 4" PJ POST APP COP TO SEC. 5-6. DI. 32

78.00 ENTER PJ 4-6"

64.00 ENTER MIXED BRUSH

58.33 LEAVE LAKE ENTER HB 2-4"

49.82 LAKE

48.00 RIDGE N. AND S.

46.71 LEAVE LAKE ENTER HA 2-4" BM

40.00 SET APPX 4 POST

34.28 LAKE

29.00 ENTER BIRCH 2-4"

19.00 ENTER HA-2-6"

11.00 ENTER HB-2-4"

1/2 LBS ROAD CLASS C. N. AND S.

STARTED FROM W. ASPIN POST CAR. PUSES

346
347

T 139-138-26

WEATHER CLEAR WARM

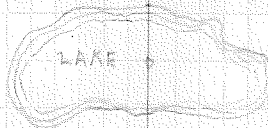
PARTY ROBE A
CERKOWNIAR
COMSTOCK
KNOWLTON
EMARD
SIMS

32 5

31 6

30 7

BM



HB-2-4

HA-2-6



31 HA-2-6

36 1

N ←

LINE RUNNING EAST BET SEC. 32 & N 83° 30' E

80.00 SET APP ~~1/4~~ 4" SO BIRCH COR TO SEC. ^{33 1/4} 32 5

79.00 ENTER PN 4-8

65.00 ENTER ASPIN 2-6⁹ MIXED BRUSH

47.00 ENTER PN 8-10⁹ HA-4-6

46.00 SET APP ~~1/4~~ POST

36.00 ENTER JACK PINE

10 LBS LEAVE PJ ENTER BM

STARTED FROM 4" PJ POST APP COR TO SEC.

32 1/5
31 1/5

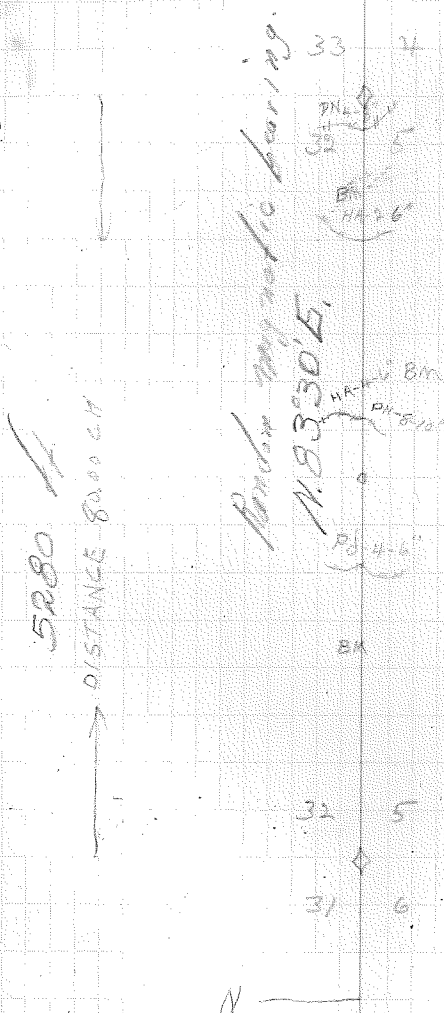
T 139-131
R 26

WEATHER - CLEAR WARM

4/9/37

4/9/37 31X

PARTIAL
CERKONIA
CAMPBELL
KNOWLTON
EMARD
SIMS



LINE RUNNING EAST BET SEC. 33-4. N 83° 30' E.

STARTED FROM 4" BIRCH APP COR TO SEC. $\frac{33}{32} \frac{4}{5}$

139-26
-155
T 139-R 26

WEATHER CLEAR WARM

33 4

32 5

N 83° 30' E
Random map

Distance
Var.

32 5

31 6

N ←

4/9/39

32

PARTY ROLF A
CERKOWNIAK
COMSTOCK
KNOWLTON
EMARD
SCULLY

LINE RUNNING SP. BET. SEC. 2-3 S. $6^{\circ}36' E$

82.42 EAST AND WEST LINE 7 LKS E. OF COR. J. SEC
2" I.P. IN PLACE

57.00 LEAVE ROAD ENTER 8M

41.34 EA AND W. LINE 4 LKS. EA. OF $\frac{1}{4}$ POST 2" I.P.
 $\frac{1}{4}$ COR. TO SEC. 2-3

657 OFFSET 36 LKS EAST TO ROAD
400 SIDEROAD

T139N R26W

WEATHER - CLEAR - WINDY

4/13/39

33 X

PARTY: ROSE
SCULLY
DUFORT
JOHNSON
KEELEY
JONES



LINE RUNNING SO. BET SEC 10-11 S 6° 30' E.

80.00 SET APP 1 MILE POST COR. TO SEC. 10-11-14-15
4" ASPIN

69.19 OFFSET 1.70 LKS EAST TO ROAD

58.15 ROAD SE-NW

40.25 EAST AND WEST LINE 87 LKS EA. OF 1/4 POST CORNER

33.98 TRAIL N-S. 3" SD ASPIN COR. TO 14-10

29.00 RIDGE SE-NW

27.00 STREAM 15 LKS WIDE

22.50 ENTER BM

13.00 ENTER PJ 6-10

STARTED FROM 2" I.P. COR. TO SEC. 2-3-10-11

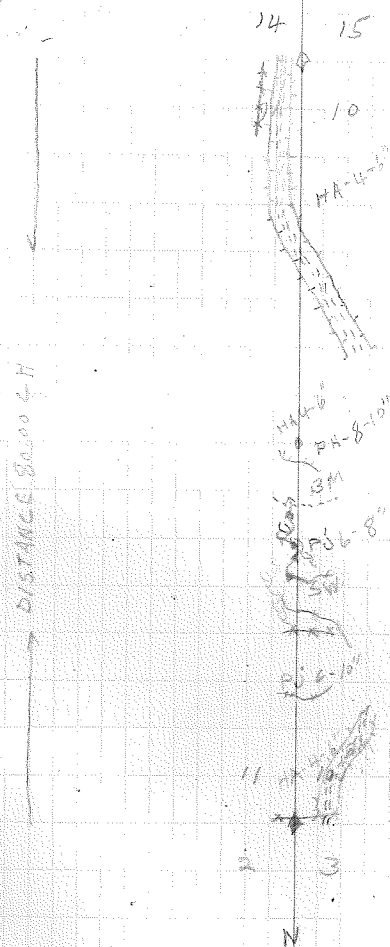
T 139 N R 26 W

11/3/31

34 X

WEATHER - CLEAR - WINDY

PARTY - ROLF A
SCULLAY
KEEFEY
JONES
DUFFY
JOHNSON



LINE RUNNING NO. BET. SEC. 34-35 N. 5° 30' E.

81.00 SET. 16" ASPEN POST APP. CO. R. TO SEC. ^{2700X} ~~34~~ 35

40.00 SET. APP. 1/4 POST

21.96 LEFT LAKE

12.12 LAKE CHAINED ACROSS ICE

T 140 - R 256

WEATHER - LIGHT SNOW

140-25
26
35
4/15/37 X

PARTY - ROLF A.
JOHNSON E.
JONES
SCULLY
DUFALTY
KEELEY



LINE RUNNING NO. BET SEC 25-26 N. 8° E.

8:00 SET APP. GOR. POST. COR. TO SEC. 22-23-26-29

4:00 SET APP. POST

29.63 TIED TO 2" IR FROM WHIZLET BOX NO. ON N. 8° E,
2" I.P. 1.36 CH W. OF LINE

13:00 LEAVE ROAD ENTER MGR

STARTED FROM 4" ASPH. APP. COR. TO SEC. $\frac{27}{34}$
N. 53° E.

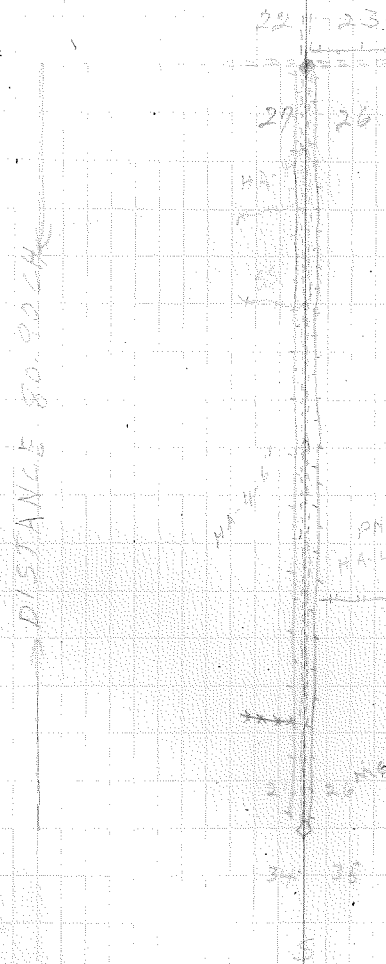
T 140 R 256

4/15/37

36

WEATHER LIGHT SNOW

PARTY ROLF &
JOHNSON F.
KEELEY
JONES
SEVILLY
DURFOUT



LINE RUNNING EAST-BET SEC. 23-26 N 95° 30' E

8/24 NO. AND SO. LINE 2 1/2 LKS N. OF COR. TO SEC. 23 & 26
S.I.P. $\frac{2423}{3326}$ SCRIBED ON CAP.

110.00 SET APP. 1/4 POST

STARTET FROM CROSS ROAD AT INTER. SECTION

T 140 R 26

4/16/31

37

WEATHER - CLOUDY - WARM

PARTY CONSIST

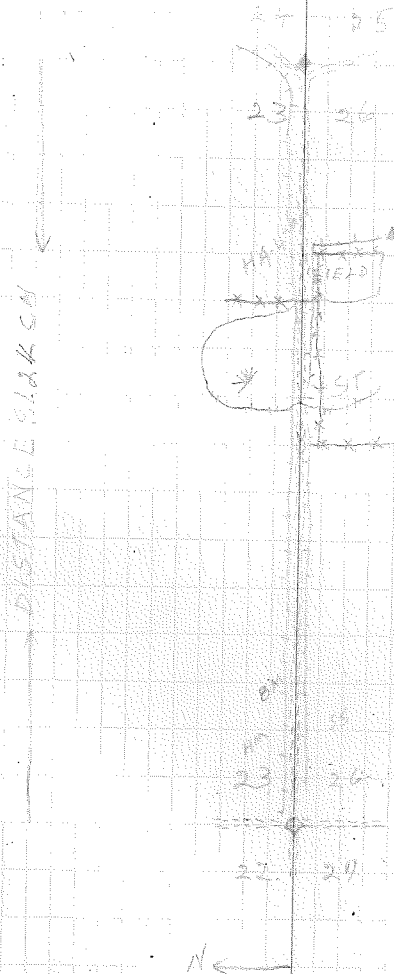
JOHNSON

JONES

SEVILLY

DUFFALL

KEELY



LINE RUNNING WEST BET SEC. 22-27 N 86° E
 BT 14" PN S 30° E 42 LKS. SCRIBING UNABLE TO READ
 12" PN N 13° W 29 LKS " " " "
 4" SO CEMENT POST WITH IRON CAP
 81.78 HANDS, LINE 4.82 CH N. OF COR. SEC. 22-27

70.65 LEAVE LANE
 69.00 LAKE

49.1 LEAVE ROAD

43.60 OFFSET 69 LKS. SO. TO ROAD

41.00 LEAVE ROAD ENTER HA 2-4 PN 8-12"

40.00 SET APP 1/4 POST BT 14" PN SIDE 31 LKS
 SCRIBED 114 S. BT NO 1st FOUND
 REST UNABLE TO READ

STARTED FROM CROSS ROAD AT INTERSECTION
 Line Runs West

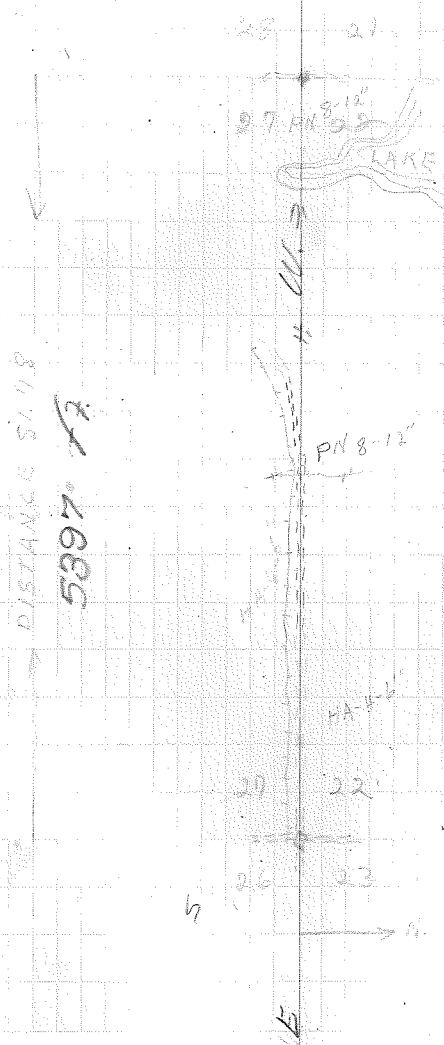
T 140 P. 26

4/16/37

38

WEATHER - HIGH WIND

PARTY
 JOHN F. JONES, F.
 SCULLY
 KELLEY
 O'FAULT



DISTANCE 51.18
 5397.7

20 22
 26 23
 h → n

LINE RUNNING EAST OF SECT 12 N 85° E

To 26 NORTH AND SOUTH LINE AT 2' I.P. COR. TO 7-12

40.00 SET APP 1/4 POST

STARTED FROM ROAD INTERSECTION
BT 12" PW N. 30° E 69 LKS SCRIBED 1143
14" RW S 37° 30' W 83 LKS SCRIBED
114 SW BT

1/4 CORNER OF 11/12

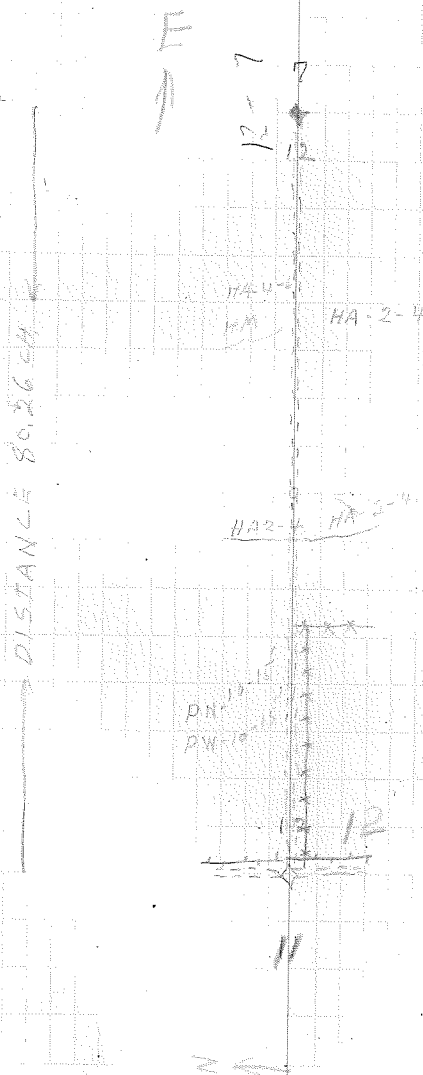
T 140-R²⁶₂₅

4/19

1-19
39

WEATHER - FAIR

PARTY - ROLTA R
CERKOWIAK
COMSTOCK
DUFFALT
SCULLY
JOHNSON P.



LINE RUNNING EAST ON SEC 7 N 85° E

80.00 SET APP POST COR TO SEC 7-8

42.00 SET APP'S POST

31.90 BEAVER DAM BRIDGE 34 LKS

STARTED FROM S.I.R. / COR. TO SEC 12-12
4

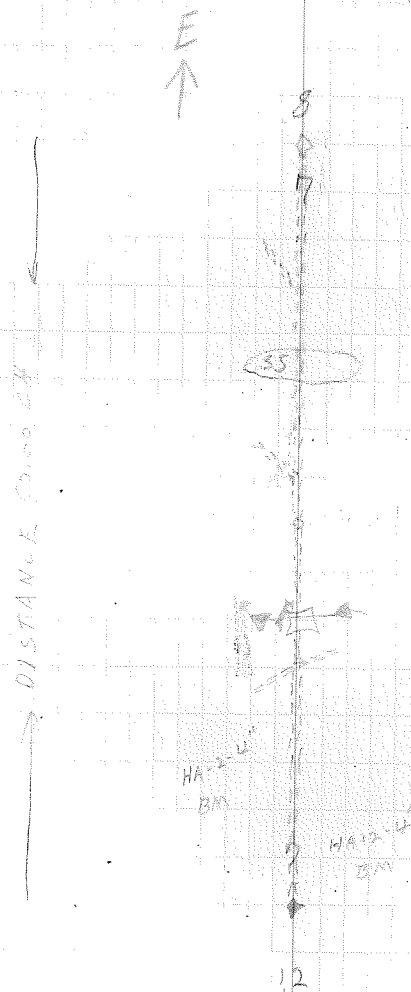
T 140 R 25

4/19/30

40 X

WEATHER FAIR

PARTY ROLL &
LEKOWNAK
COMSTOCK
JOHNSON F.
SCULLY
DUFFALT



139-140
20

9-25

140-25
20

LINE RUNNING EAST ON SEC 8 N 82° E

SET UP 1/4 POST

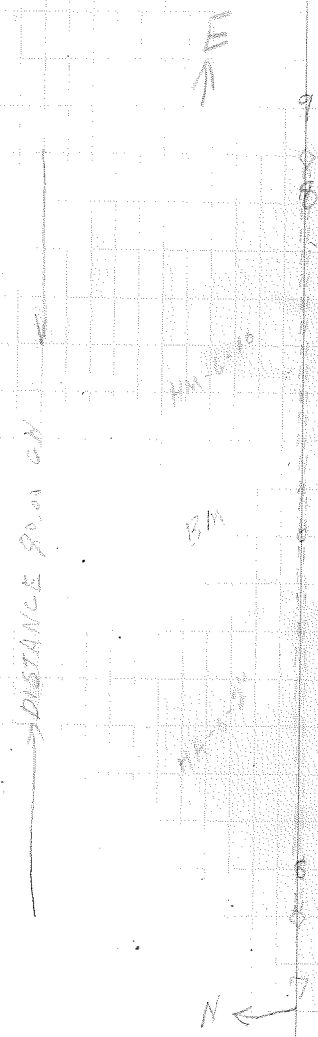
STARTED FROM W. ASPEN POST COR. TO SEC 7

T. 140 R. 25

12037 41 X

WEATHER - WINDY - RAIN

PARTY BUILT
GERKOWIAK
COM STOKER
DUFFERT
SCULLY
JOHNSON



LINE RUNNING EAST ON SEC 9 N 88° 30' E

79.95 SEC 1 APE 1 MILE POST / COR TO SEC 9-10
4

10.00 SEC 1 APE 1/4 POST

STARTED FROM 4" ASPIN POST / COR TO SEC 8-9
4

139-140
26

9-25

140-25
26

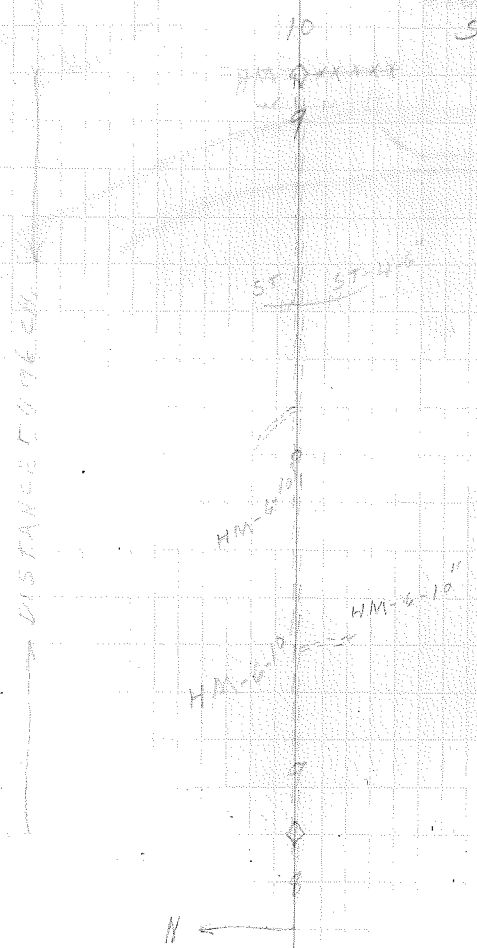
+ 100-R 25

4/20/39

42 y

WEATHER - WINDY - RAIN

PARTY - ROLF &
CERNOWIAK
COMSTOCK
DUFFAULT
JOHNSON F.
SCULLY



137-140 26 9-25 140-25 26

WINDING M. BET. SEC. 9-10. N. 231.00

413
413
CUT RAIL 2 POSTS FOR SEC. 9-10

STARTED FROM X CUT TO SEC. 9-10

4/23/50 X 43

ROBERT R. ROLE P
CERRIGNIAK
CON STOK
JOHNSON F
GOFALTY
SCULLY

DISTANCE 43.00 CH

N
↑

44.6
HM

44.5

9 10
16 15

LINE RUNNING WEST BET SEC. 9-4 N. 83° 30' E
 Line Running west bet 9-4 + 140
 R. 25 W. bearing S. 83° 30' W.

80.00 SET W. ASPIN APP. L.M. POST. COR. T. 29 1/2

85.00 R. 25 W. COR. 140

59.00 LEAVE MARSH

49.60 MARSH N. W. COR.

40.10 W. AND S. COR. T. 29 1/2
 COR. T. 29 1/2

27.67 STREAM IN N. HANDS 0.14

25.00 ENTER MIXED HARD WOOD

STARTED FROM W. ASPIN POST. COR. TO SEC.

3-4-9-10

T. 40 P. 25

4/21/31 44

WEATHER CLOUDY

PARTY - ROLF A
 CEMERONIAN
 COMBEE
 SIMS
 SCULLY
 JOHNSON E.

W
 ↑ 8 5
 9 4

LOT 1 ON
 MARSH

DISSECTION BRIDGE

W.
 ↑

AM
 (M. 29)

AM
 (M. 29)

9 7

10 3

→ N

LINE RUNNING NO. BET. SEC. 5-4 N. 6° 30' W

4.00 REACHED LAKE SET APP. MARKER COR.

25.00 LEAVE SWAMP ENTER HA. 0-2 BM

19.00 ENTER SWAMP

11.00 LEAVE HM ENTER HA. 0-2 BM

9.00 TRAIL EAST AND WEST

STARTED FROM 4' DEEP IN APP. COR. TO SEC. $\frac{5}{8}$

T. 140 R. 25

WEATHER: CLOUDY

N



32

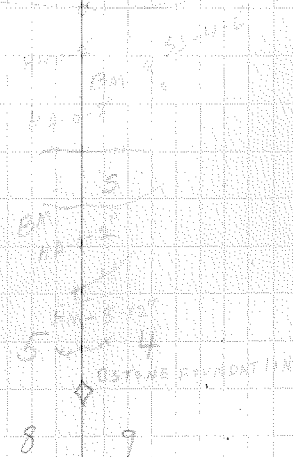
33

5

4

↓
DISTANCE 14000 FT

LAKE



PARKY P. ET
CERKOWNIA
COMSTOCK
SULLY
SIMS
JOHNSON F.

140-25
20

45

LINE RUNNING NO. BET SEC 7-12 N 6° 30' W

40.00 LEFT SWAMP SET APP. POST COR. TO SEC. 11/6
39.00 ENTER SWAMP

15.00 LEAVE HM ENTER HA 2-6 BM
11.00 ENTER MIXED HARDWOOD

STARTED FROM 2nd I.P. 1/4 COR. TO SEC. 7-12

T 140 R 25-26

4/22/37

X 46

WEATHER - CLEAR - WINDY

PARTY - ROLF T
CERKOWNIAK
COMSTOCK
JOHNSON E.
SCULLY
SIMS

N 6° 30' W →
Random magnetic bearing

R. 26

6

R. 26

DISTANCE 1/4 COR. 26

2640 ft.

4 12
12 12
HA-2-6

BM

SM
HA-2-6
HM 10/11/12

BM

SM
7-12

12

7

LINE RUNNING NORTH BET. SEC. 1-6 N. 6° 30' W.

80.00 SET APP. PIST. COR. TO SEC. 1-6-31-36

71.00 ENTER SS MIXED HARD WOOD

40.00 SET APP. 1/4 POST

35.00 LEAVE P.W. ENTER BM HA 2-4

27.00 ENTER P.W. 10-14

14.75 SWAMP 1.00 CH. WIDE

STARTED FROM 1/4 SECTION POST APP. COR. TO SEC. 1-6-7-12

T 140 R. 25-26

4/22/39

47

WEATHER - CLEAR - WINDY

PARTY - RILEY
LEAKINWAY
COMSTOCK
SCOTT
JOHNSON, F.
SIMS

N
↑

36
31

31
36

5280 ft.

N. 6° 30' W.

Running along bearing

PBA
1
SS HM
SW

HA 2-6

BM 83
HA 2-4

PW 10-14

1
HA 2-4

7 12

B.T. 6" TAM S. 61° E 28 LKS SCRIBING UNABLE TO READ
 BT 6" " S. 70° E 90 LKS " " "
 BT 5" " N 56° E 61 LKS " T 140 R 26 W S 17 B.T.
 BT 6" " STAMP N 50° E 35 LKS " B.T. T 140 N S 19
 B.T. 6" " N 23° W 49 LKS " T 140 N R 26 W S 24 B.T.
 BT 6" " S 35° W 80 LKS " T 140 N R 26 W S 25 S.S.

80.00 EAST AND WEST LINE 4 LKS E. OF 2nd I.P. SCRIBED

79.00 ENTER SS AND ST 4-6"

76.00 TRAIL BEARING E. AND W.

76.50 LEAVE SWAMP SPRUCE

63.49 ENTER SWAMP SPRUCE 4-6"

55.00 LEAVE SWAMP

52.00 ENTER ST-4-6

43.00 LEAVE SWAMP

40.00 EAST AND WEST LINE 8 LKS EAST OF 1/4 COR TO
 SCRIBING UNABLE TO READ SEC 25-30 4" S.S. POST

27.00 ENTER SWAMP

6.72 CLASS C. ROAD N-E S-W

5.00 LEAVE MGR

STARTED FROM 2nd I.P. SEC. $\frac{30}{31}$ SCRIBED ON ZAP.

LINE RUNNING NO. BEY. SEC. 25-30 N. 6° W. - 140-26.

25

T 140 R. 26 - 25

4/26/39 X 48

WEATHER CLOUDY

PARTY-ROLE T
 SCULLY
 JONES F.
 COMSTOCK
 SIMS

$\frac{19}{25}$
 $\frac{30}{25}$

24 19

SS ST

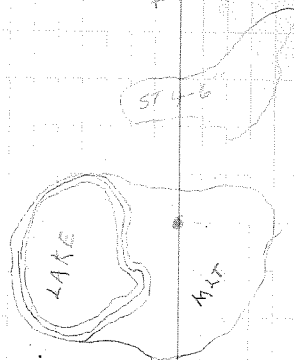
25-30

SW

SS 4-6"

ST 4-6"

5280 FT.



N. 6° W.
 true magnetic bearing

25-30

MGR

30

31

LINE RUNNING NO. BET. SEC. 19-24 N. 6° W

SET APP/4 POST

40.00 EAST AND WEST LINE 56 LKS W OF 2ND 50 POST

132 CH W. OF 2ND 50 POST APP/4 COR TO SEC. 19-24

26.39 TRAIL NE-SW

10.00 TRAIL NE-SW

226 TRAIL BEARING NW-SE

3.00 LEAVE SWAMP

STARTED FROM 2ND I.P. SEC. $\frac{19}{30} | \frac{24}{25}$ SCRIBED ON CAP

T140 N R 26 25

4/26/31

149

WEATHER - CLOUDY

PARTY - ROLF A
COMSTOCK
SCULLY
JONES F.
SIMS

13 18

24 19

25 20

LINE RUNNING SOUTH BETWEEN SEC 26-25 - So. 8' East

5
2
1

1722 FT. WEST TO APP SEC. $\frac{26}{35} | \frac{25}{36}$
 52+49.5 Set 2' oak stake with yellow tag
 49150 Set rec. control stake
 4700
 42100 Set rec. control stake
~~37160~~ Set rec. control stake
 31130 Set rec. control stake.

2640 FT SET APP 1/4 STAKE 3" BIRCH

1353 FT LEAVE FENCE CORNER

200 FT TO ROAD CENTER RUNNING NW/SE
 100 FT STARTED FROM 2 1/2" DP IN SMALL MARK

137-140
26 9-25

TIMOTHY R 26W S.

DATE MAY 21, 1950
WEATHER WINDY CLOUDY

PARTY
 ENGINEER
 P. J. JAMES
 E. M. BIRD
 S. O. BROWN
 H. R. BROWN

140 - 26

S
↑

5200
 4800
 4220
 4280 ✓
 3960
 3630 ✓
 3300
 2970 ✓
 2640 ✓
 2310 ✓
 1980 ✓
 1650 ✓
 1320 ✓
 990 ✓
 660 ✓
 330 ✓

Map
○

○

○

○

HA-IV

HA-IV

FIND

25-26

24-23

Random line section 411 S.C. 2625 T. 140 N. R. 20 W
 Course 56° E

51+27 37.6 FT- EAST TO I.P. MARKED $\frac{3536}{211}$
 41-20 Beginning of 0-2 Mt.
~~41-10~~

- 43-70 Hay Pond
- 43-70 Beginning of MIT
- 38-20 Beginning of 0-2 HA
- 38-20 Ending of SS
- 35+00 Beginning of SS
- 30+36 Ending of pond
- 30+37 Beginning of pond
- 14+50 Beginning of BM and 0-2 HM
- 14+50 End of Mre.
- 13+50 Beginning of Mre.
- 12+63 Water Pond
- 11+35 Beginning of H-A 4-6
- 11+35 END of Hardwood
- 7+59 Beginning of Hardwood
- 6+96 END of MIT
- 4+56 ~~Ending~~ of MIT
 Beginning

0+00 N.W. S.C. 2625 T. 140 N. R. 20 W

137-140 26 9-25

140 N
 R 26 W

May 25, 1937 51
 weather windy - cloudy
 Party - Ed, J. W. T.
 Sponsored
 OIT & O.F.F.

May 25, 1937
 Weather: windy - cloudy

- 5280
- 4950 ✓
- 4820
- 4890 ✓
- 3960
- 3630 ✓
- 3300
- 2970 ✓
- 2640
- 2310 ✓
- 1980
- 1650 ✓
- 1320
- 990 ✓
- 660
- 330 ✓

SS

○ ○ ← Pond



|||||

RANDOM LINE RUNNING SOUTH 84° ^{WEST} BETWEEN SEC

T. 140 - 139 N - R. 26 W

SUB OF 24" RW. STUB 10 FT. HIGH BEARS

S. 84° 30' W. 85 FT. SCRIBED - BT and A

30" BURNED P.N. STUMP BEARING S 9° E 45 FT. (BT)

52+82 INTERSECT N/S LINE 27.3 FT. NORTH OF

I.P. MARKED $\frac{57}{21} \frac{98}{1}$ - 2" WITH CAPPED

ROD WITH STONES AT BASE

46+81 LEAVE SWP. ENTER ASPEN 5-2"

47+00 ENTER SCATTERED ST. M.L.T. SWP.

39+60 SET 1" ASPEN ST.

27+66 WALK ROAD N/S

26+42 SET 1/4 ST. 3" WORK WITH TREE BUTER.

26+42 INTERSECT N/S 1/4 LINE FT. No. OF 2" I.P.

WITH ROD CAPPED MARKED 1/4-2-1/4 35

11" BURNED W.D. N 86° E 37.5 FT. LOWER BLAZE (BT)

25" W. OAK S. 57° E 44.5 FT. SCRIBED - 1/4 32 - (BT)

23+10 LEAVE SW. ENTER - H.M. 1/4 32 - ASPEN

13+20 SET 1/4 ST. 2" ASPEN - ENTER SW. SWALE

5+45 LEAVE FENCE COR. RUNNING SO.

1+35 TO FORESTRY TEL. LINE & FENCE COR.

1+00 TO CENTER OF HIGHWAY

0+76 TELEPHONE LINE

0+00 I.P. IN EAST EDGE OF SW. SWALE

I.P. N/S - 2" WITH CAPPED

DATE - MAY 26, 1937

52

WEATHER - CLOUDY - WIND

PART - INTERESTING

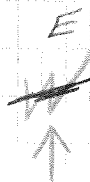
J.P.P. - H.M. 1/4

HOPKINS - ROAD

STONESTAD - EAST

FALLON - AXE

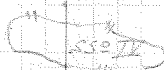
OLTHOFF - AXE



36 1

35 2

2" 1/4 20" 2" - 10



H.M. 6-12" - 46

1/4 35 - 1/4 32

SW

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

1/4

Random line Ranging East $N 83^{\circ} 30' E$ Between Sec. 30/31
T. 139 R. 25

2nd I.R. 28 FT From Culvert. Post = beside
I.P. No Cap on I.P./

line bears $N. 83^{\circ} 30' E$

52+29 From 4'x4" conc. Mon. Secs. 30/31 T. 139 R. 24

50+00 Mar.

46+64 Intersect y in Road leading North West

45+87 Intersect y in Road leading North East

35+71 I.P. SET 18 FT. To The North of Ranging Line.

25+26 End of Bog

19+00 Bog With ss + st + sw

15+51 Intersect Road running Nward S

13+26.3 Intersect N.E. in 3 1/2" and pipe

To Int of Road leading N.E.

12+00 Log cabin 75 ft So. of line

$N 83^{\circ} 30' E$ on road line bet Secs 30-31 T. 139 R. 25

4' x 4' conc. mon. with 1/2" dia. pipe

Weather
O'cast

Chaining Record:
11111289 FT

Date: May 27, 1937

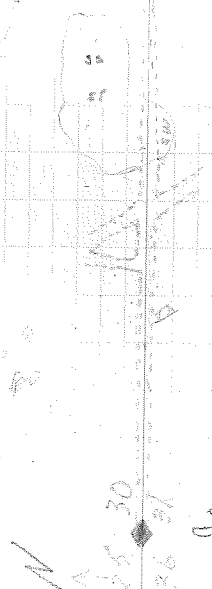
Party:
Culp T. & head chain
Nordquist - rear chain
Shonstad - Rod
Lover - Brush
201 Thott - Brush

E
N

1830301
10505811

Mag. bearing

20
30
31



Start east.

Last Lot. Sec. $\frac{29}{32}$ Twp.
139 N. R. 25 W.

- 47+60 End of Bog
41+60 End of Bog
41+39 Bog with st-sw-ss
30+75 Water Pond Running NW+SE
26+40 3' 2" Soft Maple
20+00 End of Hay Field
13+25 Field S of Road. 30 FT. 75 acres
13+26 Left Road. Road Turned to line NE
13+20 House and barn 250 FT. N of line
14+00 Log cabin 100 FT. North of line

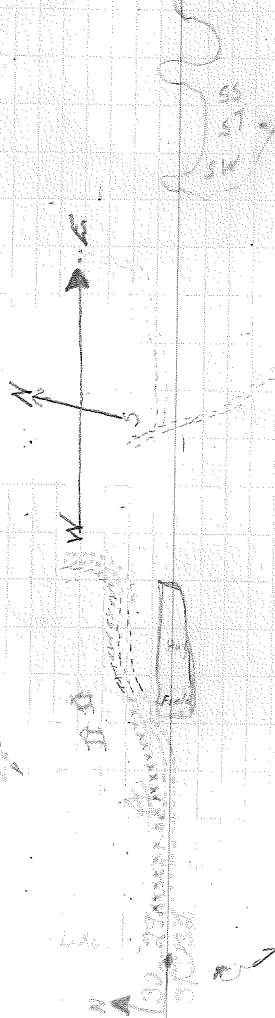
0+00 Start. east.

N 85° E on Road line bet sec 29/32 T139 R15
3" IP with top 10" 3" below ground level

Wentons
Coast.
Quarry Record
11/11

Late: May 23, 1934
Party:

Culp - Tr head chain
Nobles - pars chain
Stonstead - pars
Jones - Brush
O'Thott - Brush



Random line running 23° NE of $\frac{24}{33}$

No cor. Estab.

65 FT. N From brick 12" wide 35' high
blazed on 4 sides, writing on the W. side
can't make out what it reads.

497 20 Beginning of HA + HA
357 30 Edge of HA PJ
161 50 Beginning of Csp.
131 00 Beginning of PJ

137 00 End of HA
007 00 Beginning of HA

113° E on sec line $\frac{24}{33}$ T139 R25. No cor. Estab.

Weather:

Clear

Chaining

||||| 280

Date: June 2, 1937. 755

Party

Culp: X head chain.
Nordquist: rear chain.
Stronstead: Rod.
Jones: Brush.
Fallon: Reel h.

57 20

49 20

42 20

36 20

29 20

23 20

19 20

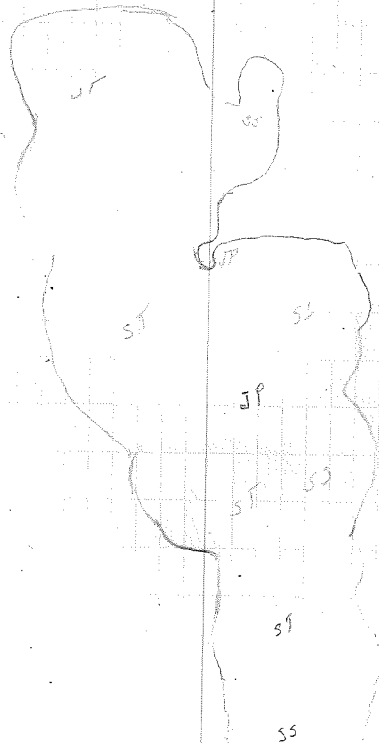
16 20

13 20

9 20

4 20

33 20



22 20
19 20
16 20
13 20
9 20
4 20

Start each

Random Line Running N 83° E Between Sec 27-34

T. 139 N - R. 25 W

26+40 No cor. Estab. Left " Cedar Post with yellow Tag
21+00 Leave Spruce Swamp Enter Cedar Swamp
19+00 Leave Alder Swamp Enter Spruce Swamp
11+50 Enter Salt Tam Swamp
9+00 End of Swamp
8+00 Beginning of Swamp

1+00 End of Swamp

N 83° E On sec. line $\frac{2}{3}$ T 139 N R 25 W No cor. Estab.

Weather: Clear & Calm

Chaining: 11+6+0

Part

June 3, 1937 56

~~Galvan~~ Nystrom
~~Galvan~~
Brush Galvan
Coulson: 12' 1/2

2640

2310

1980

1650

1320

990

660

330

N
11
12
13
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99
100

~~N Bet 27-34~~
 Live Runs East keta.
 27-34 L. 139 R. 25 W.

Tie to L.P. from opp. corner
 95.9 ft. E of 121 ft. width
 Total distance 534754 ft.
 Alignment to true corner 121 ft. W.

0+95 Off winter road
 Found Established Con - Squared 6" Spruce Marked -
 - APP. Sec. Con. 27126 N66°E - 234 FT. From our Set App
 Con - Set APP. Con. 34135 4" Cedar post with metal Tag. at
 52+80
 50+00 Left Cedar Swp Entered Spruce & Alder Swp

Cedar Swamp

26+40 No Cor Estab. Set Approx. Cor 4" Cedar post with metal tag
 E Squared 7" Cedar 50 FT N.E. of #1 Con.

June 4, 1937 57

Weather: Clear & Windy
 Chaining: 11+290

Party:
 H. Chain - Nyström
 R. Chain - Nordqvist
 Rod - Fallon
 Brusher - Galvan
 - Lowison

Weather: Cloudy & Windy
 Occasional Showers
 Chaining: 0+600

Same Party - June 7, 37
 One new man. Kelley.
 For Galvan

Weather: Clear & Calm
 Chaining: 1+280 - 1+320

Same Party - June 9, 37

1320
 990
 660
 330
 5280
 4180
 4620
 4290
 3160
 3630
 3300
 2470
 26+40

Estab. App. S. Con
 to Spruce

N. 8. 3. 11
 11. 3. 11

T 139 N

R
 N. 8. 1. 18. 5.
 11. 3. 11

Note:
 Look
 46.4 ft.
 just back
 of them
 125 ft. W.



Random Line Running N. 83° E Between Sec $\frac{26}{35}$
T-139-R-25W

Distance = 5280 ft.

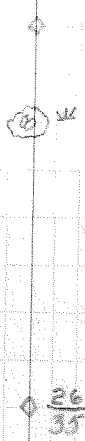
4590 Enter Swale 4630 Leave Swale
38+50 Left Spruce Swp - Entered Asp, Birch & Ash Sw.
No Est. Cor. - 7" Spruce blazed on 3 sides 30 FTN. of our
Set Approx. Cor. 3" Spruce with metal tag
22+50 Leave Cedar - Enter Spruce & Tam.
18+00 Leave Spruce Swp - Enter Cedar

Weather: Clear & Calm
Chaining: 1470

Weather: Cloudy & Calm
Chaining: 111

5280
4928
4620
4290
3960
3630
3300
2970
2640
2310
1980
1650
1320

N. 83° E.
Random No. 6. 676.



June 10, 1937. / 58
Party

H. Chain - Nyström
R. Chain - Nordqvist
Rod - Coulson
Brushers - Alley
- Ahrendt

June 11, 37

Party
H. Ch. Nyström
R. Ch. Nordqvist
Rod. Coulson
Brushers - Alley - Chupko
Carvead - Graf

Random line Running S. 83° West Between 625-36
T. 139 N. R. 25 W.

West bet. sec. $\frac{25}{136}$ T. 139 N. R. 25 W.

total distance 5280 FT.

52+80 - Found 3 Orig. B.T.s - Set Est. Cor. 26/25
162' FT N 10° W. of cor (Set App. Cor) 35/36

- 37+00 - Leave Asp. etc. - Enter Spruce & Tam. Swp.
28+70 - Leave Spruce & Bal. - Enter Asp & Ash & Birch
25+80 - Leave deciduous trees - Enter Spruce & Bal.
21+00 - Leave Pine
19+51 - Old Wagon trail
16+00 - Enter Scattered White & Norway Pine
7+96 Old Wagon trail
4+00 Enter Aspen, Birch & Soft Maple
3+70 Leave Swale
2+20 Enter Swale
2+74 Old Winter Stone - Squared
0+20 Power Line

No. Cor. Est. Set of Part

Weather: Clear & Calm
Chaining: ||||

June 14, 1937

Party

H. Ch. - Nystrom

R. Ch. - Nordquist

Red - Coulson

Brushers - Alley - Chupka

Cariveram.

59

5280

4480

4620

4296

3960

3630

3300

2970

2640

2310

1980

1650

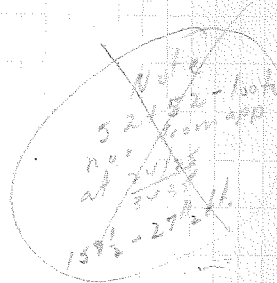
1320

990

660

330

S. 83° W
Mag. bearing.



1/4 Cor.

1/16 Cor.

25/30

35/31

Random line running S 82° W Between S. 14 - 23
T. 139 N. R. 25 W.

52130 Tied in with center of road set approx.
con. Birch post 18" with metal tag.

52120 Left marsh
50100 Enter marsh
41120 left swale
37100 Enter swale
29130 left swale
29150 Enter swale
26140 Set approx 1/4 way at 26140 ft.
11100 Left Road in aspen, Birch & Poplar
3100 Left Marsh on Road

APPROX. COR. ¹⁴¹³ ₂₃₂₄ RUNNING WEST

Weather: Clear & Calm
Chaining: IIII

June, 15, 1937

Party

H. Ch. - Nordquist

R. Ch. - Chupka

Red. - Cariveau

Brushers - Alley - Galven

X60

52180

1950

2120

4290

3960

3630

3300

2970

2640

2310

1980

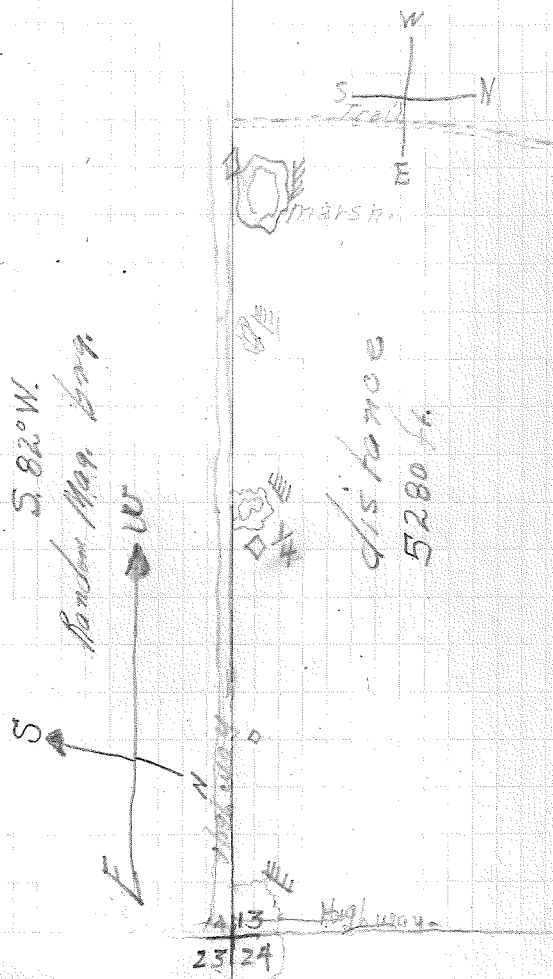
1650

1320

990

660

330



Random line running S 22° W Between 16-21
T 139 N R. 25 W

Line Runs west bet. Sec. 16
T. 139 N. R. 25 W.

Which Mark's Line Run west from 1615 5397 ft.
We discovered Old org. Cor. $\frac{1716}{20/21}$ 222 ft. North

52+80 set approx sec. cor. $\frac{1716}{20/21}$ 4" Tam. post.

40+50 Beginning of elder brush and spruce swamp.

40+50 Left aspen and Birch

40+00 Enter aspen and Birch

39+40 Left spruce and elderberry swamp

34+00 Cross creek

29+70 Enter spruce and Elderberry Swamp

27+00 Beginning of Elder brush

26+40 set approx $\frac{1}{4}$ cor. 2 1/2" Poplar post with metal top

Tie to L.P. from 26+40 - 130 ft. west.

1141 ft. north.

10-00 start

330 Aspen & Birch and poplar

Approx sec. cor. $\frac{1615}{21/22}$

Weather: Clear + calm

Fri - June 18, 1937 62

Chert log - 1/1/1/1 + 28 ft
Weather: calm - cloudy

W
↑

Party:
H.C. - Nordquist
R.C. - Chupka
Rod. - Coulson
Brushers - Alley
Carveall
June 18, 1937
same party



Center of Wagon Road - Running South + North

5280 IN Meadow - 117 ft East of Road

4950

4620

4290

3960 to

3630

3300

2970

2640 $\frac{1}{4}$

2310

1980

1650

1320 to

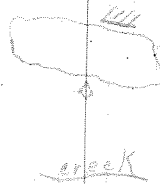
990

660

330

584° 24' W

face map. born



Chained dish
5397 ft.

Start west

$\frac{1615}{21/22}$ 15122

Running West on R. 25 W. line (S 23-30 W) Between
Sec. 17-20 T 139 N. R. 25 W.

Line runs west bet. Sec. 17
T. 139 N. R. 25 W.

1517
Tag, 19120
52480 Set approx. Temp. Cor. which is 200 ft. south of org. Cor. of 1817
52473 Wagon Road running North and South
52449 Begin Slew
49470 End of spruce, Tam, Ash, swamp
45470 Beginning of spruce, Tam + Ash, swamp
45400 End of Slew
40480 Enter J. Pine
38473 End of Slew
38421 Wagon Road running North and South
37422 Beginning of Slew

26440 Set approx 1/4 cor. 8" poles with metal tags. 17
29450 Enter spruce with
22450 left spruce swamp
20410 Enter spruce swamp
17410 Enter spruce and W. Pine.
17400 left spruce and Tam. swamp

1710 Enter spruce and Tam. swamp

1710 Enter spruce

1730 Enter spruce

Stop at Org. Cor. 1716 1 N. Meadow -
2017

Wagon Road - Clear + Cross

June 21, 1937

63

Timing: 1111 + 280

Parks - t

Party -

H.R. Mudge at Cor. 17

R.C. Chyka

Rob. Coulson

Brushers: Ailey
Cariveau

W
↑

W
N
E

5280

4290

3960

3630

3300

2970

2640 1/4

2310

1980

1650

1320 1/4

990

660

330

S 85° 42' W

Wagon Road



5280 FT

Chained dist.

Wagon Road

1716

2017

West from
orig. cor

Running North of random line S. 83°40' W. 800
 Section T 139N R 25W

- 8 ft East short of original corner
 21.87 - from original
 Approx corner S 64° E
 BT - N 82 E
 52+80 Original corner - 153 ft W.P. 22"
 original -
 52+80 Set ^{our} approx Sec corner 13 1/2' S of
 41+67 Left Swamp
 45+10 Swamp
 34+00 Road branches out back S other W
 31+00 Enter Ha
 2" Aspen - Metal tag
 26+40 Set approx 1/4 corner S 51° E
 BT - FISHY 46 ft
 26+00 Original 1/4 corner S 26° W
 87
 21+00 Left road - Enter sldm - 5
 20+37 Road turns Runs S
 18+26 Private road
 west on road S 82° 40' W
 Compute new bearing & distance
 1420 Offset south to road 23 ft
 1390 Road into House
 8+50 Enter Open Pasture
 6+50 Cross Fence E-W
 6+30 Enter Balsam E-W
 5+27 Trail NE & SW
 7192 From 55 To High ground
 5000 at Crags 1817 in Beaver Dam

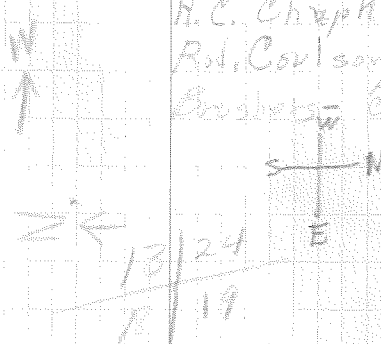
June 2 1937
 Party 64
 11117280

Paras H.C. Nordquist - owner

R.C. Chapka

Rob. Coulson

Brusher ^{Allen} Carlson



- 5280
 4950
 4620
 4290
 3960
 3630
 3300
 2970
 2640 1/4
 2310
 1980
 1650
 1320 1/4
 990
 660
 330

West from sec.

1817
 1920

Running W. on Handson line S. 84.40 W. Between Sec.
 12/13. - E. to W. T 139 N R. 25

the other 2' high S 48° E - 40' dist.
 one 4' high N 47° W 40' dist

Located two bearing post
 square wooden stack in middle of road

5280

Found original Sec corner $\frac{13}{12}$ $\frac{13}{11}$

& continued West S 86.40 W

calculated new bearing

QSS set to edge road 10 ft

12 ft N of center of road.

26+40 Set approx $\frac{1}{4}$ corner.

26+10 Left swamp - Enter Hand

16+50 Enter swamp

0+00 - 1659 Hm

0+00 Start of operation. $\frac{13}{12}$ f. 139 N
 Strat at Approx. Sec. Cor. $\frac{13}{11}$ R. 25 W.

Weather: Clear, Breezy

Chaining = 1111 + 280

June 23, 1937

65X

Party:

H.C. Nordquist & Parks

R.C. C. Kupka

Rod. Covison

Brushers Alley, Cariveau



5280

4950

4620

4290

3960

3630

3300

2970

2640

2310

1980

1650

1320

990

660

330

Hm

Hm

$\frac{13}{12}$ app. Sec. Cor.
 $\frac{13}{11}$

Running W on Random line S 86°40' W
Between Sec 14 E to W T. 139 N R 26 W

road
E of BT in the middle of
set up approx corner 14th
located original corner
metal tag gone - couldn't
3" Aspen. Located N. BT with
52+80 Set approx Sec. corner ^{metal} tag
37+00 Enter Ha
34+88 Middle abandoned road
30+00 Enter Alder knob
28+00 Enter Birch Hb.
26+40 Set approx 1/4 corner 2nd Birch
16+50 Leave SHd. Enter Ss-c-ba.
9+00 " SHd.
over 900 Enter Balsam swamp
Start at org. cor. in center Sec 14/12
13/12

Weather clear Windy June 23, 1937
Chaining 11111 + 280 Party 66 X
H.C. Nordquist & Park K's
R.C. C. Kupka
Bud. Coulson
Bruster Carlson



5280
4950
4620
4290
3960
3630
3300
2970
2640
2310
1980
1650
1320
990
660
330

Ha 330

Ss-c-ba

14/11
13/12

Running W on Handley line S 24 W
 Between $\frac{10}{15}$ E to W T 139 N # 25 W

Tie to restoration monument (10-21-37)
 from opp. S.C. 13.5 ft. east and
 61.8 ft. south.

52+80 Post with metal Tap
 Set approx. Sec. Cor of $\frac{910}{1615}$ set 4" Tam

58+32 Leaf meadow - Under S.C.
 45+75 Enter meadow
 33+00 Enter Ha.
 4" Tam stump
 26+40 Set up approx $\frac{1}{4}$ corner
 23+10 Enter St
 19+20 Enter Skm
 15+60 Enter S.W.
 14+79 Middle old logging road
 8+80 Enter S.S.
 0+00 Middle old road - Fa
 Start of approx sec corner $\frac{610}{1615}$
 4" Tam stump 4" H

Weather Clear
 Cloudy
 Change 1/11

June 24, 37 67
 25

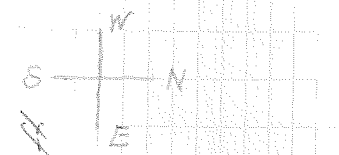
H.C. Nordquist
 R.C. Chyphka
 Rod: Colzak
 Brushers Miller - Parks
 Capron

5280
 4950
 4620
 4290
 3960
 3630
 3300
 2970
 2640
 2310
 1980
 1650
 1320
 990
 660
 330

Snow
 Random Map App.

Meadow

Lake



Corr. Dist - 5266.5 ft

Corr. Map App
 3,912.4 ft

Running random line S 83° 30'
Between $\frac{7}{16}$ E to W T 189N R 25W

line running east -
Random bears N. 83° 30' E

Apr. 26. ⁸¹⁹ 17/16

39145.5 N 50° W - 16.9 ft. to 13120 E of

Tam

26+43 Set up approx 1/4 corner

26+46 Enter S+

14+75 Enter Ss

7+67 Middle old logging road

5+00 Start bear

Running random line from approx

S 83° 30' E

Weather cloudy
Calm
Chaining 1111+960

June 25, 39

68

H.C. Nordqvist
R.C. Alley
Bud - Parks
Brushers Chapha
Hensel



3960

3630

3300

2970

2640

2310

1980

1650

1320

990

660

330

Run East on Random line S. 83°30' W. Cor. Sec. 7/8
T 139N R 25W Page I.

Random line running East
Bear. N. 83°30' E

32+00 Enter Slew

38+77 Left Slew

42+00 Enter Slew

47+30 Enter Elder Brush

43+30 Left Slew

42+90 Enter Slew

33+77 Old logging Road Run N. on S.

Start at logging road 33+77 E. on Random line

Weather Clear Breeze
Chaining - 111114286

June 29, 1937

69

Party
H. Nordqvist
R. Alley
Red-Parks
Brushing - Huska
Hosley



52+80 No See, No Found. See Cor. 52+80 St.
Set Approx. Sec. Cor. Between Sec. 7/8
4" pipe Cor. post
With Metal Tag 713
7517

49+50

46+77 - Slew

46+20

45+98

Random line bearing
N. 83°30' E



Running East on Range line N83°30'E. Bal. Sec.
T. 139 N. R. 25 W. Page II

21186 Enter Balcon Swamp

19467 Old Creek Bottom

2100 Enter Aspen

2100 Left Stew

Start at Sec. Cor of

1060 Start East

Weather Clear Breeze
Charming 111112 50

June 29 1939

70

Party

He Nordquist

R. L. Allen

Red. Parks

Brusher

Chapin

Merby



Old Creek

3 33+10
4 19+80
5 50
6 27+20
7 19+90
8 27+60
9 27+20



41410 Enter spruce swamp
41420 left cedar swamp

42400 Enter Cedar swamp
42410 left spruce swamp 1/2 h

32400 Enter Spruce & Cedar slash

Page III

1950

June 29, 1937 71

T 139 R 25W X

44420

45490

45760

46130

46500

46870

46440

Set approx. 1/2 cord of gear
2' Balsam Wilkes
Metal 2, 4, 40 Found no B.T.s.
Bot. Sec 8

19 8
19 17

T 132 EN 125

$258^\circ E - 169$ ft. to $39145.5'$ West
~~Approx. 100 ft. 556° East~~
Tied into Random in Running West

$183^\circ 30' E$

Random west corner

Con. Dis: $5423'$ Fx

Con. 679. 11.85° / 24.

10000
01490
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

S.C. $\frac{819}{1716}$

Tie from true corner to random corner
North 165.4 ft.
West - 143 ft.

Stand at cor 109 $\frac{819}{1716}$ Running East

Sac. Apr. Sac. Cor. Sac. Log
 $\frac{819}{1716}$ Sac. Log
Sound no. S.T. on Log Sac. 22 Temp. post as
Apr. Cor. Without Tag

$\frac{19}{187}$

Ind

T 139 N R W

| | | | | |
|-------|-----|--|------|----|
| East | Bet | 28-21 | Page | 1 |
| West | " | 29-20 | " | 2 |
| " | " | 30-19 | " | 3 |
| North | " | 36-31 R 29-27 W | " | 4 |
| " | " | 25-30 " " | " | 5 |
| " | " | 24-19 " " | " | 6 |
| East | " | 18-19 R 27 W | " | 7 |
| " | " | 17-20 " " | " | 8 |
| North | " | 7-12 R 20-21 ²⁵⁻²⁴ W | " | 10 |
| " | " | 1-6 " " | " | " |
| West | " | 36-1 (T 139-140 R 25) | Page | 12 |
| " | " | 35-2 (" " ") | " | 13 |
| East | " | 31-6 (" " ") | " | 14 |
| " | " | 32-5 (" " ") | " | 15 |
| East | " | 32-5 (T 139-138 R 25) | " | 17 |
| " | " | 33-4 (" " ") | " | 18 |
| " | " | 31-6 (" " ") | " | 19 |

T 139 N R 27 W

| | | | | |
|-------|-----|-------|------|----|
| North | Bet | 34-35 | Page | 20 |
| " | " | 27-26 | " | 21 |
| " | " | 22-23 | " | 22 |
| " | " | 14-15 | " | 23 |
| " | " | 10-11 | " | 24 |
| " | " | 2-3 | " | 25 |

T 139 N R 27 W

| | | | | |
|-------|-----|-------|------|----|
| North | Bet | 32-33 | Page | 26 |
| " | " | 29-29 | " | 27 |
| " | " | 20-21 | " | 28 |
| " | " | 16-17 | " | 29 |

T 139-138 N R 26 W

| | | | | |
|------|-----|------|---|----|
| East | Bet | 6-31 | " | 30 |
| " | " | 32-5 | " | 31 |
| " | " | 33-4 | " | 32 |

T 139 N R 26 W

| | | | | |
|-------|-----|-------|---|----|
| South | Bet | 2-3 | " | 33 |
| " | " | 10-11 | " | 34 |

T 140 N R 26 W

| | | | | |
|-------|--------------------------|-------|---|----|
| North | Bet | 34-35 | " | 35 |
| " | " | 26-27 | " | 36 |
| East | " | 28-26 | " | 37 |
| West | " | 22-27 | " | 38 |
| East | along $\frac{1}{4}$ line | 12 | " | 39 |

T 140 N R 25 W

| | | | | |
|-------|--------------------------|------|---|----|
| East | along $\frac{1}{4}$ line | 7 | " | 40 |
| " | " | " | " | 41 |
| " | " | " | " | 42 |
| North | Bet | 9-10 | " | 43 |
| West | " | 4-9 | " | 44 |
| North | " | 5-4 | " | 45 |

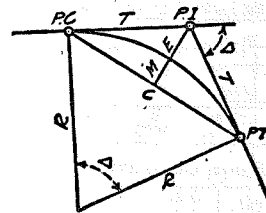
| T 140 N R 25-26 W | | | |
|-------------------|-----|---------------------|---------|
| North | Bet | 7-12 | Page 46 |
| " | " | 1-6 | " 47 |
| " | " | 25-30 | " 48 |
| " | " | 19-24 | " 49 |
| T 140 N R 26 W | | | |
| South | Bet | 25-26 | " 50 |
| " | " | 35-36 | " 51 |
| West | Bet | 35-2 T 140-139 R 26 | " 52 |
| T 139 N R 25 W | | | |
| East | Bet | 30-31 | " 53 |
| " | " | 29-32 | " 54 |
| " | " | 28-33 | " 55 |
| " | " | 27-34 | " 56-57 |
| " | " | 26-35 | " 57-58 |
| " | " | 25-36 | " 59 |
| West | " | 14-23 | " 60 |
| " | " | 15-22 | " 61 |
| " | " | 16-21 | " 62 |
| " | " | 17-20 | " 63 |
| " | " | 18-19 | " 64 |
| " | " | 12-13 | " 65 |
| " | " | 11-14 | " 66 |
| " | " | 10-15 | " 67 |
| " | " | 9-16 | " 68 |
| East | " | 7-18 | " 69 |
| " | " | 8-17 | " 70-72 |

~~T 139 N~~ R 25 W
 East Bet 9-16 Page 72

Line S - 14/15 - T 140 - 25
 Chainage - 26 + 64.5
 BT = 12' Normal
 S 88° 30' E
 Distance - 110 ft from 1/4 post

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

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CURVE FORMULAS

Radius = $R = \frac{50}{\sin \frac{D}{2}}$ (1) Degree of Curve = D and $\sin \frac{D}{2} = \frac{50}{R}$ (2)

Tangent = $T = R \tan \frac{\Delta}{2}$ (3) Length of Curve = $L = 100 \frac{\Delta}{D}$ (4)

Middle ordinate = $M = R(1 - \cos \frac{\Delta}{2})$ (5) = $R \text{vers} \frac{\Delta}{2}$ (6)

External = $E = T \tan \frac{\Delta}{4}$ (7) = $R \div \cos \frac{\Delta}{2} - R$ (8) = $R \text{exsec} \frac{\Delta}{2}$ (9)

Long Chord = $C = 2 R \sin \frac{\Delta}{2}$ (10) Δ = Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I. = Sta. 161 + 60.35 to find Sta. of P. C. and P. T. $\Delta = 62^\circ 10'$ $D = 8^\circ 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{2} = 414.49$ ft. From Table V correction = .36 or $T = 414.85$ ft. P. C. = Sta. P. I. - $T = 157 + 45.50$. Also from (4) $L = 746.00$ and P. T. = Sta. P. C. + $L = 164 + 91.50$.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for Sta. 158 on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft. = 7.27 ft. Distance = 158 - Sta. P. C. = 54.50, hence offset = $7.27 (54.50 \div 100)^2 = 2.16$ ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2 \div (2 \times 688.26) = 2.16$ ft.

Deflections.—Deflection angle = $\frac{1}{2} D$ for 100 ft., $\frac{1}{4} D$ for 50 ft., etc. For c ft. = (in minutes) $3 \times C \times D^\circ$ or = defl. for 1 ft. from Table III $\times C$. For Sta. 158 of above curve = $3 \times 54.5 \times 8\frac{1}{2} = 136.2'$ or $2^\circ 16.2'$, or = $2.50 \times 54.5 = 136.2'$ from Table III. For Sta. 159 deflection angle = $2^\circ 16.2' + 8^\circ 20' \div 2 = 6^\circ 26.2'$, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve $E = 960.6$ for $8^\circ 20' = 960.6 \div 8\frac{1}{2} = 91.27$ and from Table V correction = .10 or $E = 91.37$ ft. Or suppose $\Delta = 32^\circ$ and E is measured and found to be 42 ft. What is D ? From Table IV $E = 230.9$ and $\div 42 = 5.5$ or $D = 5^\circ 30'$.

TABLE I.—MINUTES IN DECIMALS OF A DEGREE.

| | | | | | | | | | | | |
|----|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|--------|
| 1' | .0167 | 11' | .1833 | 21' | .3500 | 31' | .5167 | 41' | .6833 | 51' | .8500 |
| 2 | .0333 | 12 | .2000 | 22 | .3667 | 32 | .5333 | 42 | .7000 | 52 | .8667 |
| 3 | .0500 | 13 | .2167 | 23 | .3833 | 33 | .5500 | 43 | .7167 | 53 | .8833 |
| 4 | .0667 | 14 | .2333 | 24 | .4000 | 34 | .5667 | 44 | .7333 | 54 | .9000 |
| 5 | .0833 | 15 | .2500 | 25 | .4167 | 35 | .5833 | 45 | .7500 | 55 | .9167 |
| 6 | .1000 | 16 | .2667 | 26 | .4333 | 36 | .6000 | 46 | .7667 | 56 | .9333 |
| 7 | .1167 | 17 | .2833 | 27 | .4500 | 37 | .6167 | 47 | .7833 | 57 | .9500 |
| 8 | .1333 | 18 | .3000 | 28 | .4667 | 38 | .6333 | 48 | .8000 | 58 | .9667 |
| 9 | .1500 | 19 | .3167 | 29 | .4833 | 39 | .6500 | 49 | .8167 | 59 | .9833 |
| 10 | .1667 | 20 | .3333 | 30 | .5000 | 40 | .6667 | 50 | .8333 | 60 | 1.0000 |

TABLE II.—INCHES IN DECIMALS OF A FOOT.

| | | | | | | | | | | |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1-16 | 3-32 | 1/8 | 3-16 | 1/4 | 5-16 | 3/8 | 1/2 | 5/8 | 3/4 | 7/8 |
| .0052 | .0078 | .0104 | .0156 | .0208 | .0260 | .0313 | .0417 | .0521 | .0625 | .0729 |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| .0833 | .1667 | .2500 | .3333 | .4167 | .5000 | .5833 | .6667 | .7500 | .8333 | .9167 |

TABLE III.—RADI, ORDINATES AND DEFLECTIONS.

| Deg. | Radius | Mid. Ord. | Tan. Offset | Def. for 1 Foot | Deg. | Radius | Mid. Ord. | Tan. Offset | Def. for 1 Foot |
|--------|---------|-----------|-------------|-----------------|------|--------|-----------|-------------|-----------------|
| 0° 10' | 34377.5 | .036 | .145 | 0.05' | 7° | 819.02 | 1.528 | 6.105 | 2.10' |
| 20 | 17188.8 | .073 | .291 | 0.10 | 20' | 781.84 | 1.600 | 6.395 | 2.20 |
| 30 | 11459.2 | .109 | .436 | 0.15 | 30 | 764.49 | 1.837 | 6.540 | 2.25 |
| 40 | 8594.42 | .145 | .582 | 0.20 | 40 | 747.89 | 1.673 | 6.685 | 2.30 |
| 50 | 6875.55 | .182 | .727 | 0.25 | 8 | 716.78 | 1.746 | 6.976 | 2.40 |
| 1 10 | 5729.65 | .218 | .873 | 0.30 | 20 | 688.16 | 1.819 | 7.266 | 2.50 |
| 20 | 4911.15 | .255 | 1.018 | 0.35 | 30 | 674.69 | 1.855 | 7.411 | 2.55 |
| 30 | 4297.28 | .291 | 1.164 | 0.40 | 40 | 661.74 | 1.892 | 7.556 | 2.60 |
| 40 | 3819.83 | .327 | 1.309 | 0.45 | 9 | 637.28 | 1.985 | 7.846 | 2.70 |
| 50 | 3437.87 | .364 | 1.454 | 0.50 | 20 | 614.56 | 2.037 | 8.136 | 2.80 |
| 1 40 | 3125.36 | .400 | 1.600 | 0.55 | 30 | 603.80 | 2.074 | 8.281 | 2.85 |
| 2 10 | 2864.93 | .436 | 1.745 | 0.60 | 40 | 593.42 | 2.110 | 8.426 | 2.90 |
| 20 | 2644.58 | .473 | 1.891 | 0.65 | 10 | 573.69 | 2.183 | 8.716 | 3.00 |
| 30 | 2455.70 | .509 | 2.036 | 0.70 | 30 | 546.44 | 2.292 | 9.150 | 3.15 |
| 40 | 2292.01 | .545 | 2.181 | 0.75 | 11 | 521.67 | 2.402 | 9.585 | 3.30 |
| 50 | 2148.79 | .582 | 2.327 | 0.80 | 30 | 499.06 | 2.511 | 10.02 | 3.45 |
| 1 30 | 2022.41 | .618 | 2.472 | 0.85 | 12 | 478.34 | 2.620 | 10.45 | 3.60 |
| 2 20 | 1910.08 | .655 | 2.618 | 0.90 | 30 | 459.28 | 2.730 | 10.89 | 3.75 |
| 30 | 1809.57 | .691 | 2.763 | 0.95 | 13 | 441.68 | 2.839 | 11.32 | 3.90 |
| 40 | 1719.12 | .727 | 2.908 | 1.00 | 30 | 425.40 | 2.949 | 11.75 | 4.05 |
| 50 | 1637.28 | .764 | 3.054 | 1.05 | 14 | 410.28 | 3.058 | 12.18 | 4.20 |
| 1 40 | 1562.88 | .800 | 3.199 | 1.10 | 30 | 396.20 | 3.168 | 12.62 | 4.35 |
| 50 | 1494.95 | .836 | 3.345 | 1.15 | 15 | 383.07 | 3.277 | 13.05 | 4.50 |
| 2 10 | 1432.69 | .873 | 3.490 | 1.20 | 30 | 370.78 | 3.387 | 13.49 | 4.65 |
| 20 | 1375.40 | .909 | 3.635 | 1.25 | 16 | 359.27 | 3.496 | 13.92 | 4.80 |
| 30 | 1322.53 | .945 | 3.718 | 1.30 | 30 | 348.45 | 3.606 | 14.35 | 4.95 |
| 40 | 1273.57 | .982 | 3.926 | 1.35 | 17 | 338.27 | 3.716 | 14.78 | 5.10 |
| 50 | 1228.11 | 1.018 | 4.071 | 1.40 | 18 | 319.62 | 3.935 | 15.64 | 5.40 |
| 1 50 | 1185.78 | 1.055 | 4.217 | 1.45 | 19 | 302.94 | 4.155 | 16.51 | 5.70 |
| 2 30 | 1146.28 | 1.091 | 4.362 | 1.50 | 20 | 287.94 | 4.374 | 17.37 | 6.00 |
| 40 | 1109.33 | 1.127 | 4.507 | 1.55 | 21 | 274.37 | 4.594 | 18.22 | 6.30 |
| 50 | 1074.68 | 1.164 | 4.653 | 1.60 | 22 | 262.04 | 4.814 | 19.08 | 6.60 |
| 1 10 | 1042.14 | 1.200 | 4.798 | 1.65 | 23 | 250.79 | 5.035 | 19.94 | 6.90 |
| 20 | 1011.51 | 1.237 | 4.943 | 1.70 | 24 | 240.49 | 5.255 | 20.79 | 7.20 |
| 30 | 982.64 | 1.273 | 5.088 | 1.75 | 25 | 231.01 | 5.476 | 21.64 | 7.50 |
| 4 10 | 955.37 | 1.309 | 5.234 | 1.80 | 26 | 222.27 | 5.697 | 22.50 | 7.80 |
| 20 | 929.57 | 1.346 | 5.379 | 1.85 | 27 | 214.18 | 5.918 | 23.35 | 8.10 |
| 30 | 905.13 | 1.382 | 5.524 | 1.90 | 28 | 206.68 | 6.139 | 24.19 | 8.40 |
| 40 | 881.95 | 1.418 | 5.669 | 1.95 | 29 | 199.70 | 6.360 | 25.04 | 8.70 |
| 50 | 859.92 | 1.455 | 5.814 | 2.00 | 30 | 193.18 | 6.583 | 25.88 | 9.00 |

Note. Chord Deflection=2 times tangent deflection.

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

| Central Angle | Tangent | External | Central Angle | Tangent | External | Central Angle | Tangent | External |
|---------------|---------|----------|---------------|---------|----------|---------------|---------|----------|
| 1° | 50.00 | .22 | 11° | 551.70 | 26.50 | 21° | 1061.9 | 97.57 |
| 10' | 58.34 | .30 | 10' | 580.11 | 27.31 | 10' | 1070.6 | 99.16 |
| 20 | 66.67 | .39 | 20 | 568.53 | 28.14 | 20 | 1079.2 | 100.75 |
| 30 | 75.01 | .49 | 30 | 576.95 | 28.97 | 30 | 1087.8 | 102.35 |
| 40 | 83.34 | .61 | 40 | 585.36 | 29.82 | 40 | 1096.4 | 103.97 |
| 50 | 91.68 | .73 | 50 | 593.79 | 30.68 | 50 | 1105.1 | 105.60 |
| 2 10 | 100.01 | .87 | 12 | 602.21 | 31.56 | 22 | 1113.7 | 107.24 |
| 20 | 116.68 | 1.02 | 10 | 610.64 | 32.45 | 10 | 1122.4 | 108.90 |
| 30 | 133.36 | 1.19 | 20 | 619.07 | 33.35 | 20 | 1131.0 | 110.57 |
| 40 | 150.04 | 1.36 | 30 | 627.50 | 34.26 | 30 | 1139.7 | 112.25 |
| 50 | 166.72 | 1.55 | 40 | 635.93 | 35.18 | 40 | 1148.4 | 113.95 |
| 1 10 | 183.40 | 1.75 | 50 | 644.37 | 36.12 | 50 | 1157.0 | 115.66 |
| 20 | 199.70 | 1.96 | 13 | 652.81 | 37.07 | 23 | 1165.7 | 117.38 |
| 30 | 215.06 | 2.19 | 10 | 661.25 | 38.03 | 10 | 1174.4 | 119.12 |
| 40 | 230.42 | 2.43 | 20 | 669.70 | 39.01 | 20 | 1183.1 | 120.87 |
| 50 | 245.78 | 2.67 | 30 | 678.15 | 39.99 | 30 | 1191.8 | 122.63 |
| 1 20 | 261.14 | 2.93 | 40 | 686.60 | 40.99 | 40 | 1200.5 | 124.41 |
| 30 | 276.50 | 3.21 | 50 | 695.06 | 42.00 | 50 | 1209.2 | 126.20 |
| 40 | 291.86 | 3.49 | 14 | 703.51 | 43.03 | 24 | 1217.9 | 128.00 |
| 50 | 307.22 | 3.79 | 10 | 711.97 | 44.07 | 10 | 1226.6 | 129.82 |
| 1 30 | 322.58 | 4.10 | 20 | 720.44 | 45.12 | 20 | 1235.3 | 131.65 |
| 20 | 337.94 | 4.42 | 30 | 728.90 | 46.18 | 30 | 1244.0 | 133.50 |
| 30 | 353.30 | 4.76 | 40 | 737.37 | 47.25 | 40 | 1252.8 | 135.35 |
| 40 | 368.66 | 5.10 | 50 | 745.85 | 48.34 | 50 | 1261.5 | 137.23 |
| 50 | 384.02 | 5.46 | 15 | 754.32 | 49.44 | 25 | 1270.2 | 139.11 |
| 1 40 | 399.38 | 5.83 | 10 | 762.80 | 50.55 | 10 | 1279.0 | 141.01 |
| 20 | 414.74 | 6.21 | 20 | 771.29 | 51.68 | 20 | 1287.7 | 142.93 |
| 30 | 430.10 | 6.61 | 30 | 779.77 | 52.89 | 30 | 1296.5 | 144.85 |
| 40 | 445.46 | 7.01 | 40 | 788.26 | 53.97 | 40 | 1305.3 | 146.79 |
| 50 | 460.82 | 7.43 | 50 | 796.75 | 55.13 | 50 | 1314.0 | 148.75 |
| 1 50 | 476.18 | 7.86 | 16 | 805.25 | 56.31 | 26 | 1322.8 | 150.71 |
| 2 10 | 491.54 | 8.31 | 10 | 813.75 | 57.50 | 10 | 1331.6 | 152.69 |
| 20 | 506.90 | 8.76 | 20 | 822.25 | 58.70 | 20 | 1340.4 | 154.69 |
| 30 | 522.26 | 9.23 | 30 | 830.76 | 59.91 | 30 | 1349.2 | 156.70 |
| 40 | 537.62 | 9.71 | 40 | 839.27 | 61.14 | 40 | 1358.0 | 158.72 |
| 50 | 552.98 | 10.20 | 50 | 847.78 | 62.38 | 50 | 1366.8 | 160.76 |
| 1 60 | 568.34 | 10.71 | 17 | 856.30 | 63.63 | 27 | 1375.6 | 162.81 |
| 2 20 | 583.70 | 11.22 | 10 | 864.82 | 64.90 | 10 | 1384.4 | 164.86 |
| 30 | 599.06 | 11.75 | 20 | 873.35 | 66.18 | 20 | 1393.2 | 166.95 |
| 40 | 614.42 | 12.29 | 30 | 881.88 | 67.47 | 30 | 1402.0 | 169.04 |
| 50 | 629.78 | 12.85 | 40 | 890.41 | 68.77 | 40 | 1410.9 | 171.15 |
| 1 70 | 645.14 | 13.41 | 50 | 898.95 | 70.09 | 50 | 1419.7 | 173.27 |
| 2 30 | 660.50 | 13.99 | 18 | 907.49 | 71.42 | 28 | 1428.6 | 175.41 |
| 40 | 675.86 | 14.58 | 10 | 916.03 | 72.76 | 10 | 1437.4 | 177.55 |
| 50 | 691.22 | 15.18 | 20 | 924.58 | 74.12 | 20 | 1446.3 | 179.72 |
| 1 80 | 706.58 | 15.80 | 30 | 933.13 | 75.49 | 30 | 1455.1 | 181.89 |
| 2 40 | 721.94 | 16.43 | 40 | 941.69 | 76.86 | 40 | 1464.0 | 184.08 |
| 30 | 737.30 | 17.07 | 50 | 950.25 | 78.26 | 50 | 1472.9 | 186.29 |
| 40 | 752.66 | 17.72 | 19 | 958.81 | 79.67 | 29 | 1481.8 | 188.51 |
| 50 | 768.02 | 18.38 | 10 | 967.38 | 81.09 | 10 | 1490.7 | 190.74 |
| 1 90 | 783.38 | 19.06 | 20 | 975.96 | 82.53 | 20 | 1499.6 | 192.99 |
| 2 50 | 798.74 | 19.75 | 30 | 984.53 | 83.97 | 30 | 1508.5 | 195.25 |
| 30 | 814.10 | 20.45 | 40 | 993.12 | 85.43 | 40 | 1517.4 | 197.53 |
| 40 | 829.46 | 21.16 | 50 | 1001.7 | 86.90 | 50 | 1526.3 | 199.82 |
| 50 | 844.82 | 21.89 | 20 | 1010.3 | 88.39 | 30 | 1535.3 | 202.12 |
| 1 100 | 860.18 | 22.62 | 10 | 1018.9 | 89.89 | 10 | 1544.2 | 204.44 |
| 2 60 | 875.54 | 23.35 | 20 | 1027.5 | 91.40 | 20 | 1553.1 | 206.77 |
| 30 | 890.90 | 24.14 | 30 | 1036.1 | 92.92 | 30 | 1562.1 | 209.12 |
| 40 | 906.26 | 24.94 | 40 | 1044.7 | 94.46 | 40 | 1571.0 | 211.48 |
| 50 | 921.62 | 25.70 | 50 | 1053.3 | 96.01 | 50 | 1580.0 | 213.86 |

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

| Central Angle | Tangent | External | Central Angle | Tangent | External | Central Angle | Tangent | External |
|---------------|---------|----------|---------------|---------|----------|---------------|---------|----------|
| 31° | 1589.0 | 216.3 | 41° | 2142.2 | 387.4 | 51° | 2732.9 | 618.4 |
| 10' | 1598.0 | 218.7 | 10' | 2151.7 | 390.7 | 10' | 2743.1 | 622.8 |
| 20 | 1606.9 | 221.1 | 20 | 2161.2 | 394.1 | 20 | 2753.4 | 627.2 |
| 30 | 1615.9 | 223.5 | 30 | 2170.8 | 397.4 | 30 | 2763.7 | 631.7 |
| 40 | 1624.9 | 226.0 | 40 | 2180.3 | 400.8 | 40 | 2773.9 | 636.2 |
| 50 | 1633.9 | 228.4 | 50 | 2189.9 | 404.2 | 50 | 2784.2 | 640.7 |
| 32 | 1643.0 | 230.9 | 42 | 2199.4 | 407.6 | 52 | 2794.5 | 645.2 |
| 10 | 1652.0 | 233.4 | 10 | 2209.0 | 411.1 | 10 | 2804.9 | 649.7 |
| 20 | 1661.0 | 235.9 | 20 | 2218.6 | 414.5 | 20 | 2815.2 | 654.3 |
| 30 | 1670.0 | 238.4 | 30 | 2228.1 | 418.0 | 30 | 2825.6 | 658.8 |
| 40 | 1679.0 | 241.0 | 40 | 2237.7 | 421.4 | 40 | 2835.9 | 663.4 |
| 50 | 1688.1 | 243.5 | 50 | 2247.3 | 425.0 | 50 | 2846.3 | 668.0 |
| 33 | 1697.2 | 246.1 | 43 | 2257.0 | 428.5 | 53 | 2856.7 | 672.7 |
| 10 | 1706.3 | 248.7 | 10 | 2266.6 | 432.0 | 10 | 2867.1 | 677.3 |
| 20 | 1715.3 | 251.3 | 20 | 2276.2 | 435.6 | 20 | 2877.5 | 682.0 |
| 30 | 1724.4 | 253.9 | 30 | 2285.9 | 439.2 | 30 | 2888.0 | 686.7 |
| 40 | 1733.5 | 256.5 | 40 | 2295.6 | 442.8 | 40 | 2898.4 | 691.4 |
| 50 | 1742.6 | 259.1 | 50 | 2305.2 | 446.4 | 50 | 2908.9 | 696.1 |
| 34 | 1751.7 | 261.8 | 44 | 2314.9 | 450.0 | 54 | 2919.4 | 700.9 |
| 10 | 1760.8 | 264.5 | 10 | 2324.6 | 453.6 | 10 | 2929.9 | 705.7 |
| 20 | 1770.0 | 267.2 | 20 | 2334.3 | 457.3 | 20 | 2940.4 | 710.5 |
| 30 | 1779.1 | 269.9 | 30 | 2344.1 | 461.0 | 30 | 2951.0 | 715.3 |
| 40 | 1788.2 | 272.6 | 40 | 2353.8 | 464.6 | 40 | 2961.5 | 720.1 |
| 50 | 1797.4 | 275.3 | 50 | 2363.5 | 468.4 | 50 | 2972.1 | 725.0 |
| 35 | 1806.6 | 278.1 | 45 | 2373.3 | 472.1 | 55 | 2982.7 | 729.9 |
| 10 | 1815.7 | 280.8 | 10 | 2383.1 | 475.8 | 10 | 2993.3 | 734.8 |
| 20 | 1824.9 | 283.6 | 20 | 2392.8 | 479.6 | 20 | 3003.9 | 739.7 |
| 30 | 1834.1 | 286.4 | 30 | 2402.6 | 483.3 | 30 | 3014.5 | 744.6 |
| 40 | 1843.3 | 289.2 | 40 | 2412.4 | 487.2 | 40 | 3025.2 | 749.6 |
| 50 | 1852.5 | 292.0 | 50 | 2422.3 | 491.0 | 50 | 3035.8 | 754.6 |
| 36 | 1861.7 | 294.9 | 46 | 2432.1 | 494.8 | 56 | 3046.5 | 759.6 |
| 10 | 1870.9 | 297.7 | 10 | 2441.9 | 498.7 | 10 | 3057.2 | 764.6 |
| 20 | 1880.1 | 300.6 | 20 | 2451.8 | 502.5 | 20 | 3067.9 | 769.7 |
| 30 | 1889.4 | 303.5 | 30 | 2461.7 | 506.4 | 30 | 3078.7 | 774.7 |
| 40 | 1898.6 | 306.4 | 40 | 2471.5 | 510.3 | 40 | 3089.4 | 779.8 |
| 50 | 1907.9 | 309.3 | 50 | 2481.4 | 514.3 | 50 | 3100.2 | 784.9 |
| 37 | 1917.1 | 312.2 | 47 | 2491.3 | 518.2 | 57 | 3110.9 | 790.1 |
| 10 | 1926.4 | 315.2 | 10 | 2501.2 | 522.2 | 10 | 3121.7 | 795.2 |
| 20 | 1935.7 | 318.1 | 20 | 2511.2 | 526.1 | 20 | 3132.6 | 800.4 |
| 30 | 1945.0 | 321.1 | 30 | 2521.1 | 530.1 | 30 | 3143.4 | 805.6 |
| 40 | 1954.3 | 324.1 | 40 | 2531.1 | 534.2 | 40 | 3154.2 | 810.9 |
| 50 | 1963.6 | 327.1 | 50 | 2541.0 | 538.2 | 50 | 3165.1 | 816.1 |
| 38 | 1972.9 | 330.2 | 48 | 2551.0 | 542.2 | 58 | 3176.0 | 821.4 |
| 10 | 1982.2 | 333.2 | 10 | 2561.0 | 546.3 | 10 | 3186.9 | 826.7 |
| 20 | 1991.5 | 336.3 | 20 | 2571.0 | 550.4 | 20 | 3197.8 | 832.0 |
| 30 | 2000.9 | 339.3 | 30 | 2581.0 | 554.5 | 30 | 3208.8 | 837.3 |
| 40 | 2010.2 | 342.4 | 40 | 2591.0 | 558.6 | 40 | 3219.7 | 842.7 |
| 50 | 2019.6 | 345.5 | 50 | 2601.1 | 562.8 | 50 | 3230.7 | 848.1 |
| 39 | 2029.0 | 348.6 | 49 | 2611.2 | 566.9 | 59 | 3241.7 | 853.5 |
| 10 | 2038.4 | 351.8 | 10 | 2621.2 | 571.1 | 10 | 3252.7 | 858.9 |
| 20 | 2047.8 | 354.9 | 20 | 2631.3 | 575.3 | 20 | 3263.7 | 864.3 |
| 30 | 2057.2 | 358.1 | 30 | 2641.4 | 579.5 | 30 | 3274.8 | 869.8 |
| 40 | 2066.6 | 361.3 | 40 | 2651.5 | 583.8 | 40 | 3285.8 | 875.3 |
| 50 | 2076.0 | 364.5 | 50 | 2661.6 | 588.0 | 50 | 3296.9 | 880.8 |
| 40 | 2085.4 | 367.7 | 50 | 2671.8 | 592.3 | 60 | 3308.0 | 886.4 |
| 10 | 2094.9 | 371.0 | 10 | 2681.9 | 596.6 | 10 | 3319.1 | 892.0 |
| 20 | 2104.3 | 374.2 | 20 | 2692.1 | 600.9 | 20 | 3330.3 | 897.5 |
| 30 | 2113.8 | 377.5 | 30 | 2702.3 | 605.3 | 30 | 3341.4 | 903.2 |
| 40 | 2123.3 | 380.8 | 40 | 2712.5 | 609.6 | 40 | 3352.6 | 908.8 |
| 50 | 2132.7 | 384.1 | 50 | 2722.7 | 614.0 | 50 | 3363.8 | 914.5 |

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

| Central Angle | Tangent | External | Central Angle | Tangent | External | Central Angle | Tangent | External |
|---------------|---------|----------|---------------|---------|----------|---------------|---------|----------|
| 61° | 3375.0 | 920.2 | 71° | 4086.9 | 1308.2 | 81° | 4893.6 | 1805.3 |
| 10' | 3386.3 | 925.9 | 10' | 4099.5 | 1315.6 | 10' | 4908.0 | 1814.7 |
| 20 | 3397.5 | 931.6 | 20 | 4112.1 | 1322.9 | 20 | 4922.5 | 1824.1 |
| 30 | 3408.8 | 937.3 | 30 | 4124.8 | 1330.3 | 30 | 4937.0 | 1833.6 |
| 40 | 3420.1 | 943.1 | 40 | 4137.4 | 1337.7 | 40 | 4951.5 | 1843.1 |
| 50 | 3431.4 | 948.9 | 50 | 4150.1 | 1345.1 | 50 | 4966.1 | 1852.6 |
| 62 | 3442.7 | 954.8 | 72 | 4162.8 | 1352.6 | 82 | 4980.7 | 1862.2 |
| 10 | 3454.1 | 960.6 | 10 | 4175.6 | 1360.1 | 10 | 4995.4 | 1871.8 |
| 20 | 3465.4 | 966.5 | 20 | 4188.5 | 1367.6 | 20 | 5010.0 | 1881.5 |
| 30 | 3476.8 | 972.4 | 30 | 4201.2 | 1375.2 | 30 | 5024.8 | 1891.2 |
| 40 | 3488.3 | 978.3 | 40 | 4214.0 | 1382.8 | 40 | 5039.5 | 1900.9 |
| 50 | 3499.7 | 984.3 | 50 | 4226.8 | 1390.4 | 50 | 5054.3 | 1910.7 |
| 63 | 3511.1 | 990.2 | 73 | 4239.7 | 1398.0 | 83 | 5069.2 | 1920.5 |
| 10 | 3522.6 | 996.2 | 10 | 4252.6 | 1405.7 | 10 | 5084.0 | 1930.4 |
| 20 | 3534.1 | 1002.3 | 20 | 4265.6 | 1413.5 | 20 | 5098.9 | 1940.3 |
| 30 | 3545.6 | 1008.3 | 30 | 4278.5 | 1421.2 | 30 | 5113.9 | 1950.3 |
| 40 | 3557.2 | 1014.4 | 40 | 4291.5 | 1429.0 | 40 | 5128.9 | 1960.2 |
| 50 | 3568.7 | 1020.5 | 50 | 4304.6 | 1436.8 | 50 | 5143.9 | 1970.3 |
| 64 | 3580.3 | 1026.6 | 74 | 4317.6 | 1444.6 | 84 | 5159.0 | 1980.4 |
| 10 | 3591.9 | 1032.8 | 10 | 4330.7 | 1452.5 | 10 | 5174.1 | 1990.5 |
| 20 | 3603.5 | 1039.0 | 20 | 4343.8 | 1460.4 | 20 | 5189.3 | 2000.6 |
| 30 | 3615.1 | 1045.2 | 30 | 4356.9 | 1468.4 | 30 | 5204.4 | 2010.8 |
| 40 | 3626.8 | 1051.4 | 40 | 4370.1 | 1476.4 | 40 | 5219.7 | 2021.1 |
| 50 | 3638.5 | 1057.7 | 50 | 4383.3 | 1484.4 | 50 | 5234.9 | 2031.4 |
| 65 | 3650.2 | 1063.9 | 75 | 4396.5 | 1492.4 | 85 | 5250.3 | 2041.7 |
| 10 | 3661.9 | 1070.2 | 10 | 4409.8 | 1500.5 | 10 | 5265.6 | 2052.1 |
| 20 | 3673.7 | 1076.6 | 20 | 4423.1 | 1508.6 | 20 | 5281.0 | 2062.5 |
| 30 | 3685.4 | 1082.9 | 30 | 4436.4 | 1516.7 | 30 | 5296.4 | 2073.0 |
| 40 | 3697.2 | 1089.3 | 40 | 4449.7 | 1524.9 | 40 | 5311.9 | 2083.5 |
| 50 | 3709.0 | 1095.7 | 50 | 4463.1 | 1533.1 | 50 | 5327.4 | 2094.1 |
| 66 | 3720.9 | 1102.2 | 76 | 4476.5 | 1541.4 | 86 | 5343.0 | 2104.7 |
| 10 | 3732.7 | 1108.6 | 10 | 4489.9 | 1549.7 | 10 | 5358.6 | 2115.3 |
| 20 | 3744.6 | 1115.1 | 20 | 4503.4 | 1558.0 | 20 | 5374.2 | 2126.0 |
| 30 | 3756.5 | 1121.7 | 30 | 4516.9 | 1566.3 | 30 | 5389.9 | 2136.7 |
| 40 | 3768.5 | 1128.2 | 40 | 4530.4 | 1574.7 | 40 | 5405.6 | 2147.5 |
| 50 | 3780.4 | 1134.8 | 50 | 4544.0 | 1583.1 | 50 | 5421.4 | 2158.4 |
| 67 | 3792.4 | 1141.4 | 77 | 4557.6 | 1591.6 | 87 | 5437.2 | 2169.2 |
| 10 | 3804.4 | 1148.0 | 10 | 4571.2 | 1600.1 | 10 | 5453.1 | 2180.2 |
| 20 | 3816.4 | 1154.7 | 20 | 4584.8 | 1608.6 | 20 | 5469.0 | 2191.1 |
| 30 | 3828.4 | 1161.3 | 30 | 4598.5 | 1617.1 | 30 | 5484.9 | 2202.2 |
| 40 | 3840.5 | 1168.1 | 40 | 4612.2 | 1625.7 | 40 | 5500.9 | 2213.2 |
| 50 | 3852.6 | 1174.8 | 50 | 4626.0 | 1634.4 | 50 | 5517.0 | 2224.3 |
| 68 | 3864.7 | 1181.6 | 78 | 4639.8 | 1643.0 | 88 | 5533.1 | 2235.5 |
| 10 | 3876.8 | 1188.4 | 10 | 4653.6 | 1651.7 | 10 | 5549.2 | 2246.7 |
| 20 | 3889.0 | 1195.2 | 20 | 4667.4 | 1660.5 | 20 | 5565.4 | 2258.0 |
| 30 | 3901.2 | 1202.0 | 30 | 4681.3 | 1669.2 | 30 | 5581.6 | 2269.3 |
| 40 | 3913.4 | 1208.9 | 40 | 4695.2 | 1678.1 | 40 | 5597.8 | 2280.6 |
| 50 | 3925.6 | 1215.8 | 50 | 4709.2 | 1686.9 | 50 | 5614.2 | 2292.0 |
| 69 | 3937.9 | 1222.7 | 79 | 4723.2 | 1695.8 | 89 | 5630.5 | 2303.5 |
| 10 | 3950.2 | 1229.7 | 10 | 4737.2 | 1704.7 | 10 | 5646.9 | 2315.0 |
| 20 | 3962.5 | 1236.7 | 20 | 4751.2 | 1713.7 | 20 | 5663.4 | 2326.6 |
| 30 | 3974.8 | 1243.7 | 30 | 4765.3 | 1722.7 | 30 | 5679.9 | 2338.2 |
| 40 | 3987.2 | 1250.8 | 40 | 4779.4 | 1731.7 | 40 | 5696.4 | 2349.8 |
| 50 | 3999.5 | 1257.9 | 50 | 4793.6 | 1740.8 | 50 | 5713.0 | 2361.5 |
| 70 | 4011.9 | 1265.0 | 80 | 4807.7 | 1749.9 | 90 | 5729.7 | 2373.3 |
| 10 | 4024.4 | 1272.1 | 10 | 4822.0 | 1759.0 | 10 | 5746.3 | 2385.1 |
| 20 | 4036.8 | 1279.3 | 20 | 4836.2 | 1768.2 | 20 | 5763.1 | 2397.0 |
| 30 | 4049.3 | 1286.5 | 30 | 4850.5 | 1777.4 | 30 | 5779.9 | 2408.9 |
| 40 | 4061.8 | 1293.6 | 40 | 4864.8 | 1786.6 | 40 | 5796.7 | 2420.9 |
| 50 | 4074.4 | 1300.9 | 50 | 4879.2 | 1796.0 | 50 | 5813.6 | 2432.9 |

TABLE IV.—TANGENTS AND EXTERNALS TO A 1° CURVE.

| Central Angle | Tangent | External | Central Angle | Tangent | External | Central Angle | Tangent | External |
|---------------|---------|----------|---------------|---------|----------|---------------|---------|----------|
| 91° | 5830.5 | 2444.9 | 101° | 6950.6 | 3278.1 | 111° | 8336.7 | 4386.1 |
| 10' | 5847.5 | 2457.1 | 10' | 6971.3 | 3294.1 | 10' | 8362.7 | 4407.6 |
| 20 | 5864.6 | 2469.3 | 20 | 6992.0 | 3310.1 | 20 | 8388.9 | 4429.2 |
| 30 | 5881.7 | 2481.5 | 30 | 7012.7 | 3326.1 | 30 | 8415.1 | 4450.9 |
| 40 | 5898.8 | 2493.8 | 40 | 7033.6 | 3342.3 | 40 | 8441.5 | 4472.7 |
| 50 | 5916.0 | 2506.1 | 50 | 7054.5 | 3358.5 | 50 | 8468.0 | 4494.6 |
| 92 | 5933.2 | 2518.5 | 102 | 7075.5 | 3374.9 | 112 | 8494.6 | 4516.6 |
| 10 | 5950.5 | 2531.0 | 10 | 7096.6 | 3391.2 | 10 | 8521.3 | 4538.8 |
| 20 | 5967.9 | 2543.5 | 20 | 7117.8 | 3407.7 | 20 | 8548.1 | 4561.1 |
| 30 | 5985.3 | 2556.0 | 30 | 7139.0 | 3424.3 | 30 | 8575.0 | 4583.4 |
| 40 | 6002.7 | 2568.6 | 40 | 7160.3 | 3440.9 | 40 | 8602.1 | 4606.0 |
| 50 | 6020.2 | 2581.3 | 50 | 7181.7 | 3457.6 | 50 | 8629.3 | 4628.6 |
| 93 | 6037.8 | 2594.0 | 103 | 7203.2 | 3474.4 | 113 | 8656.6 | 4651.3 |
| 10 | 6055.4 | 2606.8 | 10 | 7224.7 | 3491.3 | 10 | 8684.0 | 4674.2 |
| 20 | 6073.1 | 2619.7 | 20 | 7246.3 | 3508.2 | 20 | 8711.5 | 4697.2 |
| 30 | 6090.8 | 2632.6 | 30 | 7268.0 | 3525.2 | 30 | 8739.2 | 4720.3 |
| 40 | 6108.6 | 2645.5 | 40 | 7289.8 | 3542.4 | 40 | 8767.0 | 4743.6 |
| 50 | 6126.4 | 2658.5 | 50 | 7311.7 | 3559.6 | 50 | 8794.9 | 4766.9 |
| 94 | 6144.3 | 2671.6 | 104 | 7333.6 | 3576.8 | 114 | 8822.9 | 4790.4 |
| 10 | 6162.6 | 2684.7 | 10 | 7355.6 | 3594.2 | 10 | 8851.0 | 4814.1 |
| 20 | 6180.2 | 2697.9 | 20 | 7377.8 | 3611.7 | 20 | 8879.3 | 4837.8 |
| 30 | 6198.3 | 2711.2 | 30 | 7399.9 | 3629.2 | 30 | 8907.7 | 4861.7 |
| 40 | 6216.4 | 2724.5 | 40 | 7422.2 | 3646.8 | 40 | 8936.3 | 4885.7 |
| 50 | 6234.6 | 2737.9 | 50 | 7444.6 | 3664.5 | 50 | 8965.0 | 4909.9 |
| 95 | 6252.8 | 2751.3 | 105 | 7467.0 | 3682.3 | 115 | 8993.8 | 4934.1 |
| 10 | 6271.1 | 2764.8 | 10 | 7489.6 | 3700.2 | 10 | 9022.7 | 4958.6 |
| 20 | 6289.4 | 2778.3 | 20 | 7512.2 | 3718.2 | 20 | 9051.7 | 4983.1 |
| 30 | 6307.9 | 2792.0 | 30 | 7534.9 | 3736.2 | 30 | 9080.9 | 5007.8 |
| 40 | 6326.3 | 2805.6 | 40 | 7557.7 | 3754.4 | 40 | 9110.3 | 5032.6 |
| 50 | 6344.8 | 2819.4 | 50 | 7580.5 | 3772.6 | 50 | 9139.8 | 5057.6 |
| 96 | 6363.4 | 2833.2 | 106 | 7603.5 | 3791.0 | 116 | 9169.4 | 5082.7 |
| 10 | 6382.1 | 2847.0 | 10 | 7626.6 | 3809.4 | 10 | 9199.1 | 5107.9 |
| 20 | 6400.8 | 2861.0 | 20 | 7649.7 | 3827.9 | 20 | 9229.0 | 5133.3 |
| 30 | 6419.5 | 2875.0 | 30 | 7672.9 | 3846.5 | 30 | 9259.0 | 5158.8 |
| 40 | 6438.4 | 2889.0 | 40 | 7696.3 | 3865.2 | 40 | 9289.2 | 5184.5 |
| 50 | 6457.3 | 2903.1 | 50 | 7719.7 | 3884.0 | 50 | 9319.5 | 5210.3 |
| 97 | 6476.2 | 2917.3 | 107 | 7743.2 | 3902.9 | 117 | 9349.9 | 5236.2 |
| 10 | 6495.2 | 2931.6 | 10 | 7766.8 | 3921.9 | 10 | 9380.5 | 5262.3 |
| 20 | 6514.3 | 2945.9 | 20 | 7790.5 | 3940.9 | 20 | 9411.3 | 5288.6 |
| 30 | 6533.4 | 2960.3 | 30 | 7814.3 | 3960.1 | 30 | 9442.2 | 5315.0 |
| 40 | 6552.6 | 2974.7 | 40 | 7838.1 | 3979.4 | 40 | 9473.2 | 5341.5 |
| 50 | 6571.9 | 2989.2 | 50 | 7862.1 | 3998.7 | 50 | 9504.4 | 5368.2 |
| 98 | 6591.2 | 3003.8 | 108 | 7886.2 | 4018.2 | 118 | 9535.7 | 5395.1 |
| 10 | 6610.6 | 3018.4 | 10 | 7910.4 | 4037.8 | 10 | 9567.2 | 5422.1 |
| 20 | 6630.1 | 3033.1 | 20 | 7934.6 | 4057.4 | 20 | 9598.9 | 5449.2 |
| 30 | 6649.6 | 3047.9 | 30 | 7959.0 | 4077.2 | 30 | 9630.7 | 5476.5 |
| 40 | 6669.2 | 3062.8 | 40 | 7983.5 | 4097.1 | 40 | 9662.6 | 5504.0 |
| 50 | 6688.8 | 3077.7 | 50 | 8008.0 | 4117.0 | 50 | 9694.7 | 5531.7 |
| 99 | 6708.6 | 3092.7 | 109 | 8032.7 | 4137.1 | 119 | 9727.0 | 5559.4 |
| 10 | 6728.4 | 3107.7 | 10 | 8057.4 | 4157.3 | 10 | 9759.4 | 5587.4 |
| 20 | 6748.2 | 3122.9 | 20 | 8082.3 | 4177.5 | 20 | 9792.0 | 5615.5 |
| 30 | 6768.1 | 3138.1 | 30 | 8107.3 | 4197.9 | 30 | 9824.8 | 5643.8 |
| 40 | 6788.1 | 3153.3 | 40 | 8132.3 | 4218.4 | 40 | 9857.7 | 5672.3 |
| 50 | 6808.2 | 3168.7 | 50 | 8157.5 | 4239.0 | 50 | 9890.8 | 5700.9 |
| 100 | 6828.3 | 3184.1 | 110 | 8182.8 | 4259.7 | 120 | 9924.0 | 5729.7 |
| 10 | 6848.5 | 3199.6 | 10 | 8208.2 | 4280.5 | 10 | 9957.5 | 5758.6 |
| 20 | 6868.8 | 3215.1 | 20 | 8233.7 | 4301.4 | 20 | 9991.0 | 5787.7 |
| 30 | 6889.2 | 3230.8 | 30 | 8259.3 | 4322.4 | 30 | 10025.0 | 5817.0 |
| 40 | 6909.6 | 3246.5 | 40 | 8285.0 | 4343.6 | 40 | 10059.0 | 5846.5 |
| 50 | 6930.1 | 3262.3 | 50 | 8310.8 | 4364.8 | 50 | 10093.0 | 5876.1 |

TABLE V.—CORRECTIONS FOR TANGENTS AND EXTERNALS.

These corrections are to be added to the approximate values, found by dividing the tangent, or external, for a 1° curve (Table IV) by the degree of curve, in order to obtain the true tangents, or externals. Intermediate values may be obtained by interpolation.

FOR TANGENTS ADD

| Central Angle | DEGREE OF CURVE | | | | | | | | | | | | | |
|---------------|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° |
| 10° | .03 | .06 | .09 | .13 | .16 | .19 | .22 | .25 | .28 | .31 | .34 | .38 | .42 | .46 |
| 15° | .04 | .10 | .14 | .19 | .24 | .29 | .34 | .39 | .45 | .51 | .53 | .58 | .63 | .68 |
| 20° | .06 | .13 | .19 | .26 | .32 | .39 | .45 | .51 | .58 | .65 | .72 | .79 | .84 | .90 |
| 25° | .08 | .16 | .24 | .33 | .40 | .49 | .58 | .67 | .75 | .83 | .90 | .99 | 1.06 | 1.14 |
| 30° | .10 | .19 | .29 | .39 | .49 | .59 | .69 | .79 | .89 | .99 | 1.09 | 1.20 | 1.29 | 1.39 |
| 35° | .11 | .22 | .34 | .47 | .58 | .69 | .79 | .81 | .92 | 1.04 | 1.29 | 1.42 | 1.54 | 1.66 |
| 40° | .13 | .26 | .40 | .53 | .67 | .80 | .93 | 1.06 | 1.20 | 1.34 | 1.49 | 1.64 | 1.79 | 1.94 |
| 45° | .15 | .30 | .44 | .60 | .76 | .91 | 1.06 | 1.21 | 1.37 | 1.52 | 1.70 | 1.87 | 2.04 | 2.21 |
| 50° | .17 | .34 | .51 | .68 | .85 | 1.02 | 1.19 | 1.36 | 1.54 | 1.72 | 1.91 | 2.10 | 2.29 | 2.48 |
| 55° | .19 | .38 | .57 | .76 | .95 | 1.14 | 1.32 | 1.52 | 1.72 | 1.92 | 2.14 | 2.35 | 2.56 | 2.77 |
| 60° | .21 | .42 | .63 | .84 | 1.05 | 1.27 | 1.49 | 1.71 | 1.94 | 2.17 | 2.38 | 2.60 | 2.83 | 3.07 |
| 65° | .23 | .46 | .69 | .93 | 1.16 | 1.40 | 1.64 | 1.88 | 2.13 | 2.38 | 2.63 | 2.88 | 3.13 | 3.39 |
| 70° | .25 | .51 | .76 | 1.02 | 1.28 | 1.54 | 1.80 | 2.06 | 2.33 | 2.60 | 2.88 | 3.16 | 3.44 | 3.72 |
| 75° | .27 | .56 | .83 | 1.12 | 1.40 | 1.69 | 1.98 | 2.27 | 2.57 | 2.87 | 3.16 | 3.47 | 3.78 | 4.09 |
| 80° | .30 | .61 | .91 | 1.22 | 1.53 | 1.84 | 2.15 | 2.46 | 2.78 | 3.10 | 3.44 | 3.78 | 4.12 | 4.46 |
| 85° | .33 | .66 | 1.00 | 1.33 | 1.68 | 2.02 | 2.36 | 2.70 | 3.05 | 3.40 | 3.77 | 4.14 | 4.55 | 4.89 |
| 90° | .36 | .72 | 1.09 | 1.45 | 1.83 | 2.20 | 2.57 | 2.94 | 3.32 | 3.70 | 4.10 | 4.50 | 4.91 | 5.32 |
| 95° | .39 | .79 | 1.19 | 1.55 | 2.00 | 2.40 | 2.80 | 3.20 | 3.61 | 4.02 | 4.40 | 4.98 | 5.38 | 5.83 |
| 100° | .43 | .86 | 1.30 | 1.74 | 2.18 | 2.62 | 3.06 | 3.50 | 3.95 | 4.40 | 4.88 | 5.37 | 5.85 | 6.34 |
| 110° | .51 | 1.03 | 1.56 | 2.08 | 2.61 | 3.14 | 3.67 | 4.21 | 4.76 | 5.31 | 5.86 | 6.43 | 7.01 | 7.60 |
| 120° | .62 | 1.25 | 1.93 | 2.52 | 3.16 | 3.81 | 4.45 | 5.11 | 5.77 | 6.44 | 7.12 | 7.80 | 8.50 | 9.22 |

FOR EXTERNALS ADD

| Central Angle | DEGREE OF CURVE | | | | | | | | | | | | | |
|---------------|-----------------|------|------|------|------|------|------|------|------|------|------|------|------|------|
| | 5° | 10° | 15° | 20° | 25° | 30° | 35° | 40° | 45° | 50° | 55° | 60° | 65° | 70° |
| 10° | .001 | .003 | .004 | .006 | .007 | .008 | .009 | .011 | .012 | .014 | .015 | .017 | .018 | .020 |
| 15° | .003 | .007 | .010 | .014 | .018 | .023 | .027 | .032 | .036 | .041 | .043 | .047 | .051 | .054 |
| 20° | .006 | .011 | .017 | .022 | .028 | .034 | .038 | .045 | .051 | .057 | .063 | .070 | .076 | .083 |
| 25° | .009 | .018 | .027 | .036 | .046 | .056 | .065 | .074 | .083 | .093 | .106 | .120 | .127 | .135 |
| 30° | .013 | .025 | .038 | .051 | .065 | .079 | .090 | .103 | .116 | .129 | .149 | .170 | .179 | .188 |
| 35° | .018 | .035 | .054 | .072 | .086 | .109 | .131 | .153 | .175 | .197 | .213 | .230 | .247 | .264 |
| 40° | .023 | .046 | .070 | .093 | .117 | .141 | .172 | .203 | .234 | .265 | .277 | .290 | .315 | .341 |
| 45° | .030 | .060 | .093 | .119 | .153 | .184 | .216 | .254 | .289 | .325 | .351 | .378 | .411 | .445 |
| 50° | .037 | .075 | .116 | .151 | .189 | .227 | .266 | .305 | .345 | .384 | .425 | .467 | .508 | .550 |
| 55° | .046 | .093 | .142 | .188 | .236 | .283 | .332 | .381 | .420 | .479 | .530 | .582 | .641 | .700 |
| 60° | .055 | .112 | .168 | .225 | .283 | .340 | .398 | .457 | .516 | .575 | .636 | .697 | .774 | .851 |
| 65° | .067 | .135 | .204 | .273 | .343 | .412 | .483 | .554 | .625 | .697 | .771 | .845 | .922 | 1.01 |
| 70° | .080 | .159 | .240 | .321 | .403 | .485 | .568 | .652 | .735 | .819 | .906 | .994 | 1.08 | 1.17 |
| 75° | .095 | .182 | .266 | .353 | .440 | .528 | .617 | .707 | .797 | .891 | .977 | 1.07 | 1.18 | 1.29 |
| 80° | .110 | .220 | .332 | .445 | .558 | .671 | .787 | .903 | 1.02 | 1.13 | 1.25 | 1.38 | 1.50 | 1.62 |
| 85° | .123 | .259 | .391 | .524 | .657 | .790 | .926 | | | | | | | |

TABLE VI.--CORRECTIONS FOR SUB-CHORDS AND LONG CHORDS.

| FOR SUB-CHORDS ADD | | | | | | | | | | Excess of arc per 100 ft. | LONG CHORDS | | | | |
|--------------------|-----|-----|------|------|------|------|------|------|-----|---------------------------|-------------|--------|--------|--------|--------|
| D | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | | D | 200 | 300 | 400 | 500 |
| 4° | .00 | .00 | .01 | .01 | .01 | .01 | .01 | .01 | .00 | .02 | 1 | 199.99 | 299.97 | 399.92 | 499.85 |
| 6 | .00 | .01 | .01 | .02 | .02 | .02 | .02 | .01 | .01 | .05 | 2 | 199.97 | 299.88 | 399.70 | 499.39 |
| 8 | .01 | .02 | .02 | .03 | .03 | .03 | .03 | .02 | .01 | .08 | 3 | 199.93 | 299.73 | 399.32 | 498.63 |
| 10 | .01 | .02 | .03 | .04 | .05 | .05 | .05 | .04 | .02 | .13 | 4 | 199.88 | 299.51 | 398.78 | 497.57 |
| 12 | .02 | .04 | .05 | .06 | .07 | .07 | .07 | .05 | .03 | .18 | 5 | 199.81 | 299.24 | 398.10 | 496.20 |
| 14 | .02 | .05 | .07 | .08 | .09 | .10 | .09 | .07 | .04 | .25 | 6 | 199.73 | 298.90 | 397.28 | 494.53 |
| 16 | .03 | .06 | .09 | .11 | .12 | .12 | .12 | .09 | .05 | .33 | 7 | 199.63 | 298.51 | 396.28 | 492.57 |
| 18 | .04 | .08 | .11 | .14 | .15 | .16 | .15 | .12 | .07 | .41 | 8 | 199.51 | 298.05 | 395.14 | 490.31 |
| 20 | .05 | .10 | .14 | .17 | .19 | .20 | .18 | .15 | .09 | .51 | 9 | 199.38 | 297.54 | 393.86 | 487.75 |
| 22 | .06 | .12 | .17 | .21 | .23 | .24 | .22 | .18 | .10 | .62 | 10 | 199.24 | 296.96 | 392.42 | 484.90 |
| 24 | .07 | .14 | .20 | .25 | .28 | .28 | .26 | .21 | .12 | .74 | 12 | 198.90 | 295.63 | 389.12 | 478.34 |
| 26 | .09 | .17 | .24 | .29 | .32 | .33 | .31 | .25 | .15 | .86 | 14 | 198.51 | 294.06 | 385.22 | 470.65 |
| 28 | .10 | .19 | .27 | .34 | .37 | .38 | .36 | .29 | .17 | 1.00 | 16 | 198.05 | 292.25 | 380.76 | 461.86 |
| 30 | .11 | .22 | .31 | .39 | .43 | .44 | .41 | .33 | .19 | 1.15 | 18 | 197.54 | 290.21 | 375.74 | 452.02 |
| 32 | .13 | .25 | .36 | .44 | .49 | .50 | .47 | .38 | .22 | 1.31 | 20 | 196.90 | 287.94 | 370.17 | 441.15 |
| 34 | .15 | .28 | .40 | .50 | .55 | .57 | .53 | .43 | .25 | 1.48 | 22 | 196.32 | 285.44 | 364.06 | 429.30 |
| 36 | .17 | .32 | .45 | .56 | .62 | .64 | .59 | .48 | .28 | 1.66 | 24 | 195.63 | 282.71 | 357.43 | 416.53 |
| 38 | .18 | .36 | .51 | .62 | .70 | .71 | .66 | .53 | .31 | 1.88 | 26 | 194.87 | 279.76 | 350.30 | 402.89 |
| 40 | .21 | .40 | .56 | .69 | .77 | .79 | .73 | .59 | .35 | 2.06 | 28 | 194.06 | 276.59 | 342.69 | 388.42 |
| 42 | .23 | .44 | .62 | .76 | .85 | .87 | .81 | .65 | .38 | 2.28 | 30 | 193.18 | 273.20 | 334.61 | 373.20 |
| 44 | .25 | .48 | .68 | .84 | .94 | .96 | .89 | .72 | .42 | 2.50 | 32 | 192.25 | 269.61 | 326.08 | 357.28 |
| 46 | .27 | .52 | .75 | .92 | 1.02 | 1.05 | .98 | .78 | .46 | 2.74 | 34 | 191.26 | 265.81 | 317.12 | 340.73 |
| 48 | .30 | .57 | .81 | 1.00 | 1.12 | 1.14 | 1.06 | .86 | .50 | 2.99 | 36 | 190.21 | 261.80 | 307.77 | 323.61 |
| 50 | .32 | .62 | .89 | 1.09 | 1.21 | 1.24 | 1.15 | .93 | .55 | 3.24 | 38 | 189.10 | 257.60 | 298.03 | 305.99 |
| 52 | .35 | .67 | .96 | 1.18 | 1.31 | 1.35 | 1.25 | 1.01 | .59 | 3.52 | 40 | 187.94 | 253.21 | 287.94 | 287.94 |
| 54 | .38 | .73 | 1.04 | 1.28 | 1.42 | 1.46 | 1.35 | 1.09 | .64 | 3.80 | 42 | 186.72 | 248.63 | 277.51 | 269.54 |
| 56 | .41 | .78 | 1.12 | 1.38 | 1.53 | 1.57 | 1.46 | 1.17 | .69 | 4.09 | 44 | 185.44 | 243.87 | 266.78 | 250.85 |
| 58 | .44 | .84 | 1.20 | 1.48 | 1.65 | 1.69 | 1.57 | 1.20 | .74 | 4.40 | 46 | 184.10 | 239.93 | 255.78 | 231.95 |
| 60 | .47 | .91 | 1.29 | 1.59 | 1.76 | 1.81 | 1.68 | 1.35 | .80 | 4.72 | 48 | 182.71 | 233.83 | 244.61 | 212.92 |

NOTE.—When a chord of less than 100 ft. is used the corrections given in the above table should be added to the nominal length of chord to get the length which should be used in order that the 100 ft. points will check with those obtained by using the standard 100 ft. chord. Thus in locating a 14° curve by 25 ft. chords measure 25.06 for each chord. Long chords are useful in passing obstacles.

TABLE VII.—MIDDLE ORDINATES FOR RAILS IN FEET.

| Deg. of Curve | LENGTH OF RAILS | | | | | | | Deg. of Curve | LENGTH OF RAILS. | | | | | | |
|---------------|-----------------|------|------|------|------|------|------|---------------|------------------|------|------|------|------|------|------|
| | 32 | 30 | 28 | 26 | 24 | 22 | 20 | | 32 | 30 | 28 | 26 | 24 | 22 | 20 |
| 1° | .022 | .020 | .016 | .013 | .011 | .009 | .008 | 16° | .366 | .313 | .273 | .236 | .200 | .170 | .139 |
| 2 | .045 | .038 | .034 | .029 | .025 | .021 | .017 | 17 | .378 | .333 | .290 | .252 | .213 | .180 | .148 |
| 3 | .067 | .058 | .051 | .044 | .037 | .031 | .026 | 18 | .400 | .351 | .306 | .265 | .225 | .190 | .156 |
| 4 | .089 | .079 | .069 | .060 | .050 | .042 | .035 | 19 | .423 | .371 | .324 | .280 | .238 | .201 | .165 |
| 5 | .112 | .099 | .086 | .074 | .063 | .053 | .044 | 20 | .445 | .392 | .341 | .296 | .250 | .212 | .174 |
| 6 | .134 | .117 | .102 | .088 | .076 | .064 | .052 | 21 | .466 | .410 | .357 | .309 | .262 | .222 | .182 |
| 7 | .156 | .137 | .120 | .104 | .088 | .074 | .061 | 22 | .487 | .430 | .375 | .325 | .275 | .233 | .191 |
| 8 | .179 | .158 | .137 | .119 | .100 | .085 | .070 | 23 | .509 | .450 | .390 | .338 | .287 | .243 | .199 |
| 9 | .201 | .175 | .153 | .133 | .112 | .095 | .078 | 24 | .531 | .469 | .408 | .354 | .299 | .253 | .208 |
| 10 | .223 | .196 | .171 | .148 | .125 | .106 | .087 | 25 | .552 | .486 | .424 | .367 | .311 | .263 | .216 |
| 11 | .245 | .216 | .188 | .163 | .139 | .117 | .096 | 26 | .573 | .506 | .441 | .382 | .323 | .274 | .225 |
| 12 | .268 | .236 | .206 | .179 | .151 | .128 | .105 | 27 | .594 | .524 | .457 | .396 | .335 | .284 | .233 |
| 13 | .290 | .254 | .222 | .192 | .163 | .138 | .113 | 28 | .618 | .545 | .475 | .411 | .348 | .294 | .242 |
| 14 | .312 | .275 | .239 | .207 | .175 | .148 | .122 | 29 | .638 | .564 | .491 | .424 | .361 | .303 | .250 |
| 15 | .334 | .295 | .257 | .223 | .188 | .159 | .131 | 30 | .660 | .583 | .508 | .438 | .374 | .313 | .259 |

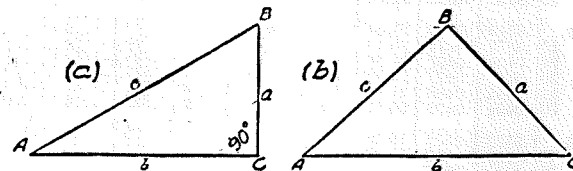
SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:— subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction=15²÷2×250.3=.45 (by slide rule) or horizontal distance=250.3—.45=249.85. When vertical angle=V. A. is measured horizontal distance=slope distance—slope distance (1—Cos. V. A.). Thus for slope distance of 248.7 ft. and V. A. of 4° 20' from Table VIII Cos=.99714 and correction=1—.99714=.00286 per foot or total of .286×2½ (near enough)=.57 and horizontal distance=248.7—.57=248.13 ft.

See fig. (a).

TRIGONOMETRICAL FORMULAS.

- sin. $A = \frac{a}{c}$
- cos. $A = \frac{b}{c}$
- tan. $A = \frac{a}{b}$
- cot. $A = \frac{b}{a}$
- sec. $A = \frac{c}{b}$
- cosec. $A = \frac{c}{a}$



FORMULA FOR SOLVING TRIANGLES.

| Given | Sought. | Right triangles. See fig. (a). |
|------------|---------|--|
| a, c | A, B, b | $\sin. A = \frac{a}{c}, \cos. B = \frac{a}{c}, b = \sqrt{(c+a)(c-a)}$ |
| a, b | A, B, c | $\tan. A = \frac{a}{b}, \cot. B = \frac{a}{b}, c = \sqrt{a^2+b^2}$ |
| A, a | B, b, c | $B=90^\circ-A, b=a \cot. A, c = \frac{a}{\sin. A}$ |
| A, b | B, a, c | $B=90^\circ-A, a=b \tan. A, c = \frac{b}{\cos. A}$ |
| A, c | B, a, b | $B=90^\circ-A, a=c \sin. A, b=c \cos. A$ |
| Given | Sought. | Oblique triangles. See fig. (b). |
| A, B, a | b | $b = \frac{a \sin. B}{\sin. A}$ |
| A, a, b | B | $\sin. B = \frac{b \sin. A}{a}$ |
| a, b, C | A — B | $\tan. \frac{1}{2}(A-B) = \frac{(a-b) \tan. \frac{1}{2}(A+B)}{a+b}$ |
| c, b, c | A | $\text{If } s = \frac{1}{2}(a+b+c), \sin. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{bc}}$ |
| | | $\cos. \frac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}, \tan. \frac{1}{2} A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$ |
| | | $\sin. A = \frac{2\sqrt{s(s-a)(s-b)(s-c)}}{bc}$ |
| A, B, C, a | area | $\text{area} = \frac{a^2 \sin. B \sin. C}{2 \sin. A}$ |
| A, b, c | area | $\text{area} = \frac{1}{2} bc \sin. A$ |
| a, b, c | area | $s = \frac{1}{2}(a+b+c), \text{area} = \sqrt{s(s-a)(s-b)(s-c)}$ |

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

| Angle | Sine. | Tan. | Cotg. | Cosin. | Angle | Sine. | Tan. | Cotg. | Cosin. | |
|-------|--------|-------|-------|--------|--------|--------|-------|--------|--------|--------|
| 0 | 0 | 0 | ∞ | 1 | 90 | 1 | ∞ | 0 | 0 | |
| 10 | .0029 | .0029 | 343.8 | .99999 | 50 | .7660 | .7660 | 1.2843 | .6428 | |
| 20 | .0058 | .0058 | 171.9 | .99998 | 40 | .6428 | .6428 | 1.5557 | .7660 | |
| 30 | .0087 | .0087 | 114.6 | .99996 | 30 | .5196 | .5196 | 1.9613 | .8660 | |
| 40 | .0116 | .0116 | 85.94 | .99993 | 20 | .3919 | .3919 | 2.5761 | .9397 | |
| 50 | .0145 | .0145 | 68.75 | .99989 | 10 | .2618 | .2618 | 3.8571 | .9914 | |
| 1 | .0175 | .0175 | 57.29 | .99985 | 89 | .1392 | .1392 | 7.115 | .9848 | |
| 10 | .0204 | .0204 | 49.10 | .99979 | 50 | .1421 | .1421 | 6.968 | .98986 | |
| 20 | .0233 | .0233 | 42.96 | .99973 | 40 | .1449 | .1449 | 6.827 | .98944 | |
| 30 | .0262 | .0262 | 38.19 | .99966 | 30 | .1478 | .1478 | 6.691 | .98902 | |
| 40 | .0291 | .0291 | 34.37 | .99958 | 20 | .1507 | .1507 | 6.561 | .98858 | |
| 50 | .0320 | .0320 | 31.24 | .99949 | 10 | .1536 | .1536 | 6.435 | .98814 | |
| 2 | .0349 | .0349 | 28.64 | .99939 | 88 | .1564 | .1564 | 6.314 | .98769 | |
| 10 | .0378 | .0378 | 26.43 | .99929 | 50 | .1593 | .1593 | 6.197 | .98723 | |
| 20 | .0407 | .0407 | 24.54 | .99917 | 40 | .1622 | .1622 | 6.084 | .98676 | |
| 30 | .0436 | .0437 | 22.90 | .99905 | 30 | .1650 | .1650 | 5.976 | .98629 | |
| 40 | .0465 | .0466 | 21.47 | .99892 | 20 | .1679 | .1679 | 5.871 | .98580 | |
| 50 | .0494 | .0495 | 20.21 | .99878 | 10 | .1708 | .1708 | 5.769 | .98531 | |
| 3 | .0523 | .0524 | 19.08 | .99863 | 87 | .1736 | .1736 | 5.671 | .98481 | |
| 10 | .0552 | .0553 | 18.07 | .99847 | 50 | .1765 | .1765 | 5.576 | .98430 | |
| 20 | .0581 | .0582 | 17.17 | .99831 | 40 | .1794 | .1794 | 5.485 | .98378 | |
| 30 | .0610 | .0612 | 16.35 | .99813 | 30 | .1822 | .1822 | 5.396 | .98325 | |
| 40 | .0640 | .0641 | 15.60 | .99795 | 20 | .1851 | .1851 | 5.309 | .98272 | |
| 50 | .0669 | .0670 | 14.92 | .99776 | 10 | .1880 | .1880 | 5.226 | .98218 | |
| 4 | .0698 | .0699 | 14.30 | .99756 | 86 | .1908 | .1908 | 5.145 | .98163 | |
| 10 | .0727 | .0729 | 13.73 | .99736 | 50 | .1937 | .1937 | 5.066 | .98107 | |
| 20 | .0756 | .0758 | 13.20 | .99714 | 40 | .1965 | .1965 | 4.989 | .98050 | |
| 30 | .0785 | .0787 | 12.71 | .99692 | 30 | .1994 | .1994 | 4.915 | .97992 | |
| 40 | .0814 | .0816 | 12.25 | .99668 | 20 | .2022 | .2022 | 4.843 | .97934 | |
| 50 | .0843 | .0846 | 11.83 | .99644 | 10 | .2051 | .2051 | 4.773 | .97875 | |
| 5 | .0872 | .0875 | 11.43 | .99619 | 85 | .2079 | .2079 | 4.705 | .97815 | |
| 10 | .0901 | .0904 | 11.06 | .99594 | 50 | .2108 | .2108 | 4.638 | .97754 | |
| 20 | .0929 | .0934 | 10.71 | .99567 | 40 | .2136 | .2136 | 4.574 | .97692 | |
| 30 | .0958 | .0963 | 10.39 | .99540 | 30 | .2164 | .2164 | 4.511 | .97630 | |
| 40 | .0987 | .0992 | 10.08 | .99511 | 20 | .2193 | .2193 | 4.449 | .97566 | |
| 50 | .1016 | .1022 | 9.788 | .99482 | 10 | .2221 | .2221 | 4.390 | .97502 | |
| 6 | .1045 | .1051 | 9.514 | .99452 | 84 | .2250 | .2250 | 4.331 | .97437 | |
| 10 | .1074 | .1080 | 9.255 | .99421 | 50 | .2278 | .2278 | 4.275 | .97371 | |
| 20 | .1103 | .1110 | 9.010 | .99390 | 40 | .2306 | .2306 | 4.219 | .97304 | |
| 30 | .1132 | .1139 | 8.777 | .99357 | 30 | .2334 | .2334 | 4.165 | .97237 | |
| 40 | .1161 | .1169 | 8.556 | .99324 | 20 | .2363 | .2363 | 4.113 | .97169 | |
| 50 | .1190 | .1198 | 8.345 | .99290 | 10 | .2391 | .2391 | 4.061 | .97100 | |
| 7 | .1219 | .1228 | 8.144 | .99255 | 83 | .2419 | .2419 | 4.011 | .97030 | |
| 10 | .1248 | .1257 | 7.953 | .99219 | 50 | .2447 | .2447 | 3.962 | .96959 | |
| 20 | .1276 | .1287 | 7.770 | .99182 | 40 | .2476 | .2476 | 3.914 | .96887 | |
| 30 | .1305 | .1317 | 7.596 | .99144 | 30 | .2504 | .2504 | 3.867 | .96815 | |
| 40 | .1334 | .1346 | 7.429 | .99106 | 20 | .2532 | .2532 | 3.821 | .96742 | |
| 50 | .1363 | .1376 | 7.269 | .99067 | 10 | .2560 | .2560 | 3.776 | .96667 | |
| | Cosin. | Cotg. | Tan. | Sine. | Angle. | Cosin. | Cotg. | Tan. | Sine. | Angle. |

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

| Angle | Sine. | Tan. | Cotg. | Cosin. | Angle | Sine. | Tan. | Cotg. | Cosin. | |
|-------|--------|-------|-------|--------|--------|--------|-------|-------|--------|--------|
| 16 | .2756 | .2867 | 3.487 | .96126 | 74 | .4067 | .4452 | 2.246 | .91355 | |
| 10 | .2784 | .2899 | 3.450 | .96046 | 50 | .4094 | .4487 | 2.220 | .91236 | |
| 20 | .2812 | .2931 | 3.412 | .95964 | 40 | .4120 | .4522 | 2.211 | .91116 | |
| 30 | .2840 | .2962 | 3.376 | .95882 | 30 | .4147 | .4557 | 2.194 | .90996 | |
| 40 | .2868 | .2994 | 3.340 | .95799 | 20 | .4173 | .4592 | 2.177 | .90875 | |
| 50 | .2896 | .3026 | 3.305 | .95715 | 10 | .4200 | .4628 | 2.161 | .90753 | |
| 17 | .2924 | .3057 | 3.271 | .95631 | 73 | .4226 | .4663 | 2.145 | .90631 | |
| 10 | .2952 | .3089 | 3.237 | .95545 | 50 | .4253 | .4699 | 2.128 | .90507 | |
| 20 | .2979 | .3121 | 3.204 | .95459 | 40 | .4279 | .4734 | 2.112 | .90383 | |
| 30 | .3007 | .3153 | 3.172 | .95372 | 30 | .4305 | .4770 | 2.097 | .90259 | |
| 40 | .3035 | .3185 | 3.140 | .95284 | 20 | .4331 | .4806 | 2.081 | .90133 | |
| 50 | .3062 | .3217 | 3.108 | .95195 | 10 | .4358 | .4841 | 2.066 | .90007 | |
| 18 | .3090 | .3249 | 3.078 | .95106 | 72 | .4384 | .4877 | 2.050 | .89879 | |
| 10 | .3118 | .3281 | 3.048 | .95015 | 50 | .4410 | .4913 | 2.035 | .89752 | |
| 20 | .3145 | .3314 | 3.018 | .94924 | 40 | .4436 | .4950 | 2.020 | .89623 | |
| 30 | .3173 | .3346 | 2.989 | .94832 | 30 | .4462 | .4986 | 2.006 | .89493 | |
| 40 | .3201 | .3378 | 2.960 | .94740 | 20 | .4488 | .5022 | 1.991 | .89363 | |
| 50 | .3228 | .3411 | 2.932 | .94646 | 10 | .4514 | .5059 | 1.977 | .89232 | |
| 19 | .3256 | .3443 | 2.904 | .94552 | 71 | .4540 | .5095 | 1.963 | .89101 | |
| 10 | .3283 | .3476 | 2.877 | .94457 | 50 | .4566 | .5132 | 1.949 | .88968 | |
| 20 | .3311 | .3508 | 2.850 | .94361 | 40 | .4592 | .5169 | 1.935 | .88835 | |
| 30 | .3338 | .3541 | 2.824 | .94264 | 30 | .4617 | .5206 | 1.921 | .88701 | |
| 40 | .3365 | .3574 | 2.798 | .94167 | 20 | .4643 | .5243 | 1.907 | .88566 | |
| 50 | .3393 | .3607 | 2.773 | .94068 | 10 | .4669 | .5280 | 1.894 | .88431 | |
| 20 | .3420 | .3640 | 2.747 | .93969 | 70 | .4695 | .5317 | 1.881 | .88295 | |
| 10 | .3448 | .3673 | 2.723 | .93869 | 50 | .4720 | .5354 | 1.868 | .88158 | |
| 20 | .3475 | .3706 | 2.699 | .93769 | 40 | .4746 | .5392 | 1.855 | .88020 | |
| 30 | .3502 | .3739 | 2.675 | .93667 | 30 | .4772 | .5430 | 1.842 | .87882 | |
| 40 | .3529 | .3772 | 2.651 | .93565 | 20 | .4797 | .5467 | 1.829 | .87743 | |
| 50 | .3557 | .3805 | 2.628 | .93462 | 10 | .4823 | .5505 | 1.816 | .87603 | |
| 21 | .3584 | .3839 | 2.605 | .93358 | 69 | .4848 | .5543 | 1.804 | .87462 | |
| 10 | .3611 | .3872 | 2.583 | .93253 | 50 | .4874 | .5581 | 1.792 | .87321 | |
| 20 | .3638 | .3906 | 2.560 | .93148 | 40 | .4899 | .5619 | 1.780 | .87178 | |
| 30 | .3665 | .3939 | 2.539 | .93042 | 30 | .4924 | .5658 | 1.767 | .87036 | |
| 40 | .3692 | .3973 | 2.517 | .92935 | 20 | .4950 | .5696 | 1.756 | .86892 | |
| 50 | .3719 | .4006 | 2.496 | .92827 | 10 | .4975 | .5735 | 1.744 | .86748 | |
| 22 | .3746 | .4040 | 2.475 | .92718 | 68 | .5000 | .5774 | 1.732 | .86603 | |
| 10 | .3773 | .4074 | 2.455 | .92609 | 50 | .5025 | .5812 | 1.720 | .86457 | |
| 20 | .3800 | .4108 | 2.434 | .92499 | 40 | .5050 | .5851 | 1.709 | .86310 | |
| 30 | .3827 | .4142 | 2.414 | .92388 | 30 | .5075 | .5890 | 1.698 | .86163 | |
| 40 | .3854 | .4176 | 2.394 | .92276 | 20 | .5100 | .5930 | 1.686 | .86015 | |
| 50 | .3881 | .4210 | 2.375 | .92164 | 10 | .5125 | .5969 | 1.675 | .85866 | |
| 23 | .3907 | .4245 | 2.356 | .92050 | 67 | .5150 | .6009 | 1.664 | .85717 | |
| 10 | .3934 | .4279 | 2.337 | .91936 | 50 | .5175 | .6048 | 1.653 | .85567 | |
| 20 | .3961 | .4314 | 2.318 | .91822 | 40 | .5200 | .6088 | 1.643 | .85416 | |
| 30 | .3987 | .4348 | 2.300 | .91708 | 30 | .5225 | .6128 | 1.632 | .85264 | |
| 40 | .4014 | .4383 | 2.282 | .91590 | 20 | .5250 | .6168 | 1.621 | .85112 | |
| 50 | .4041 | .4417 | 2.264 | .91472 | 10 | .5275 | .6208 | 1.611 | .84959 | |
| | Cosin. | Cotg. | Tan. | Sine. | Angle. | Cosin. | Cotg. | Tan. | Sine. | Angle. |

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

| Angle | Sine. | Tan. | Cotg. | Cosin. | | Angle | Sine. | Tan. | Cotg. | Cosin. | |
|-------|--------|-------|-------|--------|--------|-------|--------|-------|-------|--------|--------|
| ° | | | | | | ° | | | | | |
| 32 | .5299 | .6249 | 1.600 | .84805 | 58 | 30 | .6225 | .7954 | 1.257 | .78261 | |
| 10 | .5324 | .6289 | 1.590 | .84650 | 50 | 40 | .6248 | .8002 | 1.250 | .78079 | |
| 20 | .5348 | .6330 | 1.580 | .84495 | 40 | 50 | .6271 | .8050 | 1.242 | .77897 | |
| 30 | .5373 | .6371 | 1.570 | .84339 | 30 | | | | | | |
| 40 | .5398 | .6412 | 1.560 | .84182 | 20 | 39 | .6293 | .8098 | 1.235 | .77715 | |
| 50 | .5422 | .6453 | 1.550 | .84025 | 10 | 10 | .6316 | .8146 | 1.228 | .77531 | |
| | | | | | | 20 | .6338 | .8195 | 1.220 | .77347 | |
| 33 | .5446 | .6494 | 1.540 | .83867 | 57 | 30 | .6361 | .8243 | 1.213 | .77162 | |
| 10 | .5471 | .6536 | 1.530 | .83708 | 50 | 40 | .6383 | .8292 | 1.206 | .76977 | |
| 20 | .5495 | .6577 | 1.520 | .83549 | 40 | 50 | .6406 | .8342 | 1.199 | .76791 | |
| 30 | .5519 | .6619 | 1.511 | .83389 | 30 | | | | | | |
| 40 | .5544 | .6661 | 1.501 | .83228 | 20 | 40 | .6428 | .8391 | 1.192 | .76604 | |
| 50 | .5563 | .6703 | 1.492 | .83066 | 10 | 10 | .6450 | .8441 | 1.185 | .76417 | |
| | | | | | | 20 | .6472 | .8491 | 1.178 | .76229 | |
| 34 | .5592 | .6745 | 1.483 | .82904 | 56 | 30 | .6494 | .8541 | 1.171 | .76041 | |
| 10 | .5616 | .6787 | 1.473 | .82741 | 50 | 40 | .6517 | .8591 | 1.164 | .75851 | |
| 20 | .5640 | .6830 | 1.464 | .82577 | 40 | 50 | .6539 | .8642 | 1.157 | .75661 | |
| 30 | .5664 | .6873 | 1.455 | .82413 | 30 | | | | | | |
| 40 | .5688 | .6916 | 1.446 | .82248 | 20 | 41 | .6561 | .8693 | 1.150 | .75471 | |
| 50 | .5712 | .6959 | 1.437 | .82082 | 10 | 10 | .6583 | .8744 | 1.144 | .75280 | |
| | | | | | | 20 | .6604 | .8796 | 1.137 | .75088 | |
| 35 | .5736 | .7002 | 1.428 | .81915 | 55 | 30 | .6626 | .8847 | 1.130 | .74896 | |
| 10 | .5760 | .7046 | 1.419 | .81748 | 50 | 40 | .6648 | .8899 | 1.124 | .74703 | |
| 20 | .5783 | .7089 | 1.411 | .81580 | 40 | 50 | .6670 | .8952 | 1.117 | .74509 | |
| 30 | .5807 | .7133 | 1.402 | .81412 | 30 | | | | | | |
| 40 | .5831 | .7177 | 1.393 | .81242 | 20 | 42 | .6691 | .9004 | 1.111 | .74314 | |
| 50 | .5854 | .7221 | 1.385 | .81072 | 10 | 10 | .6713 | .9057 | 1.104 | .74120 | |
| | | | | | | 20 | .6734 | .9110 | 1.098 | .73924 | |
| 36 | .5878 | .7265 | 1.376 | .80902 | 54 | 30 | .6756 | .9163 | 1.091 | .73728 | |
| 10 | .5901 | .7310 | 1.368 | .80730 | 50 | 40 | .6777 | .9217 | 1.085 | .73531 | |
| 20 | .5925 | .7355 | 1.360 | .80558 | 40 | 50 | .6799 | .9271 | 1.079 | .73333 | |
| 30 | .5948 | .7400 | 1.351 | .80386 | 30 | | | | | | |
| 40 | .5972 | .7445 | 1.343 | .80212 | 20 | 43 | .6820 | .9325 | 1.072 | .73135 | |
| 50 | .5995 | .7490 | 1.335 | .80038 | 10 | 10 | .6841 | .9380 | 1.066 | .72937 | |
| | | | | | | 20 | .6862 | .9435 | 1.060 | .72737 | |
| 37 | .6018 | .7536 | 1.327 | .79864 | 53 | 30 | .6884 | .9490 | 1.054 | .72537 | |
| 10 | .6041 | .7581 | 1.319 | .79688 | 50 | 40 | .6905 | .9545 | 1.048 | .72337 | |
| 20 | .6065 | .7627 | 1.311 | .79512 | 40 | 50 | .6926 | .9601 | 1.042 | .72136 | |
| 30 | .6088 | .7673 | 1.303 | .79335 | 30 | | | | | | |
| 40 | .6111 | .7720 | 1.295 | .79158 | 20 | 44 | .6947 | .9657 | 1.036 | .71934 | |
| 50 | .6134 | .7766 | 1.288 | .78980 | 10 | 10 | .6967 | .9713 | 1.030 | .71732 | |
| | | | | | | 20 | .6988 | .9770 | 1.024 | .71529 | |
| 38 | .6157 | .7813 | 1.280 | .78801 | 52 | 30 | .7009 | .9827 | 1.018 | .71325 | |
| 10 | .6180 | .7860 | 1.272 | .78622 | 50 | 40 | .7030 | .9884 | 1.012 | .71121 | |
| 20 | .6202 | .7907 | 1.265 | .78442 | 40 | 50 | .7050 | .9942 | 1.006 | .70916 | |
| | | | | | | | .7071 | 1. | 1. | .70711 | |
| | | | | | | | | | | ° | |
| | Cosin. | Cotg. | Tan. | Sine. | Angle. | | Cosin. | Cotg. | Tan. | Sine. | Angle. |

TABLE IX.—CALCULATION OF EARTHWORK.

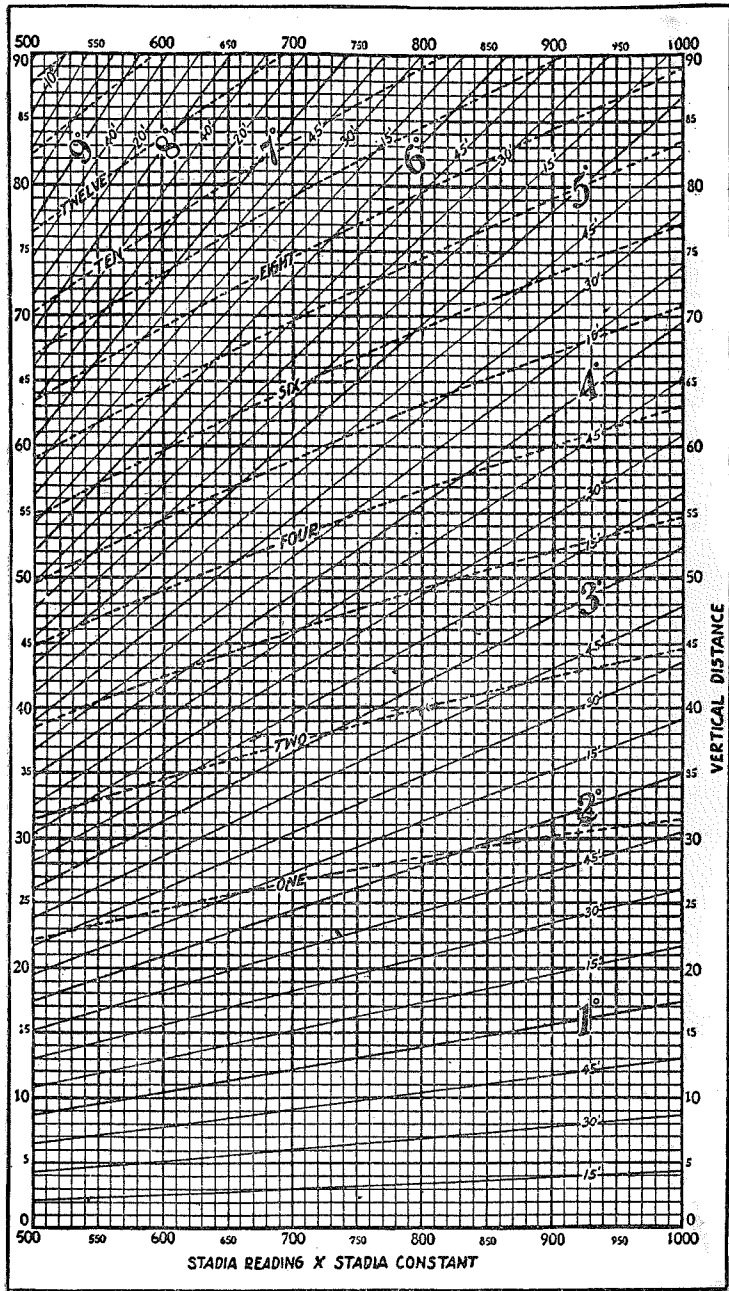
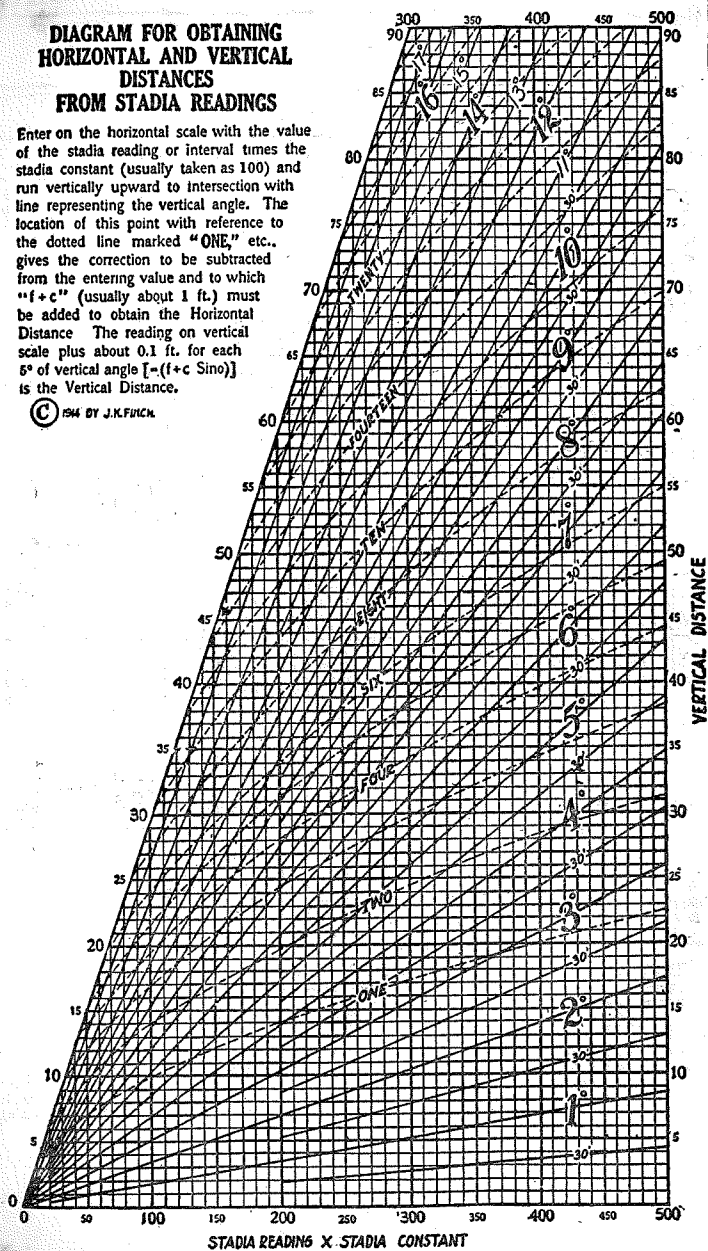
| Width | HEIGHT | | | | | | | | | | | | | | |
|-------|--------|------|------|------|------|------|------|------|------|------|------|------|------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1 | .02 | .04 | .06 | .07 | .09 | .11 | .13 | .15 | .17 | .18 | .20 | .22 | .24 | .26 | .28 |
| 2 | .04 | .07 | .11 | .15 | .18 | .22 | .26 | .30 | .33 | .37 | .41 | .44 | .48 | .52 | .56 |
| 3 | .06 | .11 | .17 | .22 | .28 | .33 | .39 | .44 | .50 | .56 | .61 | .67 | .72 | .78 | .83 |
| 4 | .07 | .15 | .22 | .30 | .37 | .44 | .52 | .59 | .67 | .74 | .81 | .89 | .96 | 1.04 | 1.11 |
| 5 | .09 | .19 | .28 | .37 | .46 | .56 | .65 | .74 | .83 | .93 | 1.02 | 1.11 | 1.20 | 1.30 | 1.39 |
| 6 | .11 | .22 | .33 | .44 | .56 | .67 | .78 | .89 | 1.00 | 1.11 | 1.22 | 1.33 | 1.44 | 1.55 | 1.67 |
| 7 | .13 | .26 | .39 | .52 | .65 | .78 | .91 | 1.04 | 1.16 | 1.30 | 1.42 | 1.55 | 1.68 | 1.81 | 1.94 |
| 8 | .15 | .30 | .44 | .59 | .74 | .89 | 1.04 | 1.19 | 1.33 | 1.48 | 1.63 | 1.78 | 1.92 | 2.08 | 2.22 |
| 9 | .17 | .33 | .50 | .67 | .83 | 1.00 | 1.17 | 1.33 | 1.50 | 1.67 | 1.83 | 2.00 | 2.17 | 2.33 | 2.50 |
| 10 | .18 | .37 | .56 | .74 | .93 | 1.11 | 1.30 | 1.48 | 1.67 | 1.85 | 2.04 | 2.22 | 2.41 | 2.59 | 2.78 |
| 11 | .20 | .41 | .61 | .82 | 1.02 | 1.22 | 1.43 | 1.63 | 1.83 | 2.04 | 2.24 | 2.44 | 2.65 | 2.85 | 3.06 |
| 12 | .22 | .44 | .67 | .89 | 1.11 | 1.33 | 1.56 | 1.78 | 2.00 | 2.22 | 2.44 | 2.67 | 2.89 | 3.11 | 3.33 |
| 13 | .24 | .48 | .72 | .96 | 1.20 | 1.44 | 1.68 | 1.92 | 2.16 | 2.41 | 2.65 | 2.89 | 3.13 | 3.37 | 3.61 |
| 14 | .26 | .52 | .78 | 1.04 | 1.30 | 1.55 | 1.81 | 2.08 | 2.33 | 2.59 | 2.85 | 3.11 | 3.37 | 3.63 | 3.89 |
| 15 | .28 | .56 | .83 | 1.11 | 1.39 | 1.67 | 1.94 | 2.22 | 2.50 | 2.78 | 3.06 | 3.33 | 3.61 | 3.89 | 4.17 |
| 16 | .30 | .59 | .89 | 1.18 | 1.48 | 1.78 | 2.07 | 2.37 | 2.67 | 2.96 | 3.26 | 3.56 | 3.85 | 4.15 | 4.44 |
| 17 | .31 | .63 | .94 | 1.26 | 1.57 | 1.89 | 2.20 | 2.52 | 2.83 | 3.15 | 3.46 | 3.78 | 4.09 | 4.41 | 4.72 |
| 18 | .33 | .67 | 1.00 | 1.33 | 1.67 | 2.00 | 2.33 | 2.67 | 3.00 | 3.33 | 3.67 | 4.00 | 4.33 | 4.67 | 5.00 |
| 19 | .35 | .70 | 1.06 | 1.41 | 1.76 | 2.11 | 2.46 | 2.82 | 3.17 | 3.52 | 3.87 | 4.22 | 4.57 | 4.92 | 5.28 |
| 20 | .37 | .74 | 1.11 | 1.48 | 1.85 | 2.22 | 2.59 | 2.96 | 3.33 | 3.70 | 4.07 | 4.44 | 4.81 | 5.18 | 5.56 |
| 21 | .39 | .78 | 1.17 | 1.55 | 1.94 | 2.33 | 2.72 | 3.11 | 3.50 | 3.89 | 4.28 | 4.67 | 5.06 | 5.44 | 5.83 |
| 22 | .41 | .81 | 1.22 | 1.63 | 2.04 | 2.44 | 2.85 | 3.26 | 3.67 | 4.07 | 4.48 | 4.89 | 5.30 | 5.70 | 6.11 |
| 23 | .43 | .85 | 1.28 | 1.70 | 2.13 | 2.56 | 2.98 | 3.41 | 3.83 | 4.26 | 4.68 | 5.11 | 5.54 | 5.96 | 6.39 |
| 24 | .44 | .89 | 1.33 | 1.78 | 2.22 | 2.67 | 3.11 | 3.50 | 4.00 | 4.44 | 4.89 | 5.33 | 5.78 | 6.22 | 6.67 |
| 25 | .46 | .92 | 1.39 | 1.85 | 2.31 | 2.78 | 3.24 | 3.70 | 4.17 | 4.63 | 5.09 | 5.56 | 6.02 | 6.48 | 6.94 |
| 26 | .48 | .96 | 1.44 | 1.92 | 2.41 | 2.89 | 3.37 | 3.85 | 4.33 | 4.82 | 5.30 | 5.78 | 6.26 | 6.74 | 7.24 |
| 27 | .50 | 1.00 | 1.50 | 2.00 | 2.50 | 3.00 | 3.50 | 4.00 | 4.50 | 5.00 | 5.50 | 6.00 | 6.50 | 7.00 | 7.50 |
| 28 | .52 | 1.04 | 1.55 | 2.07 | 2.59 | 3.11 | 3.63 | 4.15 | 4.67 | 5.18 | 5.70 | 6.22 | 6.74 | 7.26 | 7.78 |
| 29 | .54 | 1.07 | 1.61 | 2.15 | 2.69 | 3.22 | 3.76 | 4.30 | 4.83 | 5.37 | 5.91 | 6.44 | 6.98 | 7.52 | 8.06 |
| 30 | .56 | 1.11 | 1.67 | 2.22 | 2.78 | 3.33 | 3.89 | 4.44 | 5.00 | 5.55 | 6.11 | 6.67 | 7.22 | 7.78 | 8.33 |
| 31 | .57 | 1.15 | 1.72 | 2.30 | 2.87 | 3.44 | 4.02 | 4.59 | 5.17 | 5.74 | 6.32 | 6.89 | 7.46 | 8.04 | 8.61 |
| 32 | .59 | 1.18 | 1.78 | 2.37 | 2.96 | 3.56 | 4.15 | 4.74 | 5.33 | 5.92 | 6.52 | 7.11 | 7.70 | 8.30 | 8.89 |
| 33 | .61 | 1.22 | 1.83 | 2.44 | 3.05 | 3.67 | 4.28 | 4.89 | 5.50 | 6.11 | 6.72 | 7.33 | 7.94 | 8.55 | 9.17 |
| 34 | .63 | 1.26 | 1.89 | 2.52 | 3.15 | 3.78 | 4.40 | 5.04 | 5.67 | 6.29 | 6.93 | 7.56 | 8.18 | 8.81 | 9.44 |
| 35 | .65 | 1.30 | 1.94 | 2.59 | 3.24 | 3.89 | 4.53 | 5.18 | 5.83 | 6.48 | 7.13 | 7.78 | 8.42 | 9.08 | 9.72 |
| 36 | .67 | 1.33 | 2.00 | 2.67 | 3.33 | 4.00 | 4.66 | 5.33 | 6.00 | 6.67 | 7.33 | 8.00 | 8.67 | 9.33 | 10.00 |
| 37 | .68 | 1.37 | 2.06 | 2.74 | 3.42 | 4.11 | 4.79 | 5.48 | 6.17 | 6.85 | 7.54 | 8.22 | 8.91 | 9.59 | 10.28 |
| 38 | .70 | 1.41 | 2.11 | 2.82 | 3.52 | 4.22 | 4.92 | 5.63 | 6.33 | 7.03 | 7.74 | 8.44 | 9.15 | 9.85 | 10.56 |
| 39 | .72 | 1.44 | 2.17 | 2.89 | 3.61 | 4.33 | 5.05 | 5.78 | 6.50 | 7.22 | 7.95 | 8.67 | 9.39 | 10.11 | 10.83 |
| 40 | .74 | 1.48 | 2.22 | 2.96 | 3.70 | 4.44 | 5.18 | 5.92 | 6.67 | 7.41 | 8.15 | 8.89 | 9.63 | 10.37 | 11.11 |

Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths. Thus if $w = 16.2$ and $h = 5.3$, cu. yds. $= 1.48 + .028 + .089 = 1.597$ cu. yds. or practically 160 cu. yds. per 100 ft. If w exceeds 40 ft., use one half and multiply result by 2, if both w and h are large use one half of each and multiply result by 4. Any cross-section may be divided into triangles by the following rule. To the triangle of the sum of the outside cuts (or fills) $=b$, and $\frac{1}{2}$ the roadbed $=w$, add the triangles formed by taking the distance out to each break in turn ($=w$'s) by the difference between the cuts (or fills) on each side of it ($=h$'s) always subtracting the outer from the inner.

**DIAGRAM FOR OBTAINING
HORIZONTAL AND VERTICAL
DISTANCES
FROM STADIA READINGS**

Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which " $f+c$ " (usually about 1 ft.) must be added to obtain the Horizontal Distance. The reading on vertical scale plus about 0.1 ft. for each 5° of vertical angle [$=(f+c \text{ Sino})$] is the Vertical Distance.

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DISTANCES FROM CENTER OF ROADWAY FOR
CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½
For Single Track Embankment.

| H | 0 | .1 | .2 | .3 | .4 | .5 | .6 | .7 | .8 | .9 | H |
|----|------|------|------|------|------|------|------|------|------|------|----|
| 0 | 8.0 | 8.2 | 8.3 | 8.5 | 8.6 | 8.8 | 8.9 | 9.1 | 9.2 | 9.4 | 0 |
| 1 | 9.5 | 9.7 | 9.8 | 10.0 | 10.1 | 10.3 | 10.4 | 10.6 | 10.7 | 10.9 | 1 |
| 2 | 11.0 | 11.2 | 11.3 | 11.5 | 11.6 | 11.8 | 11.9 | 12.1 | 12.2 | 12.4 | 2 |
| 3 | 12.5 | 12.7 | 12.8 | 13.0 | 13.1 | 13.3 | 13.4 | 13.6 | 13.7 | 13.9 | 3 |
| 4 | 14.0 | 14.2 | 14.3 | 14.5 | 14.6 | 14.8 | 14.9 | 15.1 | 15.2 | 15.4 | 4 |
| 5 | 15.5 | 15.7 | 15.8 | 16.0 | 16.1 | 16.3 | 16.4 | 16.6 | 16.7 | 16.9 | 5 |
| 6 | 17.0 | 17.2 | 17.3 | 17.5 | 17.6 | 17.8 | 17.9 | 18.1 | 18.2 | 18.4 | 6 |
| 7 | 18.5 | 18.7 | 18.8 | 19.0 | 19.1 | 19.3 | 19.4 | 19.6 | 19.7 | 19.9 | 7 |
| 8 | 20.0 | 20.2 | 20.3 | 20.5 | 20.6 | 20.8 | 20.9 | 21.1 | 21.2 | 21.4 | 8 |
| 9 | 21.5 | 21.7 | 21.8 | 22.0 | 22.1 | 22.3 | 22.4 | 22.6 | 22.7 | 22.9 | 9 |
| 10 | 23.0 | 23.2 | 23.3 | 23.5 | 23.6 | 23.8 | 23.9 | 24.1 | 24.2 | 24.4 | 10 |
| 11 | 24.5 | 24.7 | 24.8 | 25.0 | 25.1 | 25.3 | 25.4 | 25.6 | 25.7 | 25.9 | 11 |
| 12 | 26.0 | 26.2 | 26.3 | 26.5 | 26.6 | 26.8 | 26.9 | 27.1 | 27.2 | 27.4 | 12 |
| 13 | 27.5 | 27.7 | 27.8 | 28.0 | 28.1 | 28.3 | 28.4 | 28.6 | 28.7 | 28.9 | 13 |
| 14 | 29.0 | 29.2 | 29.3 | 29.5 | 29.6 | 29.8 | 29.9 | 30.1 | 30.2 | 30.4 | 14 |
| 15 | 30.5 | 30.7 | 30.8 | 31.0 | 31.1 | 31.3 | 31.4 | 31.6 | 31.7 | 31.9 | 15 |
| 16 | 32.0 | 32.2 | 32.3 | 32.5 | 32.6 | 32.8 | 32.9 | 33.1 | 33.2 | 33.4 | 16 |
| 17 | 33.5 | 33.7 | 33.8 | 34.0 | 34.1 | 34.3 | 34.4 | 34.6 | 34.7 | 34.9 | 17 |
| 18 | 35.0 | 35.2 | 35.3 | 35.5 | 35.6 | 35.8 | 35.9 | 36.1 | 36.2 | 36.4 | 18 |
| 19 | 36.5 | 36.7 | 36.8 | 37.0 | 37.1 | 37.3 | 37.4 | 37.6 | 37.7 | 37.9 | 19 |
| 20 | 38.0 | 38.2 | 38.3 | 38.5 | 38.6 | 38.8 | 38.9 | 39.1 | 39.2 | 39.4 | 20 |
| 21 | 39.5 | 39.7 | 39.8 | 40.0 | 40.1 | 40.3 | 40.4 | 40.6 | 40.7 | 40.9 | 21 |
| 22 | 41.0 | 41.2 | 41.3 | 41.5 | 41.6 | 41.8 | 41.9 | 42.1 | 42.2 | 42.4 | 22 |
| 23 | 42.5 | 42.7 | 42.8 | 43.0 | 43.1 | 43.3 | 43.4 | 43.6 | 43.7 | 43.9 | 23 |
| 24 | 44.0 | 44.2 | 44.3 | 44.5 | 44.6 | 44.8 | 44.9 | 45.1 | 45.2 | 45.4 | 24 |
| 25 | 45.5 | 45.7 | 45.8 | 46.0 | 46.1 | 46.3 | 46.4 | 46.6 | 46.7 | 46.9 | 25 |
| 26 | 47.0 | 47.2 | 47.3 | 47.5 | 47.6 | 47.8 | 47.9 | 48.1 | 48.2 | 48.4 | 26 |
| 27 | 48.5 | 48.7 | 48.8 | 49.0 | 49.1 | 49.3 | 49.4 | 49.6 | 49.7 | 49.9 | 27 |
| 28 | 50.0 | 50.2 | 50.3 | 50.5 | 50.6 | 50.8 | 50.9 | 51.1 | 51.2 | 51.4 | 28 |
| 29 | 51.5 | 51.7 | 51.8 | 52.0 | 52.1 | 52.3 | 52.4 | 52.6 | 52.7 | 52.9 | 29 |
| 30 | 53.0 | 53.2 | 53.3 | 53.5 | 53.6 | 53.8 | 53.9 | 54.1 | 54.2 | 54.4 | 30 |
| 31 | 54.5 | 54.7 | 54.8 | 55.0 | 55.1 | 55.3 | 55.4 | 55.6 | 55.7 | 55.9 | 31 |
| 32 | 56.0 | 56.2 | 56.3 | 56.5 | 56.6 | 56.8 | 56.9 | 57.1 | 57.2 | 57.4 | 32 |
| 33 | 57.5 | 57.7 | 57.8 | 58.0 | 58.1 | 58.3 | 58.4 | 58.6 | 58.7 | 58.9 | 33 |
| 34 | 59.0 | 59.2 | 59.3 | 59.5 | 59.6 | 59.8 | 59.9 | 60.1 | 60.2 | 60.4 | 34 |
| 35 | 60.5 | 60.7 | 60.8 | 61.0 | 61.1 | 61.3 | 61.4 | 61.6 | 61.7 | 61.9 | 35 |
| 36 | 62.0 | 62.2 | 62.3 | 62.5 | 62.6 | 62.8 | 62.9 | 63.1 | 63.2 | 63.4 | 36 |
| 37 | 63.5 | 63.7 | 63.8 | 64.0 | 64.1 | 64.3 | 64.4 | 64.6 | 64.7 | 64.9 | 37 |
| 38 | 65.0 | 65.2 | 65.3 | 65.5 | 65.6 | 65.8 | 65.9 | 66.1 | 66.2 | 66.4 | 38 |
| 39 | 66.5 | 66.7 | 66.8 | 67.0 | 67.1 | 67.3 | 67.4 | 67.6 | 67.7 | 67.9 | 39 |
| 40 | 68.0 | 68.2 | 68.3 | 68.5 | 68.6 | 68.8 | 68.9 | 69.1 | 69.2 | 69.4 | 40 |

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 41.9. For same slopes but other widths of roadbed correct above figures by one-half difference in width of roadbed; thus in example above for 20 ft. roadbed distance will be $41.9 + (20 - 16) \div 2$ or 2 ft. added to 41.9 = 43.9. For slopes of 1 on 1 see inside of front cover.

