19

T/38 - R25W - M. 5TH

EXCEPT

19

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

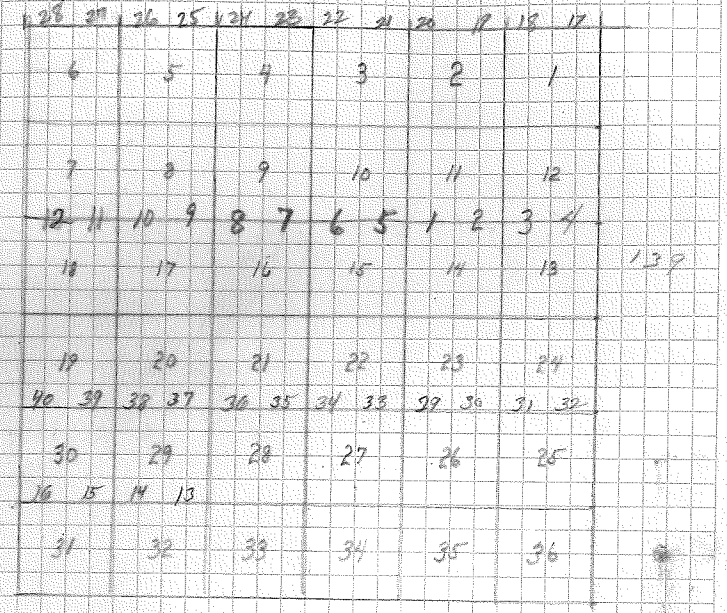
Roadway 16 feet wide. Side Slopes 1 on 1.
For Single Track Embankment.

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)÷2 or 2 ft. added to 30.6 =32.6. For slopes of 1 on 1½ see inside of back cover.

3+30 - 1 tally
9+90 - 3 tally
13+20 - 1/16 Cor.
16+50 - 5 tally
23+10 - 7 tally
26+40 - 1/4 Cor.
29+90 - 9 tally
36+30 - 11 tally
39+60 - 1/16 Cor.
43+90 - 13 tally
49+50 - 15 tally
52+80 - Sec. Cor.

T. 138 R. 25


28 27 26 25 24 23 22 21 20 19 18 17
6 5 4 3 2 1
7 8 9 10 11 12
12 11 10 9 8 7 6 5 1 2 3 4
18 17 16 15 14 13
19 20 21 22 23 24
40 39 38 37 36 35 34 33 32 31 30
30 29 28 27 26 25
16 15 14 13
31 32 33 34 35 36

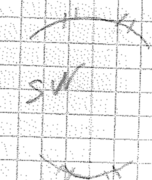
26+51.	Set approx. 1/4 cor. E. set 2" aspen, Blazed on two sides.	11 / 14	138-25	
17+00	Leave spruce swamp			
14+00	Entered spruce swamp			
13+20	Set approx. 1/16 cor. E.			
0+00	started East from " from I.P.	10 / 15 | 11 / 14	138-25	

Date: 1-19-40 1.

Party: ANDERSON - ~~CHIEF~~ CHIEF & P.
PROCHNOW - CH. & NOTES
ROIGER - CH. & BR.
MEHLBERG - BR.
HALLER - BR.

Look for:
Dist. - 40.17 chs.
26.51 Ft.
Aspen 10", S57E, 18 lks
" 10", N65E, 38 lks

Found:
Only corner of a Farmer's Fence. No Hor. cor. evidence, set our approx. 1/4 stake.



Magnetic Bearing N 83° E
Random Line

cor. is center of road
Found I.P. in road. road ⊙ road
I.P.

53+03	Set approx sec cor 11 | 12 / 14 | 13	138-25
53+96	3" Pine Blazed on 4 sides	
	Found ori. corn. 51' North	
41+41	Enter spruce swamp	
39+60	Set approx 1/16 cor. E.	
36+10	leave spruce swamp	
27+00	Entered spruce swamp	
26+07	con't. East from temp. 11 / XIII. 14	138-25

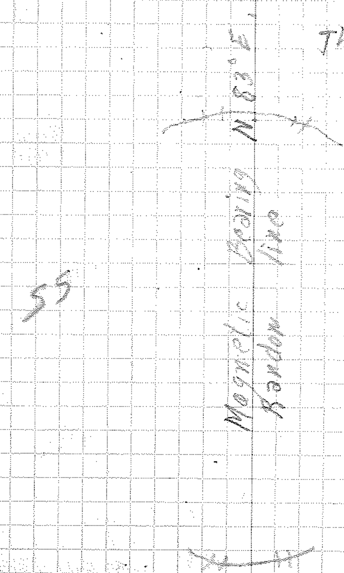
Date 1-19-40
Party Anderson - ch-f
[illegible] - ch-hd
Reiger - ch - axe
Meelberg - axe
Hallek - Bk

55

Look for:
Dist. 80.35 chs.
53.03 ft.
Tam. 5" S 33 W 19 lks.
" 3" S 30 E 20 lks.
" 3" N 36 E 9 lks.
" 2" N 28 W 16 lks.

Found:
Cedar corn. post
B.T. Tam. S. 31 W. 12'
dead snag 6" dia.
B.T. Tam. 4" N 30 E
6.5 ft.
also dead

The old corner is 51' N. of our random line.
Found the 3" squared post.
A dead Tam. snag 6" - S 31° W, 12 feet.
Also a Tam. B.T. 4" - N 30° E, 6.5 ft. - also dead.
There's considerable slash around the corner.



Var. 7°

26+40 Found prob. quartcorner
Set our approx. 1/4 stake 12 / 13 138 - 25
26+00 LEAVE CEDAR AND HARDWOOD SWAMP

23+00 ENTERED CEDAR AND HARDWOOD SWAMP

13+20 Set approx. 1/16 cor. E

7+19 electric High line and truck trail

0+00 Started East from approx. stake 11 | 12 / 14 | 13 138 - 25

Date: 1-23-90
PARTY: ANDERSON - CHIEF + PRINT
ROIDER - ch + NOTES
Lau - ch + BR
MEELBERG - BR
HALL?? - BR

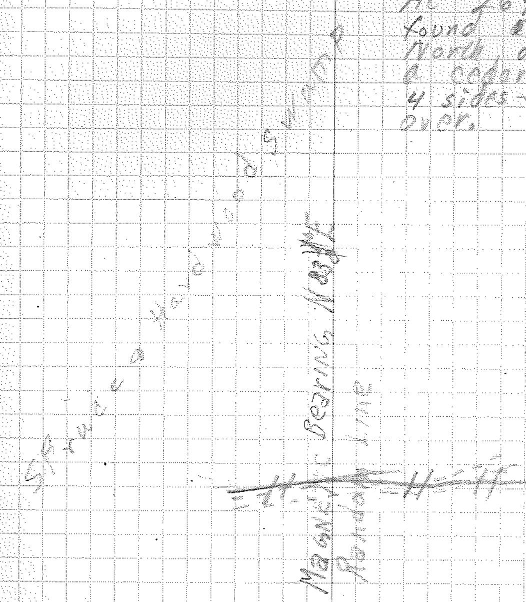
CEDAR AND HARDWOOD SWAMP

Look For;
Blk. Ash 5 ins. S 5° E 13 lks.
W. Cedar 5 ins. N 10° W 23 lks.
DIST - 2637 FT.

FOUND:
NO EVIDENCE OF original corner

Found 9" cedar blazed on 4 sides and from this tree a 10" cedar N 3 E 12' not B.T. but had a deep cut was found.

At 2640 feet East found at about 80' North of random line a cedar blazed on 4 sides - all healed over.



The line cont'd East.
Did not offset to the found cor. as described on page 2.

52+74 SET APPROX. SEC. COR. 3" BIRCH BLAZED ON 3 SIDES — 13 | 7 / 13 | 18 — 138-25

45+00 ENTER SPRUCE AND HARDWOOD SWAMP

39+60 Set Approx 1/16 COR. E

31+00 Leave SPRUCE AND HARDWOOD SWAMP ENTER ASPEN

27+00 Entered Spruce and Hardwood SWAMP

26+40 Set APPROX 1/4 COR. E — 12/13 — 138-25

~~3" BIRCH BLAZED ON 4~~

DATE: 1-22-40 — 4

PARTY: ANDERSON CHIEF 4P
ROIBER - CH & NOTES
Lau - ch
MEELBERG - BR
HALLEK - BR

Look FOR:
DIST - 5274 FT.

FOUND:
Looked around; especially to the north for over a tally but found no evidence of either old or new corner.

SPRUCE AND HDW SWAMP

Magnetic Bearing N. 83° E
Random line

SPRUCE AND HARDWOOD SWAMP

Var. 6 1/2°

96+40 Set approx ¼ cor. 3" Tam. blazed on 2 sides [illegible] 138-35

26+39 Found ¼ cor. post 28' So.

13+30 Set approx W 1/16 cor. [illegible]

11+20 Fence & leave crop land [illegible] swamp

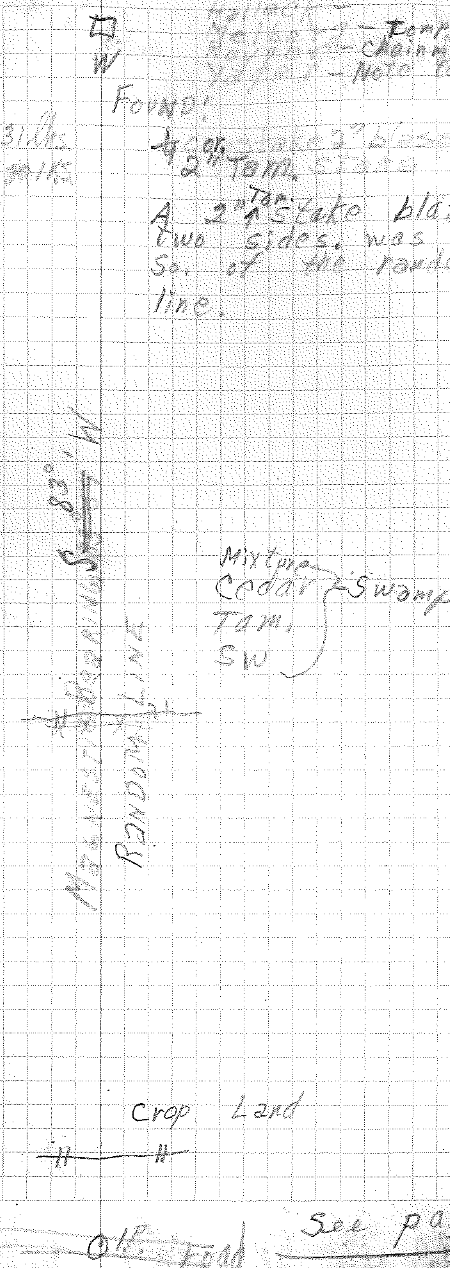
2+00 Enter crop land

0+00 Started West from [illegible] 138-35
I.P. in center of road.

Date: Jan. 23 - 40
Party: Andersen — Picket
[illegible] — Compass
[illegible] — Chainman
[illegible] — Note taker

Look For:
Tam 8" N 1° W 31 lks.
Tam 9" S 4° E [illegible] lks.
DIST — 2640 FT.

Found:
¼ cor. 2" Tam.
A 2" Tam. Stake blazed on two sides, was 28' So. of the random line.



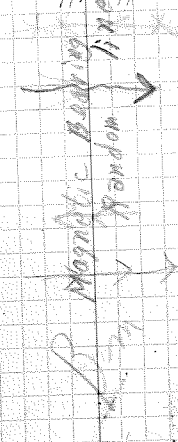
See page 1.

9/10
22+80 set approx. sec. cor. 14/15 138-25
Found B.T. #67, S 6° W.
50+50 left Spruce Swamp
18+00 SPRUCE SWAMP (entered)
46+72 Truck trail
11+90 SPRUCE SWAMP (left)
36+60 SPRUCE SWAMP (entered)
+56 Fence
34+20 creek bed
31+30 creek bed
30+18 creek bed
26+40 Continued West from 10/15 138-25

Date: Jan 24 Leader
PARTY: Anderson – Picket 4
Malberg – Brusher
Varat – Brusher
Halleck – Axe
Royger – Brusher

TREES FOR:
Aspen 6" N 38° E 21 lks.
Aspen 10" N 23° W 45 lks.
W. BIRCH 3" S 45° E 37 lks.
Spruce 10 S 53° W 45 lks.
DIST. – 5280

Found:
W. Spr. B.T. stump - nearly rotten away. Ht. -3'
d.a. 20".
67' feet So. of our approx. cor. stake. – S. 6° W.
Birch tree, 14" possible B.T. – SE.
No cor. post found.



The W. Spr. B.T. was tied in to the 5280 stake set up. The B.T. is S 6° W at 67' distance.

Var. 17° Cont'd. west on the random line. Did not offset.

26+40	Set approx. 1/4 stake.			$\frac{9}{16}$	138-25
25+00	enter A.b. & Birch & Aspen.				
9+55	Skid road				
4+25	enter Spruce Swamp				
1+00	Bal. & Hardwoods				
0+00	started west from $\frac{9 \mid 10}{16 \mid 15}$ 138-25				
	Continued same line as on page 6.				

Date: Jan. 30, 1940

Party: Melberg — L.
Kryger — [illegible]
[illegible] — [illegible]
Yager — [illegible]
Backer — leader

H.R. — H.B.

Look for:
Tam 6" S 35° W 17 lks
Tam 5" N 15° E 20 lks
Dist — 2633 FT.

Found:
No evidence

Magnetic Bearing S ~~[illegible]~~ 83° W
Random Line

Spruce Swamp
" "

Bal. & H. H.
& Hmw.

Did not offset to the B.T. —

52+80	Set Approx Sec. cor.	8 | 9 / 17 | 16	138-25
45+32	Checked		
26+40	~~[illegible]~~		
26+00	~~started East~~ contd. West.		138-25
	Continued west from 9/16		

Date: JAN. 31, 1940

Party: Becker - T
Yager - notes
Roiger - chain.
Moelberg -
Halleck - picket

Look For:
Spruce 6" N 45° E 17 lks
W. Cedar 8" N 75° W 12 lks
Fir 6" S 60° E 15 lks.
W. Pine 6" S 30° W 30 lks.
Dist - 5266 FT.

Found:
No evidence

Magnetic Bearing S 83° [illegible] W
Random Line

Var. 7°

[illegible]	set approx. ¼ cor. Ss.		$\frac{8}{17}$	138-25
22+50	entered Ss.			
13+20	set approx. ¼ cor.			
0+00	cont'd. West from		8|9 / 17|16	138-25
	Using same 7° variation.			

Date: JAN. 21
PARTY: Deiman - picket
Becker - picket - T
Yager - notes
Hallack - brush
Reiger - chain

Look FOR:
Spruce 7" N 17° E 61 lks
Tam 4" S 11° W 17 lks
DIST - 2643 FT.

FOUND:
~~No evidence~~
No signs of ¼ cor.

Using S 80°W
Magnetic Bearing
Random Line

Ori. notes call for S 83°21' W.
Running this line on S 83° W

				7 | 8 / 18 | 17	138-25
52+80	set. approx. sec. cor.				
45+70	enter Spruce Swamp				
40+50	enter H.a.				
38+50	enter Ss.				
35+00	entered H.a. & Birch				
~~27+80~~	copied. W				
26+40	"	west	from	8 / 17	138-25

DATE: Feb. 1st

PARTY: Diamon - pickets
Yager - notes
Young - brusher
Halleck - brusher
Royger - chainmen
Becker - pickets

10

Look For:
W. Birch 10" N 84° E 19 lks
" " 8" S 60° E 28 lks
" " 6" S 28° W 11 lks
" " 6" N 56° W 36 lks
DIST - 5286 FT.

FOUND:
No evidence

Magnetic Bearing S. 83° W.
Random line

Var 6°39'

26[illegible]	set. approx. ¼ cor. W.				$\frac{7}{18}$ 138-25
13+10	set. approx. ¼ cor.				
7+00	enter N.S. & mixed hardwood brush				
5+00	enter Alder Marsh.				
3+90	leave Spruce S.				
0+00	cont'd ~~Start~~ West	from	approx. cor.	$\frac{7 \mid 8}{18 \mid 17}$	138-25

DATE: Feb. 1st
PARTY: Diaman - L. & P.
Young - B.
Yager - ch. & N.
Tallack - B.
Royner - ch.
Becker - B.
FOUND: No evidence

LOOK FOR:
DIST - 2607 FT
ASPEN 10" S22°W 25 LKS
W. BIRCH 9" N10°E 10 LKS

Magnetic Bearing S 83° W
Random Line

12|7
13|18 138-25

52+80 set. approx. sec. cor.

39+60 set. approx. 1/4 cor.

37+00 enter Ha. & mixed hh. brush.

34+00 enter Tam. Swamp.

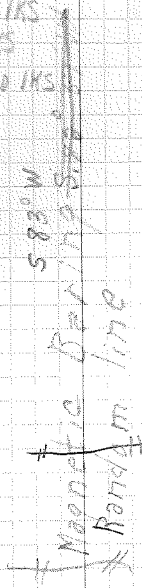
27+00 contd. West from Temp. 7/18 138-25

Date: Feb 1st

Party: Diamon - L.
Royger - ch.
Yeger - notes.
Halleck - brush
Young - "
Becker - compass

Found:
no evidence

Look for:
DIST - 5247 FT.
W. Birch 8" N 8° E 46 lks
W. Birch 7" S 76° E 8 lks
Fir 8" S 44° W 17 lks
W. Birch 9" N 59° W 10 lks



Var. 7°9'

				$\frac{29}{32}$	
27+00	leave swamp - enter Jack p & Tam. mixed				
26+40	set. approx. ½ cor. - $\frac{29}{32}$				138-25
24+00	leave crop land.				
21+70	enter marsh				
13+20	set. approx. 1/16 cor - W				
3+00	crop land				
00+00	start. West from $\frac{29}{32}\Big|\frac{28}{33}$				138-25

$\frac{29}{32}$

Date: 2-5-40 13

Party: Dieman - Leader
Melberg - brusher
Halleck - "
Roygar - chainer
Yager - chainer & notes

W.

look For:
Dist. 80+00
Y. Pine 12" S. 85 W 208 lks.
Y. Pine 10" N. 78 W 250 lks.
39+52 ½ cor. p

Found:
- No evidence

Magnetic Bearing S 83° 13' W
Random line

Var. 10 deg. 34'

Road This corner has N. Pine B.T. by hay stack

B.T.

52+60 set approx. sec. cor. 30 | 29 / 31 | 32

49+00 J.P. & H.A.

39+60 set approx. 1/16 cor. -W-

~~29+00~~ Entered Ho & Pi

29+00
~~29+00~~ contd. west. from 1/4 cor. (temp)
26+40 ~~enter Ha. & J.P.~~ 29/32 138-25

30 | 29 / 31 | 32

W

Look for:
Dist. 80+00
Scrub pine 6" S.49½ E.126 lks.
Y. pine 10" N31° 20 lks.
40+00 1/4 P.
E.T. 1/4 P.
Y. pine 18" S.82° W.12 lks.

Var 11°

Magnetic Bearing S.83° 13' W
Random Line - W.

Date 12-5-40
Party: Dizmon - leader
Melberg - brusher
Halleck " "
Reyger - chain
Yager - " & notes

14

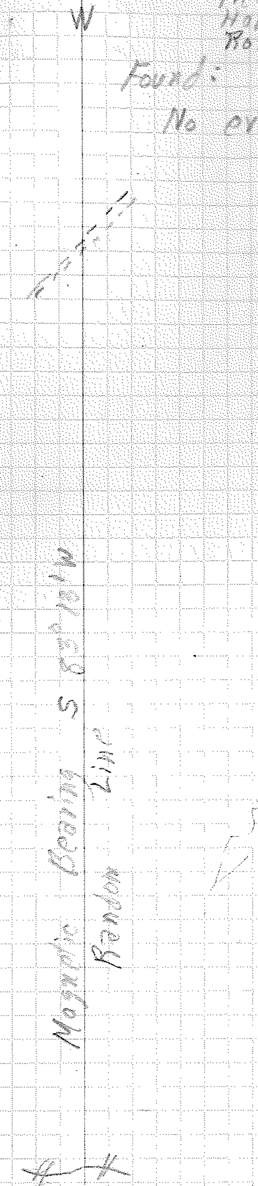
Found: -17-
No evidence

2640	set approx. 1/4 cor. W.	30/31 138-25
25+50	enter Spruce & hardwood S.	
21+90	truck trail N.W. & S.E.	
13+20	set. aprox 1/16 cor.	
6+00	enter HA. & J.P.	
1+08	enter Ss.	
00+00	Cont'd. west on same line as previous page. 30 29 / 31 32	on 138-25

Date: Feb. 1940
Party: Deimar
Meelberg
Hallock
Rotger

Look for:

Found:
No evidence



52+60	Hit	Iron pipe post	44' N	of our line	
	Our line	30' short.			
33+01	Logging road N.W. & S.E				
36+00	cont'd. West from on same line		30/31	138-25	

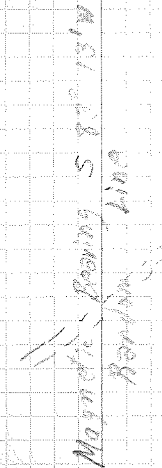
Date: Feb. , 1940
Party: Dolman
Moelberg
Hallock
Rolger

Distance 52+80

Look for:

Found: Iron posts.
N. pine B.T. 18" S.
N. " " 18" SW.
N. pine original B.T. S. 20"
N. " original " S.W. 16"

The iron pipe is 44' No. of random line.



26+40	Set temp. 1/4 cor.			36 / 1	139-25 / 138-25
13+20	Set approx. 1/16 cor.				
0+00	Started West from			36 / 1	139-25 / 138-25

DATE. FEB. 6, 1940
PARTY. DEIMAR - CHN.
ROIGER - CHN.
[illegible] - AXE
[illegible] FLAG. AXE

LOOK FOR:

FOUND:
NO EVIDENCE.

SPRUCE SWAMP

Rebrushed & reclaimed old line.

Magnetic Bear. S. 83° 24' W.

Started from I.P.
& 2 B.T. Notes
for this corner are in the T. 139 R 25 Notebook

52+80	offset to iron p. 139' North.	I.P.	35 | 36 / 2 | 1	139-25 / 138-25
26+40	Cont'd. west	from corner 36 / 1		138-25

DATE FEB 6, 1940
[illegible] - [illegible] Axe
[illegible] - Chn.
[illegible] - Axe
[illegible] - Axe
Yager - Chn.

Look for:

Resource Corner.

4 B.T.

W. Pine	N. 1°30'W	48'
Birch	S 64°30'E	84.9'
Elm	S 40 W	129.0'
Birch	N 79°30'W	62.3'

Found:

I.P. & 5 B.Ts.

FOUND:
elm B.T. S.W. of cor. 12"
W. pine B.T. Dead 16" North of cor.
Birch B.T. N.W. of cor. 10"
Birch B.T. S.E. 12"
Found iron post N. from our line - off set & contd.

These B.Ts. have been recorded for T. 139-25

W. Pine -	15" -	N 1°30'W -	48'
Birch	11½" -	S 64° 30'E -	84.9'
Elm -	12" -	S 40 W -	129'
Birch -	9½" -	N. 79°30'W -	62.3

Also found spruce stump B.T. 1' high - N.E. from I.P.

Rebrushed & reclaimed old line
Magnetic Bear. S 83°34'W.

26+40	set. approx ¼ cor. W.			35/2	138-25
20+10	creek full of water.				
0+00	Started	West	from	35 | 36 / 2 | 1	139-25 / 138-25

PARTY:
PIERMAN – NOTES
RIVERA – AXE
PICHARSKI – AXE
MELLBERY – H.V.E. – COMP.
YAEGER – AXE

W

Look for:

Found:
No evidence.

Rebrushed & rechained old line
Magnetic Bar. S. 83° 40' W.

52+80	Iron post offset 64' to our line	34 | 35 / 3 | 2	139-25 / 138-25
42+00	cross truck trail. NE & SW.		
26+40	Contd. West from	35 / 2	139-25 / 138-25

DATE: FEB. 2

PARTY

PIEMAN – NOTES
RAGER – BRUSHERS
PICKERSKI – BRUSHERS
MEADBERG – BRUSHER – COMP.
YERBAT – BRUSHER

Look for:

4 B.T.	All	New B.T.
Dist.	53+80	
Bk.Spr.	N 35° E	63.5'
Ash	S 21 E	69.2'
"	S 30 W	43.9'
"	N 23° W	60.8'

Found: what looked like original B.T. Tam dead at 18"
Black spruce NE of I.p. 12"
Black ash N W of I.p. 8"
Black ash S W of I.p. 20"
Black ash S of I.p. 9"
} approx inches

These B.T.s have been recorded for T139 R25

Black spruce	N	13½"	N 35° E	63.5'
Ash	N	9"	S 21° E	69.2'
Ash	N	10½"	S 30° W	43.8'
Ash	N	9¼"	N 23° W	60.8'

Rebrushed & rechained old line

Mag. Bar. S 83° 43' W.

36+40	set approx. $\frac{1}{4}$ cor. w. $\frac{34}{3}$	$\frac{34}{3}$ ①	T. 138-25
18+00	truck trail N+S.		
13+20	$\frac{1}{4}$ cor. approx hit beaver pond abt. 3 acres H.A. + elm		
50+00	start West from	$\frac{34 \mid 35}{3 \mid 2}$	138-25

DATE 2, 8-40 21
PARTY
DIEMAN - NOTES
W ROIGER - BRUSHER
PIEKARSK - BRUSHER
MEELBERG - BRUSHER + COMP
YAEGER - BRUSHER

Look for:
Dist. 36+40
Nothing

FOUND:
No evidence

Rebrushed [illegible] old line
Mag. Bearing S. 83°30' W.

52+60	set. approx sec. cor. W	4 | 3 (34 / 3)	138-25
50+73	hit old corner		
26+40	continued west from	34 / 3	138-25

T. 138 R. 25

Date 9-13-41 [54]

Party: Diamon - leader
Royger - b. chn
Yagen - notes
Melberg - b.
Pickarski - b

W

Dist. 53+80
same

Found: No evidence

look for:
Aspen. N. 57° E 14 lks
Aspen. N. 50° W. 60 lks.
Aspen. S. 70° W 22 "
Aspen. S. 4° E 35 "

Rebrushed & rechained old line

Mag. Var. 5.83° E 11

33 ①
¼

26+40 set approx. ¼ cor. [illegible]

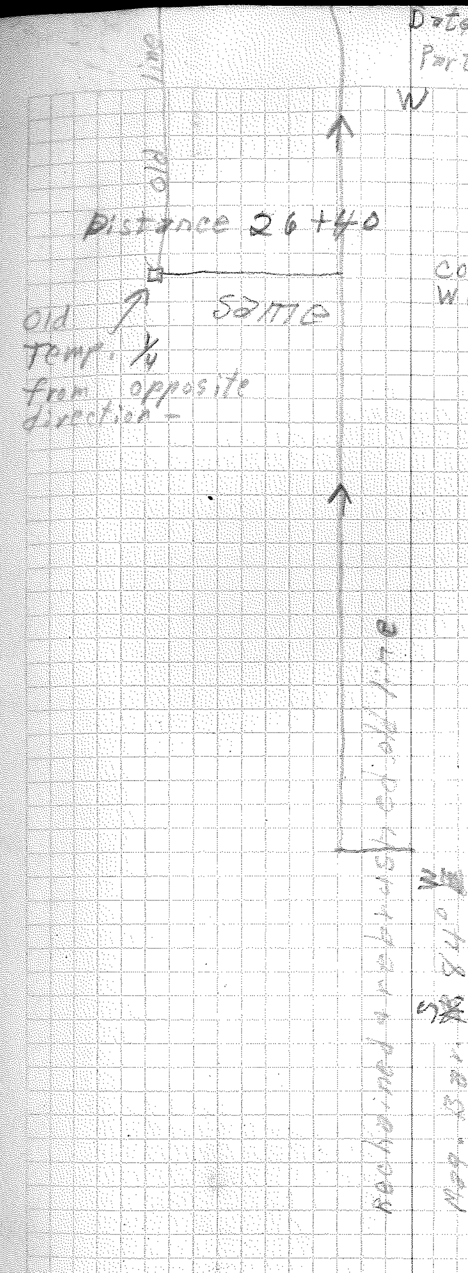
23+10 [illegible] H.a.9 oak
22+00 Hit old ^offset corner 3" - kept straight on old line.

The old temp. cor. was 296' so.

10+76 Winter N.&S. road - off-set 95' con't. W. on old line.

00+00 start west - 4|3 138-25

Date: 2-14-40
Party: Diamon - L.
Royger - chn.
Yager - chn + notes
Melberg - B.
Pickarski - B.



con'd. on new line West.

Offset 95' so. to old line.

(1)

52+80 set approx. sec. cor. w. 5|4 138-25

45+00 enter H. & birch

43+10 enter Spruce Swamp

~~42+15 enter Spruce Swamp~~

39+00 enter hay meadow abt. 6 acres

35+80 enter H. & W. pine.

30+30 enter Spruce Swamp.

26+00 contd. N. from 33/4 138-25

Date: 2-13-40

Party: Diamon - L.
Royger - chn.
W Voger - chn. & notes
Melbom - B.
Pickarski B.

Dist. 52+80

Found:
No evidence

Rebrushed & rechained old line

Mag. Bear. S 88° 24' W

26+40 set approx ⊥ cor 32/5 4 (1)

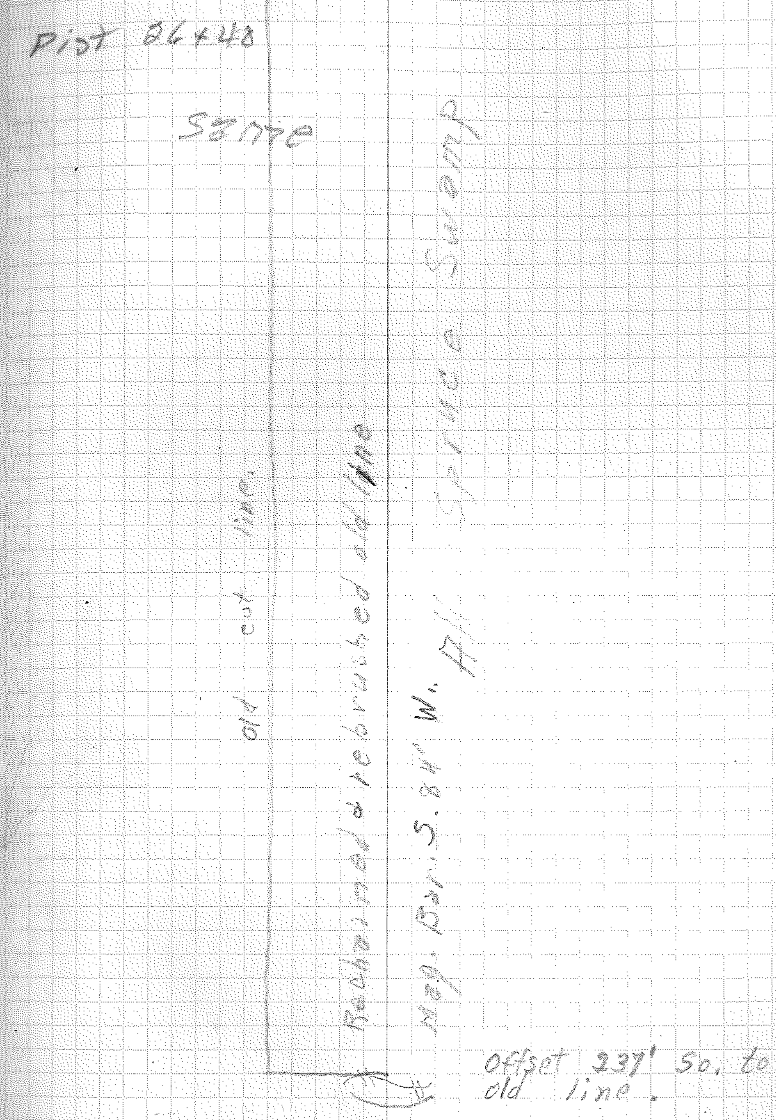
temp.

1764 contd. from old ↑ corner.

17 15 offset to old line 237' So. cont'd W. enter S.S.

00+00 start West from temp. 32/33 5/4

Date:
Party:



52+80	SET APPROX SEC COR 31 | 32 / 6 | 5	(5) 138-25
50+30	LEFT TAM ENT. ASPEN	
47+30	enter tam. Swamp again	
46+00	ridge of Ha & W. pine	
2+00	contd. West from Temp. ¼ ~~6~~ / 5	138-25

Date:

Party: Daiman, Mulberg, Lou, Reiger

Dist. 52+80

Look for:

Ha - 8" N30W 17 lks
" 6" N15E 19 lks
" 9" S64E 16 "
W. Birch 7" S44W 30 lks

Found

No evidence

Rechained/rebrushed old line

Mag. Bər. S 84° W.

26+40	SET 1/4 cor.	(Approx.)			31/6 ①
00+00	~~start~~ cont. w. on	~~work~~ same	~~from~~ line. from	6/5	138-25

Date: Feb. 1940

Party: Deiman
Lau
Reiger
Meolberg
Yager

Look for
W. Birch 7", N77E 20 lks.
W. Pine 18", S75E 12 lks.
Dist - 26+40

Found:
No evidence

Rebrushed redn. old line

Mag. Brg. ~~N~~ S 84° ~~E~~ W

52+80	Set Approx stake sec. cor.	139-26 / 138-26 36 | 31 / 1 | 6	139-25 / 138-25
34+10	LEFT TAM. ENT. ASPEN		
34+00	LEFT ASPEN ENT. TAM.		
33+15	OLD LOGGING ROAD		
~~33+15~~			
26+40	cont'd. West from temp. 1/6		138-25

Date: Feb. 1940
Party: Deiman
Lou
Reiger
Moelberg
Yager

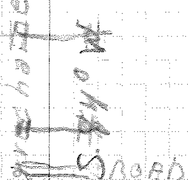
Look for:
W. Pine

W. pine 20" S.59 E 17 lks.
W. Birch 7" N.58 E 14 lks
W. Birch 8" S.50 W 21 lks
Blk. Oak 6" N 79 W 27 lks

Found:

No old evidence

Rebrushed & chained old line



Mag. Bar. S 4° W

26+40	set	approx	¼ cor	E 23/26	138-25

All Hard Birch

9+00	enter	Hd Y Birch			
2+00	entered	swamp	Tam.		
0+00	Started	East	from	22 23 / 27 26	138-25

Date: 12-31-40
Party: Royger
Yager

E

Distance 26+40

Look for:
Bl Oak 8" S31W 41ks.
Aspen 6" N17½E 71ks.

Found:
No evidence

Magnetic Bearing N 83° E

Chaining road which is sec. line

cor. is intersection of two roads

5280'	set approx sec. cor.		23 | 24 / 26 | 25	138-25
51+00	enter Tam. swamp.			
48+88	Iron post -30' S. of line. Geological survey — B.M.			
38+90	power line.			
36+00	contd. East from		23 / 26	138-25

Date: 8-21-40
Party: Royger
Vogel

Look for:
Distance = 5280'

Tam. 5 S19E 19 lks
" 4 S55W 4 "
" 5 N26W 27 "
" 3 N16E 12 "

Found
No evidence.

Magnetic Bearing N83°E
Chaining road which is sec. line

26+40	SET APPROX ¼ COR. W			24 / 25	138-25
15+00	leave SS. enter Ha + W. spruce				
20+00	started East			23 | 24 / 26 | 25	138-25

Date: 8-31-40
Party: Roiger
Yager

Look for:
Distance 2640
Tam. 8" N50W 16 lks
" 5" S10E 33 lks

Found:
No evidence.

Magnetic Bearing N 83° 15' E
Chaining road which is sec. line

52+80	SET. APPROX. $\S$ OC. COR.			24/25	138-25
26+40	Cont'd.	east	from	24/25	138-25

Date: 2-21-48
Party: Roiger
Yerer

Look for:
Dist. = 5280'
W. Birch. 8" N33W 26 lks.
" 7" S75W 20 lks.

Found: one
Birch BT stump
6' high
Maple blazed on
4 sides 4"

Magnetic Bearing N 83° 15' E
Chaining old road

2640 SET APPROX ¼ COR W. 22/27 138-27

0700 Started West from 22/23 27/26 cor. in inter. of two roads 138-25

Date: 2-21-45
Party
33

W

Look for:
Dist. 2640'
Spr. 3" N45W 21 lks
Spr. 2" S75E 16 lks

Found:
No evidence

Dairy road, which is sec line.

church

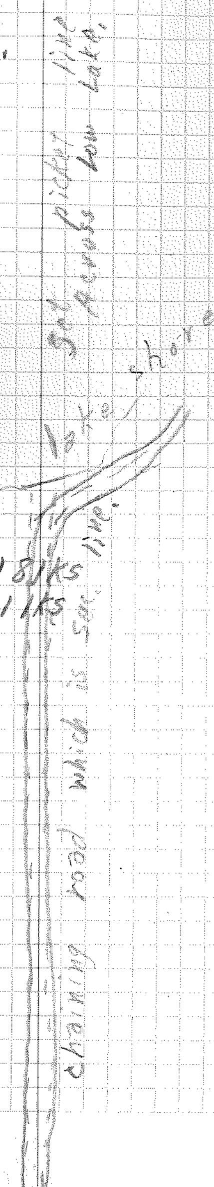
52+80	set approx.	sec. cor.	21 / 22 — 28 / 27	138-25	
		in lake.			
40+90	Set	lake	Shore		
39+70	Road	turned	north.		
26+40	cont'd	West	from approx.	22 — 27	138-25

Date: 2-23-40

Party: Boiger
Yager

Cov. in lake.
Dist. 5280
Cov. is 590.7' So.
of N. Lake shore.

At 4044.48'
Look for M.C.
Aspen 3", N35E 18 lks
" 4", S75E 21 lks



	138 – 25	$\frac{21}{28}$ (struck out)
26+40	Set approx 1/4 cor. W	
	$\frac{21}{28}$	138–25

11+00 Hit road

10+63 leave lake

~~9+40 Hit road~~

00+00 start West from cor. in lake

21|22
28|27

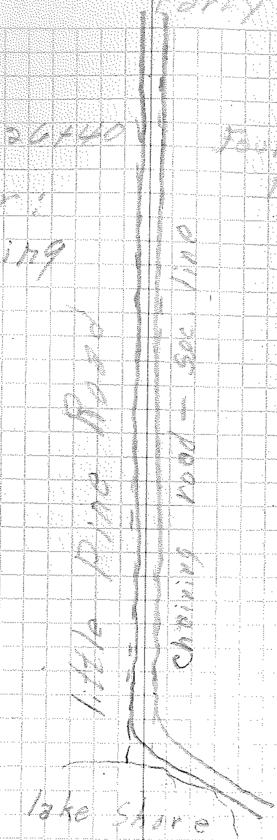
Date: 2-23-40

Party: Reiger
Yager

Distance: 26+40

look for:
Nothing

Found:
No evidence



53+36 set • approx sec. cor. 20 | 21 / 29 | 28

53+36 hit inter. of road &

started again from 0+00

and cont'd. west. – see next page.

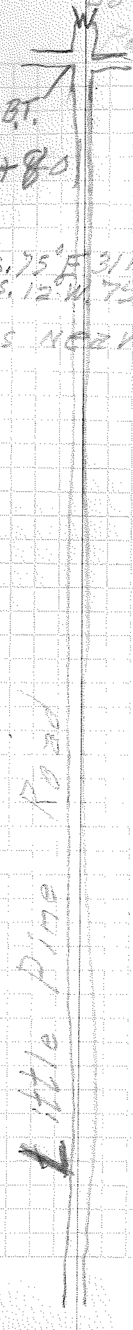
26+40 Continued west from 21/28 138-25

138-25

Date: 2-23-'55 36

Party: Roiger - chn.

Yager - chn. notes



Distance: 53+80

look for:

Scrub pine - 6" S. 75° E 31 lks

" " 5" S. 12° W. 75 lks

No other trees near:

N. pine S.E.

Found:

Jack pine B.T.

S. E of cor. 24"

Jack pine B.T. 14"

S.E. of inter. of road.

Jack Pine "S. °E.

Is resurveyed B.T.

This sec. cor. is the intersection of two roads by a school house.

36+40 set approx 1/4 cor. : 20/29 138-25

00+00 start. West from Inter. of roads 20/21, 29/28 138-25

Date 12-23-40
Party Reger - chn
Yager - comp + notes

Distance: 36+40 Found:
No evidence

Look for:

52+80	set	approx. sec. cor.		19 | 20 / 30 | 29
26+00	contd.	West	from 20/29	138-25

Date: 2-23-40
Party Paiger
Yager

Distance: 52+80

look for:

Aspen 9" N. 6° E 47 lks
" 14" N 15° W. 25 lks
" 10" S 43° W. 16 lks
" 10" S 22 E 43 lks

Found:
No evidence

Little Pine Seed
chaining along road which is sec. line.

26+40	set approx ¼ cor. W.
25+00	hit timberline or turn in road
24+90	leave road & enter Hd. Willow
00+00	Start. West From 19 | 20 / 30 | 29

138-25

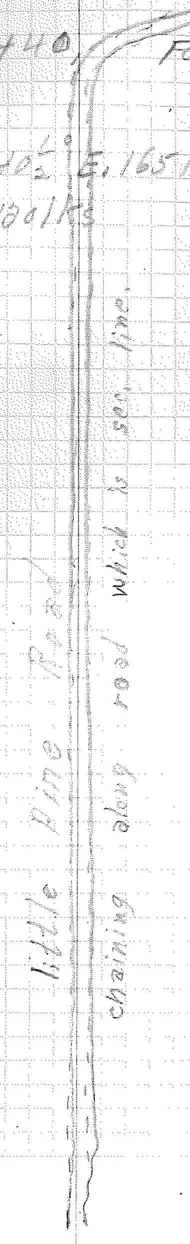
Date: 2-26-40
Party: Roiger - chn.
[illegible] - chn & notes

Diagram ¼.

Distance: 26+40

look for:
Y. pine 16" N. 40½° E. 165 lks
W. birch 8" S. 2° W. 100 lks

Found:
No evidence



T. 138-25

198
30

138-25

51+28 8/10 to B.T. - B.T. 4' N. of line

46+83 center of road

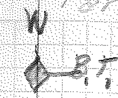
44+00 leave marsh enter J.P.

39+50 enter open marsh

36+40 cont'd. West from 19/30 138-25

Date: 12-26-49 40

Party: Diamon-brush
Rygger - Chn
Yager - chainman



Distance: 52+81

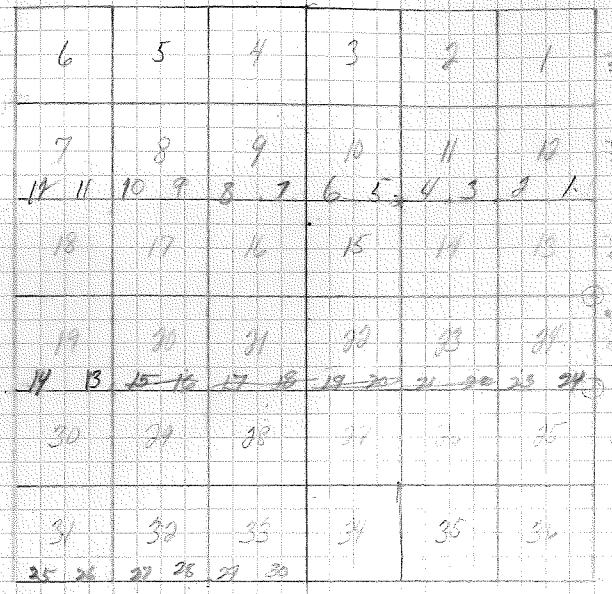
look for:

Found: ~~W. pine B.T.~~
~~4' N of ol line~~

A resurvey B.T.
is a 26" W. Pine
4' North of our
line. Found no
corner or ori.
evidence.

P. 19.

T. 13 S R. 9 E


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

12 | 13 138-28

26+30 SET APPROX 1/4 cor

17+92 ROAD

14+19 SMALL TRAIL

11+69 SMALL TRAIL

9+30 LEFT SW. WILLOWS ENT. ASPEN

0+00 STARTED West FROM 12 | 13 138-28

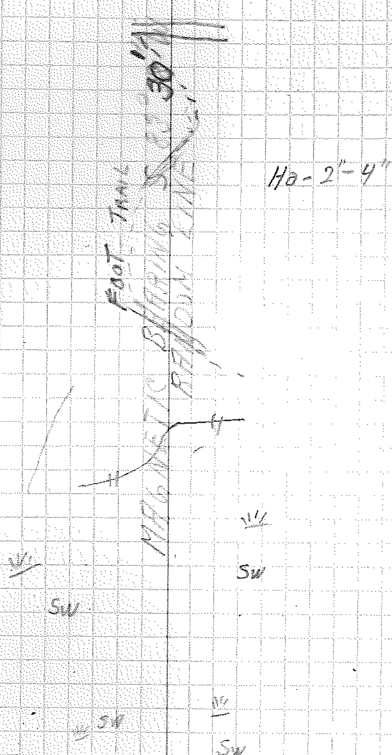
DATE: APRIL, 1, 1940
PARTY:

W.

LOOK FOR:
TAMARACK 6" N7°W 30 LKS
TAMARACK 7" S 24 LKS
DIST. 2630 FT.

BEACKER - Pick.
LAU - NOTES
ROIGER - CHAIN
PROCKNOW - AXE
GARDNER - AXE

FOUND:
no evidence



Used a sec. cor. showed to M. Morse by a settler who claims this was were the ori. cor was. At present there's only a stake marking this cor. in swamp.

52+60	SET APPROX SEC.	11 | 12 / 14 | 13 Cor.	138-28	
26+40 (26+30)	continued W. from approx. corner	12 / 13	138-28	

DATE: APRIL, 1, 1940

PARTY:

W.

BEACKER - PICK
LAU - NOTES
ROIGER - CHAIN
PROCKNOW - AXE
GARDNER - AXE

LOOK FOR:
DIST. 5260'
TAM. 6" N82°E 115 lks
W. PINE 6" S56°E 85 lks
W. PINE 6" S39°W 85 lks

FOUND:
No evidence

MAGNETIC BEARING S 83°30' W
RANDOM LINE

6 1/2° VAR

26+40	APP. 1/4 CORNER set.	11/14	138-28
25+00	LEFT. SPRUCE + HARDWOOD ENT. S.W.		
20+00	ENT. SPRUCE + HARDWOOD		
0+00	Continued west on same line — STARTED west	11/14 12/13	138-28

DATE:
PARTY:

W

LOOK FOR:
DIST. 2661'
TAM 4" N50°W 84 LKS
" 6" S 9°W 21 LKS

FOUND:
No evidence of true cor.

MAGNETIC BEARING S 83° 30' W
RANDOM LINE

53+22 SET APPROX SEC. COR. 10/15 11/14 138-38

35+17 SMALL CREEK

~~36+00~~ 36+10 Cont. West on same line. 11/14 138-28

DATE: April 2, 1940
PARTY:
W Becker
Lau
Roiger
Gardner

LOOK FOR:
DIST 53.22'
ASPEN 8" N 10° E 32 LKS
" 10" N 50° W 55 LKS
" 10" S 35° E 20 LKS
" 10" S 18° W SCRIBE

FOUND:
No evidence of true corner.

S 83° 30' W
MAGNETIC BEARING LINE
CREEK

Var 6 0/2

26+40	SET APP. 1/4 CORNER			10/15	138-28
0+00	~~Started~~ Continued	west on same	line from	10/15 11/14	138-28

DATE: Dec. 16
PARTY: R. Olson
Moore
Worlie
Delman
Meelburg

LOOK FOR:
W. BIRCH 6" S 20 W 21 LKS
" " 6" N 52 E 22 LKS
"DIST" 26.55

FOUND:
no Evidence

MAGNETIC BEARING S 8?° 30' W
RANDOM LINE

53+10	SET APP. CORNER		9/10 16/15	138-28
48+00	leave SWAMP open high land			
31+00	ENTER SWAMP			
26+41	continued West on same line		10/15	138-28

DATE: DEC. 16, 1940
PARTY: Deiman
Meelberg
Worlie
Moore
Schultz

LOOK FOR:
DIST. 53.10'
ASPEN 10" N 28 E 38 LKS
Y. PINE 10" S 53 E 46 LKS
W. PINE 10" S 30 W 34 LKS
ASPEN 12" N 78 W 35 LKS

FOUND:
NO EVIDENCE

MAGNETIC BEARING S 83° 30' W
RANDOM LINE

Var 6½°

26+40	SET APP. CORNER $\frac{9}{16}$	138-28
19+92	ENTER loging Road	
15+64	ENTER loging Road	
13+20	ENTER JACK PINE and YELLOW PINE	
3+71	ENTER loging Road	
0+00	continued W. on same line from $\frac{9 \mid 10}{16 \mid 15}$	138-28

W

DATE. DEC. 17

PARTY R. Olson
Moore
Warlie
Meelburg
Delman

LOOK FOR
N. Pine N. 10° E 10 lks.
N Pine SOUTH 18 lks.

Found.
No Evidence

Magnetic Bearing S 83° 30' W
Random line

52+80	SET APP. SEC. CORNER			8 | 9	138-28
52+80	LEAVE	JACK	pine ENTER ASPEN	17 | 16	
26+40	Continued	W. on	same	line	9 / 16 138-28

DATE. DEC. 17, 1940 8

PARTY.

LOOK FOR

FIR 7 in N. 62° E 30 lks.
W BIRCH 6 in 52° W. 15 lks.
RED OAK 6 in S 50° E. 33 lks.
ASPEN 8 in S 41° W 10 lks.

Found.

No Evidence

Magnetic Bearing S 83° 30' W
Random Line

26+40	SET APP. CORNER		$\frac{8}{17}$	138-28
0+00	CONTINUED W. ON SAME LINE		$\frac{8/9}{17/16}$	138-28

W

DATE. DEC. 18

PARTY. R. OLSON
MOORE
WORLIE
MEELBURG
DEIMAN

LOOK FOR

ASPEN 12 in. N. 36° W. 25 LKS.
ASPEN 6 in. S 10° W. 15 LKS.

FOUND
NO EVIDENCE

Magnetic Bearing S 83° 30' W
Random Line

52+80	SET STAKE - approx. cor.			$\frac{7\|8}{18\|17}$	138-28
45+90	HIT loging ROAD				
26+40	CONTINUED W. ON SAME LINE			$\frac{8}{17}$	138-28

W

DATE DEC. 18, 19[illegible]0.

10

PARTY: Deiman - chief
Olson -
Moore -
Worlie - Notes
Medberg -

LOOK FOR.

W. BIRCH 8 ins. N. 40° E. 20 LKS.
FIR 6 ins. N. 47½° W 38 LKS.
W. BIRCH 6 ins. S. 66° E 45 LKS.
W. Pine 24 ins. S. 10° W 34 LKS.

Found
No EVIDENCE of true cor.

Magnetic Bearing S83°30'W
Bandon Line

26+41	SET APP CORNER	$\frac{7}{18}$	138-28
10+25	LEAVE SWAMP		
4+30	ENTER SWAMP		
0+00	continued W. on same line	7 | 8 / 18 | 17	138-28

W

DATE, DEC. 19, 1940

LOOK FOR

ASPEN 10' N. 30° E. 10 lks.
W. BIRCH 9' S. 55° E 15 lks.

PARTY.

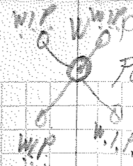
A. Olson
L. Worde
Moore
Meelburg
Dieman

Found.
No Evidence.

Magnetic Bearing S 83° 30' W
Random Line

55+77	Found SEC. CORNER OFFSET 141'	7/18	138-28
26+40	CONTINUED W ON SAME LINE	7/18	138-28

DATE DEC. 19, 1940 12



Party:
Deimon – chief
Worlie – notes
Moore –
Noelberg –
Olson –

12 | 7
13 | 18

Found: SEC COR.

T. 138 R 28 & T 138 R 29

1 IP SEC COR. S 6½ E 141'
4 IP W.T. COR. (S random line)

The iron pipe sec. cor. is 141' South of the random line. Four witness cor. pipes were present.

Magnetic Bearing S 88° 30' W
Random Line

36+65	SET APP ¼ CORNER.	19 / 30 138-28
36+65	LEAVE ROAD	
1+79	HIT ROAD	
		19 | 20 / 30 | 29 138-28
0+00	~~CONTINUED W. ON SAME LINE~~ Started W. from wood post stated as Sec. corner by Mr. Scultz in Sec. 20 of ~~this~~ township.	

W DATE: Dec. 20, 1940

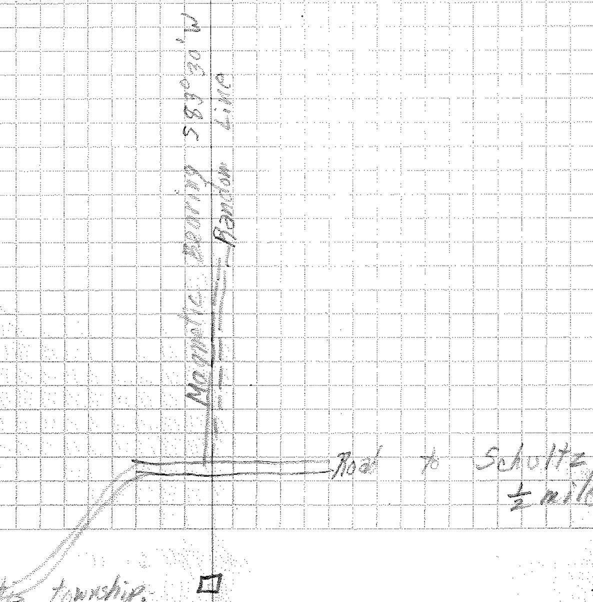
PARTY: Deiman, Worlie, Meelberg, Olson, Moore

LOOK FOR

W. BIRCH 8' N 47° E 30 LKS.
W. BIRCH 10' N 80 W 18 LKS.
ASPEN 8' S 40° E. 7 LKS.
W. BIRCH 6' S 48° W 45 LKS.
dist 53.32

FOUND:

No evidence



52+94 Found iron pipe 129' North of our random line. 19/30 - 138-28

21+66 continued E. on same line 19/30 138-28

DATE DEC. 30

PARTY.
Olson
Moore
Meclburg
Warne
Dieman

Look for.
Aspen 10" N40°W 15 lks.
Aspen 8" S.47°W, 12 lks.
Dist. 26.65

Found:
sec. corner-witness pipe marked
R-138-28 { N 6½° E
R-138-29 {

Magnetic Bearing S. 83°30' W
Random line

52+1 FOUND CORNER

~~DATE DEC 30 1941~~ 2

FOUND SEC WITNESS COR.

R 138-28 } $N 6\frac{1}{2}°$ E. 129' off
R 138-27 }

26+90	SET APP. 1/4 CORNER	$\frac{20}{29}$ 138-28
25+40	LEAVE ASH ENTER ASPEN	
0+00	started east from wood post stated as sec. cor. by Mr. Schultz in Sec. 20.	$\frac{19 \mid 20}{30 \mid 29}$ 138-28

E DATE DEC. 27, 1980.

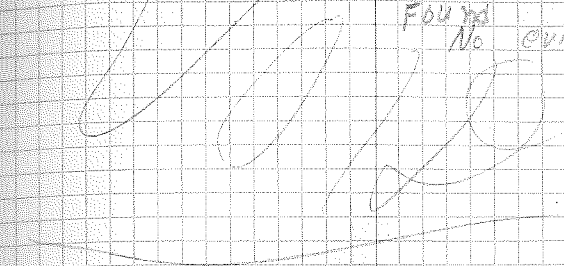
PARTY

OLSON
MEELburg
DIEMAN
Knapp
WaalkE

LOOK FOR

ASPEN 10" N 8° W 10 lks.
S MAPLE 6" S 11½° W 13 lks.

Found No evidence



Magnetic Bearing N 83° 30' E
Random Line

53+80	SET APPROX. SEC. COR.				30 | 31 / 29 | 28

Aspen Type

26+40 continued east on same line from 30/29 [illegible] 28

PARTY
Meelburg
Knapp
Delmer
[illegible]

Look For
Aspen 10" N 65° W 13 LKS.
W Birch 10" N 51 E 5 LKS.
Aspen 14" S 10° E 4 LKS.
Aspen 12" S 46° W 4 LKS

Found
No Evidence

Magnetic Bearing N 83° 30' E
Random Line

26+40	Set Approx. 1/4 Cor.				21/28	138-28
0+00	continues	E. on Same	line		20/29 | 21/28	138-28

PARTY
Knapp
Meelburg
Delmas
Waxlid
Berglund

Look For
Aspen 7" S.10°W. 60 LKS.
Aspen 4" N.45°W. 20 LKS.

Found
No evidence

Void

Mag. Bearing N 83°30' E
Random Line

52+80	SET Approx. sec. cor.	21|22 / 28|27 T. 138-28
44+00	Leave Fence	
41+37	Enter logging Road	
31+00	Continued Along Fence	
26+46	Continued E. on same line	21 / 28 138-28

E DATE Dec. 31 1940

Look For:

Aspen 14"	N 41°E	45	LKS.
W. pine 24"	N 33°W.	170	LKS.
Aspen 12"	S 55°E.	42	LKS.
W. pine 24"	S 60°W.	174	LKS.

PARTY:
Daiman – chief
Moolberg –
Worlie – notes
Knapp –
Berglund –

Magnetic Bearing N 83°30' E
Random Line

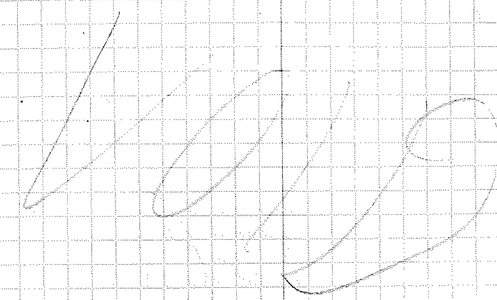
26+46	SET. Approx. ¼ cor.				22/27 138-28
4+39	HiT Fence				
3+16	HiT road				
0+00	Continued East on same line.				21|22 / 28|27 138-28

E DATE Jan. [illegible] 1941. 7 (19)

PARTY
Knapp
Medbury
Deman
[illegible]
Bergman

look for
Alders' North 6 lks.
Alders' S45°E 3 lks.

Found:
No evidence



Mag. Bearing N 83° 30' E
Random line

52+80	SET. APPROX. SEC. COR.					21|22 / 27|26 T.138-28
39+60	Leave meadow.					
36+46	Enter meadow					
30+49	HIT Fence					
26+77	continued EAST on same line					22 / 27 138-28

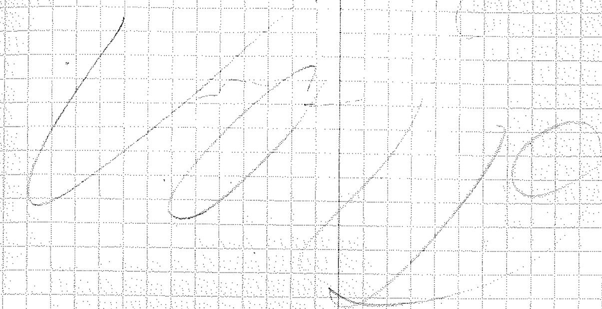
DATE: Jan. 2, 1941

E

PARTY

Knapp
Meelburg
Deiman
Bergelund
Wolfe

Look for:
1 pine 4' S.25°E. 313 lks.
1 pine 10' N.65°E. 280 lks.
1 pine 7' S.44°W. 346 lks.



Magnetic Bearing N 83°30' E
Random line

31+28.4	Found 2" iron pipe		$\frac{23}{26}$ 138-28
19+80	Jack pine stake		
18+48	Fence		
5+94	Hit road		
0+00	continued EAST on SAME line. Var. $6\frac{1}{2}°$ E.		$\frac{22/23}{27/26}$ 138-98

DATE: Jan. 3, 1941 (21)

PARTY:
Dainon –
Worlie –
Meelberg –
LeClair –
Schultz –

LOOK FOR
J. Pine 6' N 10° W. 16 links
J Pine 4' S 3° E. 4 links

Found 2" iron pipe

U. P.

Random line
Magnetic Bearing N. 83½° E
Var. 6½°

56 + 76.3	Intersected road & found I.P. Random line ~~86~~ 57' North of S.C.				23 | 24 / 26 | 25	138-28
51 + 45	Logging road & edge Jack Pine					
31+28.4	Continued on same line —				23 / 26	138-28

E

DATE: Jan. 3, 1941 (22)

PARTY:
Deiman
Warlie
Moelberg
Scholtz
Le Clair

Look for
[illegible] N 45° E 145 lks.
[illegible] S 23° E 227 lks.

No other Tree near

Found:
4 Iron witness pipes.
Sec. cor. in road.
Random line 57' North of Sec. Cor.

Void

Magnetic Bearing N 83° W
Random Line

25+54 Found iron pipe 40' south of our random line. 24/26 138-28

Found 4 witness corners

13+20 left opening

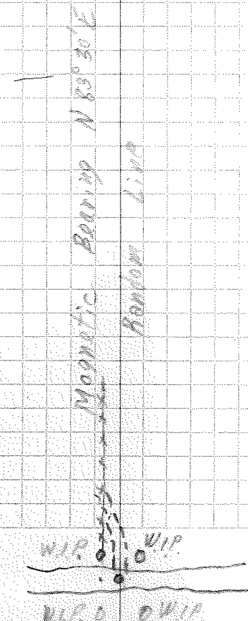
0+00 started east from sec. cor. 23|24 / 26|25 138-28
The random line was
started 35? foot north of sec. cor.

DATE: Jan. 6, 1940 (23)

PARTY: Deiman - chief
Medberg -
Worlie - Notes
LeClair -
Schultz -

Look for
Aspen 8" N 20° W. 23 lks.
Aspen 10" S 23° E. 48 lks.

Found: Iron pipe 40' S of line



Sec. cor. is in center of road.

52+80	Set approx. sec. cor. 24/25 — 138-26
46+60.9	Intersected old r.r. grade.
36+96	Jack Pine on North & open on south.
31+68	open field
25+51	Cont'd. east on same line 24/25 138-26

E

Date: Jan. 8, 1941 (24)

Party: Deiman T
Worlie Notes
Noalberg
LeClaire
Schultz

Found:
No evidence of ori. cor.

Magnetic Bearing N 83° 30' E
Random Line

0 I.P.

26+40	Set approx ¼ cor.			$\frac{31}{6}$	138-28 / 137-28
24+76	Enter River				
0+00	Started east from ¼ Twp. Cor.			31 / 6	138-28 / 137-28

Look far

E DATE: Jan. 10. 1941

PARTY Dieman
Moore
Meelburg
Schultz
Worlie

Found

Mag. Bear. N 83° 30' E
Chaining along Pine River-Emily Road

Var. 6½°

53+31	Intersected roads - sec. cor.	31 | 32 / 6 | 5	136-28 / 137-28
26+40	Cont'd east along road which is sec. line.		

Date:

Party: Dieman
Moore
Schultz.
Meelburg
Wahlie

LOOK FOR :

Found.

CCC control post on south side of road & road going north is on sec. line

Mag. Bear. N.83°30'E
Chaining along Pine River - Emily Road

26+40	Continued East on line			32 / 5	136-28 / 137-28	
0+00	continued East Along chain			31 / 6 | 32 / 5	136-28 / 137-28	

DATE: Jan. 10, 1941.

Party Dieman
Moore
Meelburg
Schultz
Warlie

LOOK FOR

Found
Jack pine B.T. on South
Side of Road

Mag. Bear N. 83° 30' E.
Chaining along Pine River - Emily Road

54+12	Set Approx Sec Cor		Leave	30 | 33 / 5 | 4	138-28 / 137-28
	Pine River - Emily Road				
30+36	Hit River				
26+40	Continued East Along Road			32 / 5	138-28 / 137-28

Look Ear

Date: June 1956

Party: Pieman
Moore
Meelburg
Schultz
Warlie

Found
No Evidence

Mag. Bear. N.89°30'E
Chaining along Pine River - Emily Road

26+40	Set App. $\frac{1}{4}$ Cor.			$\frac{33}{4}$	
13+20	Set App. $\frac{1}{16}$ Cor.				
0+00	continued East on same line			$\frac{32 \mid 33}{5 \mid 4}$	138-28 137-28

E DATE Jan. 13, 1941.

PARTY Deiman.
Moore.
Schuits.
Worlie
Kortekaas

Found no Evidences.

Mag. Bear. N.83°30' E
Random Line

32+80	Set App. Sec. Cor.					33 | 34 / 4 | 3
	~~on edge of lake.~~					
				51'		
39+60	Set App. $\frac{1}{16}$ Cor.					
30+92	hit road					
26+40	Continue E. on same line					

DATE

PARTY Deiman
Moore
Schultz
Worlie
Kortekaas

Found
no evidence

Mag Bear. N 0°30' E
Random line

26+48 Fell in lake — $\frac{34}{3}$

13+50 Fell in LAKE

0+51 Edge of lake. — 33 | 34 / 4 | 3

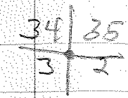
0+00 Continued E. channel across lake

E Date: Jan 13, 1941. 7

Party: D. Elmore
Moore
Worley
Schultz
Hortemas

Mag Bear N 83° 30' E
Random line

53+88	Found Sec. Cor. 297.7' So. of random line.	
~~52+88~~	~~Set App. Sec. Cor.~~	



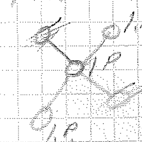
39+60	Set approx. E 1/16 stake
34+05	Left lake - enter swamp.
~~33+54~~	Leave lake Enter swamp
92+92	Continued E. on same line 34/3

DATE Jan. 13, 1941. 82

Look for.

Delman.
Moore
Worlie
Schultz.
Kortenaas.

Found:
Iron pipes -
Sec. cor & witness cor.
pipes at 45° & 42'
~~fr~~ from S.C. I.P.

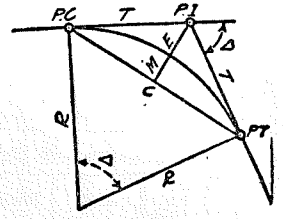


Mag. Bear. N83°30'E.
Random line

1/4 5/8

y. pine 10' N45° E. 55 LKS.
y pine 10' S60° W. 33 LKS.
DIST. 96.68

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

Radius=R=$\frac{50}{\text{sin. } D/2}$ (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 vers $\frac{\Delta}{2}$ (6)

External=E=T tan $\frac{\Delta}{4}$ (7) =R÷cos. $\frac{\Delta}{2}$—R (8)=R 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. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and÷8⅓=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÷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÷(2 x 688.26)=2.16 ft.

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′ +8° 20′÷2=6° 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° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and÷42=5.5 or D=5° 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	⅛	3–16	¼	5–16	⅜	½	⅝	¾	⅞
.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.—Radii, 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	1.637	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	5729.65	.218	.873	0.30	20	688.16	1.819	7.266	2.50
10	4911.15	.255	1.018	0.35	30	674.69	1.855	7.411	2.55
20	4297.28	.291	1.164	0.40	40	661.74	1.892	7.556	2.60
30	3819.83	.327	1.309	0.45	9	637.28	1.965	7.846	2.70
40	3437.87	.364	1.454	0.50	20	614.56	2.037	8.136	2.80
50	3125.36	.400	1.600	0.55	30	603.80	2.074	8.281	2.85
2	2864.93	.436	1.745	0.60	40	593.42	2.110	8.426	2.90
10	2644.58	.473	1.891	0.65					
20	2455.70	.509	2.036	0.70	10	573.69	2.183	8.716	3.00
30	2292.01	.545	2.181	0.75	30	546.44	2.292	9.150	3.15
40	2148.79	.582	2.327	0.80	11	521.67	2.402	9.585	3.30
50	2022.41	.618	2.472	0.85	30	499.06	2.511	10.02	3.45
3	1910.08	.655	2.618	0.90	12	478.34	2.620	10.45	3.60
10	1809.57	.691	2.763	0.95	30	459.28	2.730	10.89	3.75
20	1719.12	.727	2.908	1.00	13	441.68	2.839	11.32	3.90
30	1637.28	.764	3.054	1.05	30	425.40	2.949	11.75	4.05
40	1562.88	.800	3.199	1.10	14	410.28	3.058	12.18	4.20
50	1494.95	.836	3.345	1.15	30	396.20	3.168	12.62	4.35
4	1432.69	.873	3.490	1.20	15	383.07	3.277	13.05	4.50
10	1375.40	.909	3.635	1.25	30	370.78	3.387	13.49	4.65
20	1322.53	.945	3.718	1.30	16	359.27	3.496	13.92	4.80
30	1273.57	.982	3.926	1.35	30	348.45	3.606	14.35	4.95
40	1228.11	1.018	4.071	1.40	17	338.27	3.716	14.78	5.10
50	1185.78	1.055	4.217	1.45	18	319.62	3.935	15.64	5.40
5	1146.28	1.091	4.362	1.50	19	302.94	4.155	16.51	5.70
10	1109.33	1.127	4.507	1.55	20	287.94	4.374	17.37	6.00
20	1074.68	1.164	4.653	1.60	21	274.37	4.594	18.22	6.30
30	1042.14	1.200	4.798	1.65	22	262.04	4.814	19.08	6.60
40	1011.51	1.237	4.943	1.70	23	250.79	5.035	19.94	6.90
50	982.64	1.273	5.088	1.75	24	240.49	5.255	20.79	7.20
6	955.37	1.309	5.234	1.80	25	231.01	5.476	21.64	7.50
10	929.57	1.346	5.379	1.85	26	222.27	5.697	22.50	7.80
20	905.13	1.382	5.524	1.90	27	214.18	5.918	23.35	8.10
30	881.95	1.418	5.669	1.95	28	206.68	6.139	24.19	8.40
40	859.92	1.455	5.814	2.00	29	199.70	6.360	25.04	8.70
					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′	560.11	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	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	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	1679.1	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	5099.0	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	1786.7	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	.70	.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	1.33	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	.029	.032	.035	.039	.043	.047	.051
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	.078	.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°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.711	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.03	1.17
75°	.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.07	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.985	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
110°	.268	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96
120°	.360	.721	1.08	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32

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	397.26	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	1.26	.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	244.51	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°	.356	.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=$15^2 \div 2 \times 250.3$=.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 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.

TRIGONOMETRICAL FORMULAS.

See fig. (a).

sin. $A=\frac{a}{c}$

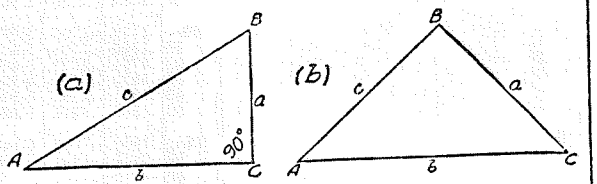
cos. $A=\frac{b}{c}$

tan. $A=\frac{a}{b}$

cot. $A=\frac{b}{a}$

sec. $A=\frac{c}{b}$

cosec. $A=\frac{c}{a}$



FORMULA FOR SOLVING TRIANGLES.

Right triangles. See fig. (a).

Given	Sought.	
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	$B=90°-A$, $b=a \cot. A$, $c=\frac{a}{\sin. A}$.
A, b	B, a, c	$B=90°-A$, $a=b \tan. A$, $c=\frac{b}{\cos. A}$.
A, c	B, a, b	$B=90°-A$, $a=c \sin. A$, $b=c \cos. A$

Oblique triangles. See fig. (b).

Given	Sought.	
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	$A-B$	$\tan. \frac{1}{2}(A-B)=\frac{(a-b) \tan. \frac{1}{2}(A+B)}{a+b}$
a, b, c	A	If $s=\frac{1}{2}(a+b+c)$, $\sin. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{bc}}$, $\cos. \frac{1}{2}A=\sqrt{\frac{s(s-a)}{bc}}$, $\tan. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$, $\sin. A=\frac{2\sqrt{(s-a)(s-b)(s-c)s}}{bc}$
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	8	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	1	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99998	40	20	.1449	.1465	6.827	.98944	40
30	.0087	.0087	114.6	.99996	30	30	.1478	.1495	6.691	.98902	30
40	.0116	.0116	85.94	.99993	20	40	.1507	.1524	6.561	.98858	20
50	.0145	.0145	68.75	.99989	10	50	.1536	.1554	6.435	.98814	10
1	.0175	.0175	57.29	.99985	89	9	.1564	.1584	6.314	.98769	81
10	.0204	.0204	49.10	.99979	50	10	.1593	.1614	6.197	.98723	50
20	.0233	.0233	42.96	.99973	40	20	.1622	.1644	6.084	.98676	40
30	.0262	.0262	38.19	.99966	30	30	.1650	.1673	5.976	.98629	30
40	.0291	.0291	34.37	.99958	20	40	.1679	.1703	5.871	.98580	20
50	.0320	.0320	31.24	.99949	10	50	.1708	.1733	5.769	.98531	10
2	.0349	.0349	28.64	.99939	88	10	.1736	.1763	5.671	.98481	80
10	.0378	.0378	26.43	.99929	50	10	.1765	.1793	5.576	.98430	50
20	.0407	.0407	24.54	.99917	40	20	.1794	.1823	5.485	.98378	40
30	.0436	.0437	22.90	.99905	30	30	.1822	.1853	5.396	.98325	30
40	.0465	.0466	21.47	.99892	20	40	.1851	.1883	5.309	.98272	20
50	.0494	.0495	20.21	.99878	10	50	.1880	.1914	5.226	.98215	10
3	.0523	.0524	19.08	.99863	87	11	.1908	.1944	5.145	.98163	79
10	.0552	.0553	18.07	.99847	50	10	.1937	.1974	5.066	.98107	50
20	.0581	.0582	17.17	.99831	40	20	.1965	.2004	4.989	.98050	40
30	.0610	.0612	16.35	.99813	30	30	.1994	.2035	4.915	.97992	30
40	.0640	.0641	15.60	.99795	20	40	.2022	.2065	4.843	.97934	20
50	.0669	.0670	14.92	.99776	10	50	.2051	.2095	4.773	.97875	10
4	.0698	.0699	14.30	.99756	86	12	.2079	.2126	4.705	.97815	78
10	.0727	.0729	13.73	.99736	50	10	.2108	.2156	4.638	.97754	50
20	.0756	.0758	13.20	.99714	40	20	.2136	.2186	4.574	.97692	40
30	.0785	.0787	12.71	.99692	30	30	.2164	.2217	4.511	.97630	30
40	.0814	.0816	12.25	.99668	20	40	.2193	.2247	4.449	.97566	20
50	.0843	.0846	11.83	.99644	10	50	.2221	.2278	4.390	.97502	10
5	.0872	.0875	11.43	.99619	85	13	.2250	.2309	4.331	.97437	77
10	.0901	.0904	11.06	.99594	50	10	.2278	.2339	4.275	.97371	50
20	.0929	.0934	10.71	.99567	40	20	.2306	.2370	4.219	.97304	40
30	.0958	.0963	10.39	.99540	30	30	.2334	.2401	4.165	.97237	30
40	.0987	.0992	10.08	.99511	20	40	.2363	.2432	4.113	.97169	20
50	.1016	.1022	9.788	.99482	10	50	.2391	.2462	4.061	.97100	10
6	.1045	.1051	9.514	.99452	84	14	.2419	.2493	4.011	.97030	76
10	.1074	.1080	9.255	.99421	50	10	.2447	.2524	3.962	.96959	50
20	.1103	.1110	9.010	.99390	40	20	.2476	.2555	3.914	.96887	40
30	.1132	.1139	8.777	.99357	30	30	.2504	.2586	3.867	.96815	30
40	.1161	.1169	8.556	.99324	20	40	.2532	.2617	3.821	.96742	20
50	.1190	.1198	8.345	.99290	10	50	.2560	.2648	3.776	.96667	10
7	.1219	.1228	8.144	.99255	83	15	.2588	.2679	3.732	.96593	75
10	.1248	.1257	7.953	.99219	50	10	.2616	.2711	3.689	.96517	50
20	.1276	.1287	7.770	.99182	40	20	.2644	.2742	3.647	.96440	40
30	.1305	.1317	7.596	.99144	30	30	.2672	.2773	3.606	.96363	30
40	.1334	.1346	7.429	.99106	20	40	.2700	.2805	3.566	.96285	20
50	.1363	.1376	7.269	.99067	10	50	.2728	.2836	3.526	.96206	10
					82						74
	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	24	.4067	.4452	2.246	.91355	66
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229	.91236	50
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211	.91116	40
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194	.90996	30
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177	.90875	20
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161	.90753	10
17	.2924	.3057	3.271	.95615	73	25	.4226	.4663	2.145	.90631	65
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128	.90507	50
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112	.90383	40
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097	.90259	30
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081	.90133	20
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066	.90007	10
18	.3090	.3249	3.078	.95106	72	26	.4384	.4877	2.050	.89879	64
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035	.89752	50
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020	.89623	40
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006	.89493	30
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991	.89363	20
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977	.89232	10
19	.3256	.3443	2.904	.94552	71	27	.4540	.5095	1.963	.89101	63
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949	.88968	50
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935	.88835	40
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921	.88701	30
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907	.88566	20
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894	.88431	10
20	.3420	.3640	2.747	.93969	70	28	.4695	.5317	1.881	.88295	62
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868	.88158	50
20	.3475	.3706	2.699	.93769	40	20	.4746	.5392	1.855	.88020	40
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842	.87882	30
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829	.87743	20
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816	.87603	10
21	.3584	.3839	2.605	.93358	69	29	.4848	.5543	1.804	.87462	61
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792	.87321	50
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780	.87178	40
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767	.87036	30
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756	.86892	20
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744	.86748	10
22	.3746	.4040	2.475	.92718	68	30	.5000	.5774	1.732	.86603	60
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720	.86457	50
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709	.86310	40
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698	.86163	30
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686	.86015	20
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675	.85866	10
23	.3907	.4245	2.356	.92050	67	31	.5150	.6009	1.664	.85717	59
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653	.85567	50
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643	.85416	40
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632	.85264	30
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621	.85112	20
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611	.84959	10
					66						58
	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	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30						
40	.5398	.6412	1.560	.84182	20	39	.6293	.8098	1.235	.77715	51
50	.5422	.6453	1.550	.84025	10	10	.6316	.8146	1.228	.77531	50
						20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30						
40	.5544	.6661	1.501	.83228	20	40	.6428	.8391	1.192	.76604	50
50	.5568	.6703	1.492	.83066	10	10	.6450	.8441	1.185	.76417	50
						20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30						
40	.5688	.6916	1.446	.82248	20	41	.6561	.8693	1.150	.75471	49
50	.5712	.6959	1.437	.82082	10	10	.6583	.8744	1.144	.75280	50
						20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30						
40	.5831	.7177	1.393	.81242	20	42	.6691	.9004	1.111	.74314	48
50	.5854	.7221	1.385	.81072	10	10	.6713	.9057	1.104	.74120	50
						20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30						
40	.5972	.7445	1.343	.80212	20	43	.6820	.9325	1.072	.73135	47
50	.5995	.7490	1.335	.80038	10	10	.6841	.9380	1.066	.72937	50
						20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30						
40	.6111	.7720	1.295	.79158	20	44	.6947	.9657	1.036	.71934	46
50	.6134	.7766	1.288	.78980	10	10	.6967	.6713	1.030	.71732	50
						20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											°
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

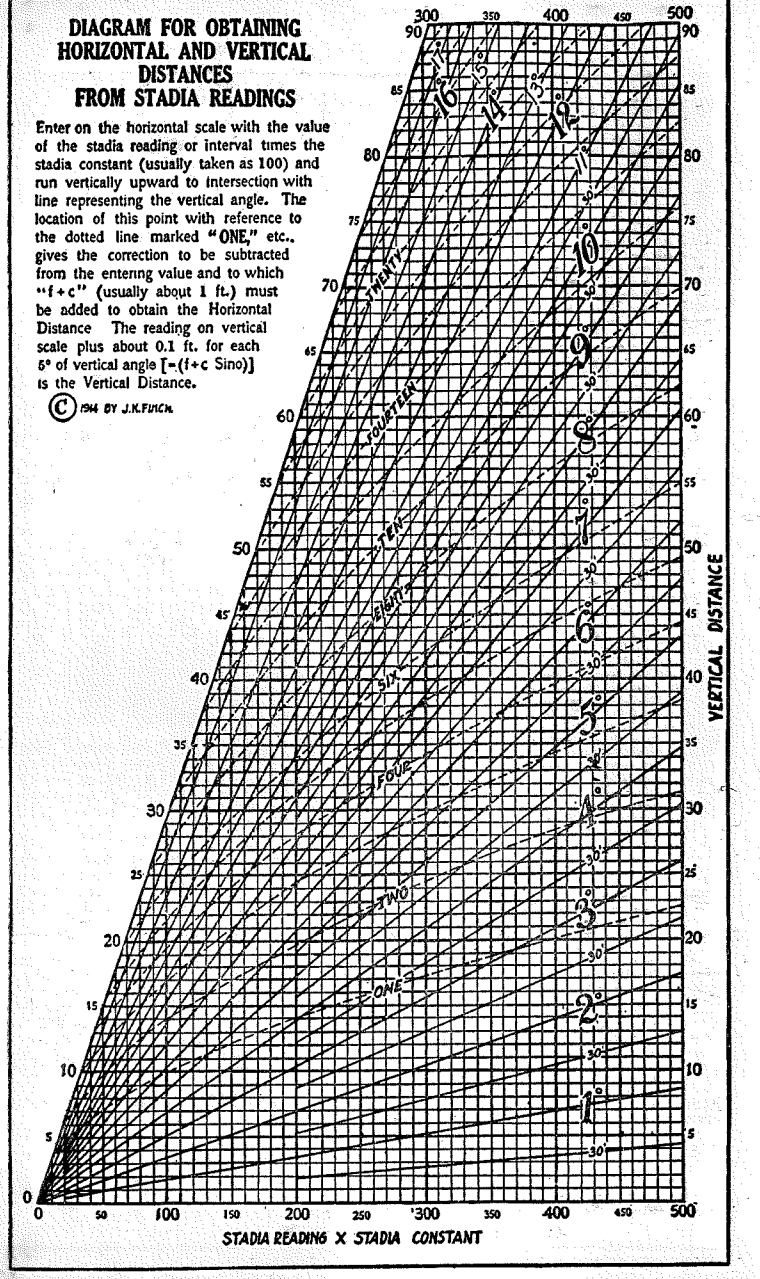
Table IX.—Calculation of Earthwork.

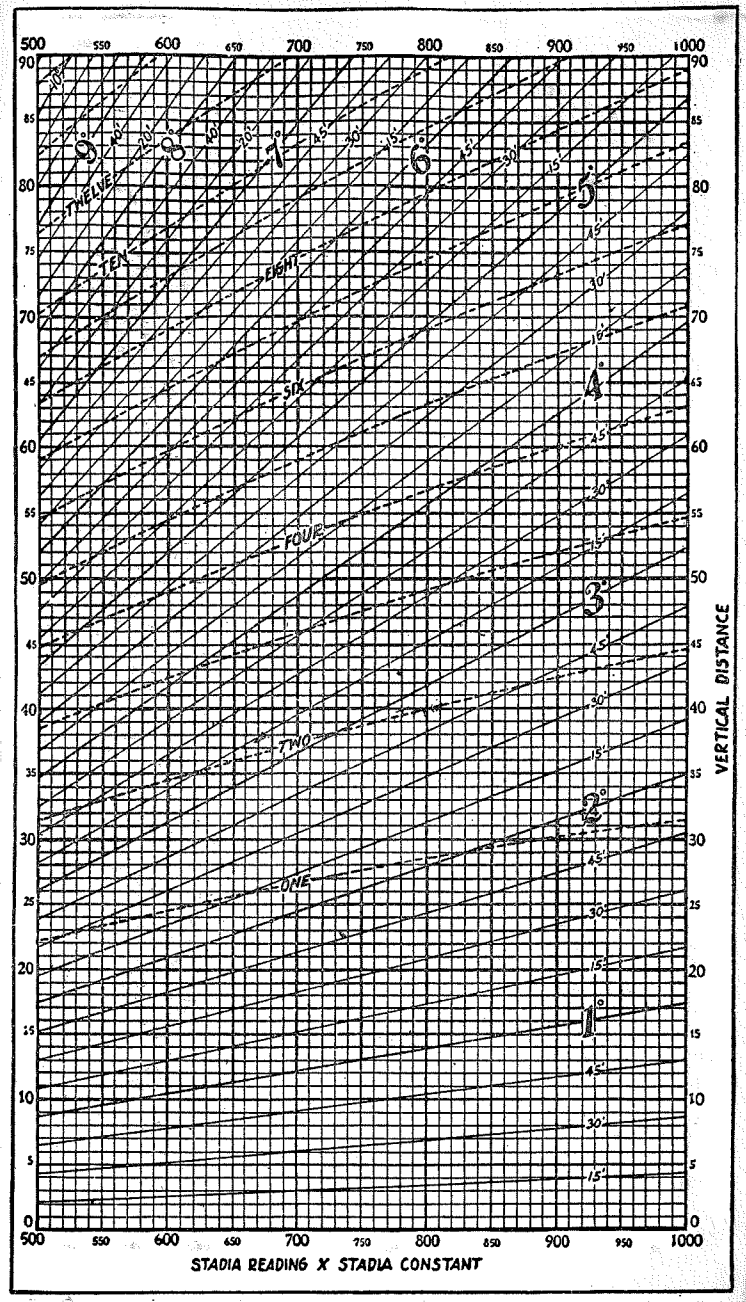
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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	3.56	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	2.68	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	0.72	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) =h, and ½ 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 Sino)] is the Vertical Distance.





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)÷2 or 2 ft. added to 41.9 =43.9.

For slopes of 1 on 1 see inside of front cover.

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