87

DIETZGEN

TRADE MARK

[illegible] State Road

ENGINEERS'

FIELD BOOK

NO. 400

[illegible]

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 20 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.

OLD STATE ROAD

Hambden Twp.

No. 608

Align. - Pg. 2-18 also pg. 25 to 27

Culverts - pg. 19-21

Topo - pg. ~~47-67~~

73.50 NE Cor Farm

Ton 251.50 3.0' East

(177°-0'-30") 1°-59'-30" Lt

Orig 8°-17' Lt - (3.0' West)

87

Sisson Cemetery (Hambden) Pg. 238 24

Claridon-Troy (C.H. #3 Sec H) Pg 1 to 6 incl

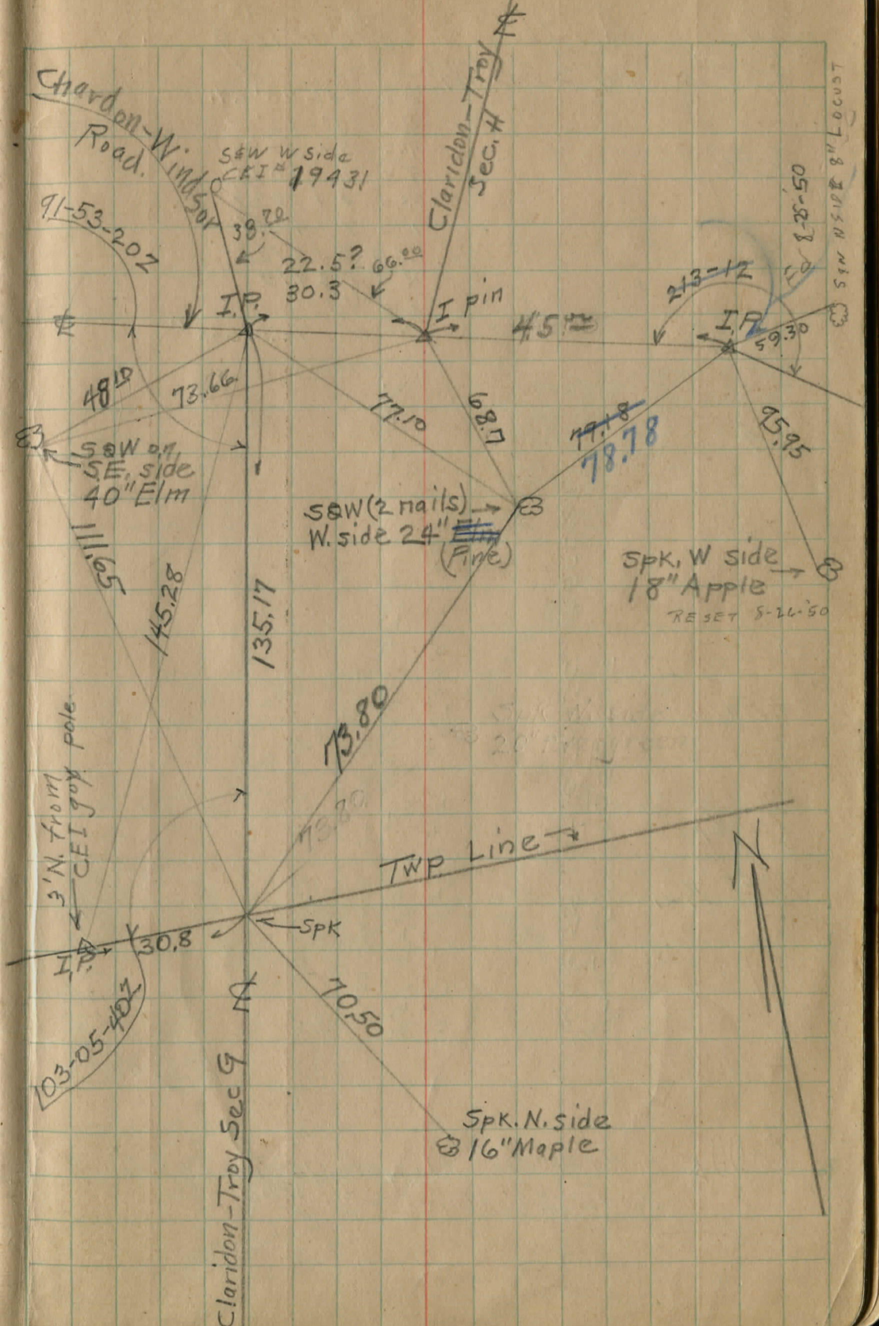
Old State Rd. (State Rt. 608)

(Sissons Corners N. to Lake Co) 5 to 18

Radcliff Rd. from S.R. 608 to Callow Rd. Pg. 28

to Brakeman Pg. 29

C.H. #3	A lign't	Pg 1-5
S.R. 608 From CH. #3 NWly	"	5-18
" " 1944		25-27
Sisson Cemetary Hamboen Twp		23-24



Chardon-Windsor Road.
S&W W side CEI # 19431
Claridon-Troy Sec. 7
91-53-20Z
38.72
22.5?
30.3
66.00
I.P.
I pin
45.00
213-12
I.P.
59.30
S&W N side 8" Locust
Fd 8-25-50
48.10
73.66
77.10
68.7
79.18
78.78
95.95
S&W on S.E. side 40" Elm
S&W (2 nails) W. side 24" (Pine)
Spk. W side 18" Apple
RESET 8-26-50
50.11
145.28
135.17
73.80
3' N. from CEI guy pole
Twp Line
Spk
I.P.
30.8
103-05-40Z
70.50
Claridon-Troy Sec 9
Spk. N. side 16" Maple
N

Sta	Angle	Bearing
+59° △	24°-28' Rt.	
+50		
5		
+50		
4		
+50		
3		
+50		
2 (21 34)		
+78 66 P.C.		
1		
+40		
0+00 △	S. Hampden st. pavement ends. 28' Lt. of sta. 0+00	

Δ = 24° 28' Rt.
D = 3°-16'
P.I. = 5+59°
T = 3 80 34
P.C. = 1+78 66
L = 7 48 97
P.T. = 9+27 63
R = 1754.19
E = 40' Approx.
Def. per ft. = .01633°

7-12-51 stkes at 15 unless otherwise marked

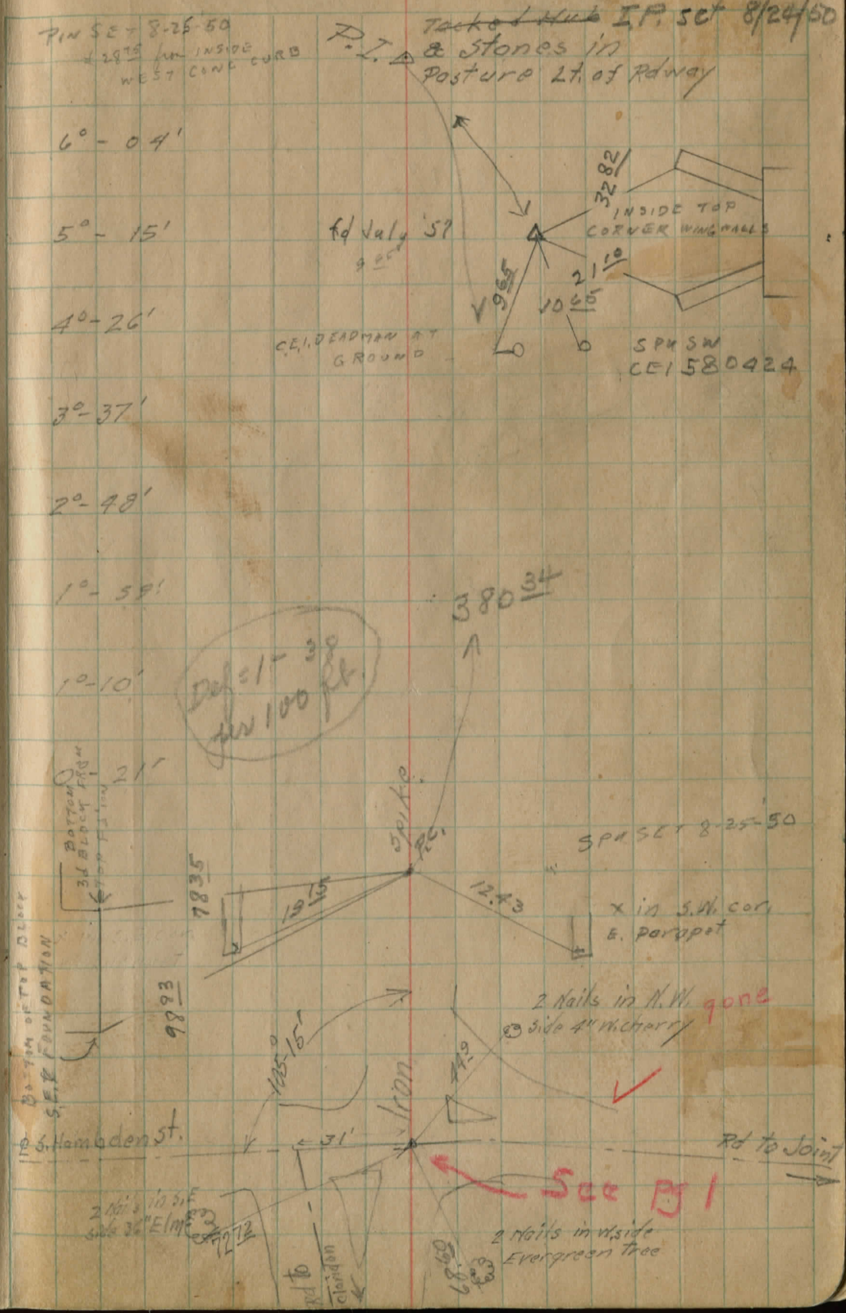
Note:- Offset stakes set 25' Rt. of ℄ unless otherwise noted.

8-26-50 stakes set 15' Rt. of ℄

11-7-24 Fair-Windy Awful dusty - Rain

℄

Hanna
Gray
Sprague



Sta	Angle	Bearing
13		
12		
	0-27	9
11	1-38	
	2-05	8
10	1-38	
(72 37)	3-43	7
+27 63 P.T.	1-38	
	5-21	6
9		
8+50		
8		
+50		
7		
+50		
6		

0-27 = def. for 27 63

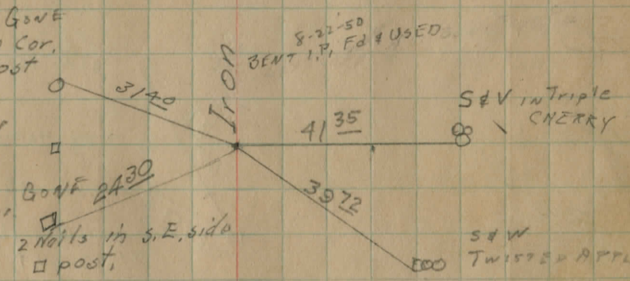
13-14
6-53
5-21

11-8-24 Cloudy-Cold.

℄

Hanna
Gray
Sprague

927.63
559
368.63



12°- 14'

11°- 47'

10°- 58'

10°- 09'

9°- 20'

8°- 31'

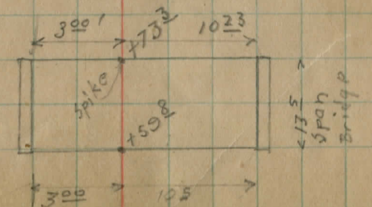
7°- 42'

6°- 53'

6-27'

6°-14'

235 between INSIDE of CURBS 8-22-50



Sta Angle Bearing

+54.7 ΔP.I. 25°-00'Rt

+50

23
(36.25)

+63.25 P.C.

22

21

20

19

18

+20.7 Δ 0°-0'

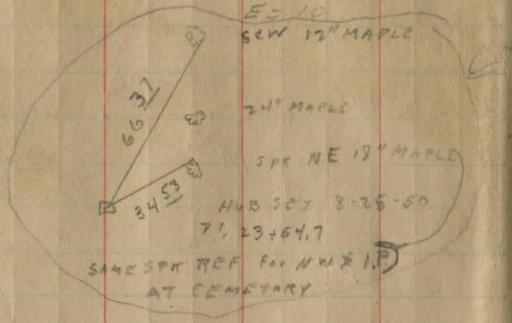
17

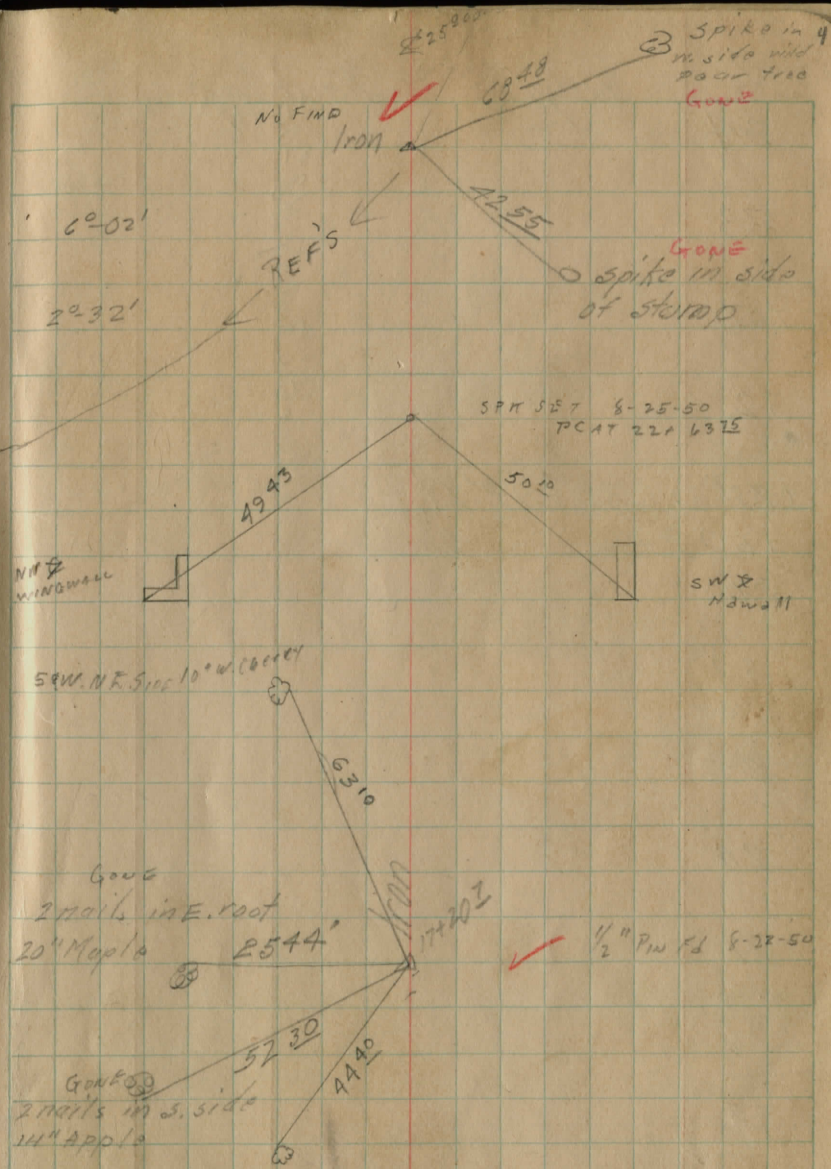
16

15

14

Δ = 25°-00'
D = 14°-00'
P.I. = 23+54.7
T = 90.75
P.C. = 22+63.75
L = 178.57
P.T. = 24+42.32
R = 410.275
Dist. per 1°, 2.57
E = 10



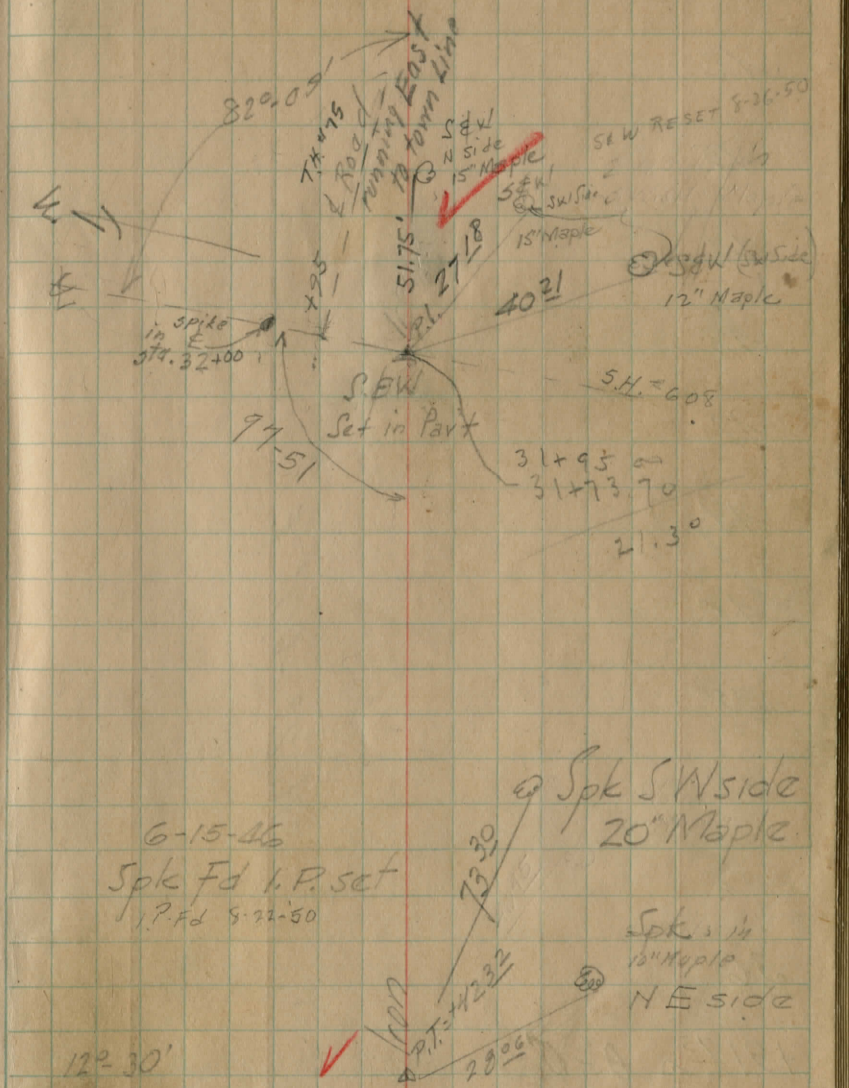


Sta	Angle	Bearing
34		
33		
+50		
32		
+73.7	Δ 82°-09' Lt.	Magnetic Reading N2°-0E
+50		
31		
30		
29		
28		
27		
26		
25		
(57.2)		
+42.32	Δ P.T.	
24		

℄ Geaugp. Co.

FB. 87

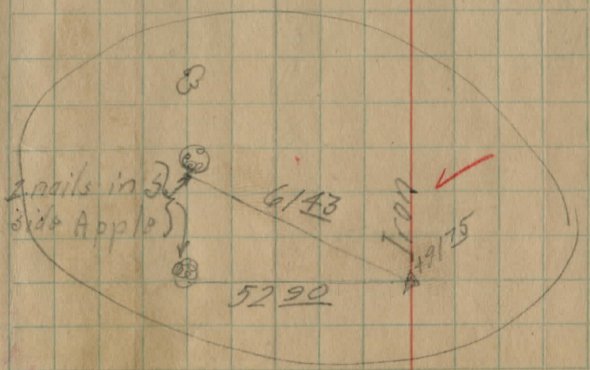
SR. 608



Sta	Angle	Bearing
47		
46		
45		
44		
43		
42		
41		
40		
39		
39		
37		
36		
+91 75	Δ 0°-0'	N. 20°-00' E
35		

11-10-24
P.M.

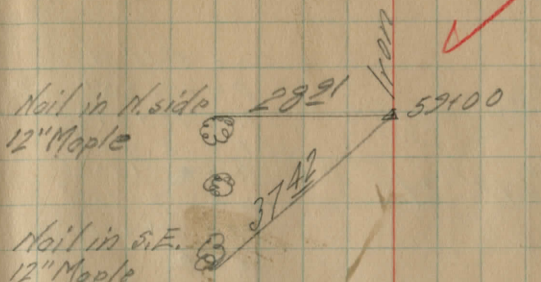
Hanna
Grou
Douglass



Sta.	Angle	Bearing
61		
60		
59	0°-0'	
58		
57		
56		
55		
54		
53		
52		
51		
50		
49		
48		

N. 2°-00'E.

℄



Sta	Angle	Bearing
74	3°47'	
73	3°02'	
72	2°17'	
+69.40	△P.I. 8°-12" Lt.	
71	1°32'	
70	0°47'	
69 (441')	0°2'	
+95.57 P.C.		
68		
67		
66		
65		
64		
63		
62		

△ = 8°-12' Lt.
D = 1°-30'
P.I. = 71 + 69.40
T = 2 73.81
P.C. = 68 + 95.59
L = 5 46.67
P.T. = 74 + 42.26
E = 9.8
R = 3819.83
Def per ft. .45'

N. 2°-00' E.

3°- 47'

3°- 02'

2°- 17'

1°- 32'

0°- 47'

0°- 02'

Iron pin

Spike

P.I. 44.85 59.00

S&W Inside 4" W. Cherry

S&W N. Side 8" Apple No. 40

71+69.40
273.81
6895.59 P.C.

71+69.40

Sta	Angle	Bearing
85		
84		
83		
90.82		
+09.18 P.T. 11°12½		
82	11°00'	
81	8°45'	
80	6°30'	
+63.4 P.I. Δ 22°-25' Lt.		
79	4°15'	
78	2°0'	
+11.03 P.C.		
77		
76		
75		
57.74		
+42.26 P.T. 4°06'		

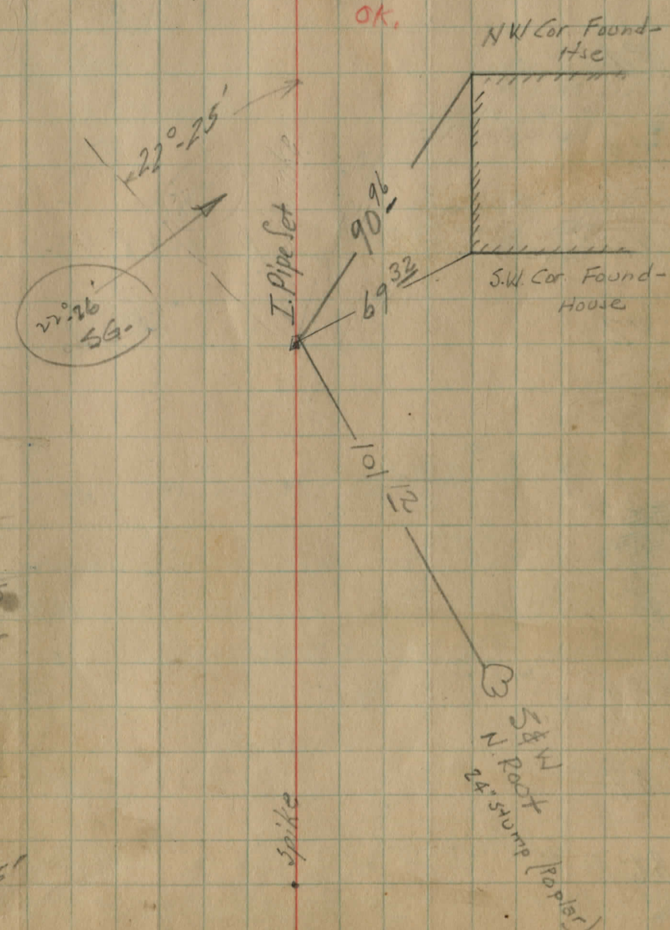
Δ = 22°-25' Lt.
D = 4°-30'
P.I. = 79+63.40
T = 2 52.37
P.C. = 77+11.03
L = 4 98.15
P.T. = 82 09.18
R = 1273.57
E = 26±
Def per ft. .0225°

24.76 used

11-15-'74
cloudy - cold
Bang!! Bang!!!

Honna
Grad
Douglass

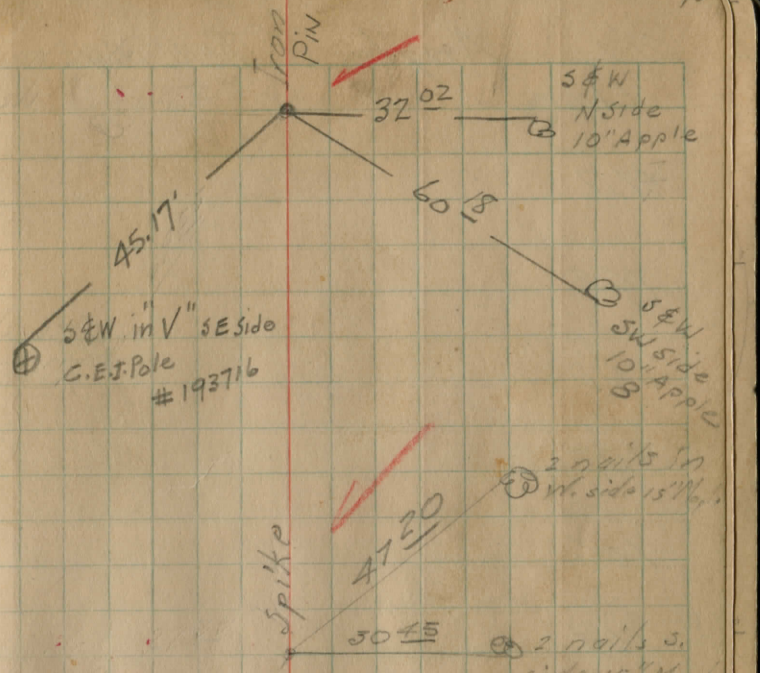
OK.



135
89
1215
1080
120.15

4°-06'

Sta.	Angle	Bearing
+91.5	Δ 0°-30" Rt.	98+91.5
98		
97		
96		
95		
94		
~~93~~		
+48.55	Δ 0°-0"	93+48.55
93		
92		
91		
90		
89		
88		
87		
86		

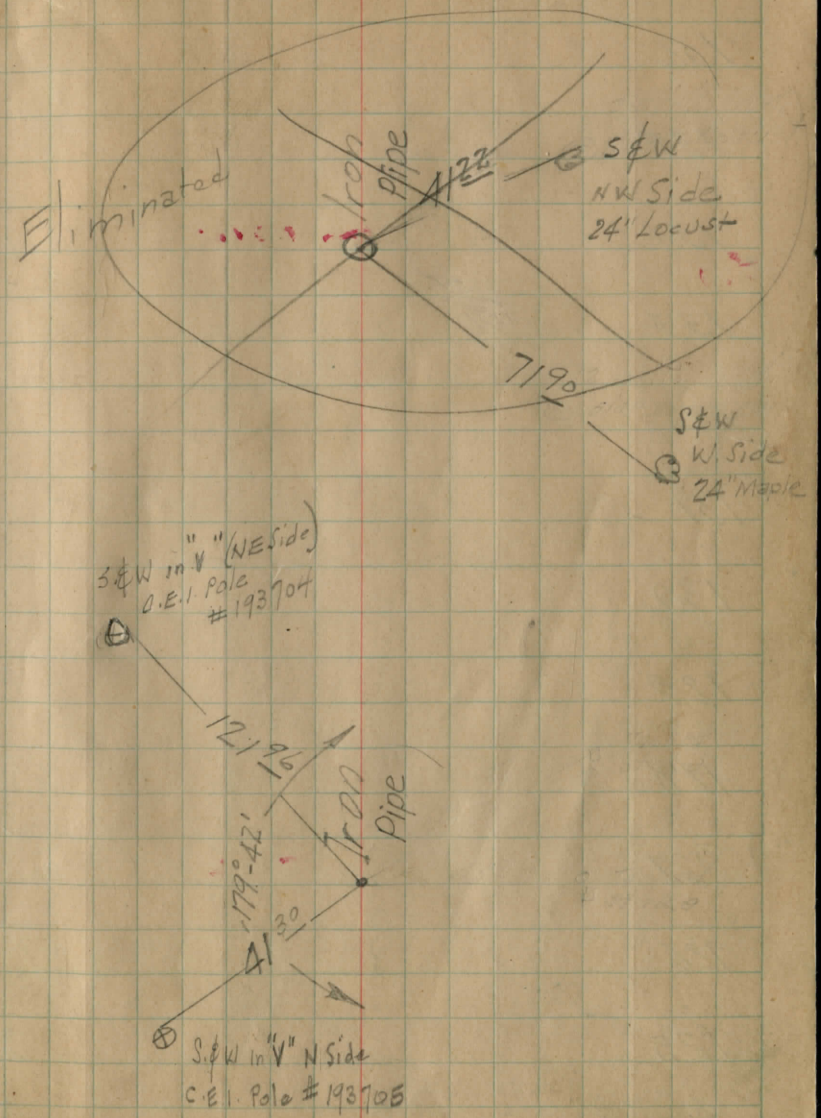


Mar. 13, 1925, Discovered that two Station Stakes had been marked "90" This requires that all stationing North of Sta 90 be corrected by adding 100 ft.

W. C. M.
Party, Marks, Grau & Sprague

Sta.	Angle	Bearing
111		
110		
109		
108		
107		
106		
105		
104		
103		
102		
101		
100		
99		

Sta	Angle	Bearing
123		
122		
+51.5		
121	0°-0'	121+51.5
120		
119+10		
118		
117		
116		
+34.4		
115	0°-18' Lt.	115+34.4
114		
113		
112		



Sta	Angle	Bearing
137		
136		
135		
134		
133		
132		
131		
130		
129		
128		
127		
126		
125		
124		

℄

1 spike

Sta. Angle Bearing

+37.7
~~+39.1~~ 145+~~39.1~~ 37.7 Def. Rt. 0°06'

145

~~144~~

~~143~~

~~142~~

141

~~140~~

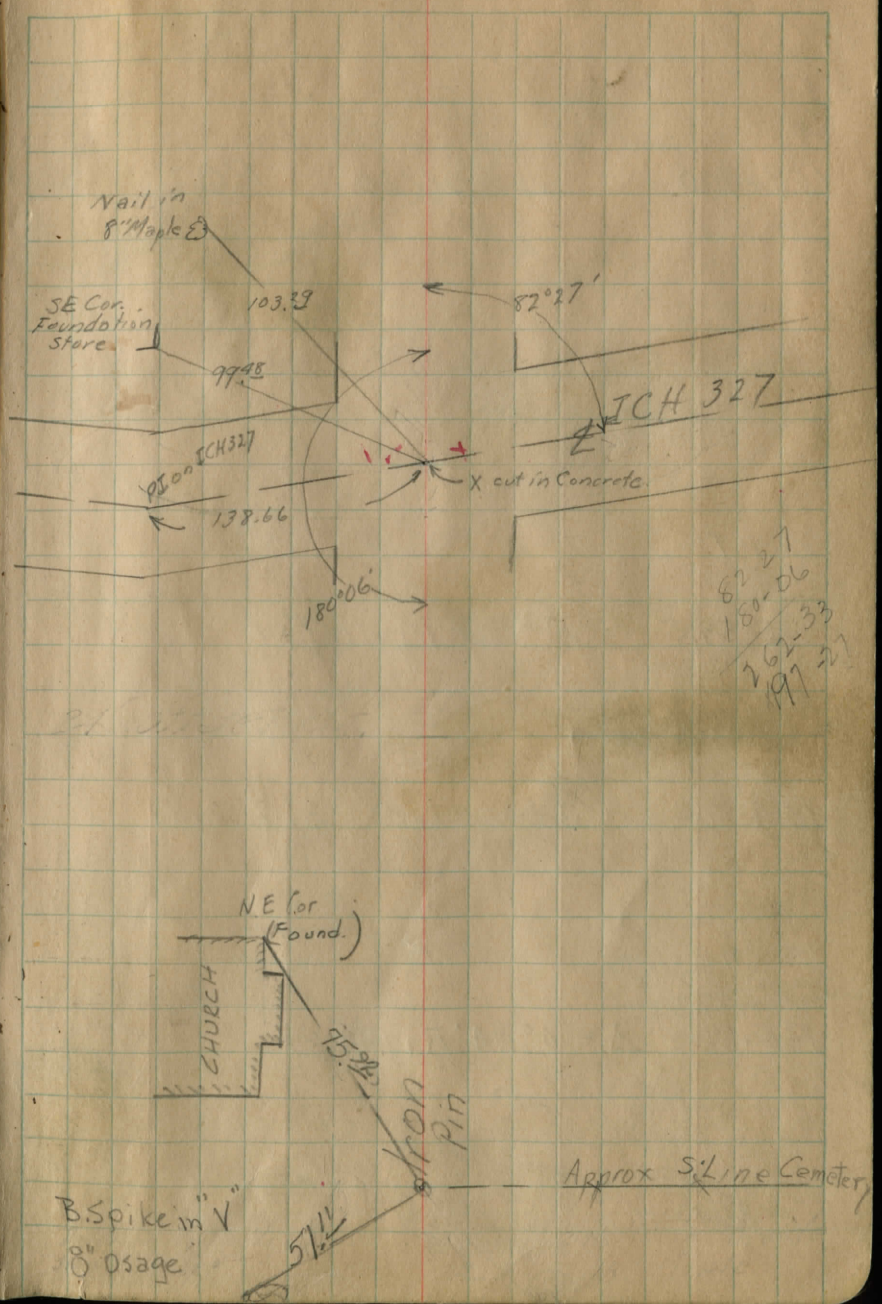
~~139~~

~~138~~

+07.8 Δ 0° 0' 138+07.8 POT

138

℄



159+90.0 Δ = 0° 00' P.O.T.

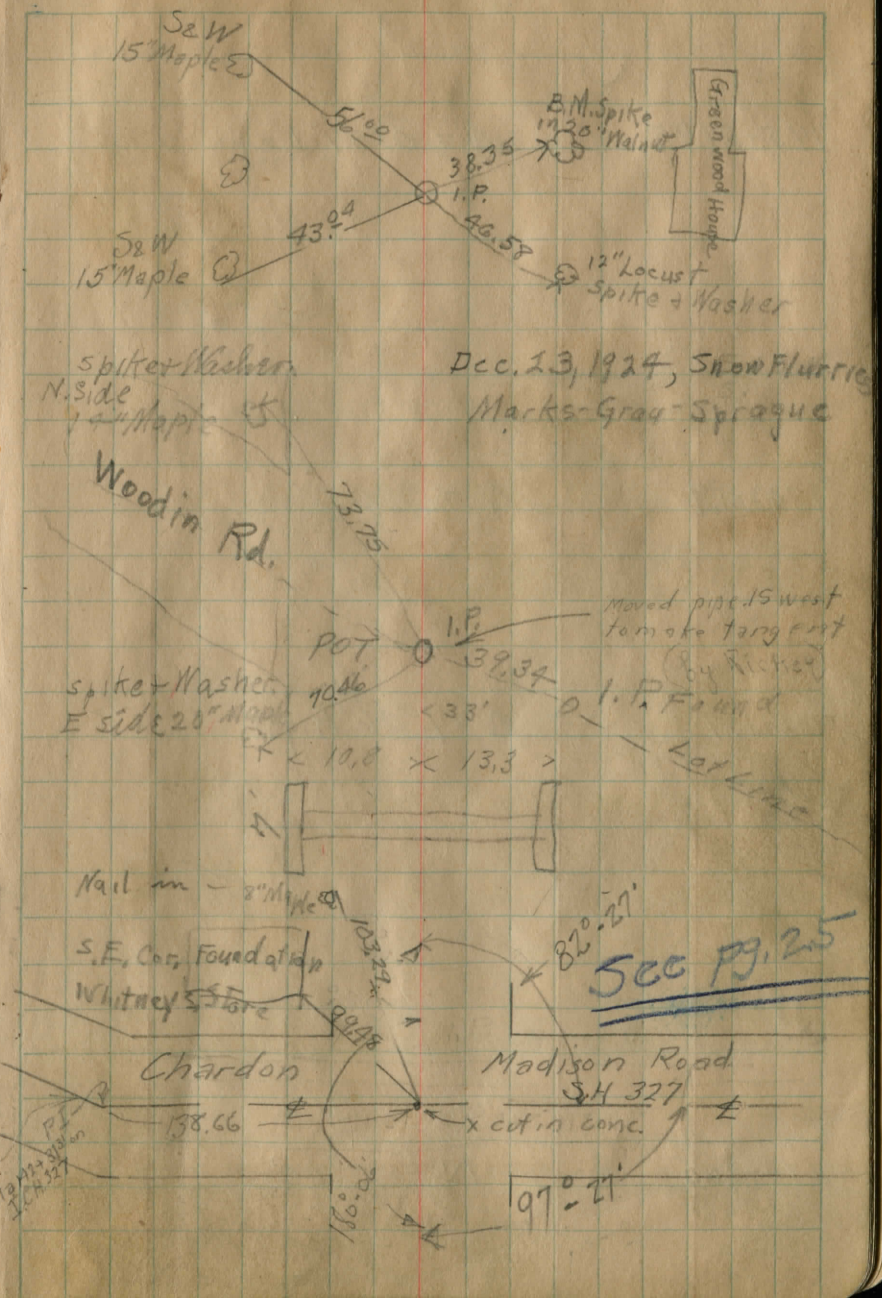
156+59.5 0°00' P.O.T

154+56 Stone Box 3' X 2.5±

145+37.7 Δ = 0°06' Right

curve on ICH 327
Δ = 14°59'
D = 50
T = 150.72
L = 299.67
R = 1145.92

x cut in Conc. pvt.

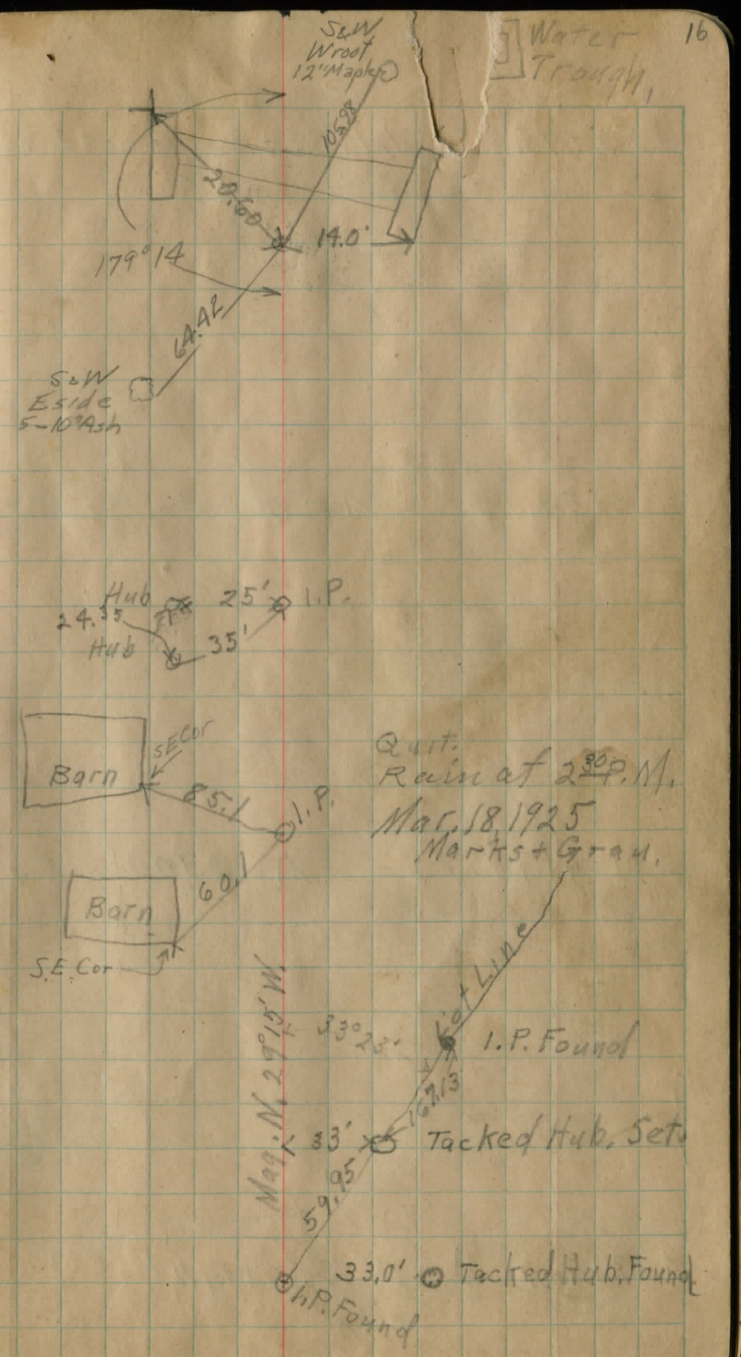


195+57.95 Δ = 0°46' Left

184+81.9 Δ = 0°00'

182+15.7 Δ = 1°06' Right

174+20.0 Δ = 0°00'

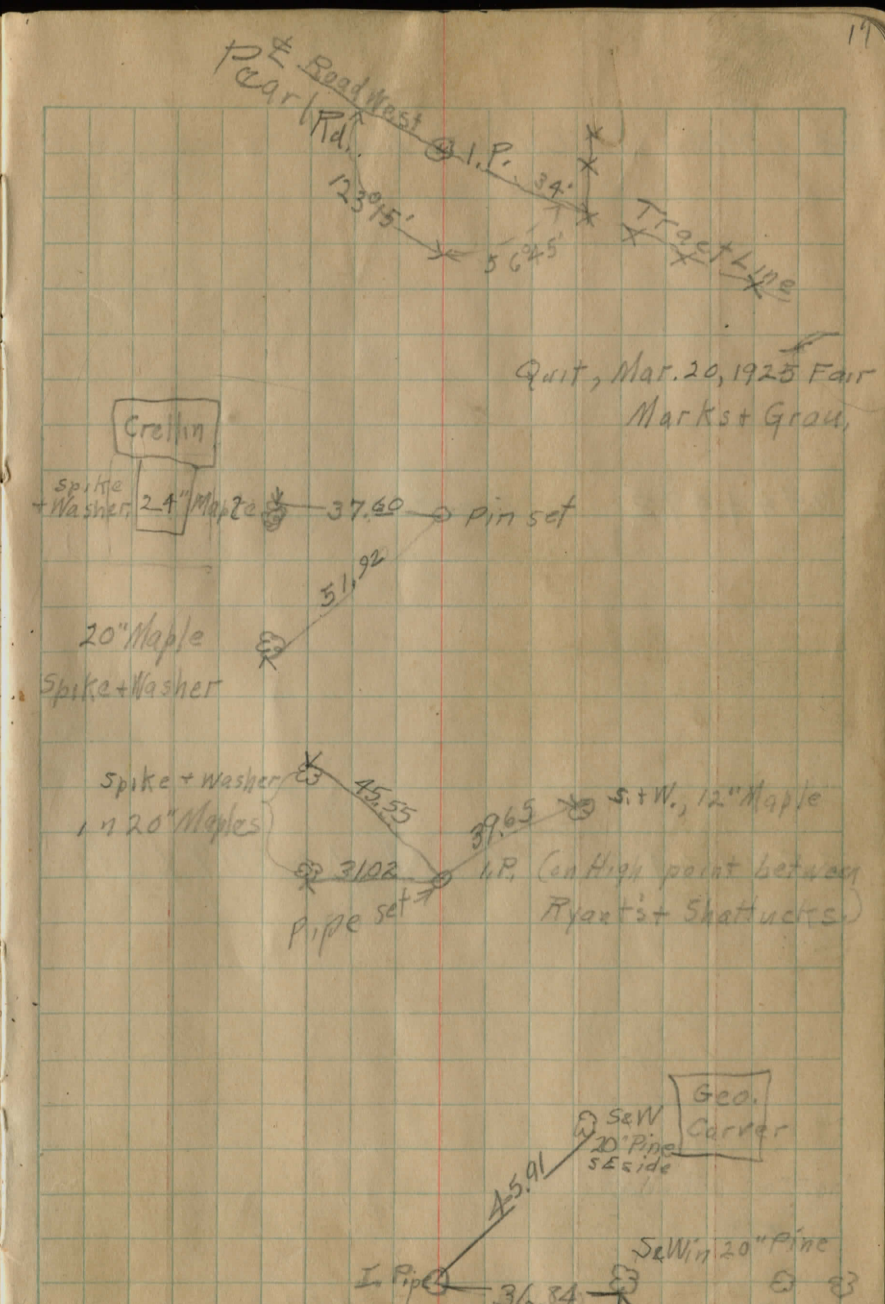


255+98.6 I.P. Set on Tract Line

243+54.0 Δ = 0°00' POT

231+41.7 Δ = 0°00' POT

203+82.7 Δ = 0°00' POT

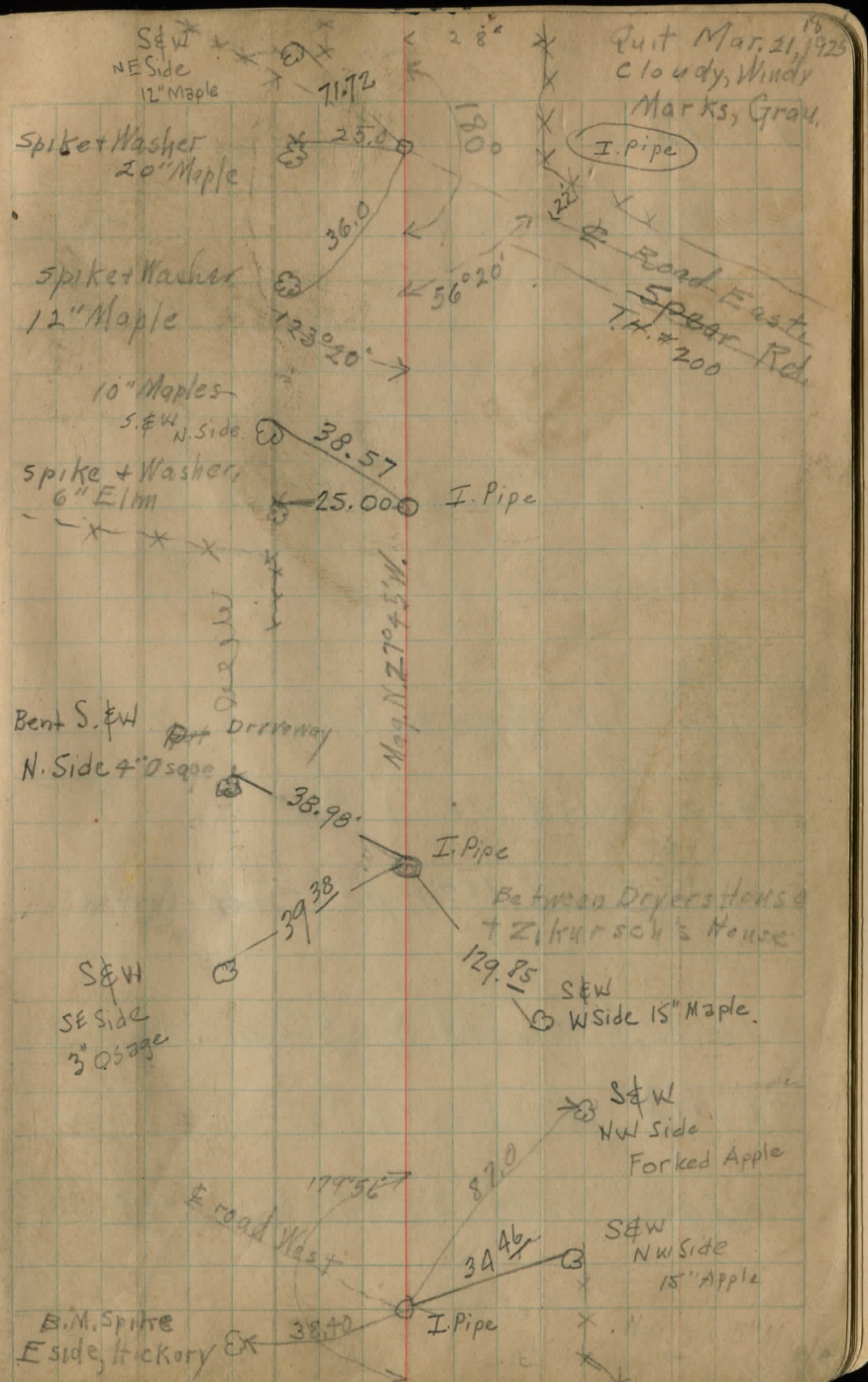


307+04.0 County Line

294+49.2 Δ = 0°00'

282+04.7 Δ = Δ = 0°17½ Left

255+98.6 Δ = 0°04' Left



Culverts.

1+72 O.K.

5+59.8 to 5+73.3

22+20 Build 12" Enc. V.I.t. Pipe.

29+63 Build 12" V.P. Enc.

31+50± Build 15" Pipe Side Road

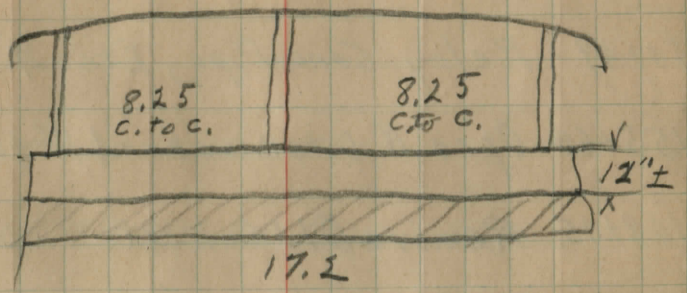
91+82.5 Build 3'x3' Conc. Box

95+95 Build 15" V.P. Enc.

106+35. Build 3'x3' Ext. on Left.

April 25, 1925 - Fiedler + Marks
Drainage Reconnoissance.

Cut Left Parapet to Level of floor,
Extend Culvert on Left.
Reset Rail



Cut off Wall in ditch on Right
" " " " " " Left,

on 5th ew Inlet 91+75
Outlet 91+90

Clean Outlet for 150'
" Inlet

110+15 Build 15" V.P. Enc.

125+45 " Ext. on Right, Straight

141+60 Replace Broken Slab With Conc.

150+49 Relay Conc. Pipe, Extend +

155+60 Open N. Ditch on Road W. for

168+05 Remove Old Culvert

174+80 Ext. Left with 3'X3' Conc. Box

~~183+35 Remove old Culvert~~

192+36 Build 12" V. P. Enc.

200+18 Build 12" V. P. Enc.

210+145 3½", Build Ext. on Right

229+55, Remove old, Build 15" Pipe

239 Remove old 3'X3' Conc. Box

260+63 Build 24" ~~V.P.~~ Corr. Pipe Encased

273+22 Build 12" V.P. Enc.

Open Ditch for 100'

H.W.S. Remove old Right Parapet

Build H.W.S.

200' E

Build 3'X3' Conc. Box

Straight H.W.S.

Slab Top, Straight H.W.

Lower F.L. ½ ft.

Open Outlet for 150'

Lower F.L. ½ ft.

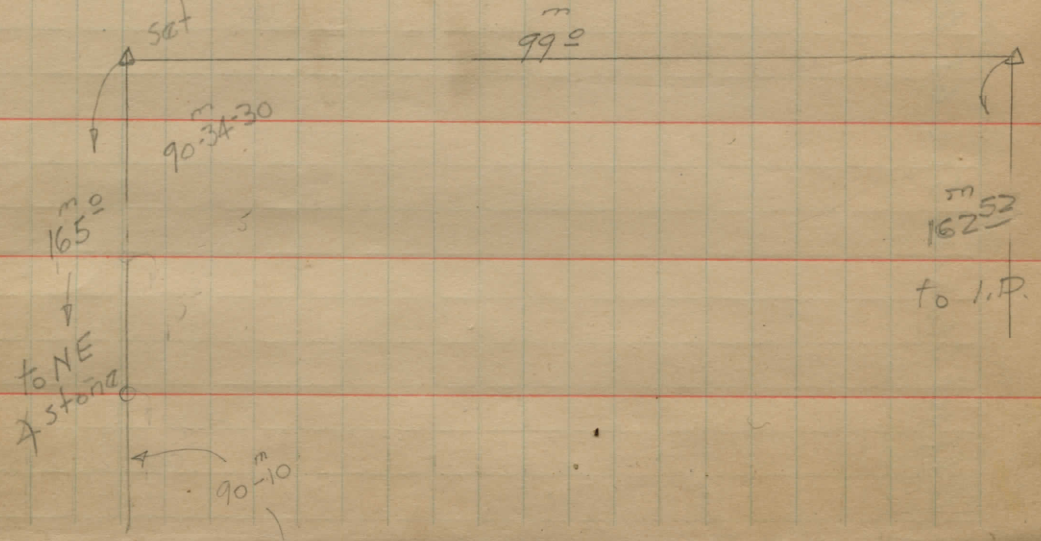
279+80	Build 12" V.P. Enc.	
290+94	Relay Encase Extend With 12"	V.P. Enc. + Build H.W.S.
304+70	Remove present 12" Pipe.	Save for replacing pipe to be relaid in other 12" P.P.C Culverts

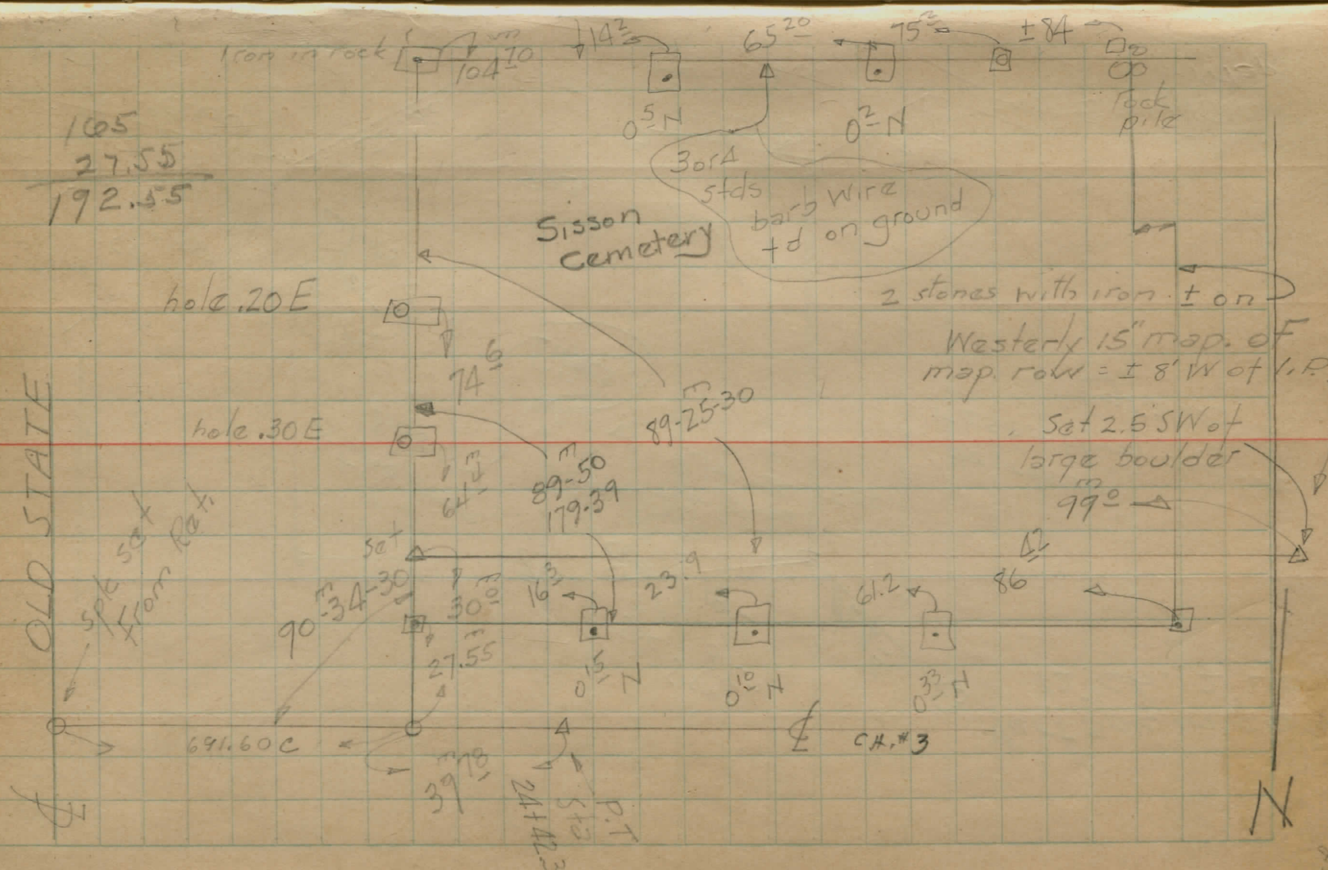
287
279.80
7.20

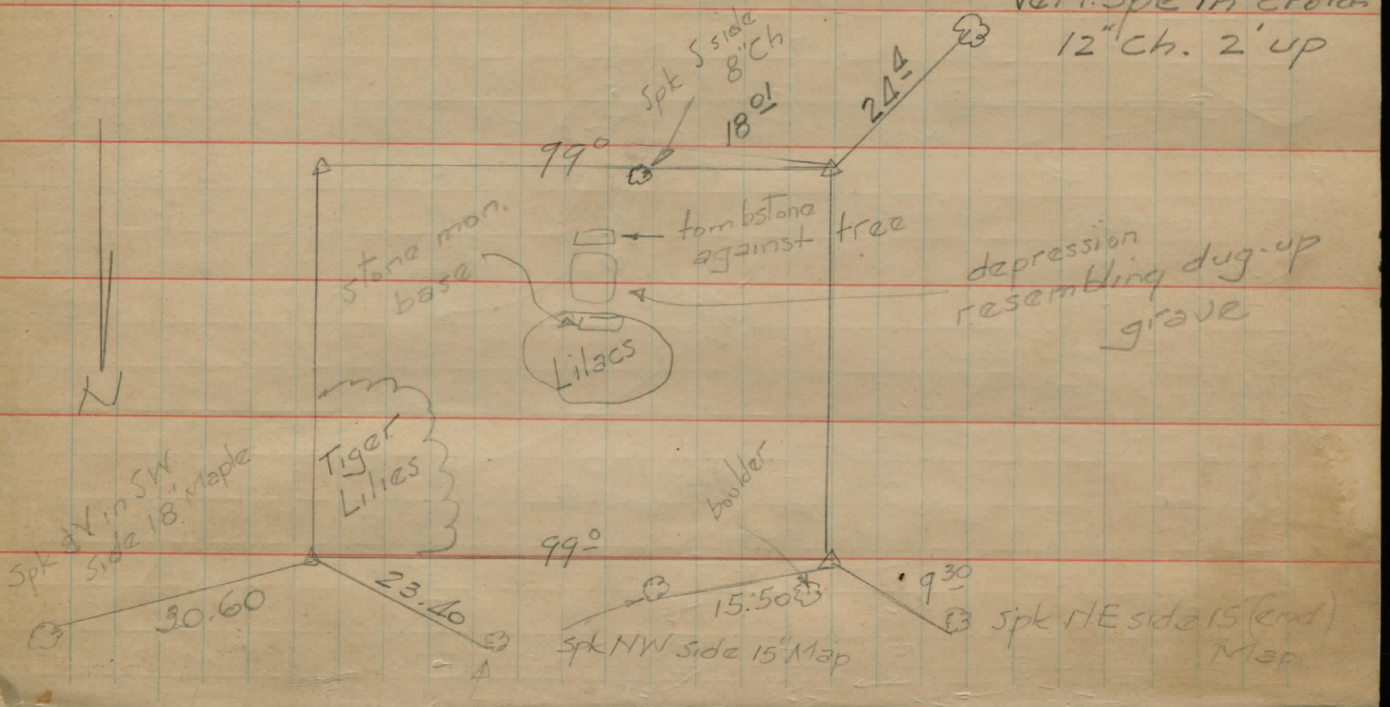
1927

May 3	Marks	1 day	Din.	.50
3	Grau	1		.50
3	Snyder	1		.50

Offset Stakes, Sta. 68 to Sta. 121

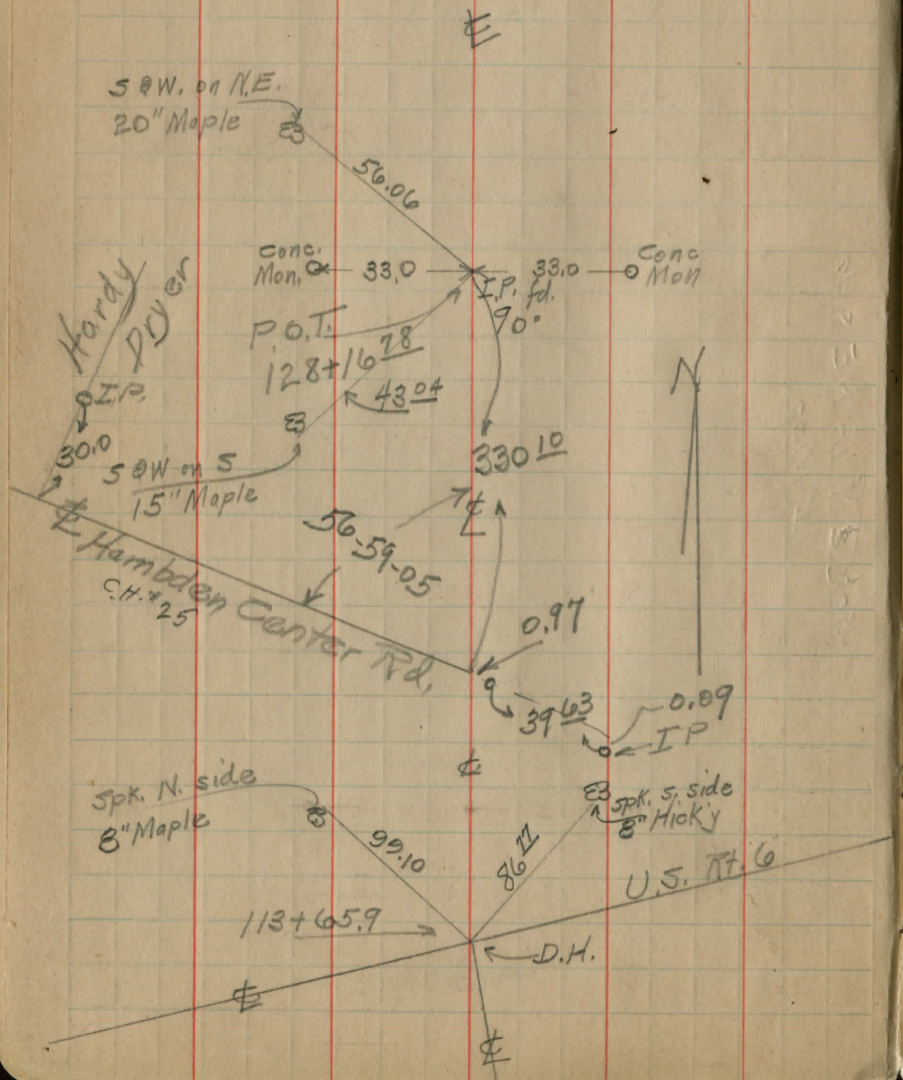

set
99.0
90-34-30
165.0
to NE
Δ stone
90-10
162.52
to I.P.

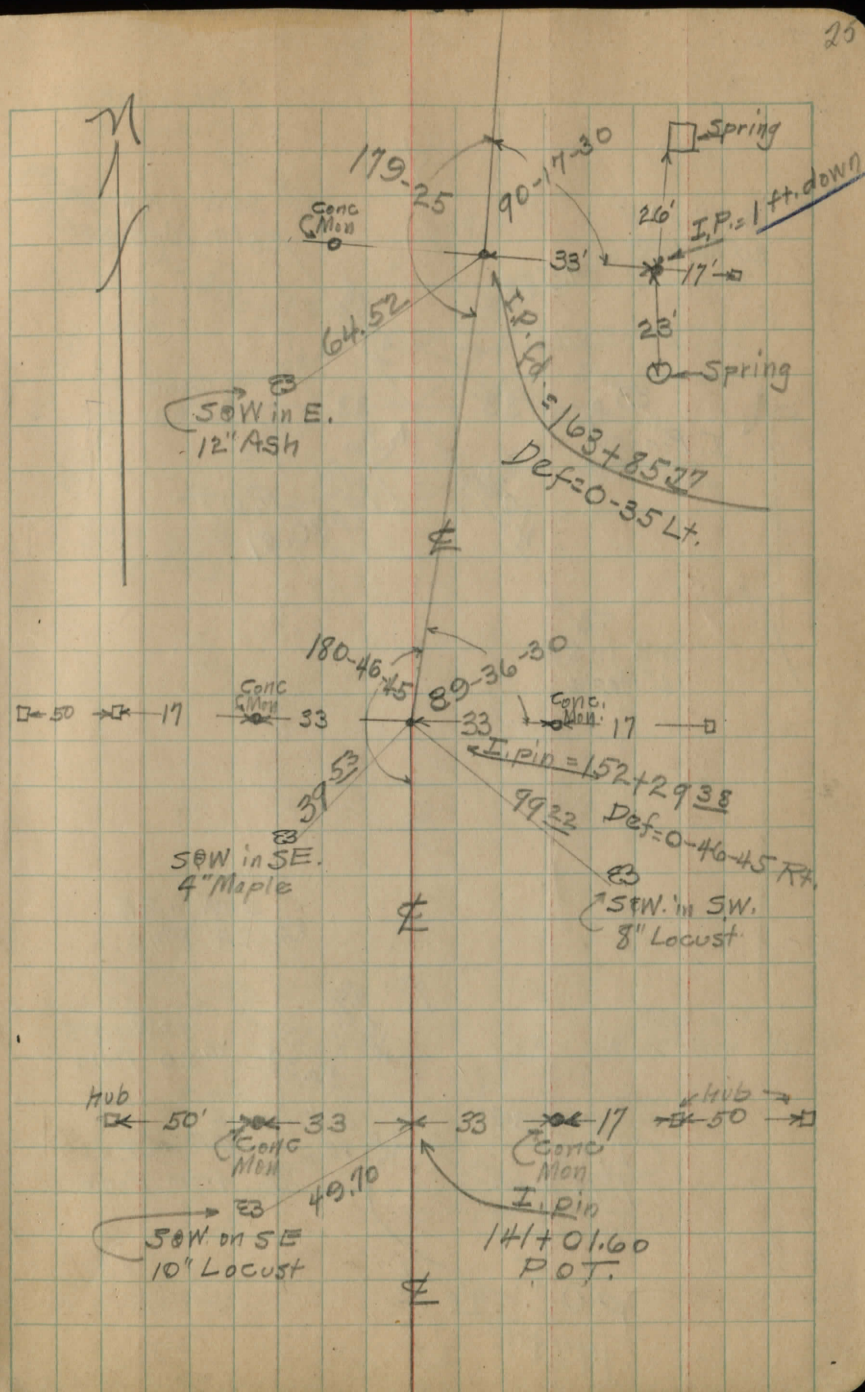

Iron in rock
104.10
14.2
65.20
75.3
±84
Rock pile
0.5 N
0.2 N
3 or 4
stds
barb wire
+d on ground
Sisson
Cemetery
165
27.55
192.55
hole .20 E
hole .30 E
74.6
89-25-30
89-50
179-39
2 stones with iron ± on
Westerly 15" map. of
map. row = ± 8' W of I.P.
Set 2.5 SW of
large boulder
99.0
OLD STATE
spk set
from Rat.
set
90-34-30
30.0
16.3
23.9
61.2
86.42
27.55
0.15 N
0.10 N
0.33 N
691.60 C
39.78
P.T.
Sta
24+42.32
CH. #3
N

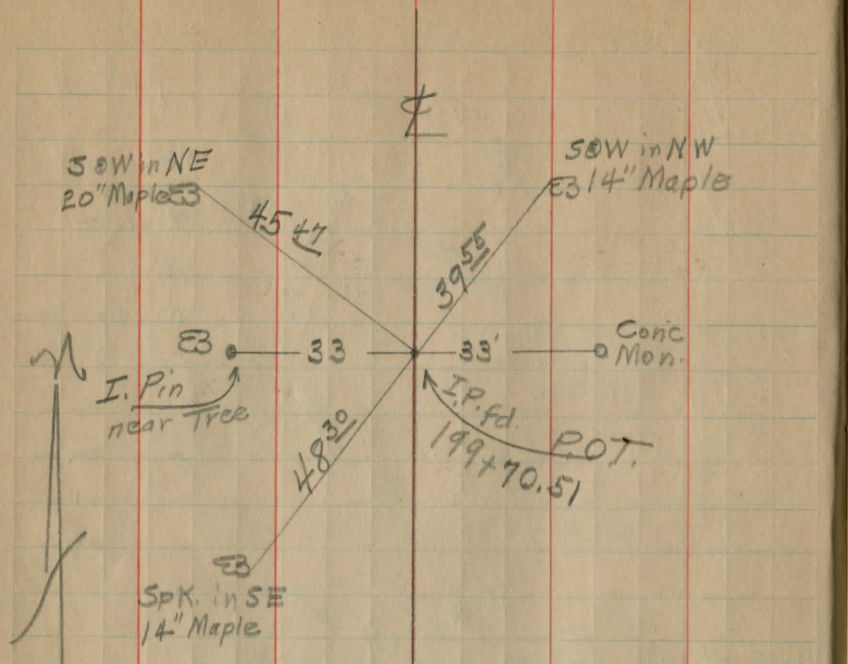


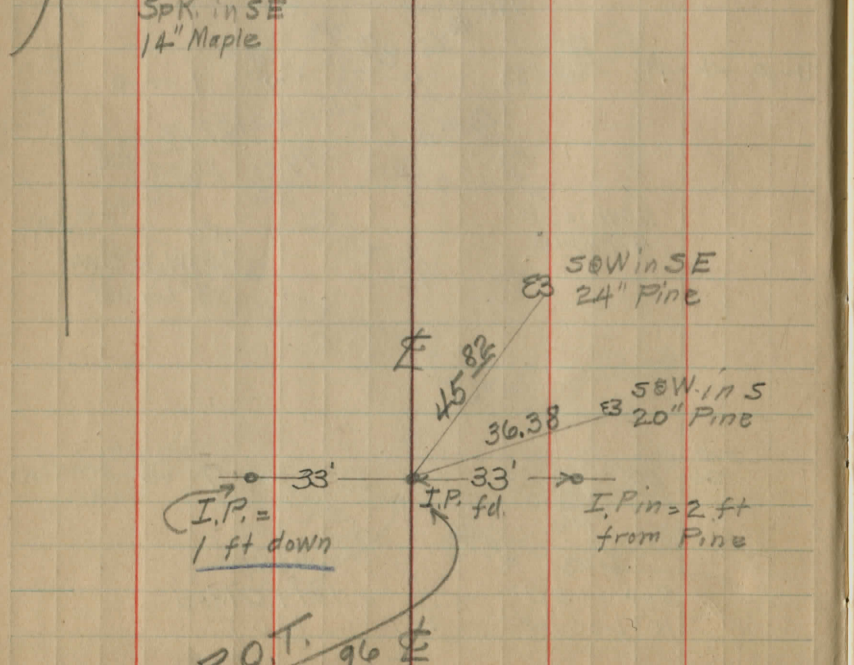
Spk & V in NE side
14" Map

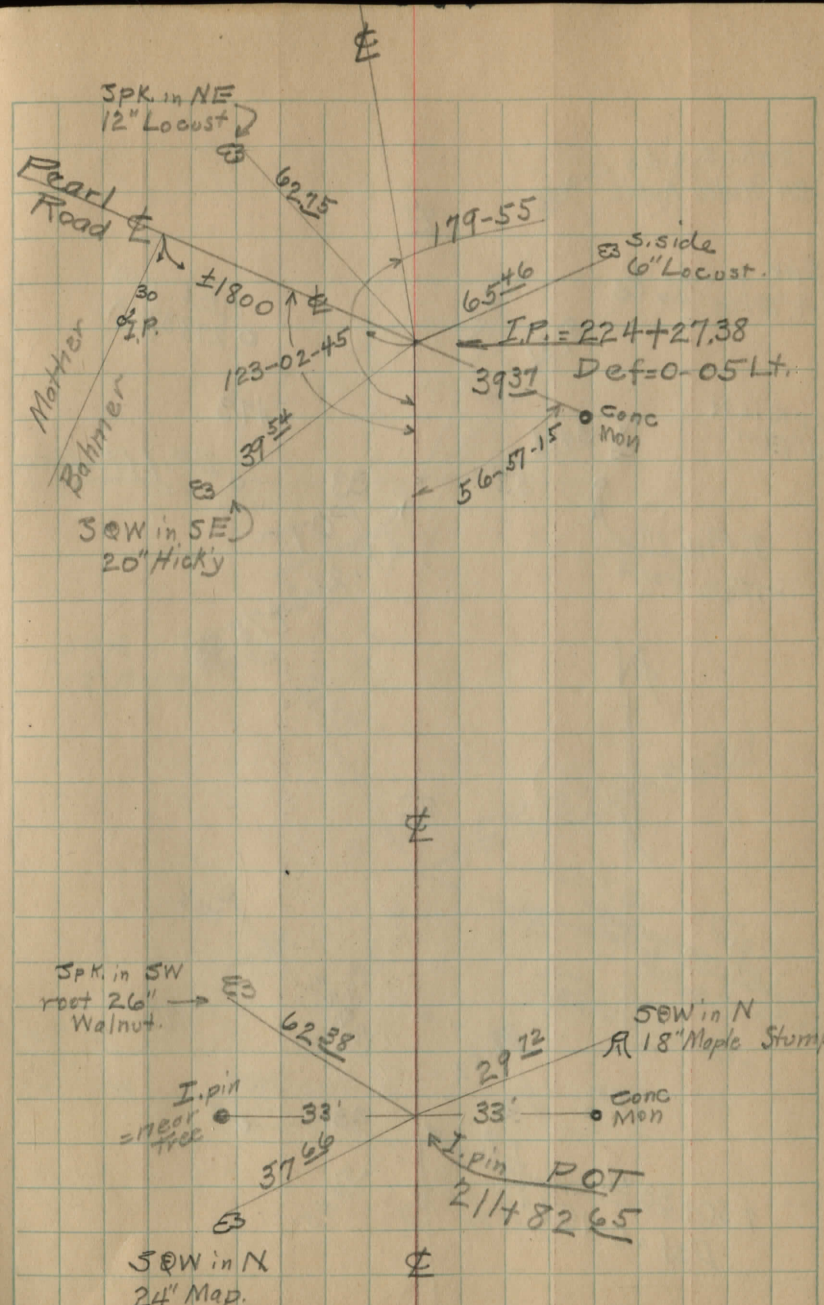
State Route #608
per State Highway Eng'rs Mar. 1949

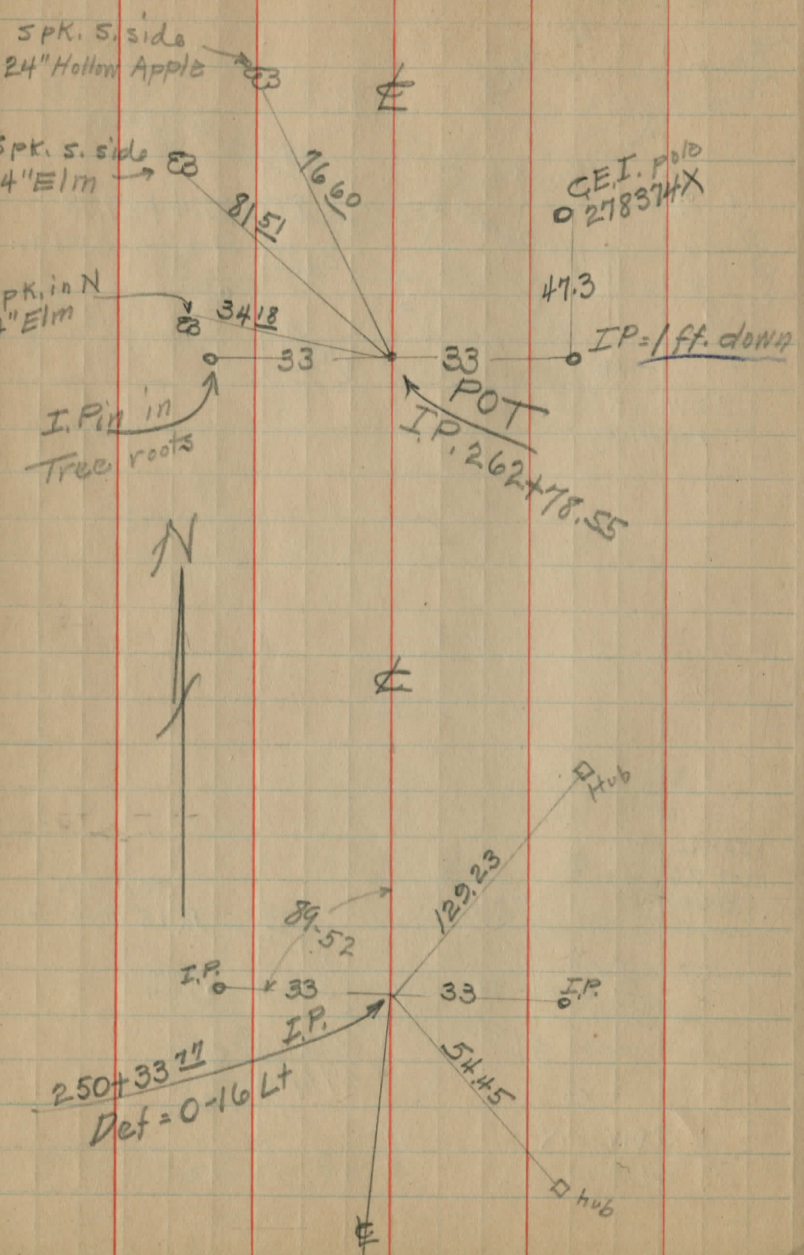


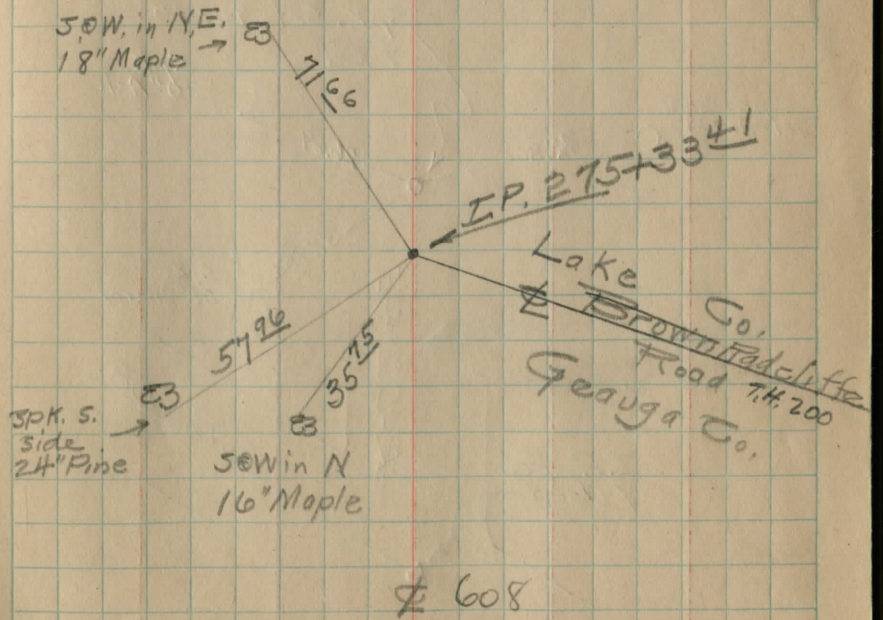



℄
S ⊗ W in NE
20" Maple
45 47
S ⊗ W in NW
14" Maple
39 55
Conc Mon.
33
33'
I. Pin near Tree
I.P. fd.
48 30
P.O.T.
199+70.51
SpK. in SE
14" Maple


S ⊗ W in SE
24" Pine
45 86
36.38
S ⊗ W in S
20" Pine
33'
33'
I.P. =
1 ft down
I.P. fd.
I. Pin = 2 ft
from Pine
P.O.T.
172+10.96 ℄

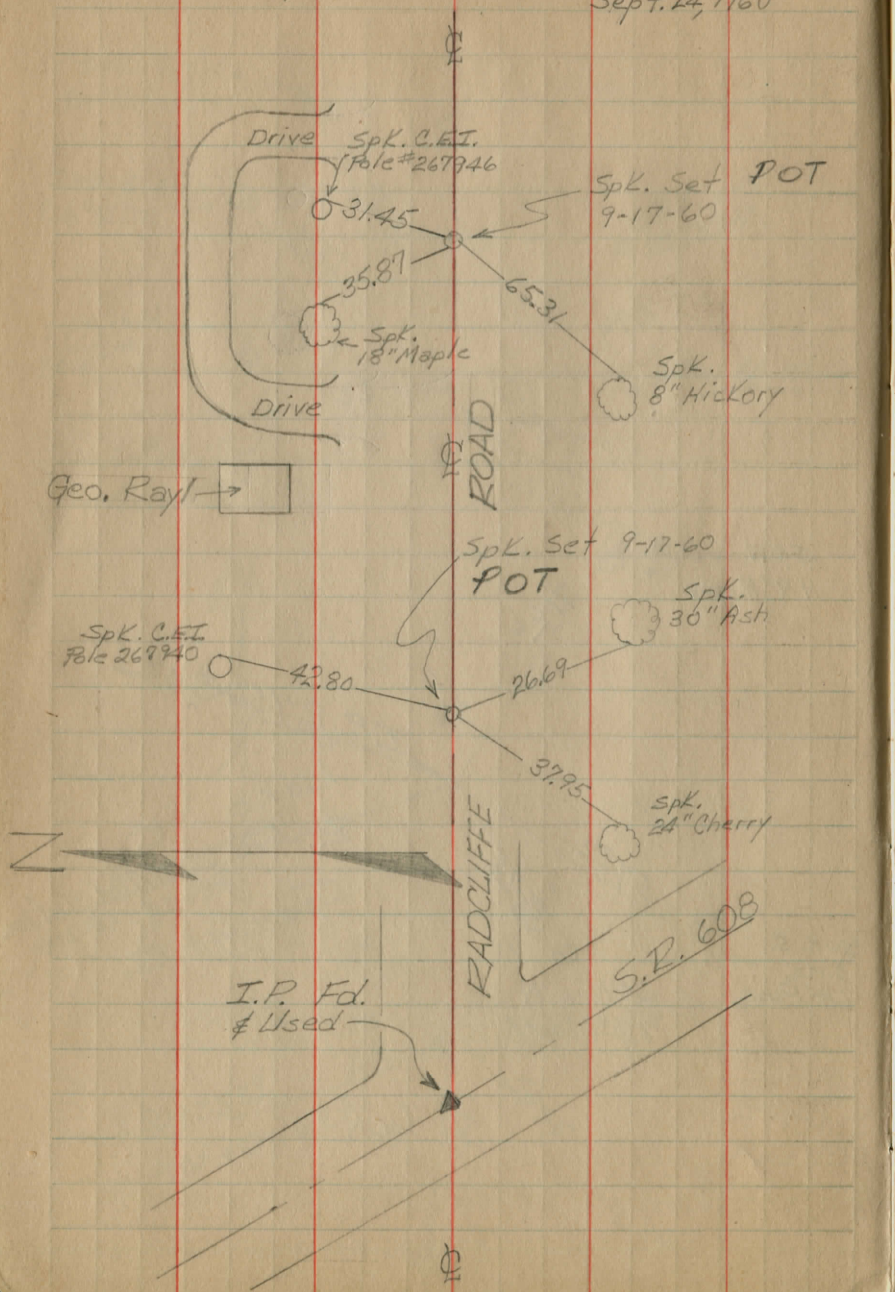

℄
SpK. in NE
12" Locust
62 75
Pearl Road ℄
±1800
179-55
S. side
6" Locust.
65 46
I.P. = 224+27.38
Def = 0-05 Lt.
30
I.P.
Mather
Bahmer
123-02-45
39 37
Conc Mon
37 54
56-57-15
S ⊗ W in SE
20" Hicky
SpK. in SW
root 26" Walnut.
62 38
S ⊗ W in N
18" Maple Stump
29 72
I. pin
= near tree
33'
33'
Conc Mon
I. pin POT
211+82.65
37 66
S ⊗ W in N
24" Map.


Spk. S. side
24" Hollow Apple
33
16.60
Spk. S. side
24" Elm
33
8.51
C.E.I. Pole
27837 HX
47.3
Spk. in N
14" Elm
33
34.18
33
33
POT
IP = 1 ft. down
I. Pin in
Tree roots
IP. 262+78.55
N
Hub
129.23
89-52
I.P.
33
33
I.P.
I.P.
250+33.77
Def = 0-16 Lt
54.45
Hub

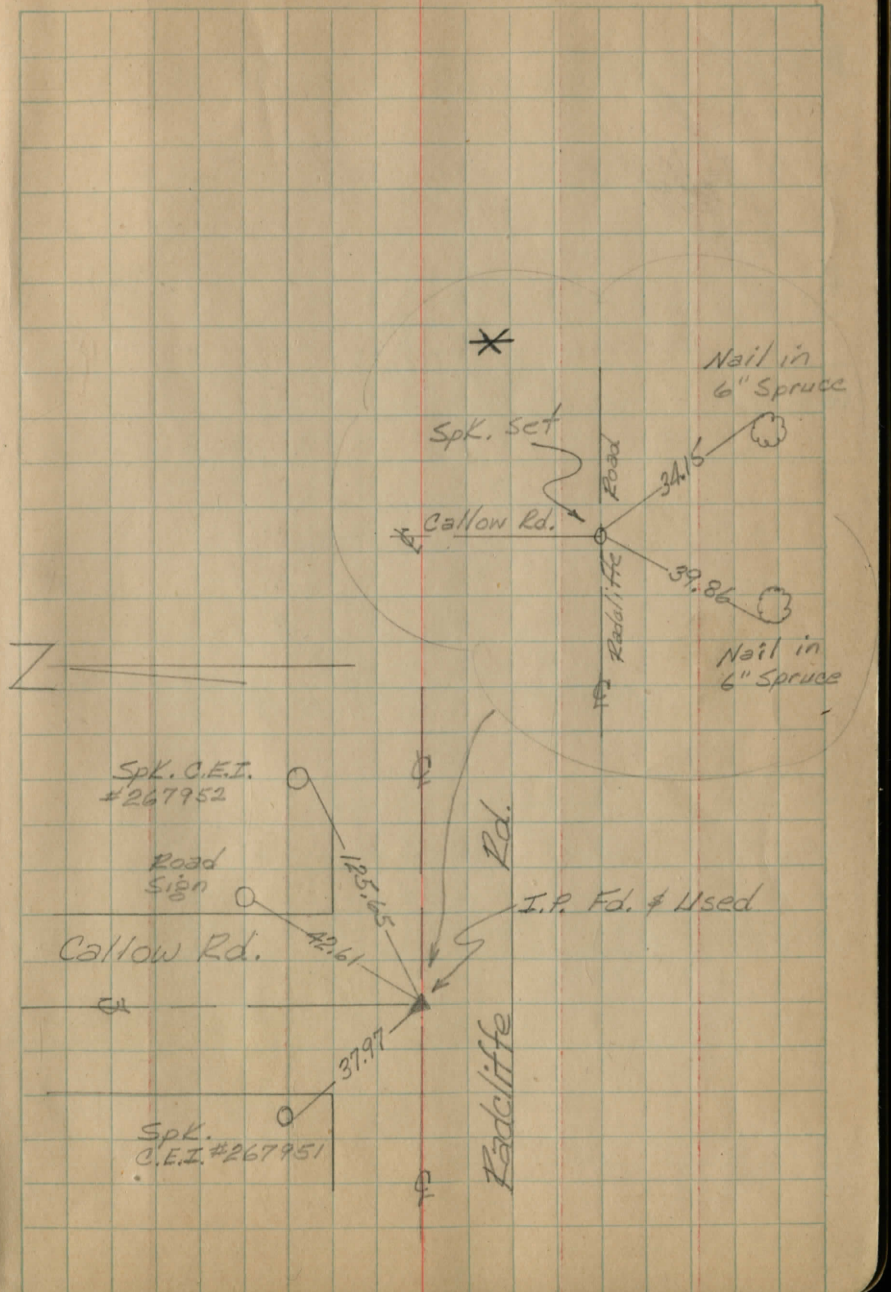

S.&W. in I.Y.E.
18" Maple
33
11.66
IP. 275+33.41
Lake
℄ Brownsville Road
Co.
T.H. 200
Geauga Co.
57.96
35.75
Spk. S.
side
24" Pine
33
S&W in N
16" Maple
℄ 608

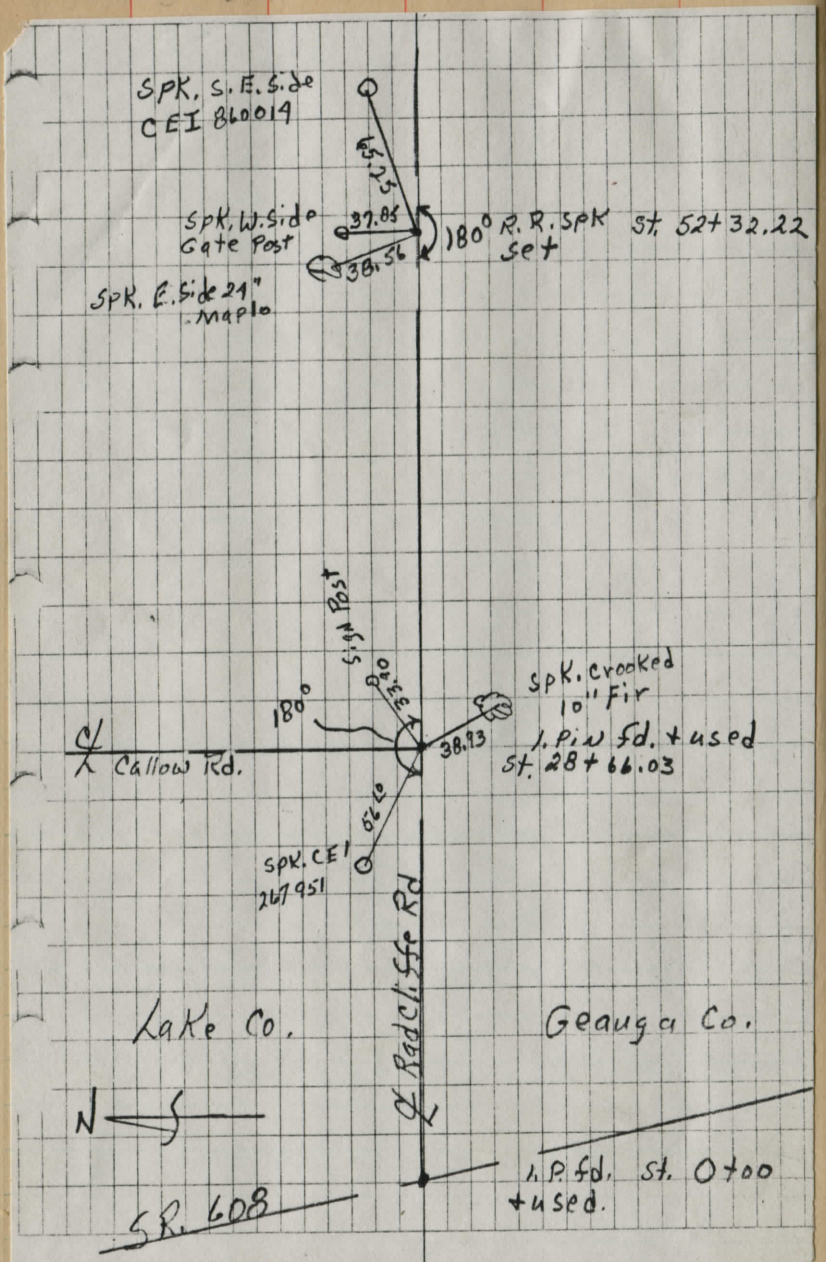
from Notes of
Lake Co. Eng. 10/17/60 *

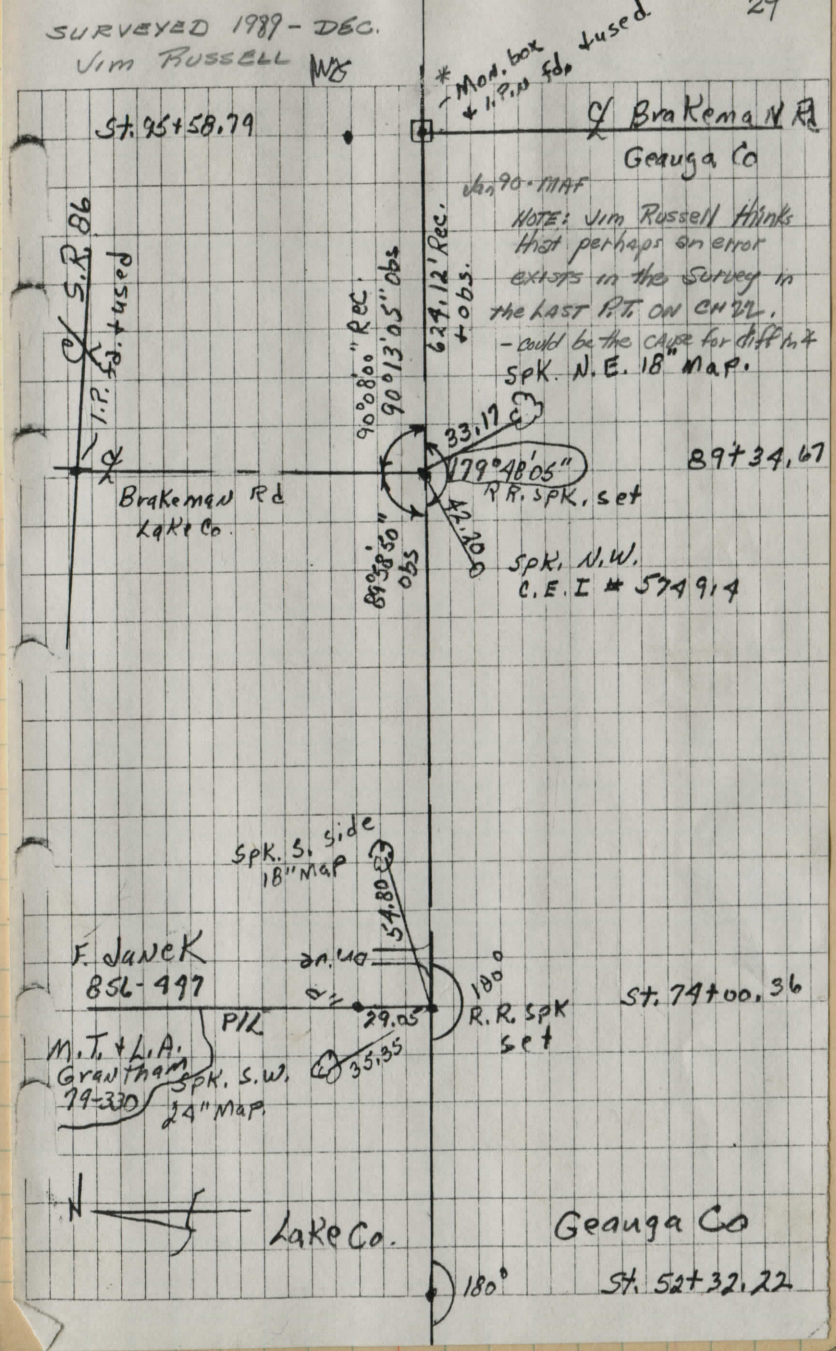
Radcliffe Rd. from
℄ of 608 to ℄ Callow
Rd.
Sept. 24, 1960



28



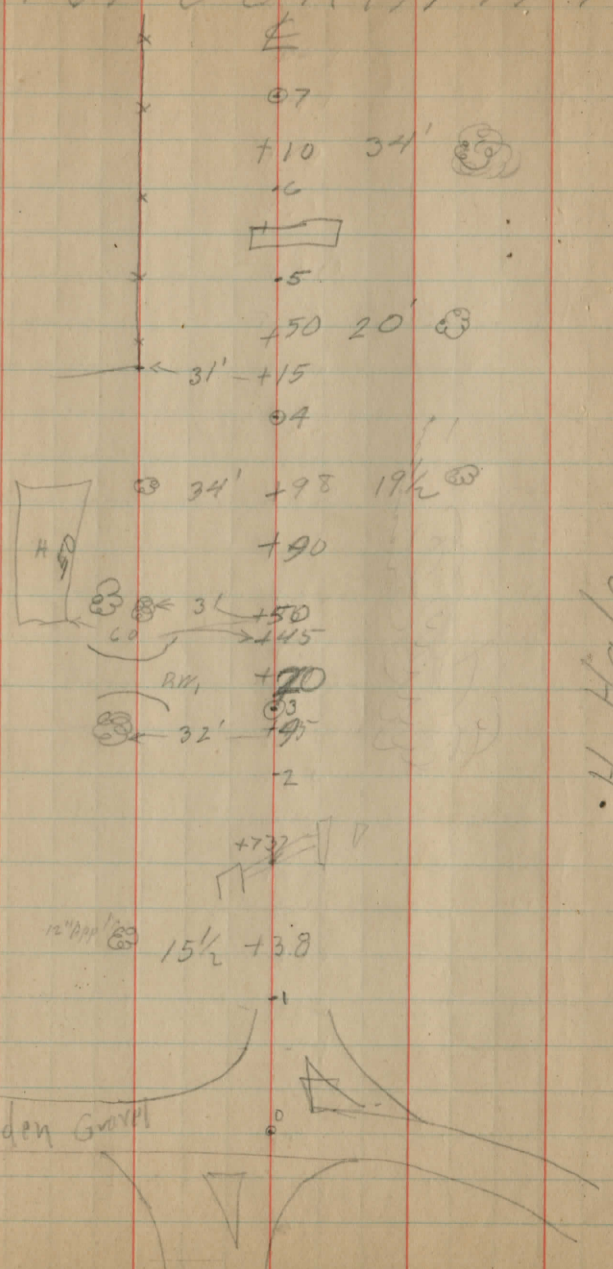

SPK. S.E.Side
CEI 860019
SPK. W.Side
Gate Post
37.85
38.56
180° R.R. SPK
Set
St. 52+32.22
SPK. E.Side 21"
Maple
SPK. Crooked
10" Fir
I.P.in fd. + used
St. 28+66.03
38.13
180°
Sign Post
SPK. CEI
267951
Callow Rd.
Lake Co.
Geauga Co.
℄ Radcliffe Rd
N
SR. 608
I.P. fd. St. 0+00
+ used.

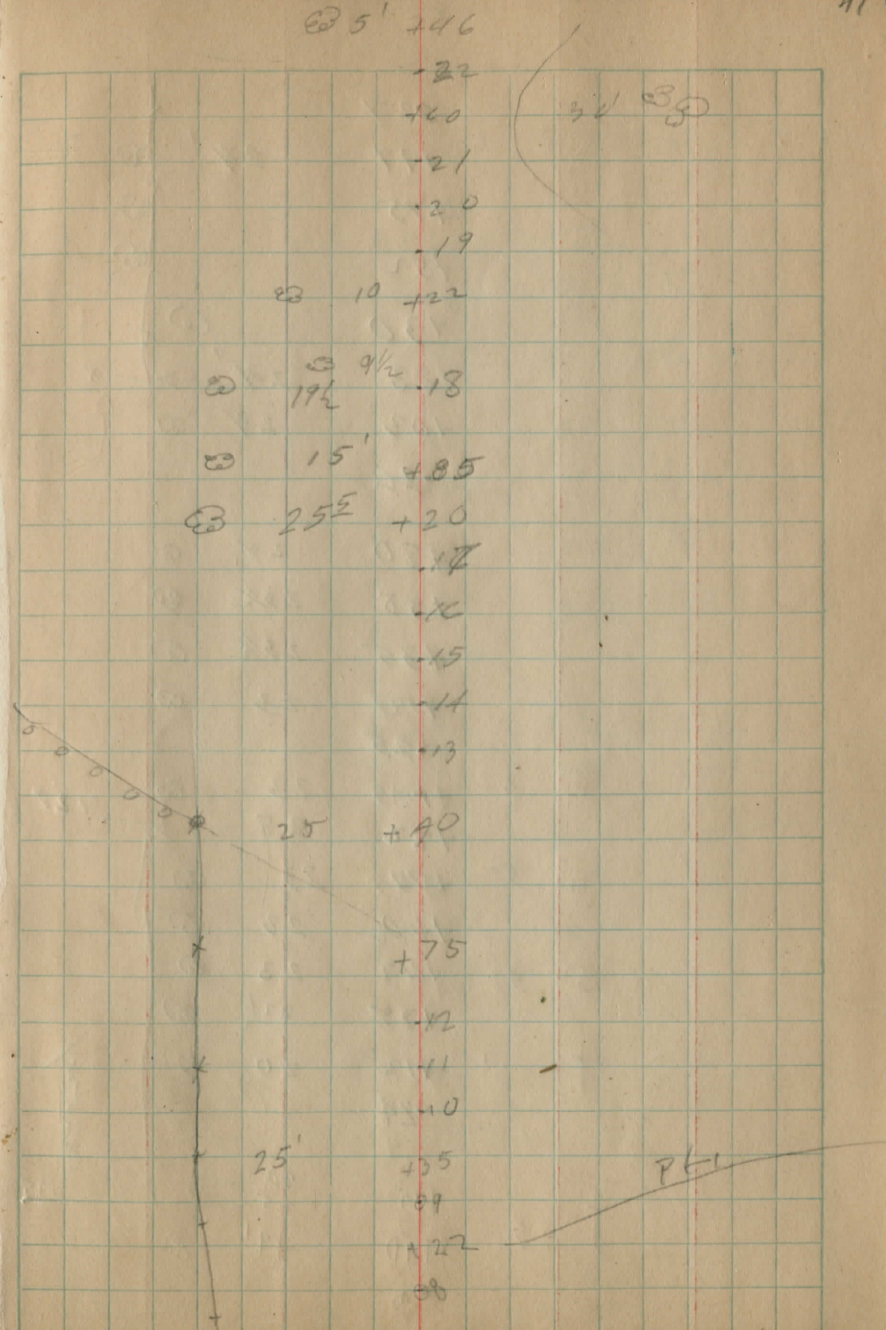

SURVEYED 1989 - DEC.
Jim RUSSELL
29
* Mon. box
+ I.P.in fd.
+ used
St. 95+58.79
℄ Brakeman N Rd
Geauga Co
Jan. 90 - MAP
NOTE: Jim Russell thinks
that perhaps an error
exists in the survey in
the LAST P.T. ON CH 22.
- could be the cause for diff in ℄
SPK. N.E. 18" Map.
℄ S.R. 86
I.P. fd. + used
90°08'00" Rec.
90°13'05" obs.
624.12' Rec.
+ obs.
33.17
179°48'05"
RR. SPK. set
89+34.67
Brakeman Rd
Lake Co.
89°58'30"
obs
40.24
SPK. N.W.
C.E.I # 574914
SPK. S. side
18" Map
54.80
F. JANEK
856-497
an. ua
℄
29.05
180°
R.R. SPK
set
St. 74+00.36
P.I.
M.T. + L.A.
Grantham
79-330
SPK. S.W.
24" Map
35.35
N
Lake Co.
Geauga Co
180°
St. 52+32.22

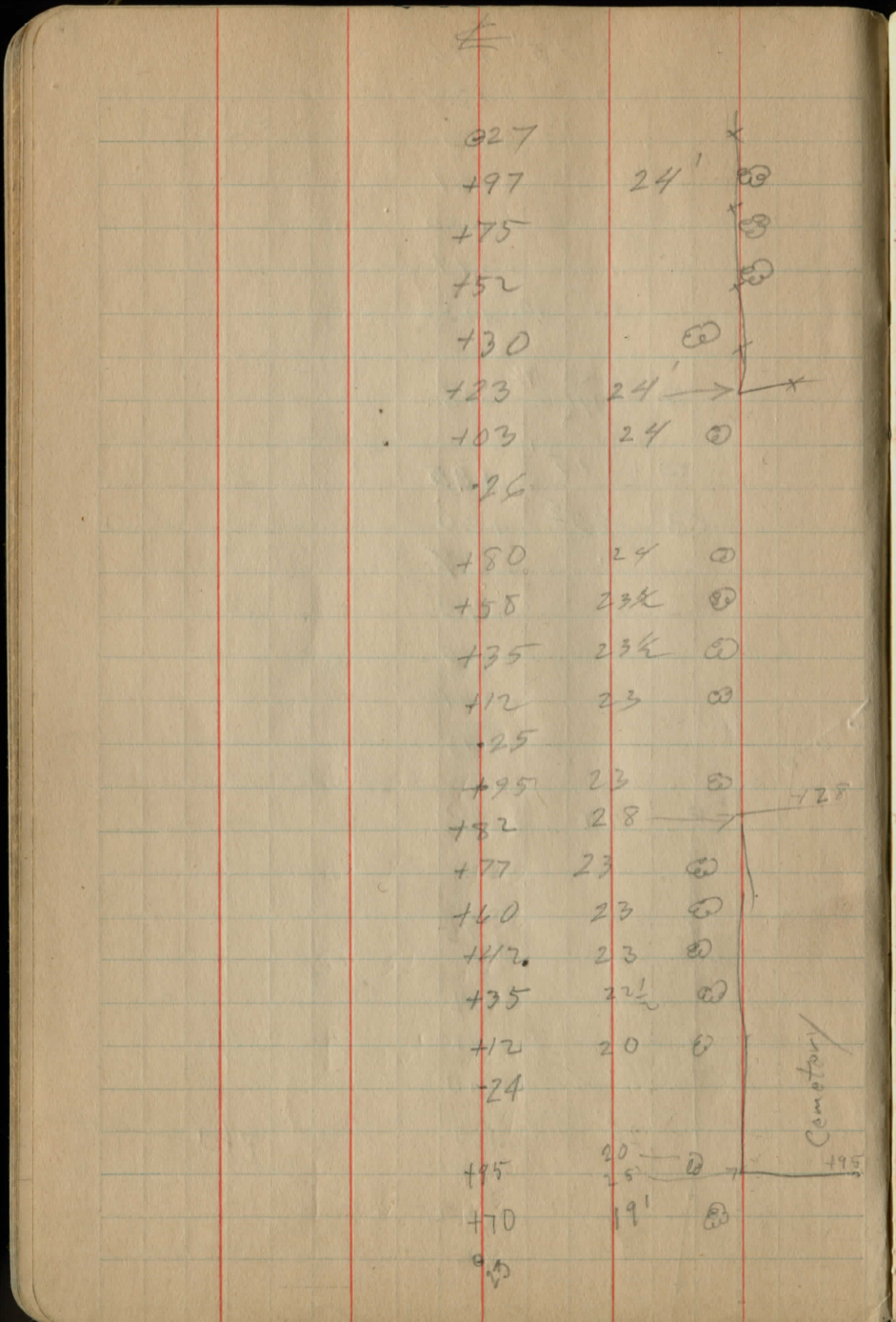
11-10-24
Fog!!!!!!!!!

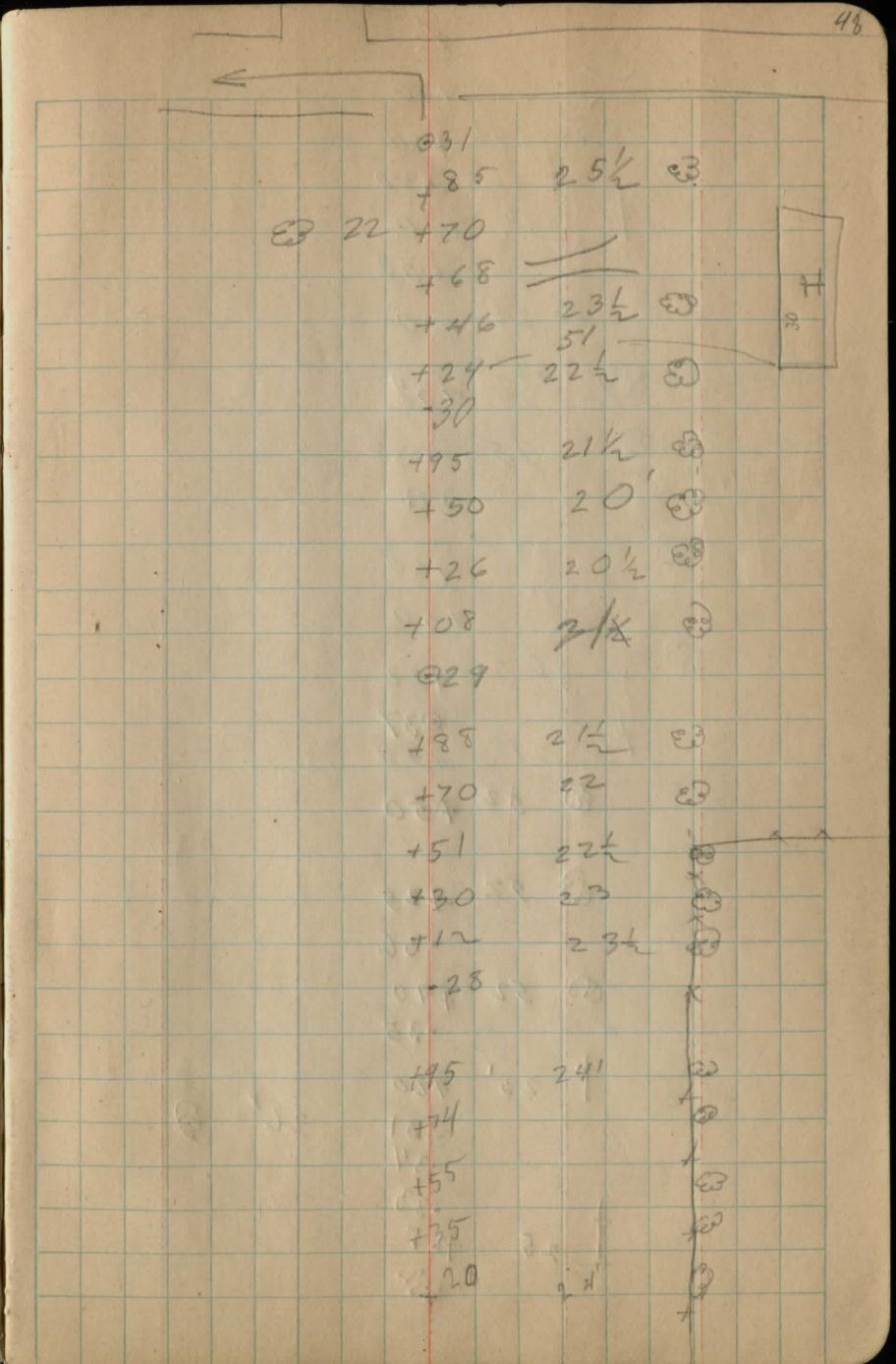
TOPOGRAPHY

Henry
Grau
Douglass






+27
+97
24'
+75
+52
+30
+23
24'
+03
24
-26
+80
24
+55
23½
+35
23½
+12
23
-25
+95
23
+82
28
+28
+77
23
+60
23
+12
23
+35
22½
+12
20
-24
Cemetery
+95
20
15
0
+95
+70
19'


+31
+85
25½
+70
22
+68
+46
23½
51
+24
22½
-30
+95
21½
+50
20'
+26
20½
+08
21½
+29
+88
21½
+70
22
+51
22½
+30
23
+12
23½
-28
+95
24'
+74
+55
+35
20
24'
H
28

+50
27' +10
040
23½ +10
039
24' +70
36' +39
35' 038
H1
75' +85
35' +60
+50
36 +22
037
21½ +90
52 +50
52 +25
-36
52 +90
-35
23' +60
+01
-34
-33
25 +25
032
26'

039
28½ +65
058
19' 057
056
20' +80
054
053
21½ +55
052
051
22½ +33
050
049
22½ 048
047
046
24' +70
045
044
25' +60
043
042
+75
60'
H
37 +55
34½ 041
H
75'
+80
DW

℄

Bingham

⊙65

21½ +25

⊙64

⊙63

27' +40

29'

Bon Holt

H

29' ⊙62

+90

19½ +45

+36

+30 32'

+15 32

⊙61

+65 32

28 ⊙60

+70 60' H

+55

+35 23½

18½ +20

⊙72

29' P.L.

+93

21' +05

⊙71

⊙70

⊙69

23½ +75

⊙68

⊙67

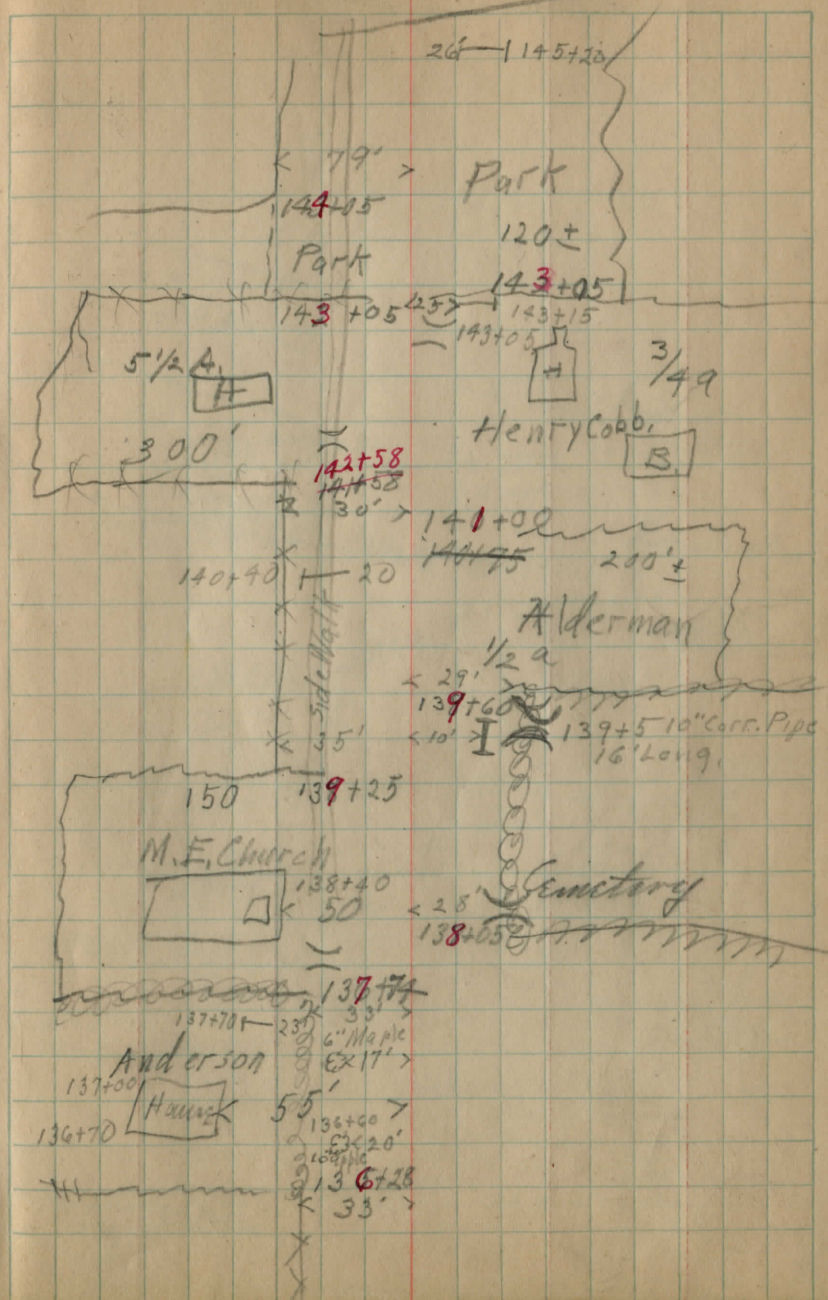
24½ +50

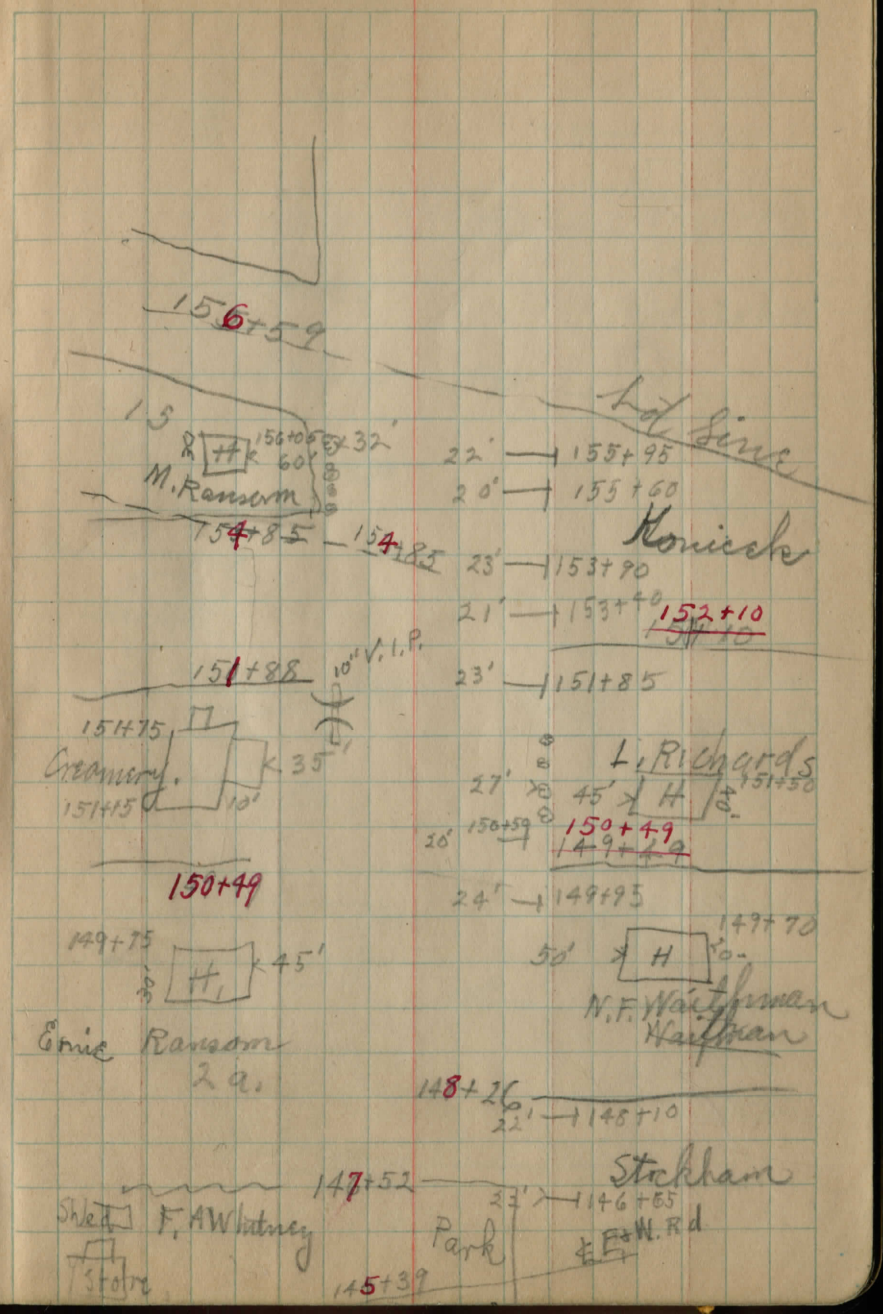
⊙66

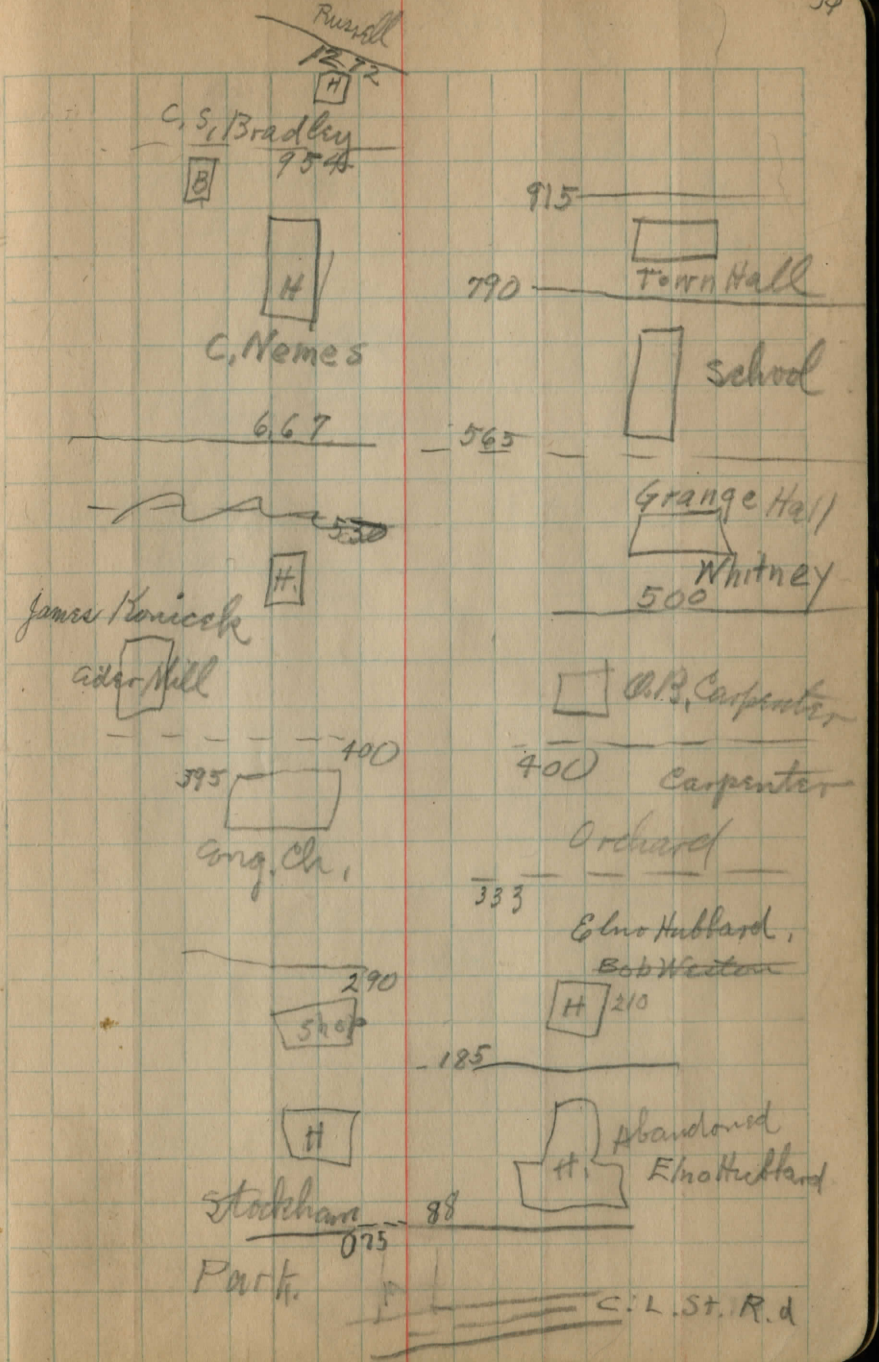
Bingham

9½ 20½ +92

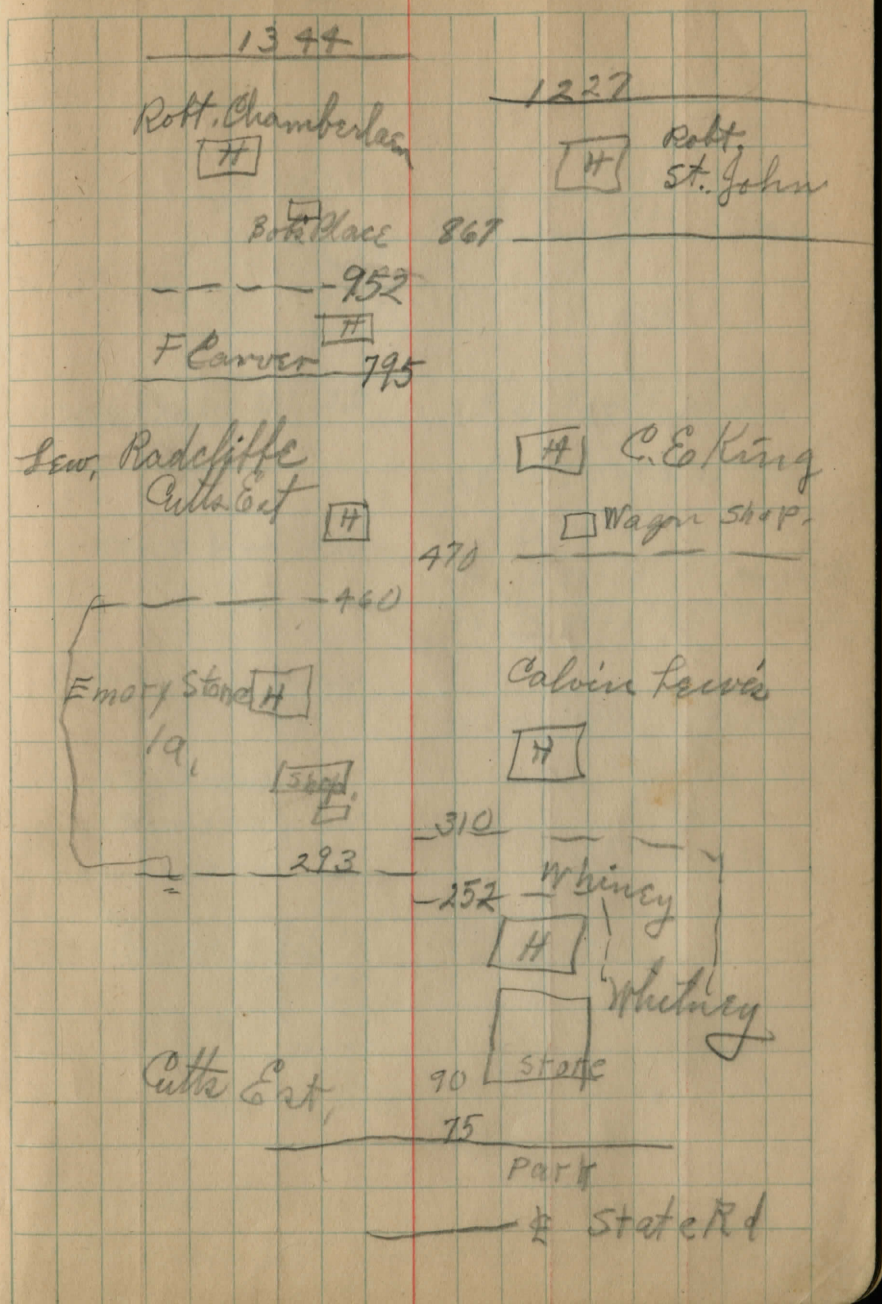
Dec. 22, 1924 Cold - Clear
Marks, Graw, Sprague.

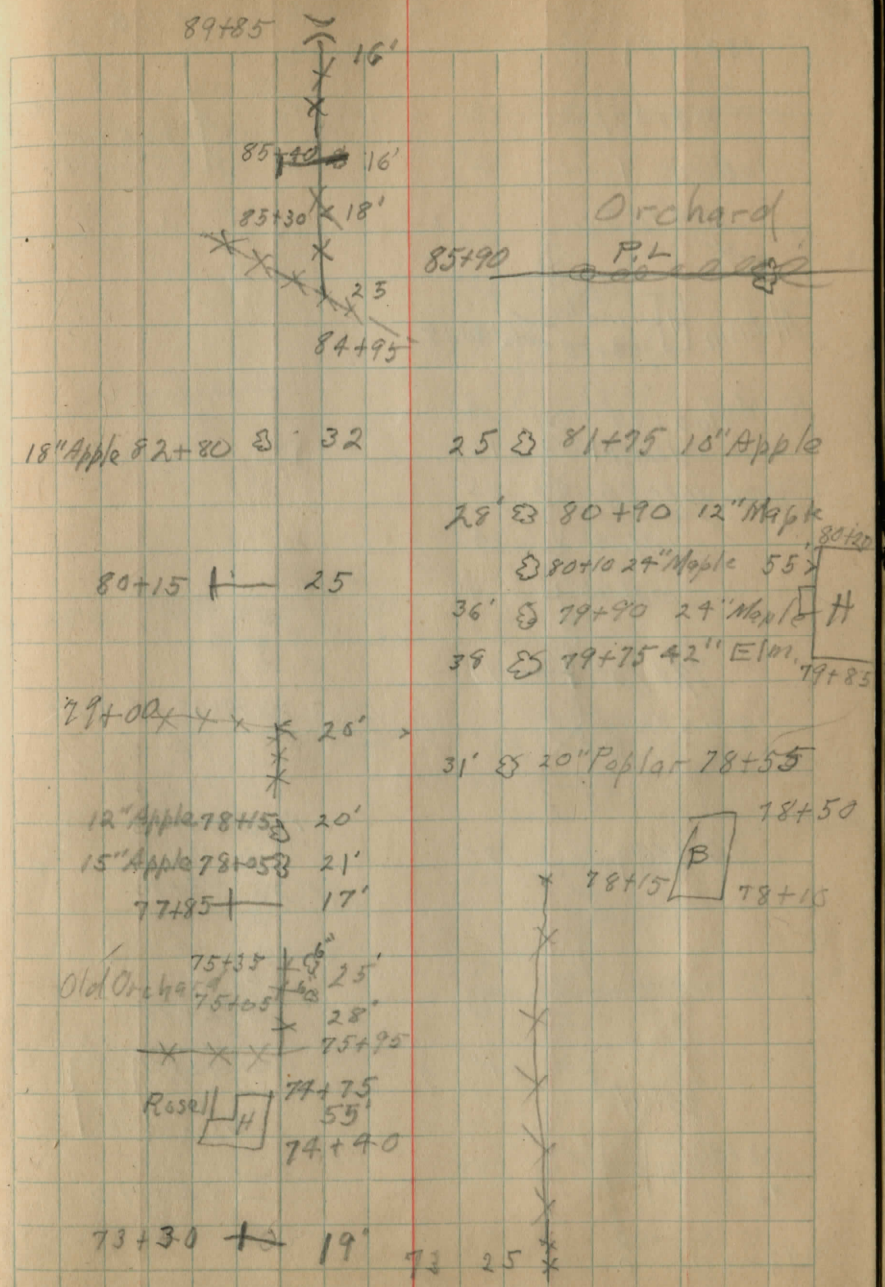


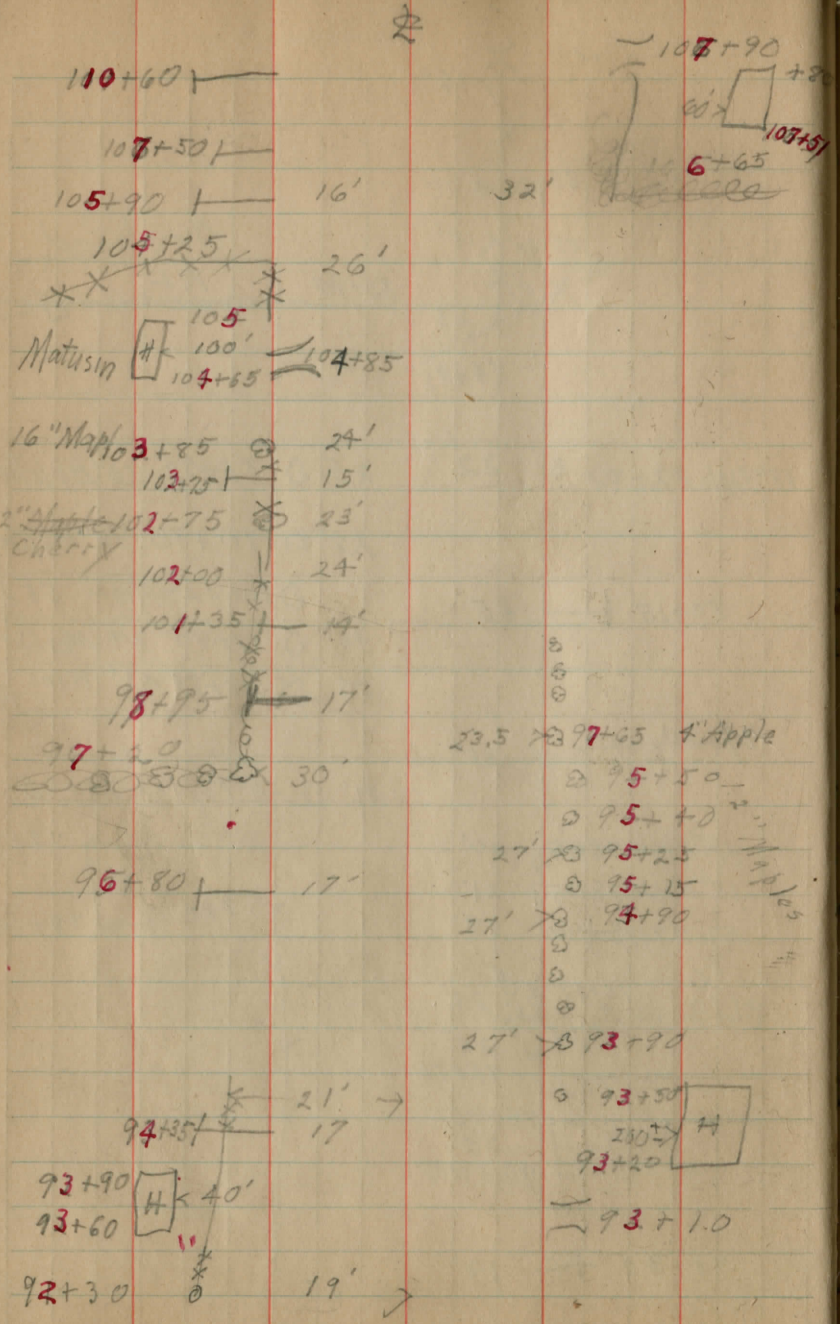

156+59
Lot Line
155
156+06
60'
32'
M. Ransom
154+85
154+85
22'
155+95
20'
155+60
Konicke
23'
153+90
21'
153+10
152+10
151+88
10" V.I.P.
23'
151+85
151+75
Creamery
35'
151+15
10'
L. Richards
151+50
27'
45'
H
150+59
150+49
150+49
20'
24'
149+95
149+75
H
45'
149+70
50'
H
N.F. Waitsman
Waitsman
Ernie Ransom
2 a.
148+26
22'
145+10
Stickham
147+52
Shed
F. A Whitney
23'
146+65
Park
E. W. Rd
Stone
145+39

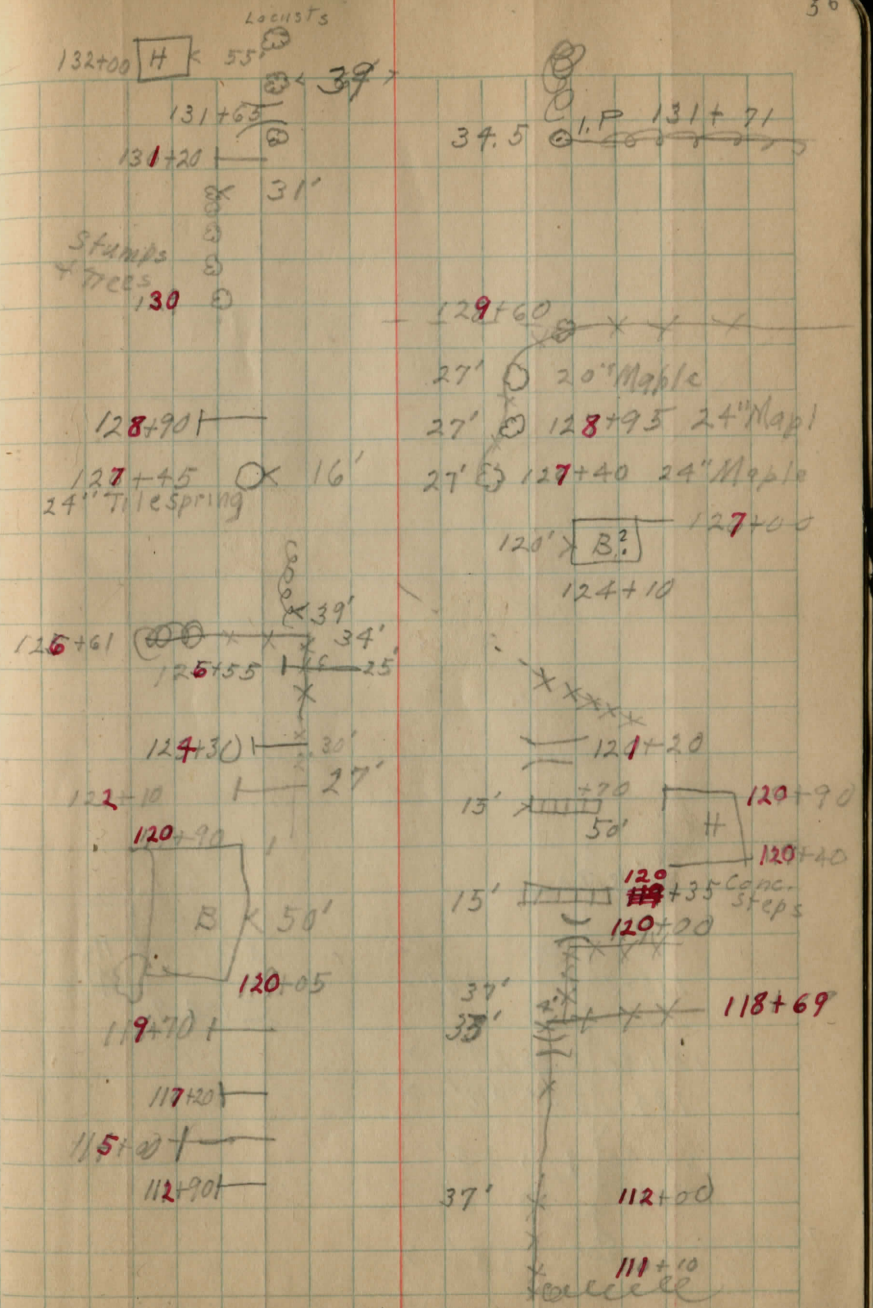

Russell
1272
H
C. S. Bradley
954
B
H
C. Nemes
667
530
H
James Konicek
Cider Mill
400
395
Cong. Ch.
290
Shop
H
Stockham
075
Park
915
Town Hall
790
School
565
Grange Hall
Whitney
500
O. B. Carpenter
400
Carpenter
Orchard
333
Elno Hubbard
Bob Weston
H
210
185
H.
Abandoned
Elno Hubbard
88
C. L. St. R. d

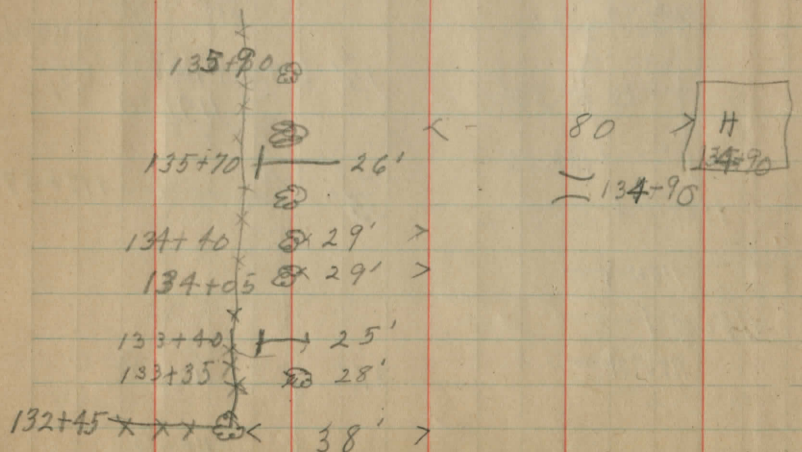
Going West

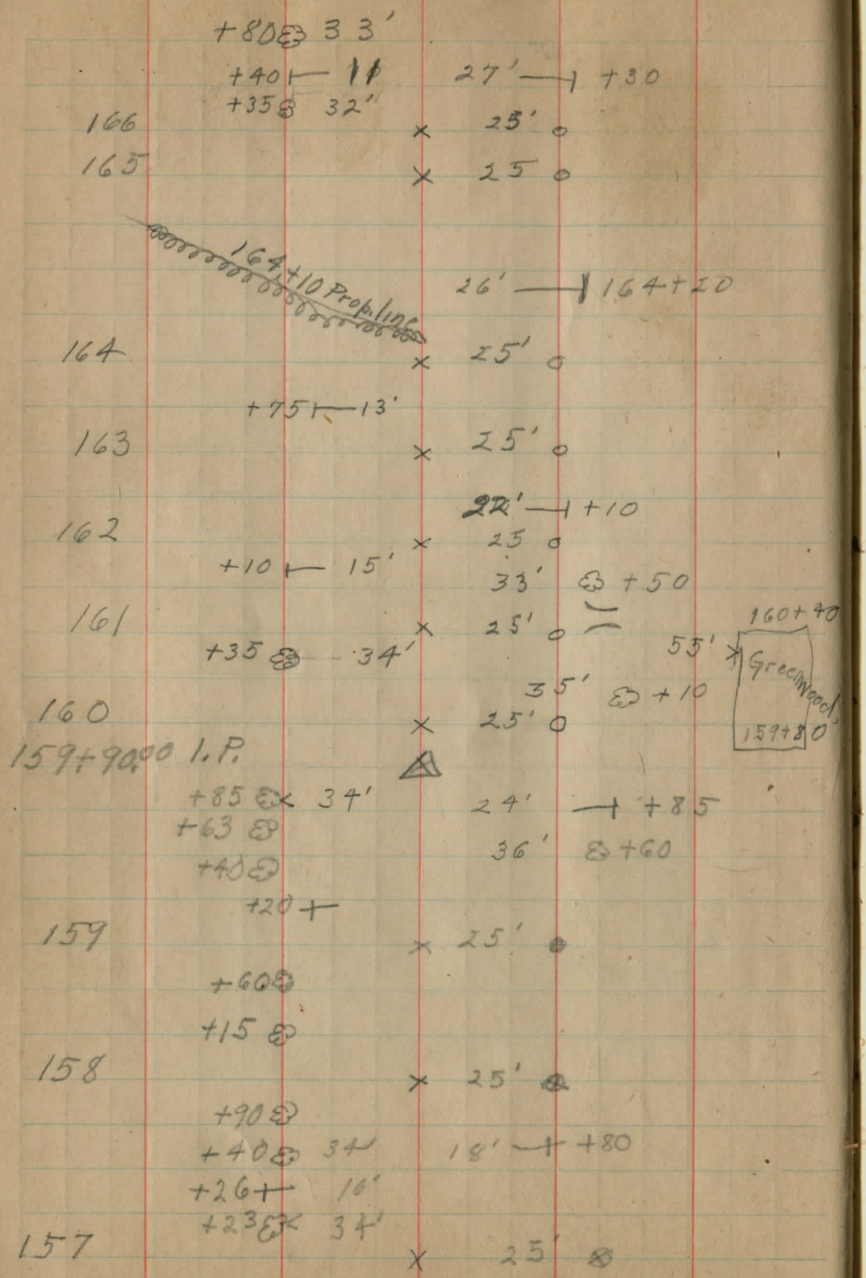

1344
Robt. Chamberlain
H
1222
H
Robt. St. John
Robt Race
867
952
H
F Carver
795
Lew. Radcliffe
Cutts Est
H
H
C. E. King
Wagon Shop
470
460
Emory Stone
H
Calvin Lewis
H
Shop
310
293
252
Whitney
H
Whitney
State
Cutts Est
90
75
Park
& State Rd

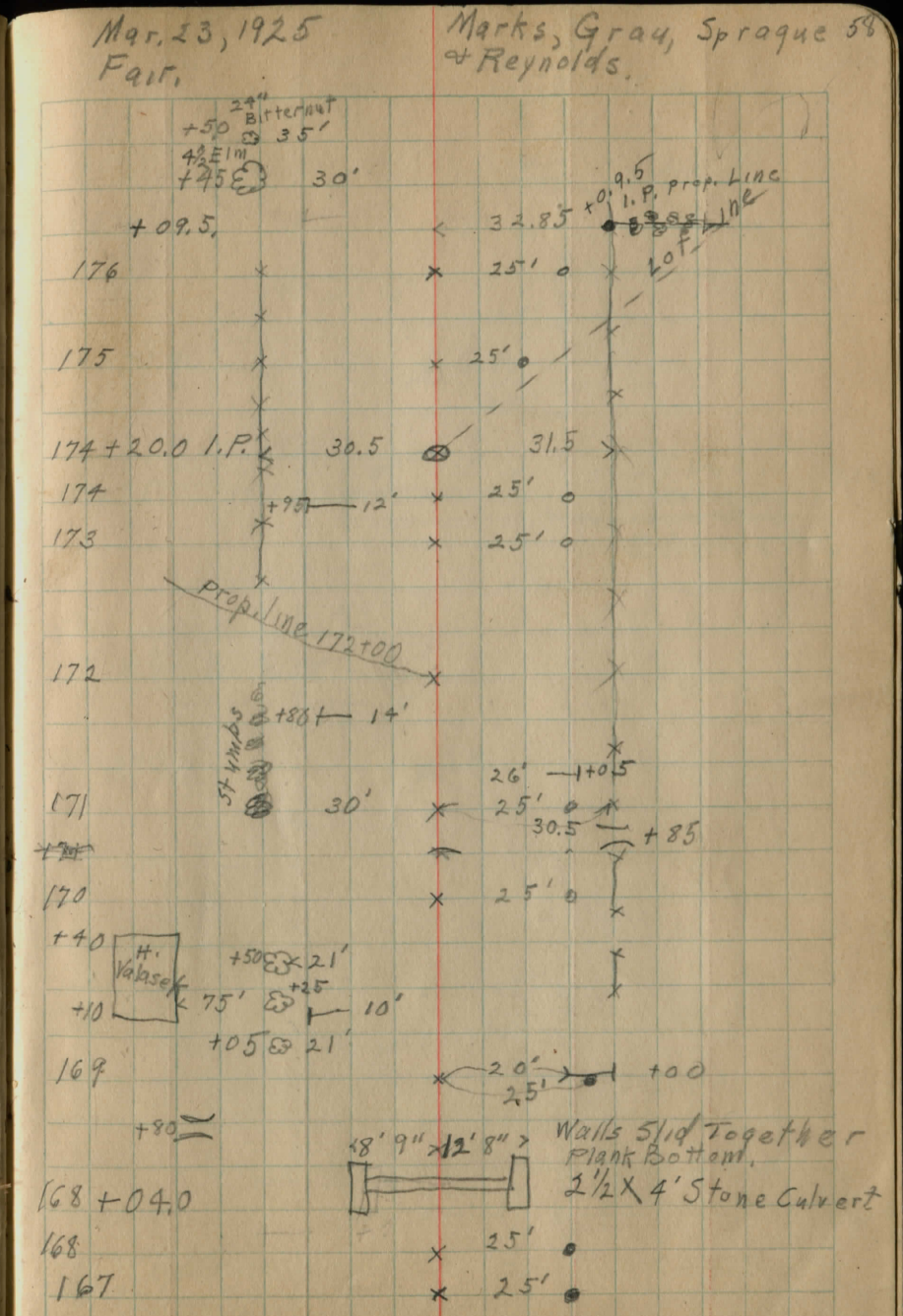

89+85
16'
85+40
16'
85+30
18'
23
84+95
Orchard
85+90
P.L
18" Apple 82+80
32
80+15
25
25
81+95 18" Apple
28'
80+90 12" Maple
80+10 24" Maple 55'
80+20
36'
79+90 24" Maple
H
36
79+75 42" Elm.
79+85
79+00
26'
12" Apple 78+55
20'
15" Apple 78+05
21'
77+85
17'
31'
20" Poplar 78+55
78+50
B
78+15
78+15
75+35
6"
25'
Old Orchard
75+05
28'
75+95
Rosell
H
77+75
55'
74+40
73+30
19'
73
25

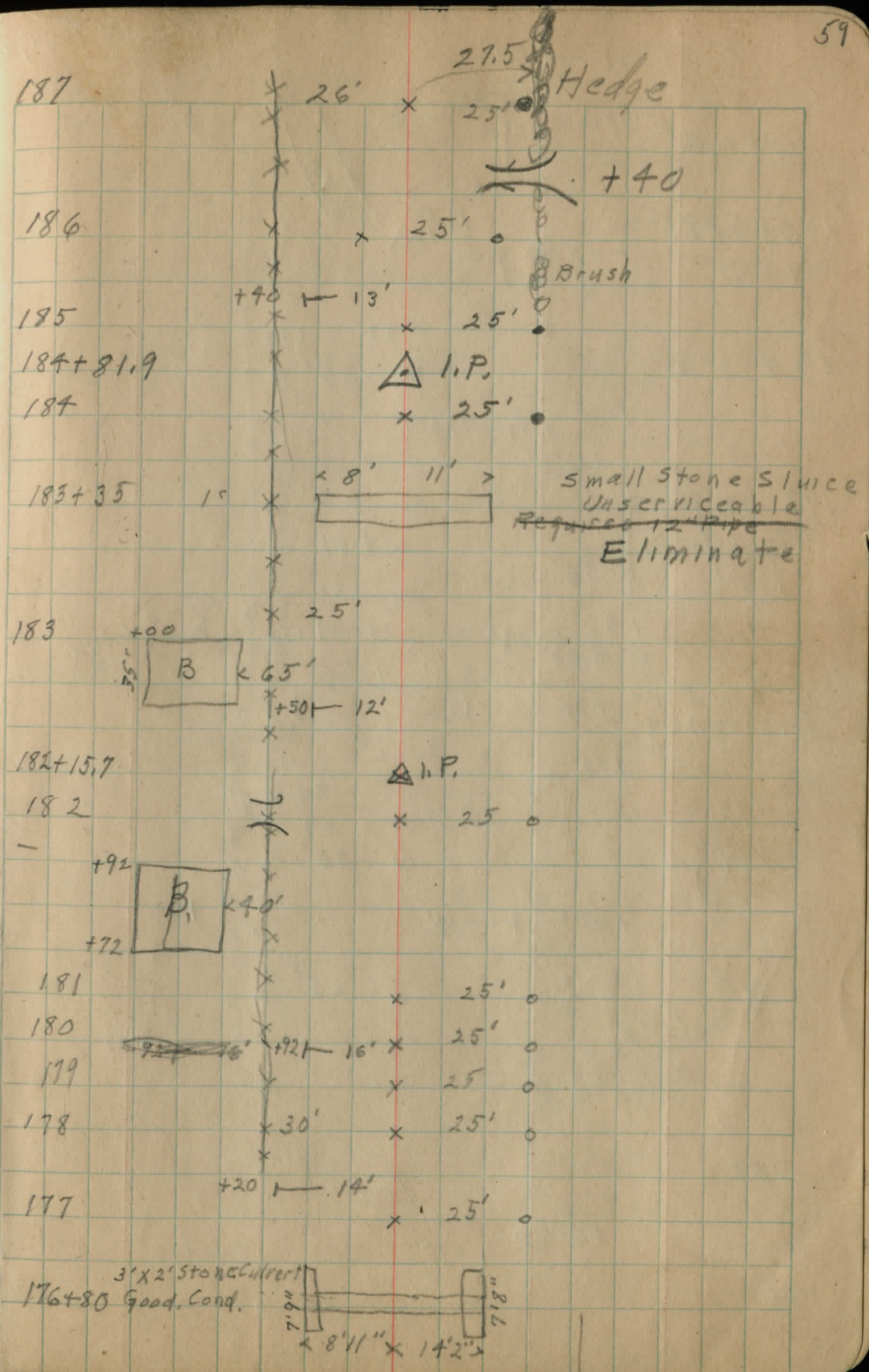

110+60
107+50
105+90
16'
105+25
26'
105
Matusin
H
100'
104+65
104+85
16" Maple
103+85
24'
103+25
15'
12" Apple
102+75
23'
Cherry
102+00
24'
101+35
14'
98+95
17'
97+20
30'
96+80
17'
94+35
21'
17
93+90
93+60
H
40'
92+30
19'
107+90
+8
60'
107+51
6+65
32'
23.5
97+65
4" Apple
95+50
95+40
27'
95+25
95+15
94+90
27'
93+90
93+50
H
93+20
93+10


Locusts
132+00
H
55'
39'
131+65
131+20
31'
Stumps
+ Trees
130
128+90
127+45
16'
24" Tile Spring
39'
126+61
34'
126+55
25'
124+30
30'
122+10
27'
120+90
B
50'
120+05
119+70
117+20
115+00
112+90
34.5
1.P
131+71
129+60
27'
20" Maple
27'
128+95
24" Maple
27'
127+40
24" Maple
127+00
120'
B.
124+10
121+20
15'
+70
50'
H
120+90
120+40
15'
120
+35
Conc.
Steps
120+20
37'
35'
118+69
37'
112+00
111+10


135+80
135+70
26'
134+40
29'
134+05
29'
133+40
25'
133+35
28'
132+45
38'
80
H
134-90
134-90


+80 33'
+40 11
27' +30
+35 32"
166
165
25'
25'
164+10 Prob. line
26' 164+20
164
25'
+75 13'
163
25'
22' +10
162
25'
+10 15'
33' +50
161
25'
+35 34'
55'
160+40
Green Wood
159+80
35' +10
160
25'
159+90.00 I.P.
+85 34'
24' +85
+63
36' +60
+40
+20
159
25'
+60
+15
158
25'
+90
+40 34'
18' +80
+26 16'
+23 34'
157
25'


Mar. 23, 1925
Fair.
Marks, Grau, Sprague & Reynolds.
56
+50 24" Bitternut 35'
4½ Elm
+45 30'
+09.5
32.85 +09.5 I.P. prop. Line
176
25'
175
25'
174+20.0 I.P.
30.5
31.5
174
+95 12'
25'
173
25'
Prop. line 172+00
172
+80 14'
St. Walks
26' +105
171
30'
25'
30.5 +85
170
25'
+40
H. Valasek
+50 21'
+10
75' +25 10'
+05 21'
169
20'
25'
+00
+80
168+04.0
18' 9" 12' 8"
Walls Slid Together
Plank Bottom.
2½ X 4' Stone Culvert
168
25'
167
25'


187
27.5
Hedge
26'
25'
+40
186
25'
Brush
+40
13'
185
25'
184+81.9
I.P.
184
25'
183+35
15'
8'
11'
Small Stone Sluice
Unserviceable
Replace 12" Pipe
Eliminate
183
25'
+00
B
65'
+50
12'
182+15.7
I.P.
182
25
+92
B
40'
+72
181
25'
180
+92
16'
25'
179
25
178
30'
25'
+20
14'
177
25'
176+80
3'X2' Stone Culvert
Good. Cond.
7.9"
7.8"
8'11"
14'2"

+80 ⊢ 21'

Water Trough +85

+68

18" Skew. 16.2' 3.5/28 18"

3'X ? Conc. 10' O.K.

195+66

14'4" 10'

195+57.95

I.P. 14' 27'

+05 30'

195 25'

23' ⊢ +60

194 25'

+35 ⊢ 14'

+15

193 193+00 25'

Fred Carver 56'

+67 +81

25'

Prop. Line

+58 12" Maple 23' 24' ⊢ +53

6' 12'

10" Conc. Pipe Disjointed, +36

+02

192 29.5 26.5 25

191 25'

+70 ⊢ 14' +65

Hedge

190 25'

189+05 Hedge

189 25'

+60 +10 ⊢ 15' Hedge

188 25'

205 25'

30' +75 Twin Cherry +44

P.L.

65' H. Geo. Carver +18

204+65

39' +10

204 25'

203+82.7 17.3 32' I.P. 39.5 +82

+60

26 ⊢ +34

+12 ⊢ 18' 36' +23

203 25'

202 25'

+40 25' ⊢ +02

201 25'

+80 ⊢ 18'

200+18 Unserviceable 1'X1' Stone Sluice 16' 5'6" 4" Farm Tile

200 11'9"

199 25'

26' ⊢ +95

+20 ⊢ 21'

198

Hedge

197 25'

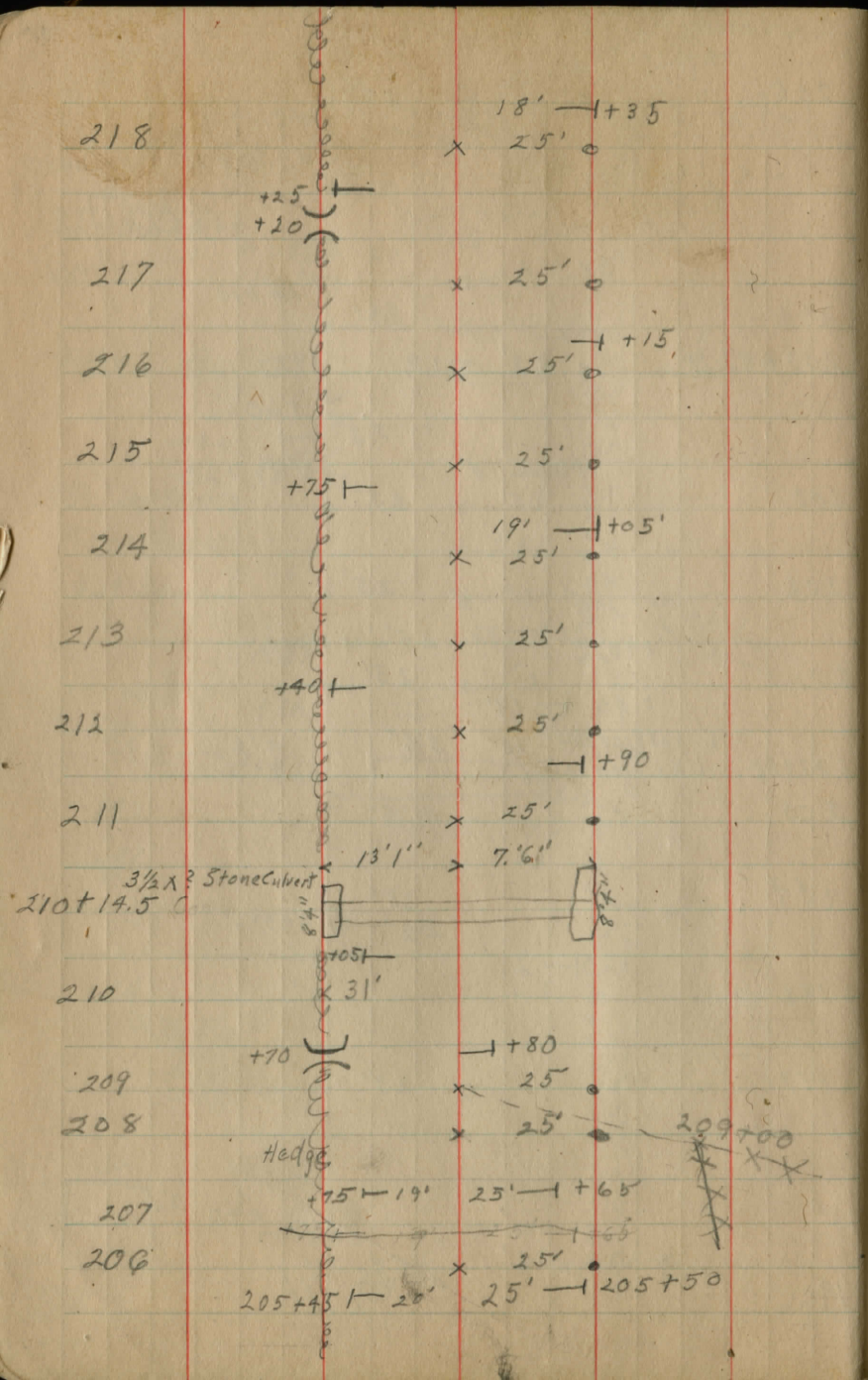
25' ⊢ +80

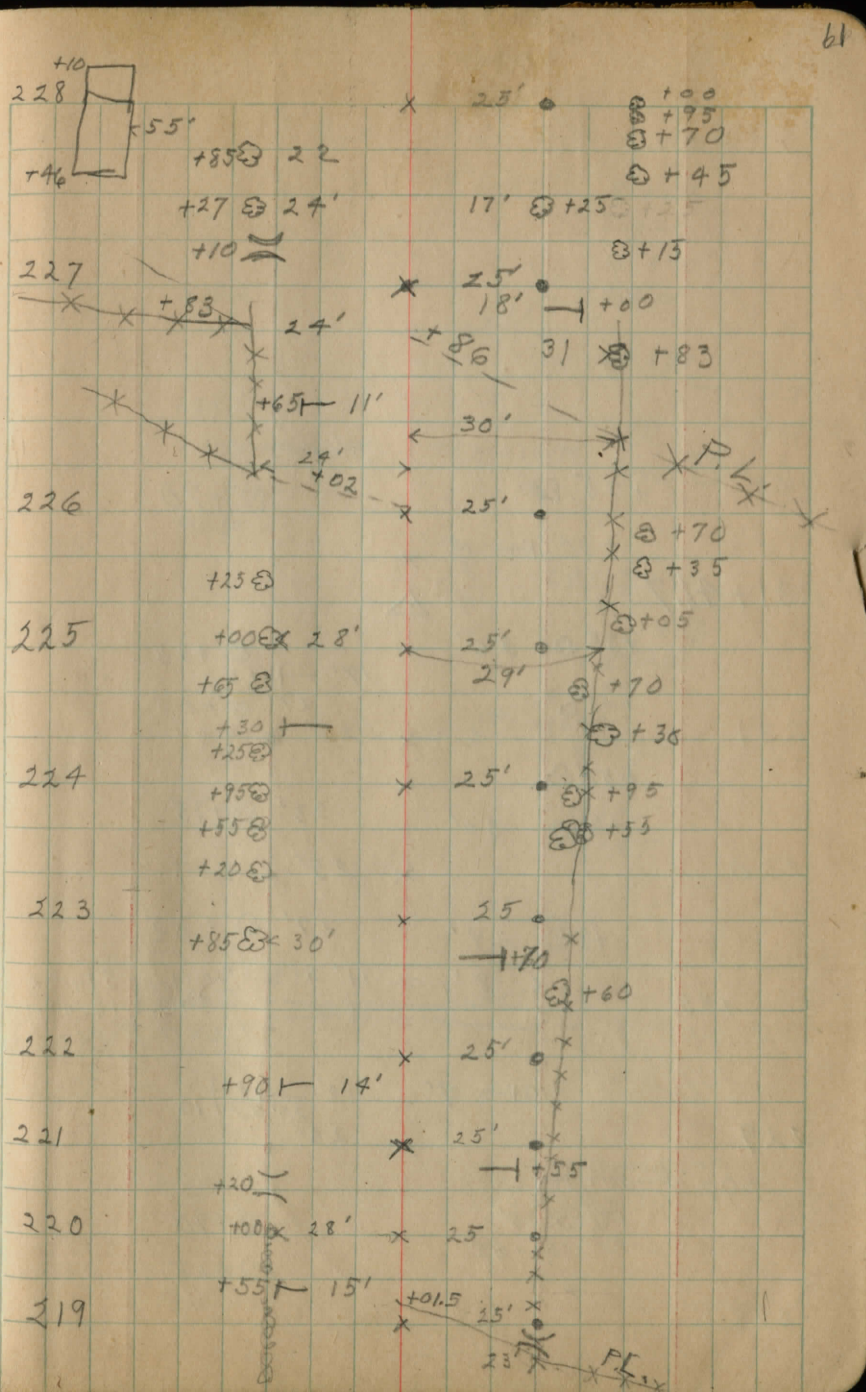
+50

43' +40 80' John Carver +48 +24

+30 36'

196 34' +15 25'

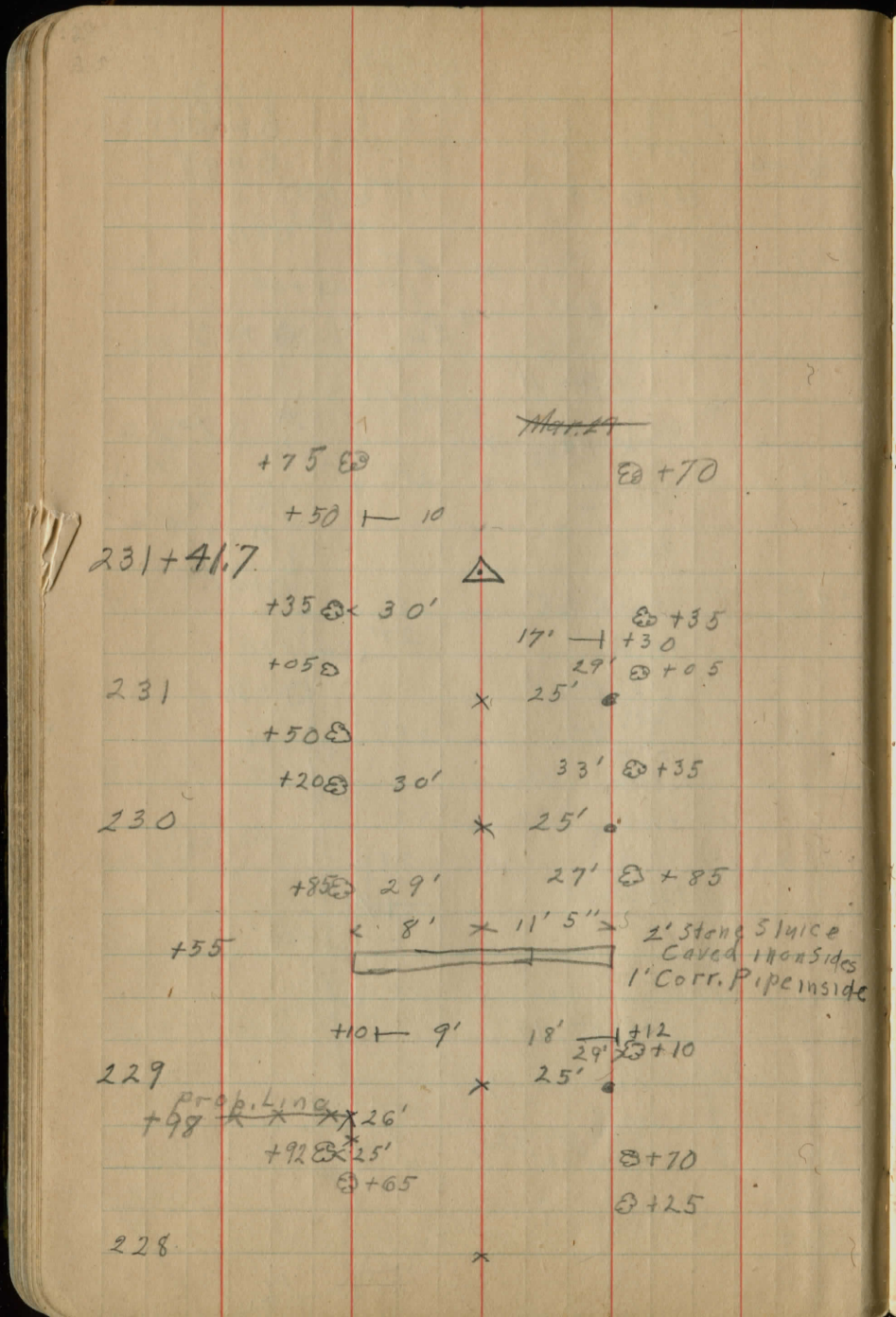

218
217
216
215
214
213
212
211
210
209
208
207
206
18' +35
25'
+25
+20
25'
+15
25'
+75
25'
19' +05'
25'
25'
+40
25'
+90
25'
13'1"
7.'6"
3½ x 2 Stone Culvert
210+14.5
+05
31'
+70
+80
25
25'
Hedge
+75 19'
25' +65
25'
205+45 20'
25' 205+50

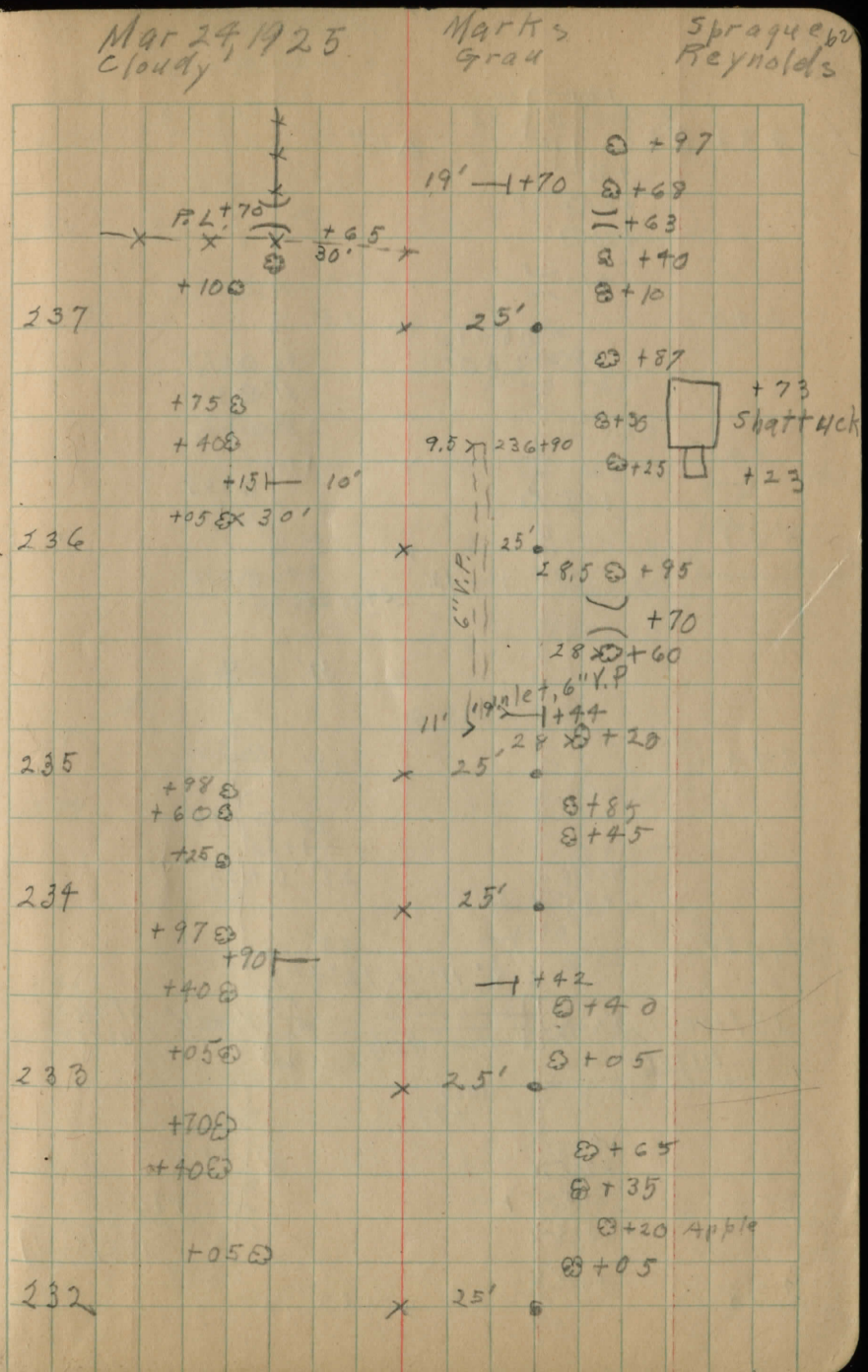

61
228
+10
55'
+46
+85 22
+27 24'
+10
227
+83
24'
+65 11'
24'
+02
226
+25
225
+00 28'
+65
+30
+25
224
+95
+55
+20
223
+85 30'
222
+90 14'
221
+20
220
+00 28'
+55 15'
219
25'
+00
+95
+70
+45
17' +25
+15
25'
18' +00
31 +83
+86
30'
P.L.
25'
+70
+35
+05
29'
+70
+36
25'
+95
+55
25
+70
+60
25'
25'
+55
+01.5
25'
23'
P.L.

Mar 24, 1925
Cloudy

Mark's
Grau

Sprague
Reynolds

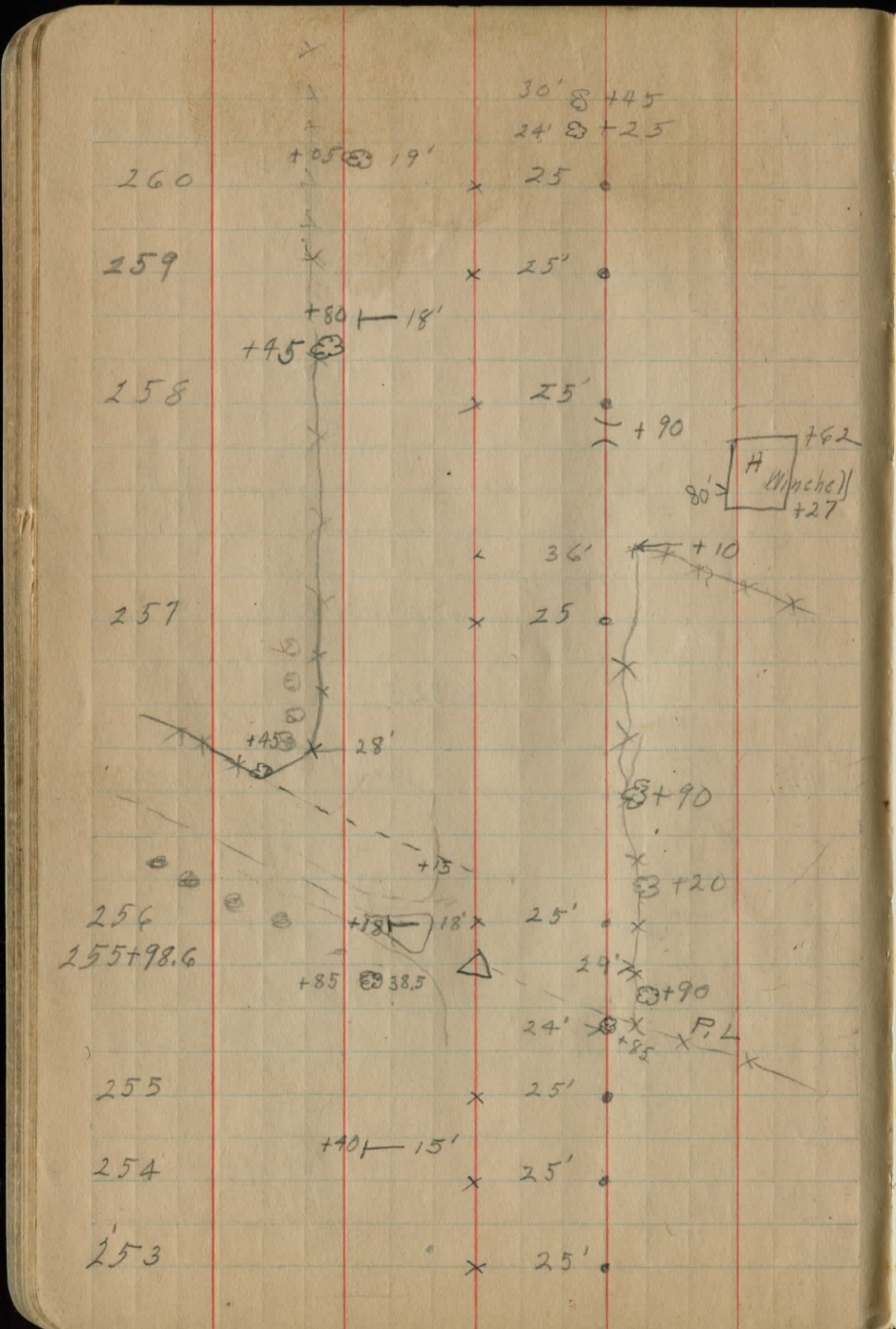


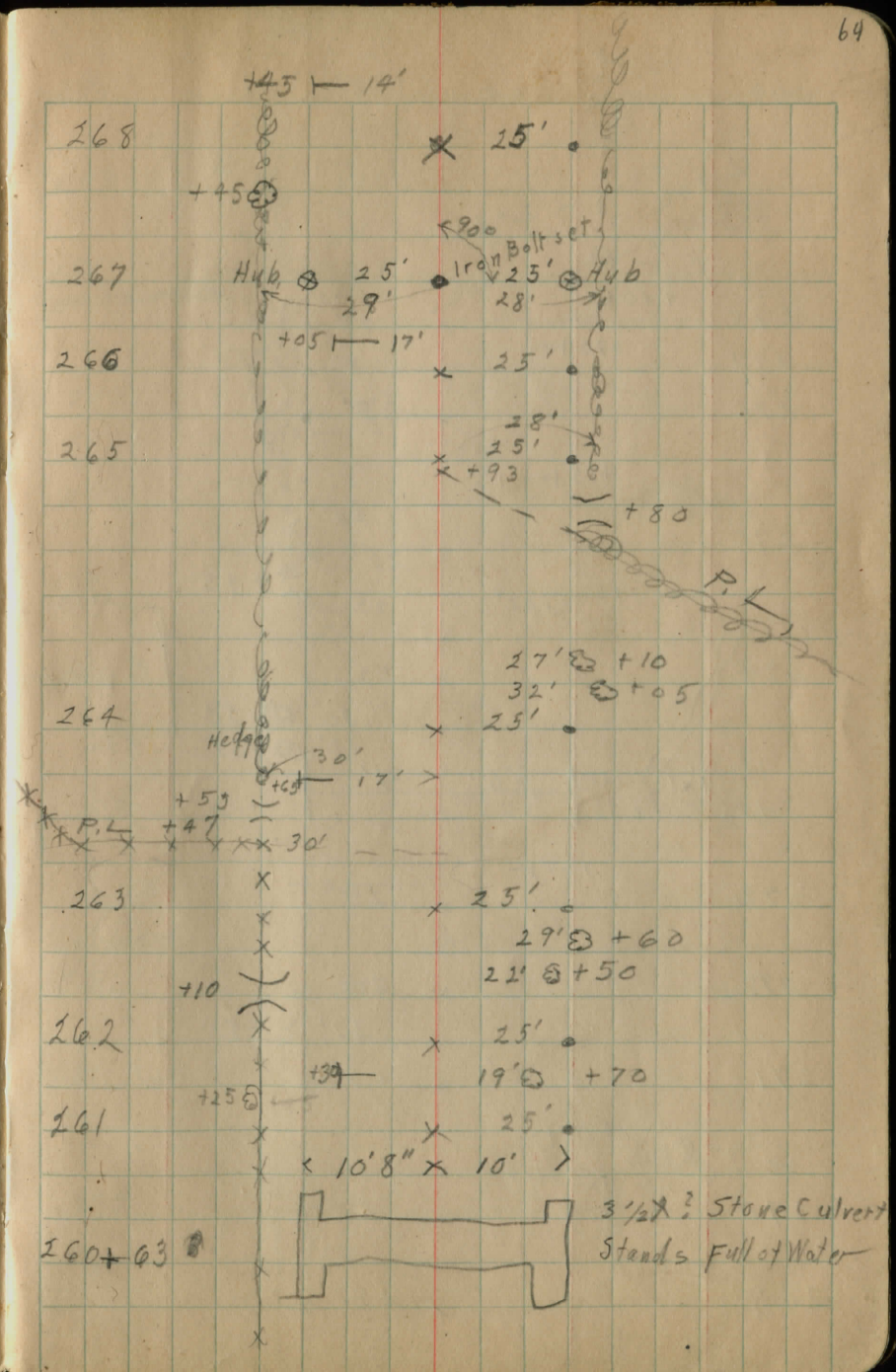


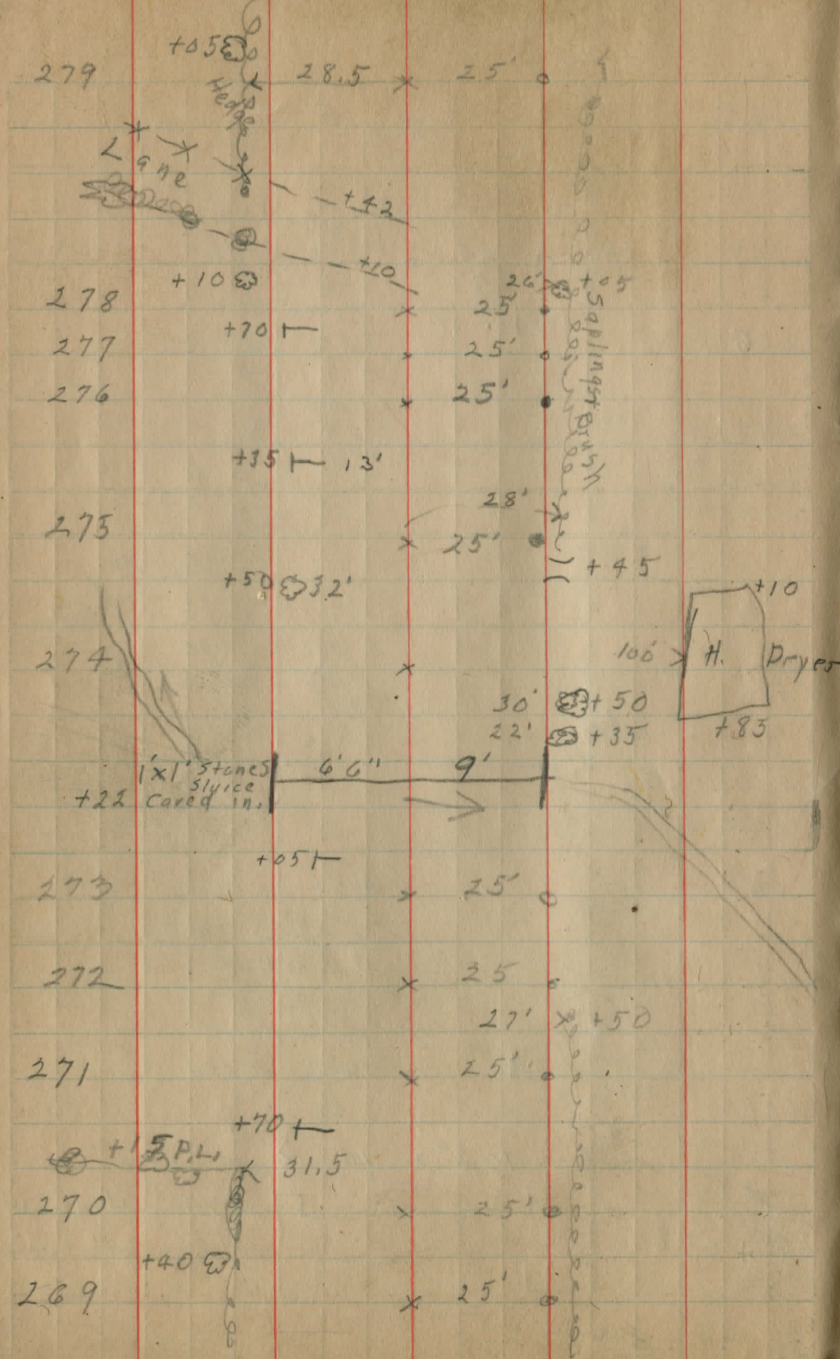
+80
Crellin H < 55
243 + 54.0
+33
+50 < 37'
+20
+10
243
+90 ⊢ 12'
+80 < 30'
242
+65
241
+85 ⊢ 12'
240
Hedge
+35 < 30'
Sta 239
239+00 3'x2½' Poor Walls 3½'x2½' Stone Culvert
8' 11" 12' 4"
Ditch
30.5'
+97
+95
+70
+55 ⊢
+35
+05
238

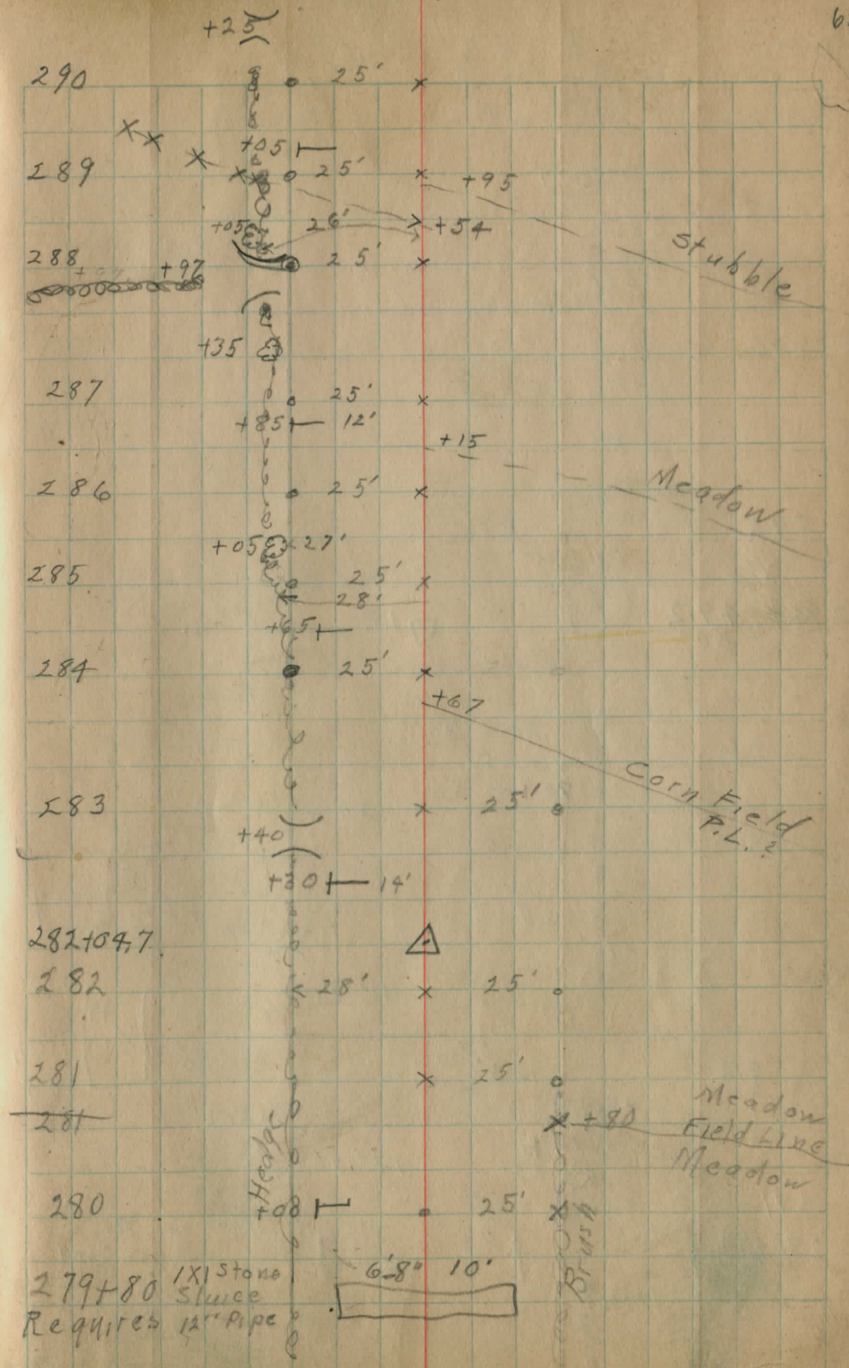
+95
+55
△ I.P.
+70
25'
30 +75
31' +20
28' +10
⊣ +00
+85
+60
25'
34' +80
240+64
31'
25'
28' +95
⊣ +85
28' +50
25'
+23
+70
100' Shed
25'

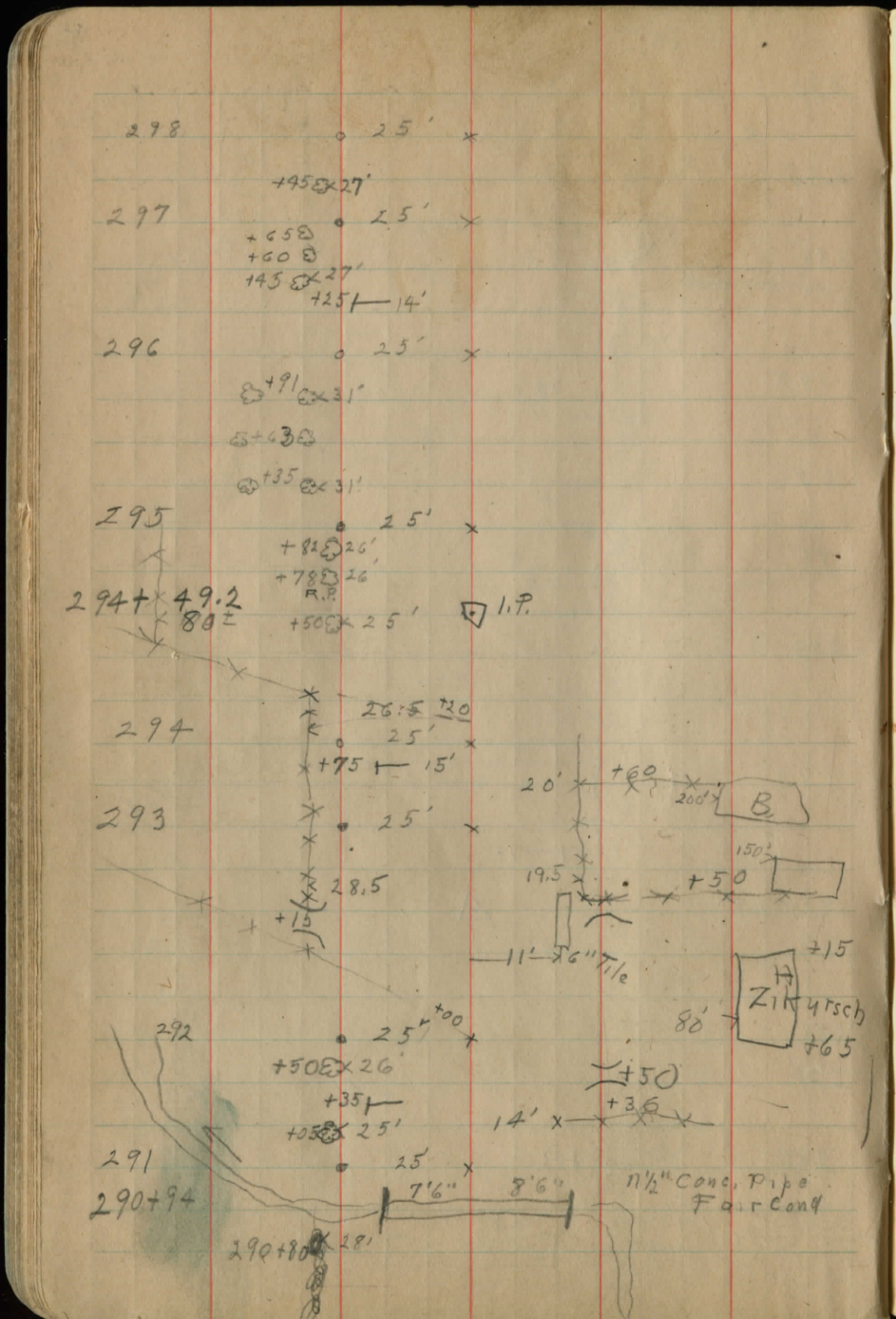
+30 ⊢ 15'
252
25'
251
25'
+05 ⊢ 15'
250
+55 < 32'
249
25'
+80
18' ⊣ +65
+50
+50
30' +40
+20
+30
Maltbie
+10
248
23
96 >
+95
+90
+70 ⊢ 15'
+70
+46
33' +50
32.5
+35
+15
247
25'
+75
+55
+40
⊣ +30
+25
+25
246
25'
31' +50
+50
+40 ⊢ 14'
+30 31'
+10 38'
245
25'
+90
+65
+75
+30
+05
244
25'

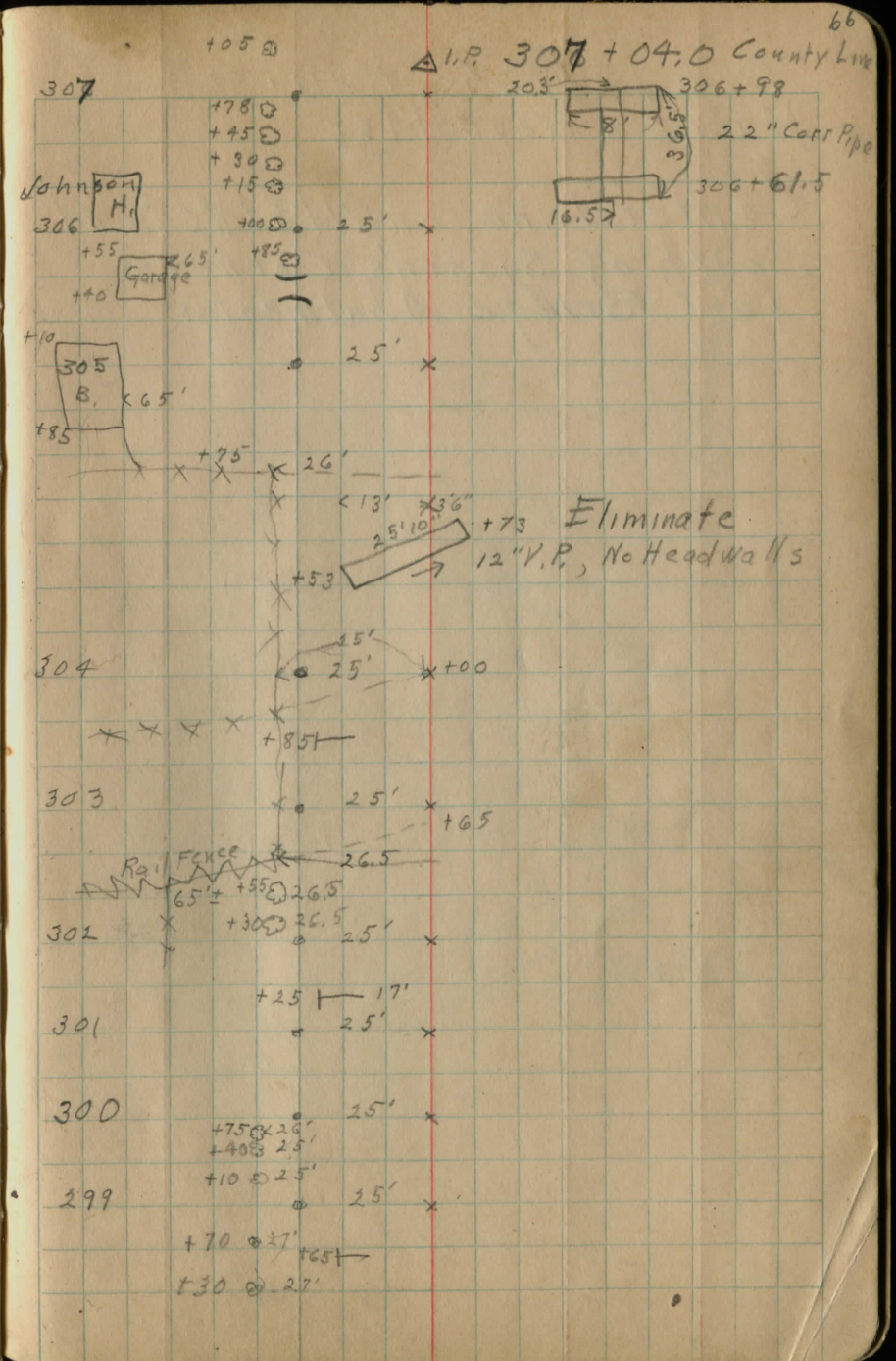

260
259
258
257
256
255+98.6
255
254
253
30' & +45
24' & +25
+05 & 19'
25
25'
+80 — 18'
+45
25'
+90
+62
H
Winchell
80'
+27
36'
+10
25
+45
28'
+90
+15
+20
+18 — 18'
25'
+85 & 38.5
29'
+90
24'
+85
P.L
25'
+40 — 15'
25'
25'


+45 — 14'
268
25'
+45
N 90° E
Iron Bolt set
267
Hub
25'
25'
Hub
29'
28'
+05 — 17'
266
25'
28'
265
25'
+93
+80
P.L
27' & +10
32' & +05
264
25'
Hedge
30'
+65 — 17'
+59
+47
P.L
30'
263
25'
29' & +60
21' & +50
+10
262
25'
+39
19' & +70
+25
261
25'
10'8" x 10'
3½' x 2' Stone Culvert
Stands Full of Water
160+63


279
+05
Hedge
28.5
25'
Lane
+42
+10
+10
278
26'
+05
Saplings & Brush
25'
+70
277
25'
276
25'
+35
13'
28'
275
25'
+45
+50
32'
+10
274
100'
H.
Dryer
30'
+50
22'
+35
+83
1'x1' Stones
Sluice
Caved in.
+22
6'6"
9'
+05
273
25'
272
25
27'
+50
271
25'
+70
+15 P.L.
31.5
270
25'
+40
269
25'

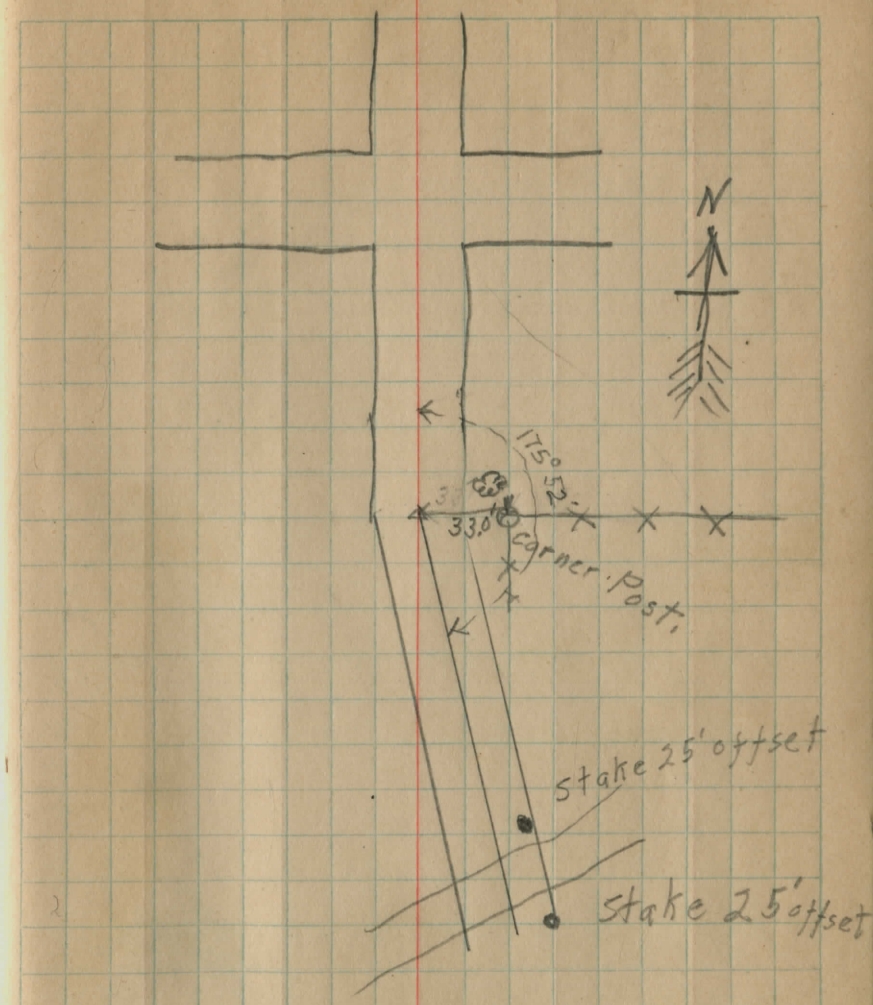

+25
290
25'
+05
289
25'
+95
+05
26'
+54
288
+97
25'
Stubble
+35
287
25'
+85
12'
+15
286
25'
Meadow
+05
27'
285
25'
28'
+65
284
25'
+67
283
25'
Corn Field
P.L.?
+40
+30
14'
282+04.7
282
28'
25'
281
281
Meadow
+80
Field Line
Meadow
Hedge
280
+08
25'
279+80
1X1 Stone
Sluice
Requires 12" Pipe
6'8"
10'
Brush


298
25'
+95
27'
297
25'
+65
+60
145
27'
+25
14'
296
25'
+91
31'
+35
31'
295
25'
+82
26'
+78
26'
R.R.
294+49.2
80±
+50
25'
I.P.
294
25'
+75
15'
293
25'
28.5
+15
20'
+60
200'
B.
19.5
+50
150'
11'-6" Tile
+15
Zirsch
80'
+65
292
25'
+00
+50
26'
+35
+05
25'
291
25'
290+94
7'6"
8'6"
11½" Conc. Pipe
Fair Cond
290+80
28'


+05
I.P. 307+04.0 County Line
307
+78
+45
+30
+15
20.3'
306+98
22" Corr. Pipe
36.5'
306+61.5
16.5'
Johnson H.
306
+00
25'
+55
65'
+85
Garage
+40
+10
305
B.
65'
+85
25'
+75
26'
<13'
36"
+73
25'10"
12" V.P., No Headwalls
Eliminate
+53
304
25'
25'
+00
+85
303
25'
+65
Rail Fence
26.5
65'±
+55
26.5
+30
26.5
302
25'
+25
17'
301
25'
300
25'
+75
26'
+40
25'
+10
25'
299
25'
+70
27'
+65
+30
27'

Oct. 1, 1925 Fair.
Marks + Reynolds.

Center Line on Old State Road
South of Sisson's Corners
for Bridge Abutments



Sta	+	H.I.	-	Elev.	Rem's
B.M.#6	1.99	1049.00		1047.01	Spike in
55+0				1044.40	
56+0				1041.80	
+50				1040.71	
57+0				1040.04	
58+0				1039.12	
T.P.	1.88	1045.50	6.38	1043.62	
59+0				1038.21	(1038.11)
60+0		changed to 37.60 in field		1037.79	
			8.00	1037.50	West F.L. Culvert
B.M.#7					Spike in

E. Root 42" Ash 30' Lt Sta 55+51

C.2.0 / 6'-3"

C.3.0 / 8'-9"

C.3.5 / 8'-3"

C.5.0 / 10'-6"

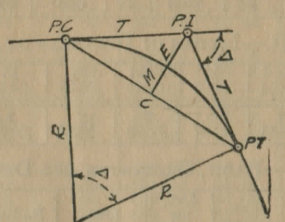
C.3.5 / 8'-0"

C.3.0 / 7'-9"

C.3.0 / 7'-9"

W Side 6" Maple 23' Lt Sta 55+85 1037.15

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=Rtan$\frac{\Delta}{2}$ (3) Length of Curve=L=100$\frac{\Delta}{D}$ (4)

Middle ordinate=M= R(1—cos. $\frac{\Delta}{2}$) (5) =Rvers $\frac{\Delta}{2}$ (6)

External=E=Ttan$\frac{\Delta}{4}$- (7) =R÷cos.$\frac{\Delta}{2}$–R(8)=Rexsec$\frac{\Delta}{2}$(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 $(54.50\div100)^2$=2.16 ft. Also square of any distance divided by twice the radius equals (approximately) the distance from tangent to curve. Thus $(54.50)^2\div(2\times688.26)$=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	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.—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					
40	3437.87	.364	1.454	0.50	9	637.28	1.965	7.846	2.70
50	3125.36	.400	1.600	0.55	20	614.56	2.037	8.136	2.80
					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
					12	478.34	2.620	10.45	3.60
3	1910.08	.655	2.618	0.90	30	459.28	2.730	10.89	3.75
10	1809.57	.691	2.763	0.95	13	441.68	2.839	11.32	3.90
20	1719.12	.727	2.908	1.00	30	425.40	2.949	11.75	4.05
30	1637.28	.764	3.054	1.05	14	410.28	3.058	12.18	4.20
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
4	1432.69	.873	3.490	1.20	30	370.78	3.387	13.49	4.65
10	1375.40	.909	3.635	1.25	16	359.27	3.496	13.92	4.80
20	1322.53	.945	3.718	1.30	30	348.45	3.606	14.35	4.95
30	1273.57	.982	3.926	1.35	17	338.27	3.716	14.78	5.10
40	1228.11	1.018	4.071	1.40	18	319.62	3.935	15.64	5.40
50	1185.78	1.055	4.217	1.45	19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.362	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1.75					
					25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	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′	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	483.8	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	5808.2	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	1.36	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	.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	1.08	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	196.96	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	1.86	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	388.43
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	.037	.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 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. $A=\frac{a}{c}$

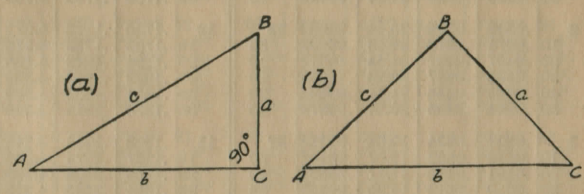
cos. $A=\frac{b}{c}$

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

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

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

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



FORMULA FOR SOLVING TRIANGLES.

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	$B=90°-A$, $b=a \cot. A$, $c=\frac{a}{\sin. A}$.
A, b	B, a, c	$B=90°-A$, $a=b \tan. A$, $c=\frac{b}{\cos. A}$.
A, c	B, a, b	$B=90°-A$, $a=c \sin. A$, $b=c \cos. A$
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	$A-B$	$\tan. \frac{1}{2}(A-B)=\frac{(a-b) \tan. \frac{1}{2}(A+B)}{a+b}$
a, b, c	A	If $s=\frac{1}{2}(a+b+c)$, $\sin. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{b c}}$, $\cos. \frac{1}{2}A=\sqrt{\frac{s(s-a)}{b c}}$, $\tan. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$, $\sin. A=\frac{2\sqrt{(s-a)(s-b)(s-c)s}}{b c}$
A, B, C, a	area	$\text{area}=\frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area}=\frac{1}{2} b c \sin. A$
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	00	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	.98218	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	2.669	.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.

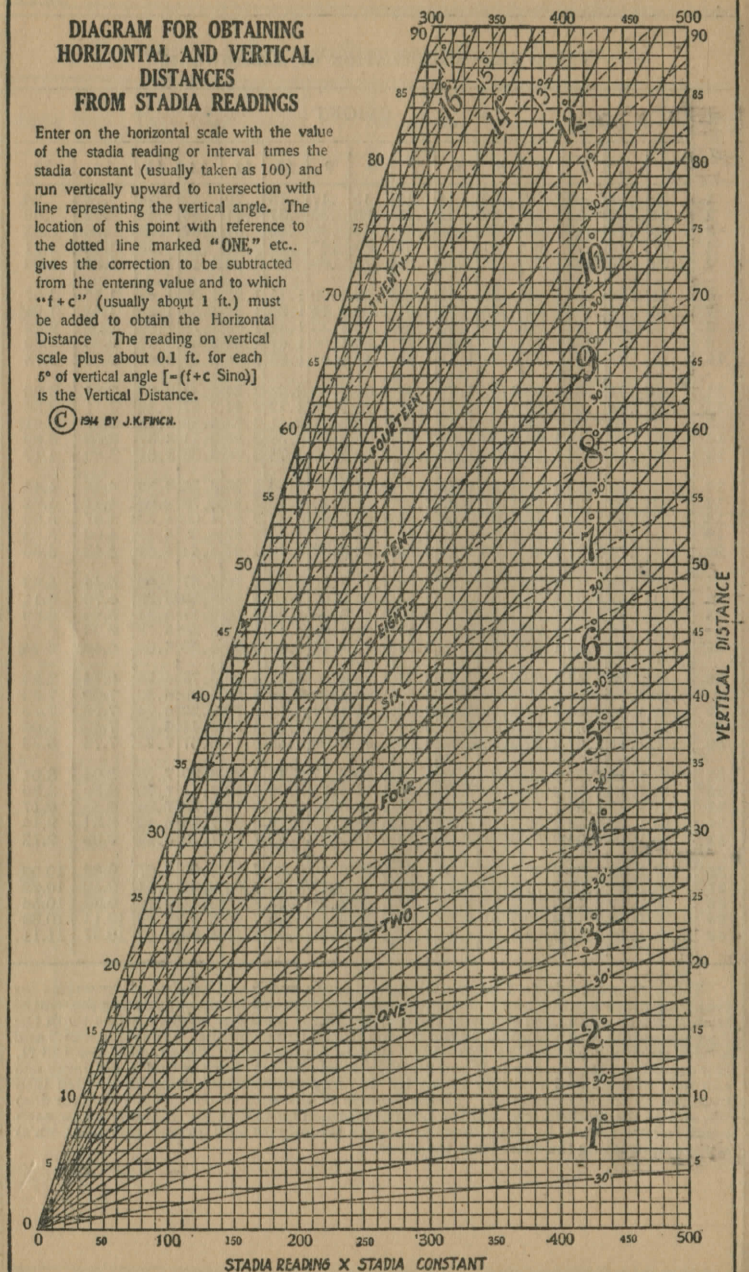
Table IX.—Calculation of Earthwork.

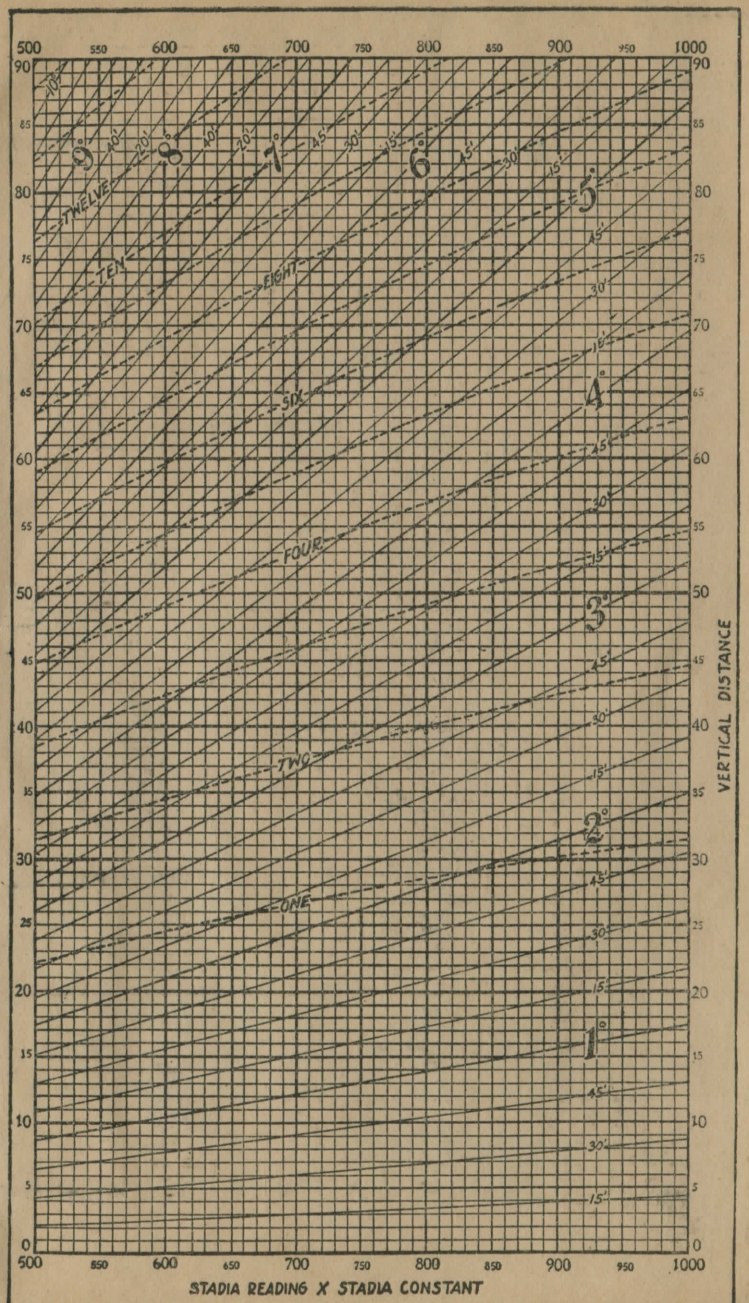
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96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





25599
19558
6041

295
12.4
1180
590
295
604 / 3658 0.60
3624
3400

3173.70
2442.32
731.38

161.1
2.45
163.55

162.48
2.45
164.93

Calc. 7, 661. to B. C Prof. Line

54.77

154-59
309-58

55-01

45-01
29-58

22+63.75
17+20.70
5 43.05
90.95
534.00

161.64
2.45
164.09

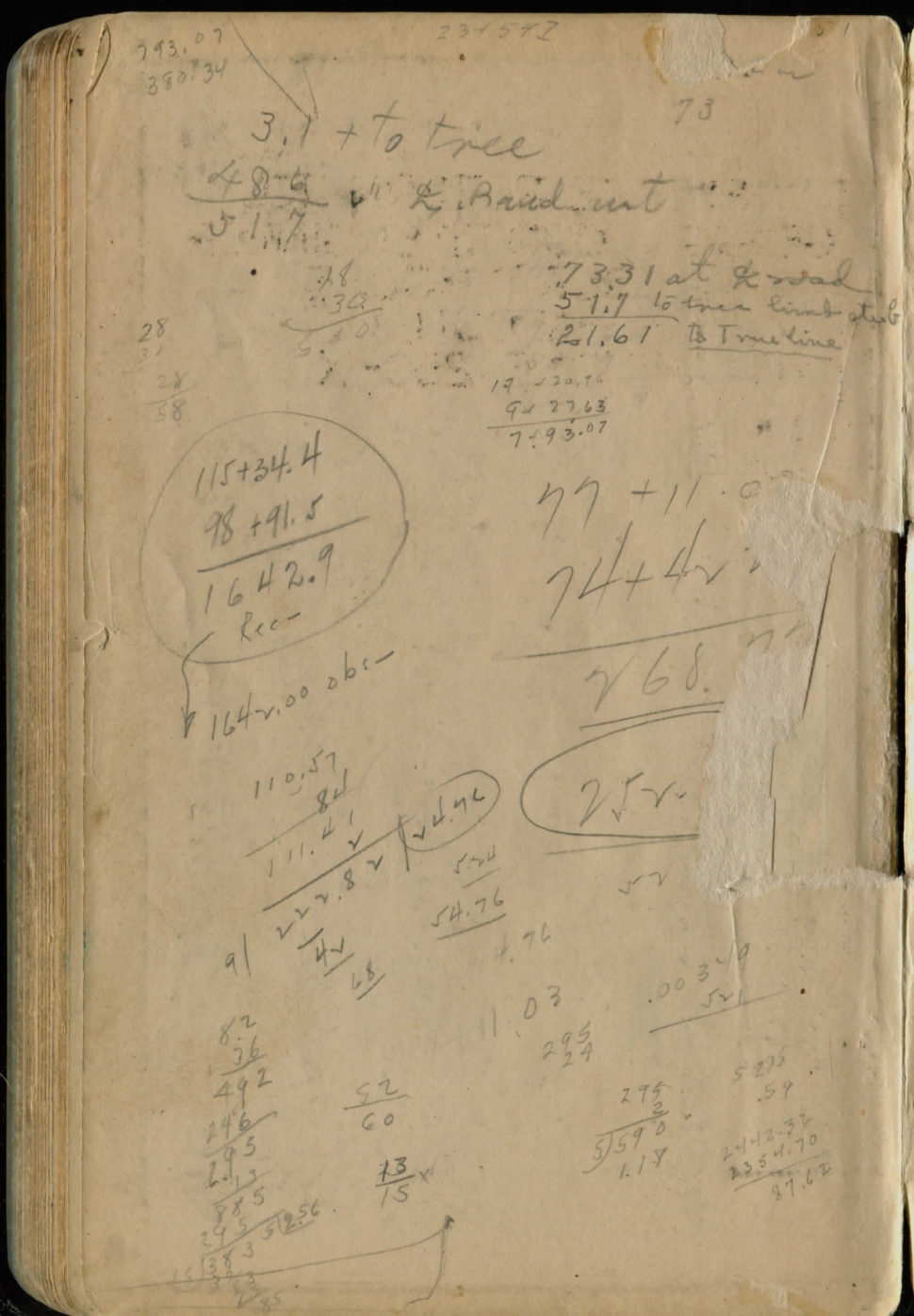
731.

3173
2353
820

99
76
23

2222
76
103.22

19' E
Back slope



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	.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	.0	25.2	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	.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19		36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20		38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21		39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22		41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23		42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24		44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25		45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26		47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27		48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28		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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