

TRANSIT NOTES - HAMMOND HILL W. F. R. D.
CEDAR FALLS

PRELIM SURVEY DENVER AND TARKENTON
BOOK #1

ENGINEERS'
FIELD BOOK

No. 10404

23

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.

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

Example—If point is 22.6 ft. above grade, how far should it be from center line to be a slope stake point? Ans. from Table 30.6. For same slopes but other widths of roadbed, correct above figures by one-half difference in width of roadbed; thus in example above, for 20 ft. roadbed distance will be $30.6 + (20 - 16) \div 2$ or 2 ft. added to 30.6 = 32.6. For slopes of 1 on 1½ see inside of back cover.

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Black Hawk Federal Aid

Proj. W. from Cedar Falls

Book I

PRELIM. SURVEY
Dewar-Dunkerton Road
From Sta. 0+00 at Center of Bridge N
of Dewar N. 3 Mi. to point 3 Mi. W of
Dunkerton

Entered 1922 CRH

TRANSIT NOTES Hawkeye W. of Cedar Falls

0+00 - 219+12

Page 3-16

Dewar-Dunkerton Road	
Prelim Survey	
Bench Mark Levels	20 - 25
P.I. References	25-30 and 45
Transit Notes	30 - 48
Cross Sections	
Sta 0+00 - 65+00	54 - 62
Sta 132+766 - 163+93 - end	49 - 52

Truck # 20

$$\begin{aligned} L &= 6.00 \\ W &= 3.00 \\ H &= 1.65 \end{aligned}$$

$$\begin{array}{r} 1.65 \\ 18.0 \\ \hline 13.20 \\ 1.65 \\ \hline 29.70 \\ 7.92 \\ \hline 37.62 \end{array}$$

$$\begin{array}{r} 3.00 \\ 3.6 \\ \hline 2 \overline{) 6.6} \\ 3.3 \\ \hline .4 R \\ 1.32 \\ 62 \\ \hline 7.92 \end{array}$$

Truck # 4

$$\begin{aligned} L &= 4.85 \\ W &= 3.00 \\ H &= 1.70 \end{aligned}$$

$$\begin{array}{r} 4.85 \\ 3 \\ \hline 17.55 \\ 1.7 \\ \hline 12.285 \\ 1.755 \\ \hline 27.835 \\ 6.00 \\ \hline 35.835 \\ 3.4 \\ 3 \\ \hline 102.6 \end{array}$$

$$\begin{array}{r} 3.4 \\ 10.2 \\ \hline 585 \\ 5.10 \\ 5816 \\ 510 \\ \hline 59670 \\ 18.00 \\ 1.7 \\ \hline 12.6 \\ 1.8 \\ \hline 30.6 \\ 6 \\ \hline 36.6 \end{array}$$

12 0° 57'

+56 Fence N.

P.C. 11+52.5 Turn 14° 23' Right

+84 Fence N.

+31.75 Nail No Angle

+25 Drive S. to field

+21 E. side House

10+16 fence S.

+69 Drive N.

9+53 fence N.

3+77 Nail No Angle

2+17 fence S.

+518 Stone Box culv 28" x 3' x 24"

P.T. +24.6 8° 03' Nail

1 6° 27'

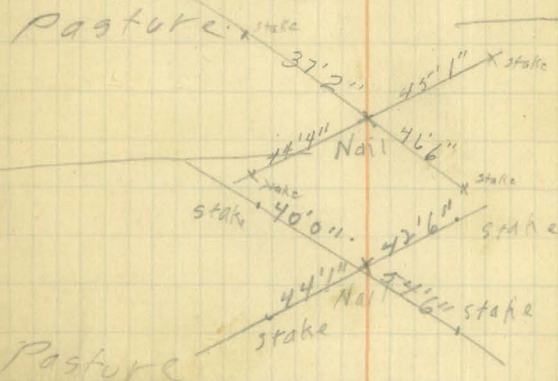
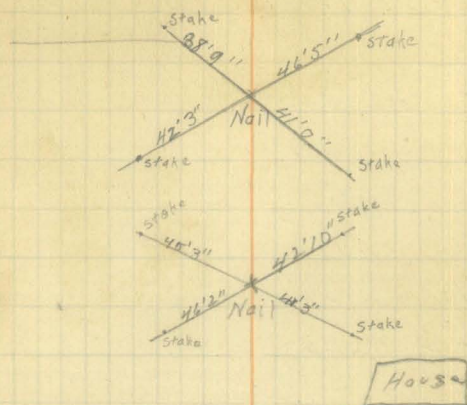
 $\Delta = 16° 06' \text{ Left}$ $D = 12° 54'$ $T = 62° 10'$ $R = 444.2'$ $L = 124.6'$

P.I. +62.83

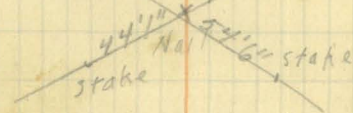
+50 3° 135'

+16 fence S.

P.C. 0 Nail fence N.

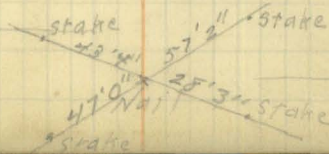


Pasture



corn

End of Paving



25+24 Drive N. @ culv. 12"x20'

24 E. side House
 +34 fence N.
 23+07 Nail
 +30 fence N.
 +28. @ Drive S.
 20+16 Gate N. (not in pt.)
 19+12 E. side House
 15+7.5 Nail
 17+37 fence S

No. Angle

15+58 stone Box Culv. 4'x2'x24'

P.T. +12.07 $7^{\circ} 11.5'$

15 $6^{\circ} 57'$

$\Delta = 14^{\circ} 23'$

$D = 4^{\circ}$

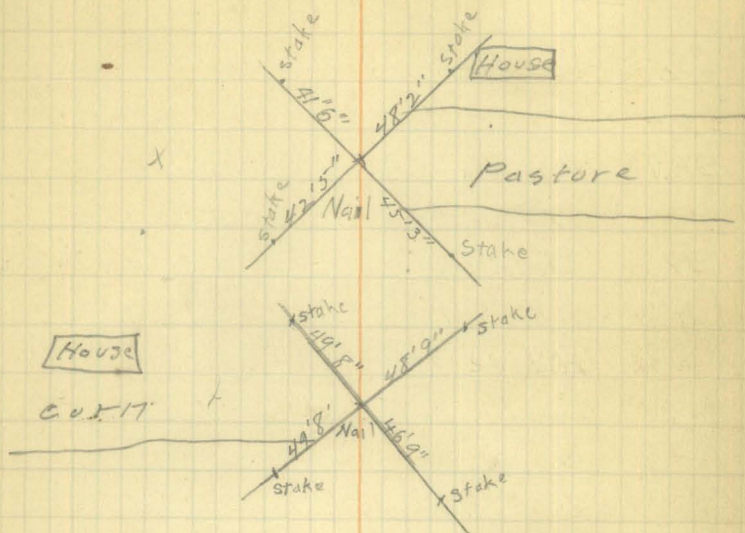
$T = 180.8$

14 $4^{\circ} 57'$

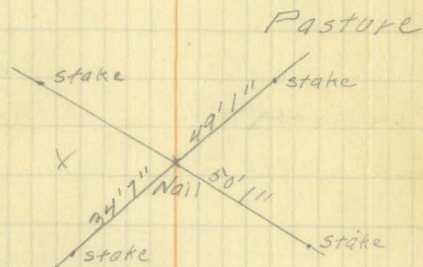
$R = 716.3$

+74 $\frac{1}{4}$ Sec Line Fences $L = 359.57'$

13 $2^{\circ} 57'$



CORN



44+29 fence N

+54 fences N & S

42+35 Nail

turn 0'6" Right

+53.1 Gates N & S

PT. +144.68 15° 38.5'

37 12° 26.2'

+50 8° 51.4'

+15 Center 2X4X23 Stone Box Culv.

36 5° 16.6' Fence N. $\Delta = 31° 17'$ Left.

$D = 14° 19.5'$

+50 1° 41.8'

$T = 112°$

$R = 400'$

$L = 218.38'$

P.C. 35+26.3 0° 0'

31+95 Nail

No Angle

37+94 fence S.

28-53 fence N.

+93.15 Nail

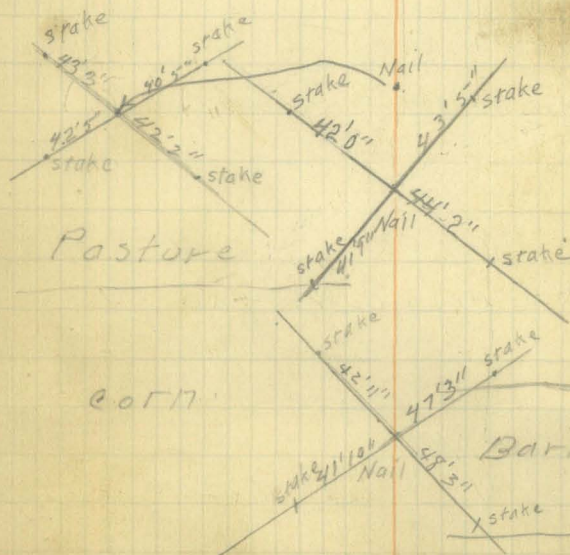
No Angle

+74 Gate to Barnyard

25+66 fence N.



Hay



+38 Eside House

63+09 fence S.

62+96 Drive S. Φ Iron culv. 12'x20' con. Box. 2'x12'x17'

62. Nail No Angle

61+07 Fence S. & E. end Sheds.

+83 Gate S.

+75 Fence S.W.

+21 Gate N. to field

58+09 Fence N.E.

57+13 Φ stone Arch. 17' wide

+91 Fence S.

55+84 Gate S. to field

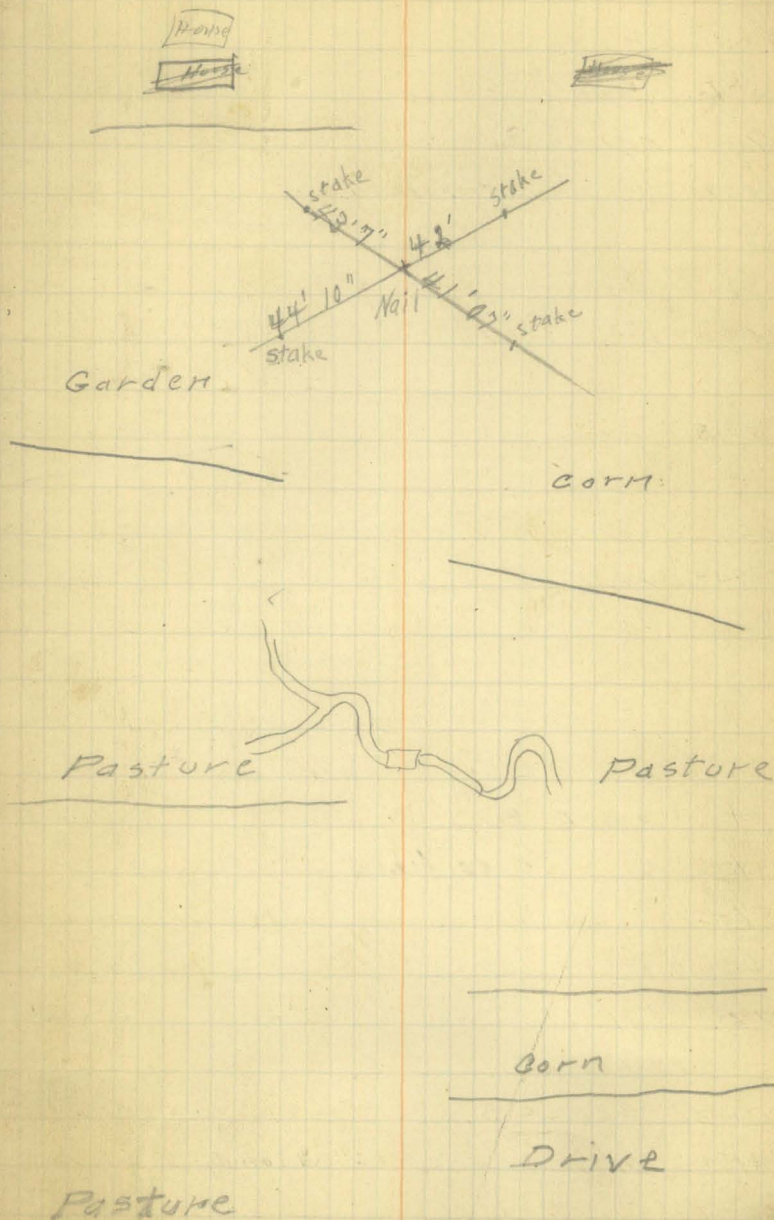
+30 Φ stone Arch. Culv. 7'x5'x17'

52+25 Fence N.

+50 Fence N.

46+25 Drive N. 15"x2'x20' stone Box Culv.

45+98 fence N.



113+62 4 Drives. Geot. tron. 12" x 20'

113+07 Fence S.

112+38 Fence S.

109+07 Gate N. (Not Impt.)

108+98 Fence N.

106+80 Fence N.

105+77 Fence N.

105+50 Nail

105+02 E. side House

+78 4 Drive

+70 Fence N.

104+65 Fence S.

100+28 Fence N.

+81 Gate S. to Field

99+62 Fence S.

95+76 Fence S.

+35 2 Stone Slab Culv. 2' x 2' x 24'

93+055 Fence S.

Garden

Corn

Pasture

Orchard

Oats

House

Garden

Hay

Pasture

Garden

134 Nail Turn 0°5' Left.

131+17 Fence S.

131+3 & Drive S. & 12" x 20' Cor. Iron.

130+88 Fence S.

129+69 Fence N.

128+63 E. side House

+84 Fence N.

+72 & Drive N.

127+49 Fence N.

126+72 Fence N.

125+64 Fence N.

+64.5 Fence S.

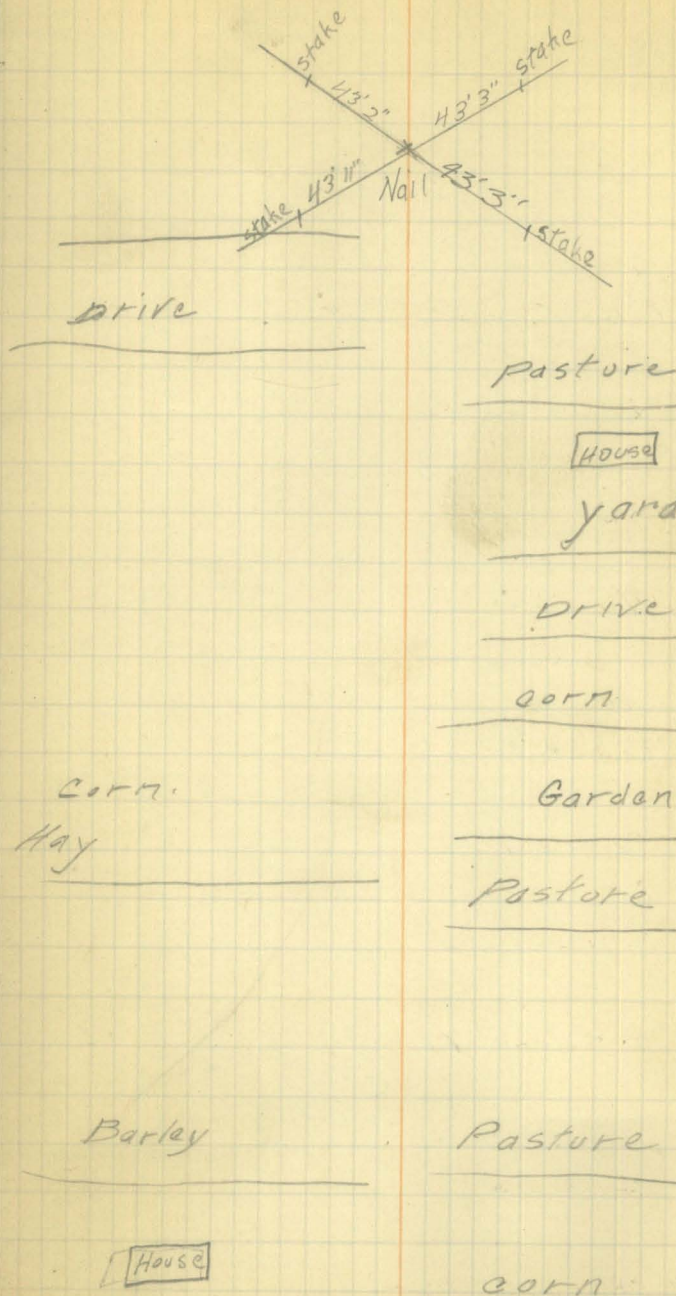
121+48.5 Fence N.

116+22 & Stone Box Culv. 2' x 3' x 24'

+50 Gate S. to field

115+43 Fences N & S

114+97 E. side House



164+46 Nail

+66 Fences N x S - W. side cross Road

+455 & X Road

161+25 Fences N x S - E. side cross Road

159+56 & Stone Box culv 2'x2'x24'

155+2 Gates N x S to field

+87 Fence N

154 Nail Turn 0° 4' Left

+79 Fence N.

153+70 & Drive N.

152+53 E. side House

151+93 Fence N.

150+165 Fence N.

+44 & Stone Box culv. 15" x 18" x 29'

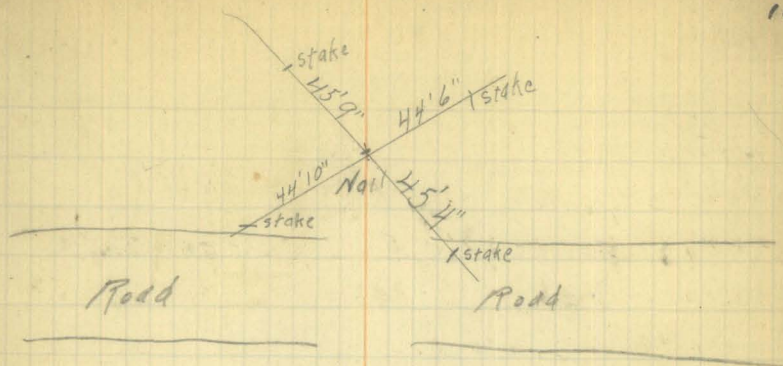
148+13 Fences N x S.

141+34 Fence S.

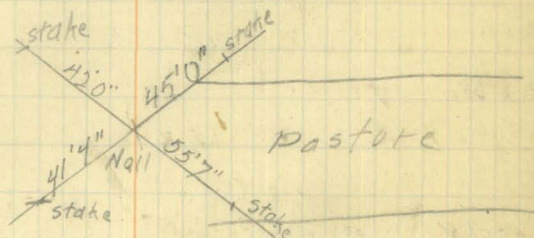
136+16 Gate N.

135+34 E. side House

134+64 Fences N x S



Pasture



House

Garden

Pasture

Orchard

Oats

Corn

Pasture

House

473 Fence S.
157+3 Fences N & S.

188 Gate to School House

135 Gate to School House

177+26 E. side School House

186+73 Fence N. & con. culv. 2' x 2' x 18.5'

175+11 Fence S.

173+25 Fences N & S

172+19 E. side House

171+94 Gate Drive S. Gate cor. iron. 12" x 20'

171+8 1/2 Nail Turn Left 0° 40'

170+79 Fence South.

169+77 Fence S.

+80 Fence N.

167+8 Gate Drive N. Gate cor. iron. 12" x 20'

+98 Fence N.

+50 Gate to House

166+40 E. side House

165+77 Fence N.

Orchard

Oats

Pasture

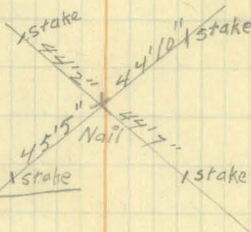
School
House

Hay

Grove

Corn

House



Yard

Pasture

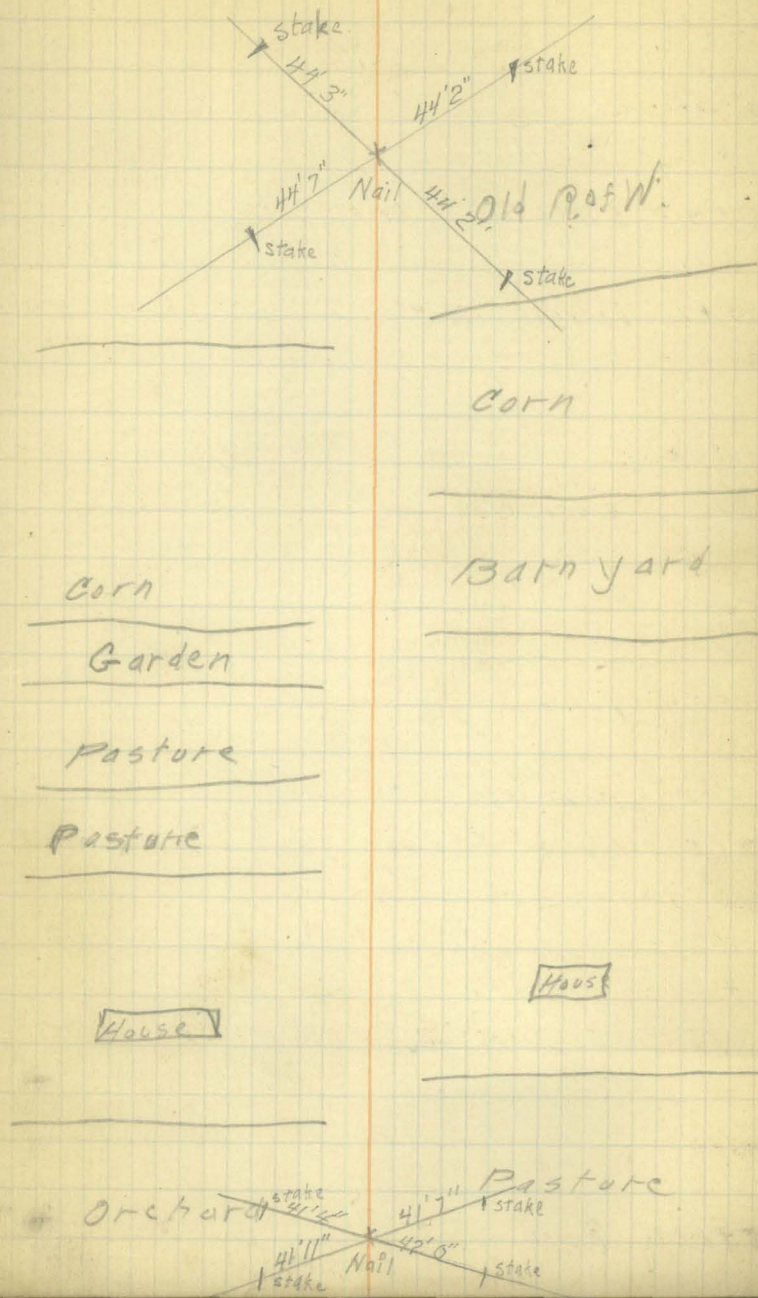
Pasture

Trees

Pasture

House

- 205+93 C. Gate N. (Not imp't)
 +48 Nail. Turn Right $0^{\circ}11''$
 203+16 Q. con. Box C. N. $2' \times 2' \times 24'$ (Skew)
 203+15 Fence N.W.
 204+32 Fence S.
 +19 Gate N. to field & con. iron $18' \times 15'$
 197 Fence N.
 +50 E. side Barn.
 194+27 Fence N. & S.
 +85 Fence S.
 +54 Fence S.
 193+16 Drive N. & con. iron $12' \times 20'$
 +69 Fence S.
 +41 Q. Drive S. $12' \times 20'$ & con. iron
 192+20 E. side House
 +89 E. side House
 +49 Fence N.
 191+40 Fence S.
 189+71 Nail Turn Left $0^{\circ}53'$



+47 Fence N

+22 fence s. Gate N. to House

189+10 E. side House

+72 Fence N. Gate S.

+71 E. side House

+54 sidewalk to House N.

+40 E. side House

+35 Fence S.

207+10 E. side Shop

+87 Fence N.

207+14 Q con Arch Culv. 2'x2' x 18.5'

+40 Fence S.

106 Fence N.W.

House

House

Yard

House

Shop

Garden

Pasture

+92 E. side House

House

+59 Drive N Φ (12" x 18) cor. Iron

+50 Fence S.

212+49 Fence N

+71 E. side House

House

+66 Gate to House

+54 Fence N

+15 Shop

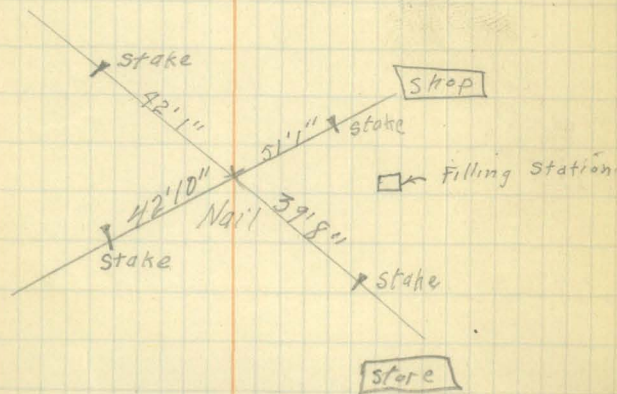
211 Nail Turn Left $0^{\circ}11'$

+89 Fence S.

210+16 E. side Store

+79 Drive S. Φ cor. Iron 12" x 20'

209+50 Gate N.



219 W. end Bridge. [7.5' waterway.
+57.5 E. end Bridge 15' 3" wide
218+44 E. end Wing wall [Wood pile Bridge]

+71.5 Fence N.

+66 Fence S.

+59 Fence S.

215+21 Drive N.

+39 E. side Creamery

+15 Fence S.

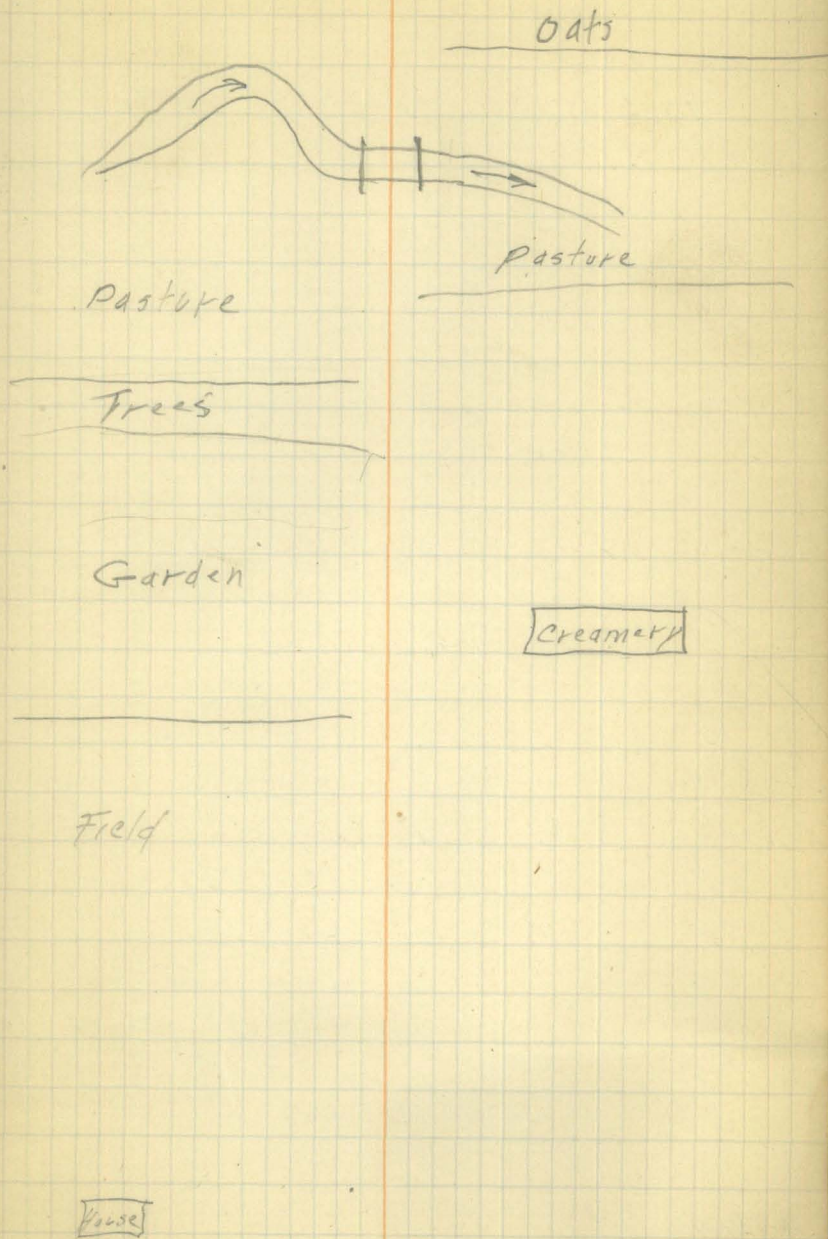
214+7 Drive N. ϕ (1" x 20') cor. Iron

+89 Drive S. ϕ 12" x 20' cor. Iron

+21 sidewalk S.

+17 sidewalk N.

213+9 E. side House



243+29.5 Fences N & S. W. side x Road
 +05 Nail.
 +78 Fence S. } E. side x Road
 242+73.5 Fence N. }

240+65 Nail Turn 0°49' Left.

237+12 Fence S.

235+84 E. side Barn

+97 Fence N.

+84 Drive N. Cor Iron 12" x 20'

+75 Fence N. → Turn 0°10' Right

+74 → Nail →
 234+71 Drive S. Cor Iron (12" x 20')

+95 E. side House

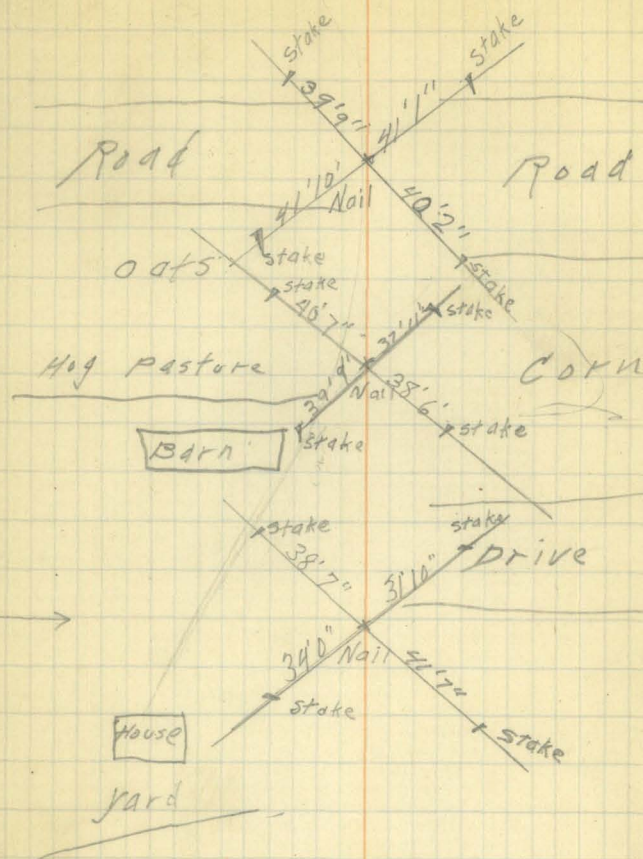
233 Fence S. W

+30 Gate S. to Field

230+9 curved Fence N

219+27 Fence S

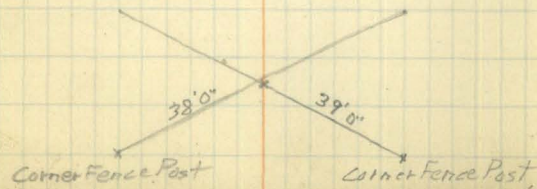
219+2 W. end wing walls



SW Corner Geometry

81.2'

*Stone 30.9' x Fence Post.



$2+12$

Gate N

2

1

 $0+25$

House N

0

Check Levels - Dewar to Dunbarton Road

21

12/3/21

BM	0.26	947.93		947.57
T.P.	4.19	939.72	12.40	935.53
T.P.	9.46	947.42	1.75	937.97
T.P.	0.12	941.52	6.02	941.41
T.P.	2.44	936.02	7.94	933.59
R.P.	5.42	934.35	7.10	928.93
T.P.	13.00	944.56	2.79	931.56
T.P.	1.02	939.42	6.16	938.40
R.P.	0.78	927.51	12.67	926.73
T.P.	0.39	915.87	12.03	915.48
T.P.	10.76	926.18	0.45	915.42
T.P.	8.30	931.00	3.48	922.70
T.P.	1.95	925.28	4.67	926.33
	2.01		2	
	4.46		1.74	
T.P.	0.42	915.96		915.48
T.P.	1.09	903.86	13.13	902.77
T.P.	3.32	895.75	11.40	892.46
T.P.	4.46	892.11	8.13	887.65
T.P.	1.96	892.32	1.75	890.36
BM#0	8.13	900.14	0.31	892.01
T.P.	12.93	911.37	1.70	898.44
T.P.	12.83	923.53	0.67	910.70
T.P.	11.74	934.01	1.26	922.27
T.P.	7.17	940.70	0.48	933.53

880 96 Connected Road W. Headwall Conc. Culv S Side Hawkroth Hwy 5 end sec 23.24
 N. End Sec 23-24
 N. End Sec 23-24
 N. End Sec 23-24

Center E Headwall Conc. box S of Dewar School

Spike in N of row Cottonwoods W side Hwy N of Dewar School

Rock Eside Hwy

Rock W. by Tel. pole

Ch walk

Pipe by

892.01 Center N. Headwall Concrete Culv R 1st X Roads N of Dewar
 892.01

		940.70			Corrected	
BM #1	3.52	941.22	3.00	937.70	937.69	X in Concrete base of N. Gate post Rt. of Sta (16+63) ^{1/4 Mi. N of Denar}
T.P.	4.75	933.99	11.98	929.24		
T.P.	0.96	924.63	9.72	924.27		
BM #2	0.89	916.23	9.29	915.34	915.34	Center W. Headwall Conc Culv Sta (21+26) = 28+17 ^{1st N of 13th}
BM #3	10.27	919.20	7.30	908.93	908.93	" E. " " " " " (25+17) 33+29 ^{2nd N of 13th}
T.P.	1.59	914.23	6.56	912.64		
BM #4	0.18	911.59	2.82	911.41	911.42	Highest pt Black boulder S. of E. W. R. Sta (42+99) ^{1st E. R. S. of E. W. R. Sta}
R.P.	3.08	904.37	10.30	901.29	911.42	Spike in Tot pole R. Sta () Opposite Wood with north ^{1st}
T.P.	5.51	906.00	2.88	900.49		
BM #5	3.72	908.21	1.51	904.49	904.55	Center N. Head wall Concrete Bridge Sta (58) ^{1st Bend in Road N. of Denar}
T.P.	12.08	919.33	0.96	907.25		
BM #6	13.04	925.99	6.38	912.95	913.01	Center E. Head wall Conc Culv Sta (70+16) ^{1st in 2nd N. of Denar}
T.P.	2.15	924.36	3.78	922.21		
T.P.	3.19	916.48	11.07	913.29		
BM #7	6.89	918.61	4.76	911.72	911.77	Spike in S. Gate post Left Sta (81+96) S. of E. Conc Culv in 2nd ^{N. Not Downway}
	2.03	920.38	0.26	918.35		
BM #8	4.63	920.18	4.83	915.55	915.60	Center E. Head wall Conc Culv Sta (91+73) 3rd in 2nd N. of Denar
R.P.	5.26	91986	5.58	914.60		X on S shoulder W Abt. I Bridge Sta () in 2nd Bend 2nd N. " "
T.P.	6.14	921.79	4.21	915.65		
BM #9	11.94	932.22	1.51	920.28	920.34	X in Conc Base Steel Cor post Left Sta (110+62) 5W of X Roads ^{2nd N. Not Denar}
T.P.	9.29	940.53	0.98	931.24		
T.P.	6.33	941.33	5.53	935.00		
BM #10	7.00	943.21	5.12	936.21	936.30	Top N. end 12' Cor. pipe Culv Left Sta (124+76) Entrance 2 1/4 Mi. N. of Denar ^{2nd}
T.P.	2.94	943.27	2.88	940.33		
BM #11			2.83	940.44	940.54	Center E. wall Conc Culv Sta (132+76) 1st in 3rd N. of Denar

94327

Corrected

N. of Denver
15 1/2 House in 3 1/2 Mi

T.P.	12.75	954.58	1.44	94 1.83	
BM#12	0.49	955.03	0.04	954.54	954.64 spikes in Brace post R. 54 (14 ft + 26) 13 1/2 ft S. of Driveway
T.P.	0.26	943.38	11.91	943.12	
T.P.	3.15	940.57	6.02	937.36	
T.P.	6.85	944.50	2.86	937.65	
BM#13			3.96	940.54	940.64 spikes in Gate post R. of Sta (152109) Approx 12 3/4 Mi. N. of Denver
T.P.	9.37	953.37	0.50	944.00	
T.P.	7.72	958.80	2.29	951.08	NW of X Roads 3 1/4 Mi. N. of Denver
BM#14			2.69	956.11	956.22 spikes in Root of Cottonwood Tree left of Sta (164425) East tree in road

check 12/6/21

BM#0	7.75	899.76		892.01	892.01
T.P.	12.79	911.25	1.30	898.46	
T.P.	12.34	923.02	0.57	910.68	
T.P.	11.14	933.59	0.57	922.45	
T.P.	7.52	941.67	1.44	932.15	
BM#1			3.98	937.69	937.69
T.P.	5.52	935.27	11.92	929.75	
T.P.	0.52	924.25	11.54	923.73	
BM#2	1.08	916.43	8.90	915.35	915.34
BM#3	10.73	919.66	7.60	908.93	908.93
T.P.	1.86	915.34	6.18	913.48	
BM#4	0.03	911.45	3.92	911.42	911.42
T.P.	3.94	905.10	10.29	901.16	
T.P.	4.82	905.40	4.52	900.58	
BM#5			0.85	900.55	900.55

BM#4	0.20	911.61		911.41	
R.P.	3.23	907.58	10.26	901.35	
T.P.	4.97	905.55	4.00	900.58	
BM#5	4.96	909.57	1.00	907.55	907.55
T.P.	11.08	919.82	0.77	908.74	
BM#6	12.84	925.86	6.80	913.02	913.01
T.P.	2.64	924.02	4.48	921.38	
T.P.	3.07	916.90	10.19	913.83	
BM#7	7.15	919.22	5.13	911.77	911.77
T.P.	6.49	920.53	5.18	914.04	
BM#8	4.96	920.76	4.73	915.50	
R.P.			5.91	914.85	
BM#7	7.21	918.98		911.77	
T.P.	2.05	920.50	0.53	918.45	
BM#8			4.85	915.65	
BM#7	7.58	919.35		911.77	
T.P.	1.95	920.34	0.96	918.39	
BM#8	4.72	920.31	4.75	915.59	915.60
R.P.	5.66	920.30	5.67	914.64	
T.P.	5.24	922.01	3.53	916.77	
BM#9	12.15	932.50	1.66	920.35	920.34
T.P.	11.82	941.71	2.66	929.89	
T.P.	6.10	940.81	7.00	934.71	
BM#10	7.13	943.47	4.47	936.34	936.30
T.P.	4.31	943.66	4.12	939.35	
BM#11	6.45	947.44	3.07	940.59	940.54

$$\begin{array}{r}
 15 \\
 915.55 \\
 911.72 \\
 \hline
 3.83 \\
 40
 \end{array}$$

$$\begin{array}{r}
 915.59 \\
 911.77 \\
 \hline
 3.82
 \end{array}$$

$$911.61$$

$$\begin{array}{r}
 940.60 \\
 936.34 \\
 \hline
 4.26
 \end{array}$$

$$\begin{array}{r}
 22 \\
 915.80 \\
 911.77 \\
 \hline
 4.13
 \end{array}$$

$$16\frac{1}{2}$$

$$4.8$$

$$1\frac{1}{2}$$

$$19\frac{1}{2}$$

$$\begin{array}{r}
 936.34 \\
 936.21 \\
 \hline
 0.13
 \end{array}$$

$$920.33$$

$$15.99$$

$$\begin{array}{r}
 926.21 \\
 900.28 \\
 \hline
 15.93
 \end{array}$$

$$\begin{array}{r}
 32 \\
 915.61 \\
 911.77 \\
 \hline
 3.88
 \end{array}$$

$$918.45$$

$$911.77$$

$$6.68$$

$$1\frac{1}{2}$$

$$918.35$$

$$911.72$$

$$6.63$$

$$918.39$$

$$911.77$$

$$6.2$$

956.31
940.71

9

947.14

T.P. 10.06 957.20 0.30 947.14

BM# 12 0.24 957.94 2.50 954.70 954.64

T.P. 1.66 945.69 10.91 944.03

T.P. 2.74 946.35 8.08 937.61

T.P. 6.50 943.61 3.24 937.11

BM# 13 9.83 950.54 2.90 940.71 940.64

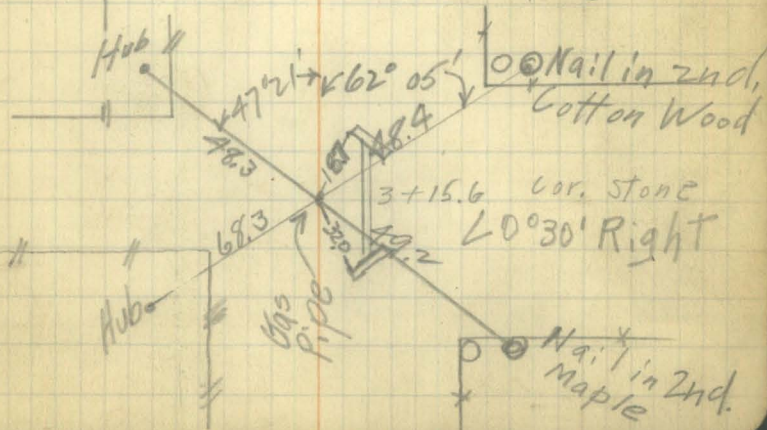
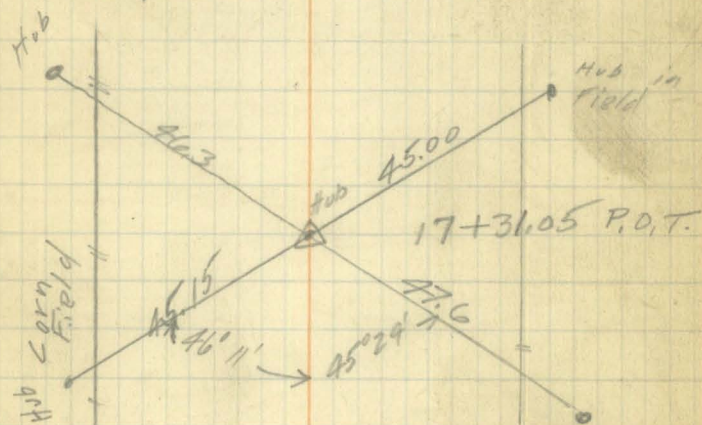
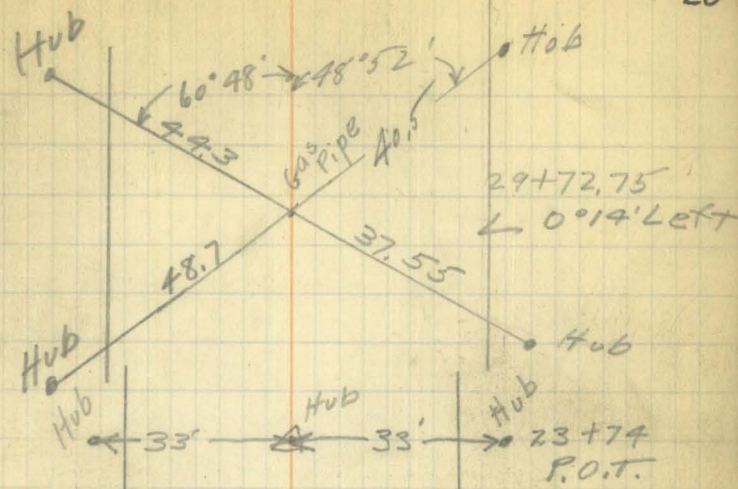
T.P. 6.45 954.93 2.07 948.47

T.P. 6.01 958.92 2.02 952.91

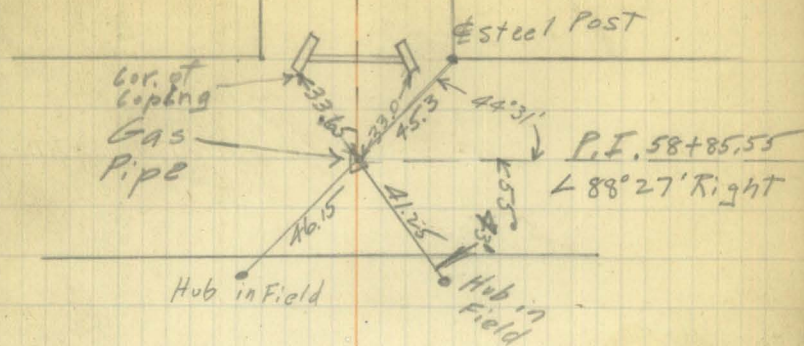
BM# 14 6.01 958.83 2.61 956.31 956.22

BM# 15 1.13 957.70 957.70 Highest pt Largest Boulder N side Dunbarton Road 175 E of Hwy

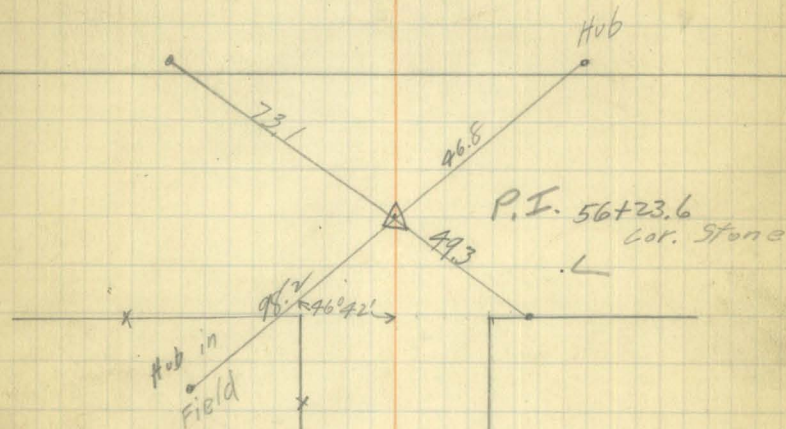
Car 3 1/4 N of Denver



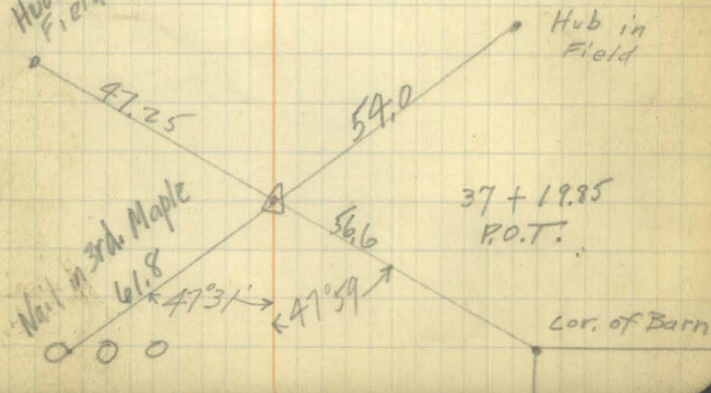
Hub ← 33' Δ 33' → Hub
P.T. 59+12.78

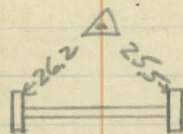
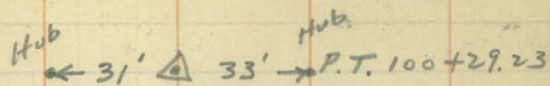


Hub ← 33' Δ 33' → Hub
P.T. 57+14.43

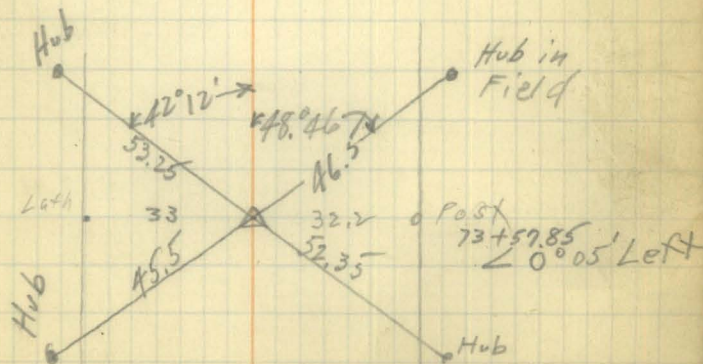
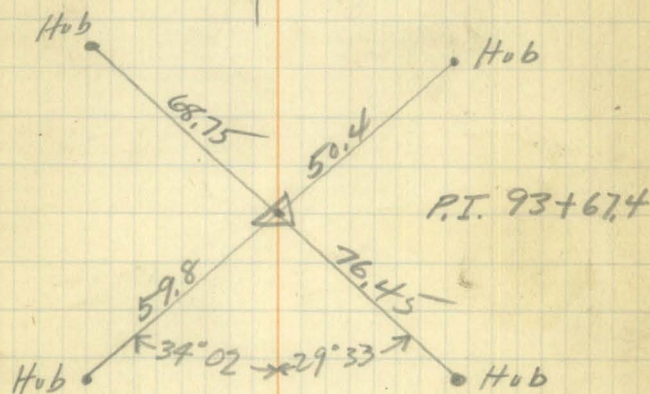
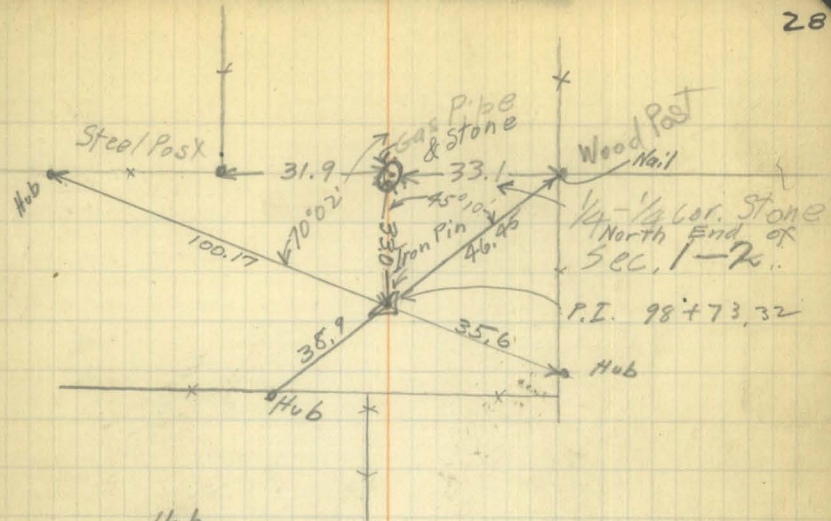
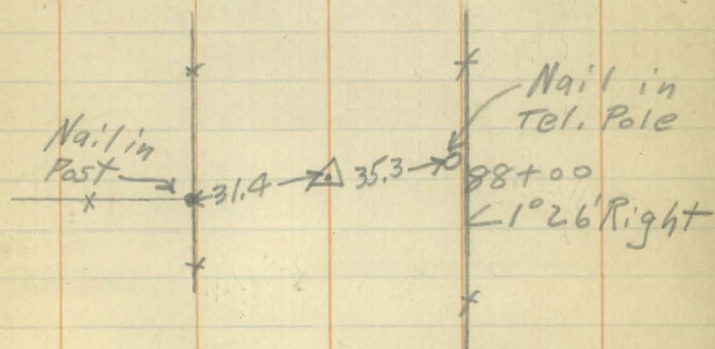


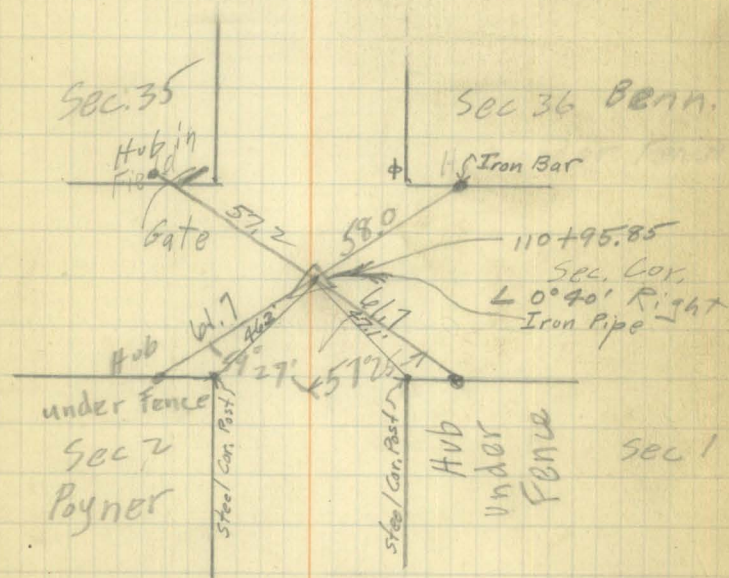
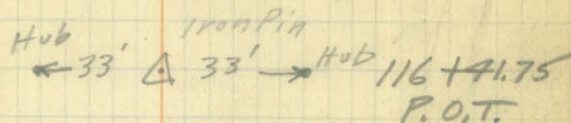
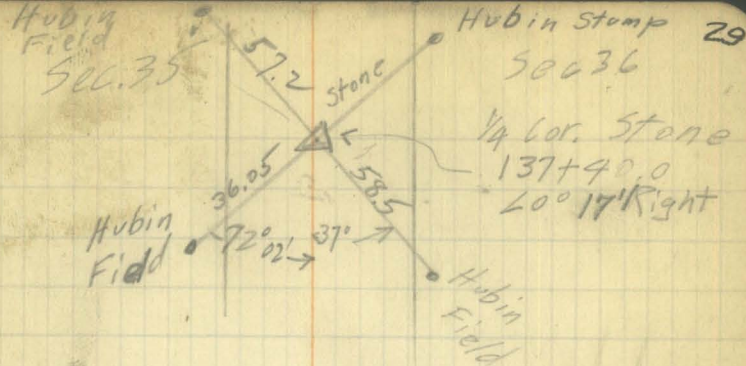
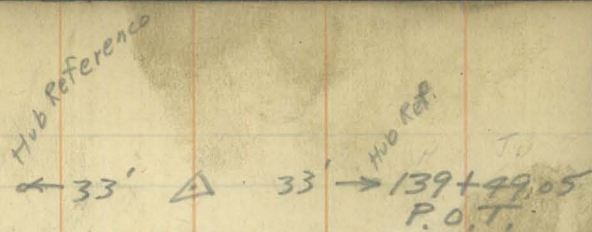
Hub ← 33' Δ 33' → Hub
P.C. 54+64.7





P.C. 92+00.73





Dec. 7 1921

30

10

9

8

7

6

5

4

Δ +15.6 L 0°30' Right sec. Cor. stone

3

+63

Drive Left

2

1

+34 End Wings
0+00 ± P.T. Bridge 50'x20'
-79.6 ± R.R.

Cultivated

+46

+40 φ 23

+93 φ 25

← 29' →

Grove

Cotton Woods

+37

← 30' → 23.6

+85

+76 φ 26

← 30' → 28

+83

Pasture

+16 φ 27
+49 φ 33

← 27' → +64

0+34



5+10+09 @ ±

Delweir

-79.6

C. G. W. R.R.

+91 Tel. Pole

22

+29.6 15" Cor. pipe & 9" Cement Tile

21

20

19

18

△ +31.05 P.O.T.

17

+63 Gate Rt.

16 +44 Fence Rt.

15

14

13

12

11

520
200x 22' →
φ22.5' Culvert +43 & 19.11.0 11.5
+22 & 20.5x +77
+51.5 & 22

Flowed

Cultivated

△

+63 Gate
x +44 x

Cultivated

+74 & 26
+61 & 25

+04 & 26

35+12 12"x20' Cor Culv

33

+73 Tel Pole

+74 12"x16' Cor Culv 16' Left

34

+27 Tel Pole

+24 2x2x20 Conc Box

33

+95 Tel pole

32

31

30

A +72.75

L 0° 14' Left

29

+17 2x2x24 Conc Box

28

+85 Tel pole

27

+84 Tel Pole

26

+73 Tel/pole

25

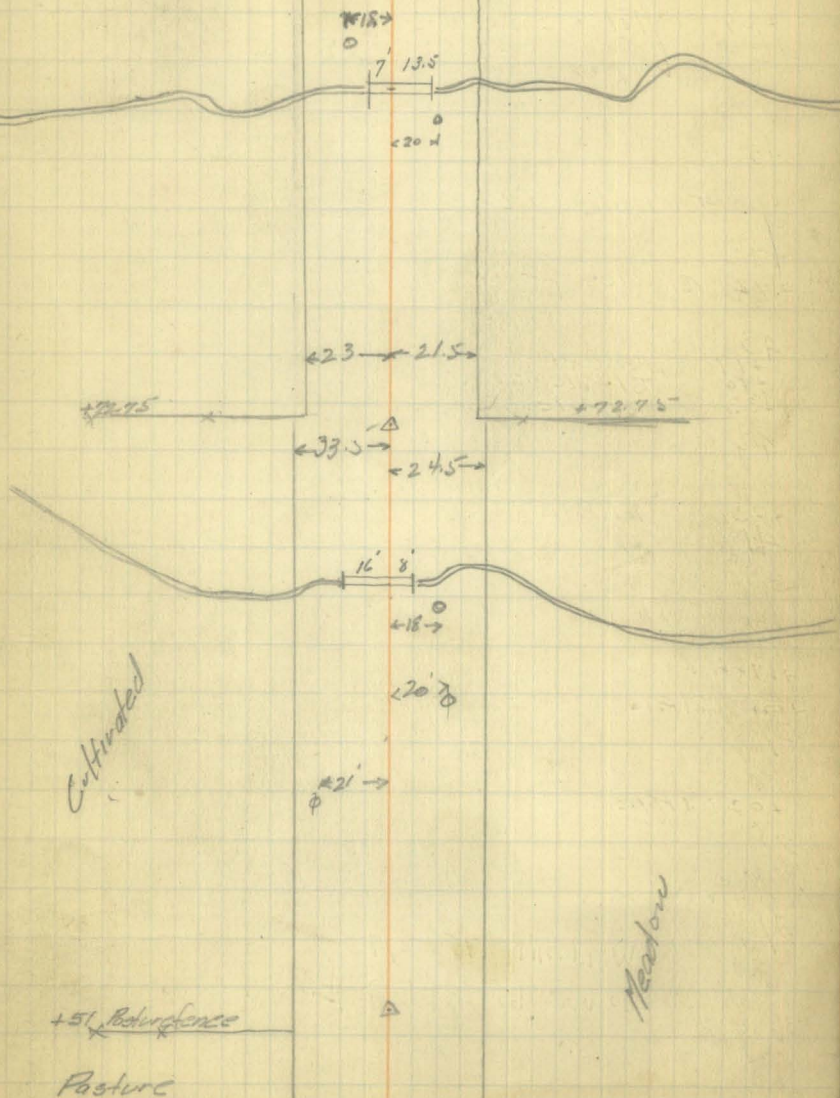
24

A +74.0 P.O.T.

+51

23

+75
Garden
+73 Fence
Gate +54



47

439 Tel R/e 22' R+
46

45

+60 Tel Pole 31' Left

44

+72 Tel/Pole 22' RF

43

43
+99
+98
+33

Penck
Tel Pole 23' R
Tel Pole

42

423	El Pie
41	

270

+67 JEP Pole

104 Tel Pole
39

403 Tel Pole
38

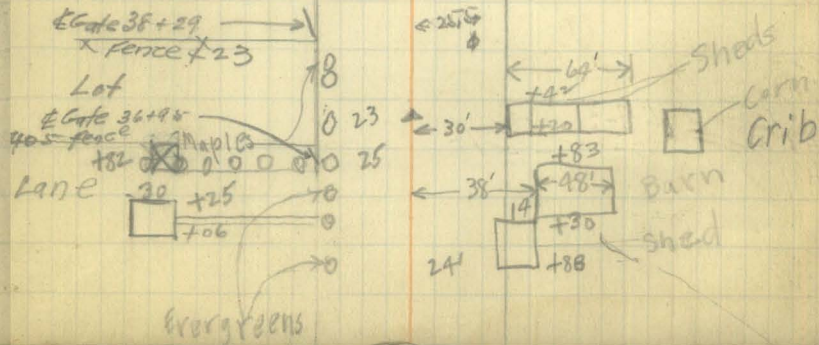
419.85 P.O.T.

37

Wind mill 75' Left

NO USE 65' Left of ϕ

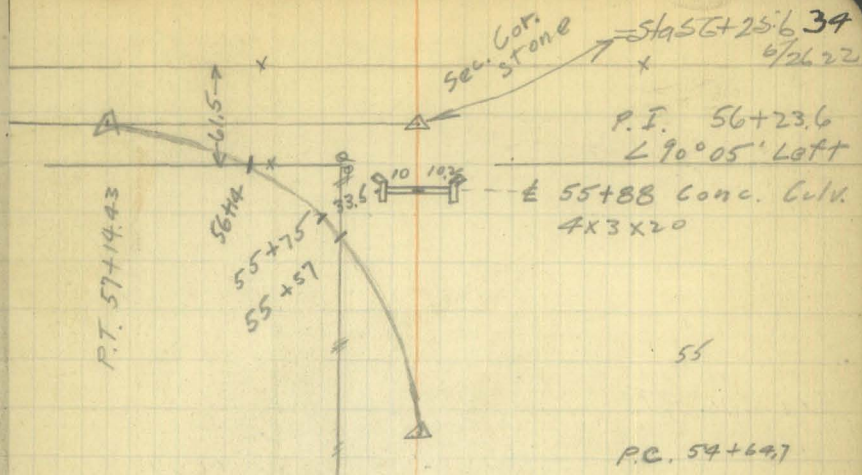
36



57+14.43 45° 02' 1/2"
 57 42° 26' 1/2"
 56+80 38° 50' 1/2"
 56+60 35° 14' 1/2"
 56+40 31° 38' 1/2"
 56+20 28° 02' 1/2"
 56 24° 26' 1/2"
 55+80 20° 50' 1/2"
 55+60 17° 14' 1/2"
 55+40 13° 38' 1/2"
 55+20 10° 02' 1/2"
 55 6° 26' 1/2"
 54+80 2° 50' 1/2"
 54+64.2 P.C.

P.T.

$$\begin{aligned}
 \Delta &= 90^\circ 05' \\
 D &= 36^\circ \\
 EXT. &= 66.09 \\
 Tan &= 159.4 \\
 L &= 250.23
 \end{aligned}$$



54

103 Tel Pole 22' R4

53

180 Tel Pole 28' Left

52

51

50

+69

+63

49

48

Gate
Fence Left

Pasture

+69 Gate
+63 Fence

Corn

Pasture

+48 Fence

Corn

+45 Fence
 Willow Stumps
 482 Fence
 Pasture

61

60

59+12.78 P.T.

59+12.78 $44^{\circ}13\frac{1}{2}'$ 59+10 $42^{\circ}33\frac{1}{2}'$ 59+00 $36^{\circ}33\frac{1}{2}'$ 58+90 $30^{\circ}33\frac{1}{2}'$ 58+80 $24^{\circ}33\frac{1}{2}'$ 58+70 $18^{\circ}33\frac{1}{2}'$ 58+60 $12^{\circ}33\frac{1}{2}'$ 58+50 $6^{\circ}33\frac{1}{2}'$

58+39.07 P.C.

$$\begin{aligned} D &= 120^{\circ} \\ \Delta &= 88^{\circ}27' \\ T &= 46.48 \\ \text{Ext.} &= 18.88 \\ L &= 73.71 \end{aligned}$$

58+85.55 $\angle 88^{\circ}27'$ Right P.T.

58

57+14.4 P.T.

Pasture

30 ϕ +70

P.T.

Conc. Culv.

P.T.

P.C. 58+39.07

58+61 Δ 85' Δ 44' Δ 70' Δ 76' Δ 61.5' Δ

22' x 20' I-beam Bridge

57+89

P.T.

△ 73+57.85 $\angle 0^{\circ} 05'$ Left

73

72

71

+95 fence Left

70

+16 $\pm$ 18 $\frac{1}{2}$ " x 14" Sewer Pipe & Circular Conc.

69

+16 $\pm$ Gate & Colv. 20' x 15' Left

68

67

66

65

64

63

62

= 33 Δ

+95 x

6 $\frac{1}{2}$ " x 12"

Condition Good
D.A. = 20 ACRES
Rolling

+16 $\pm$ Gate 18' 11" $\rightarrow$

Cultivated

31 ϕ +62

Cultivated

+47 $\pm$ Gate
x +39 x x

I-Beam with Plank Floor,
Lattice Railing, Conc. Abutments
Two Vertical cracks in
East Abut.

A Δ +75.9
A 97 +50 $\angle$ Right
South East & W. Fence

A 96

A 95

A 94

A 93

Δ 92 +00.73 P.C.

+73 ϕ Culv. Conc. 2X2 X 24

91

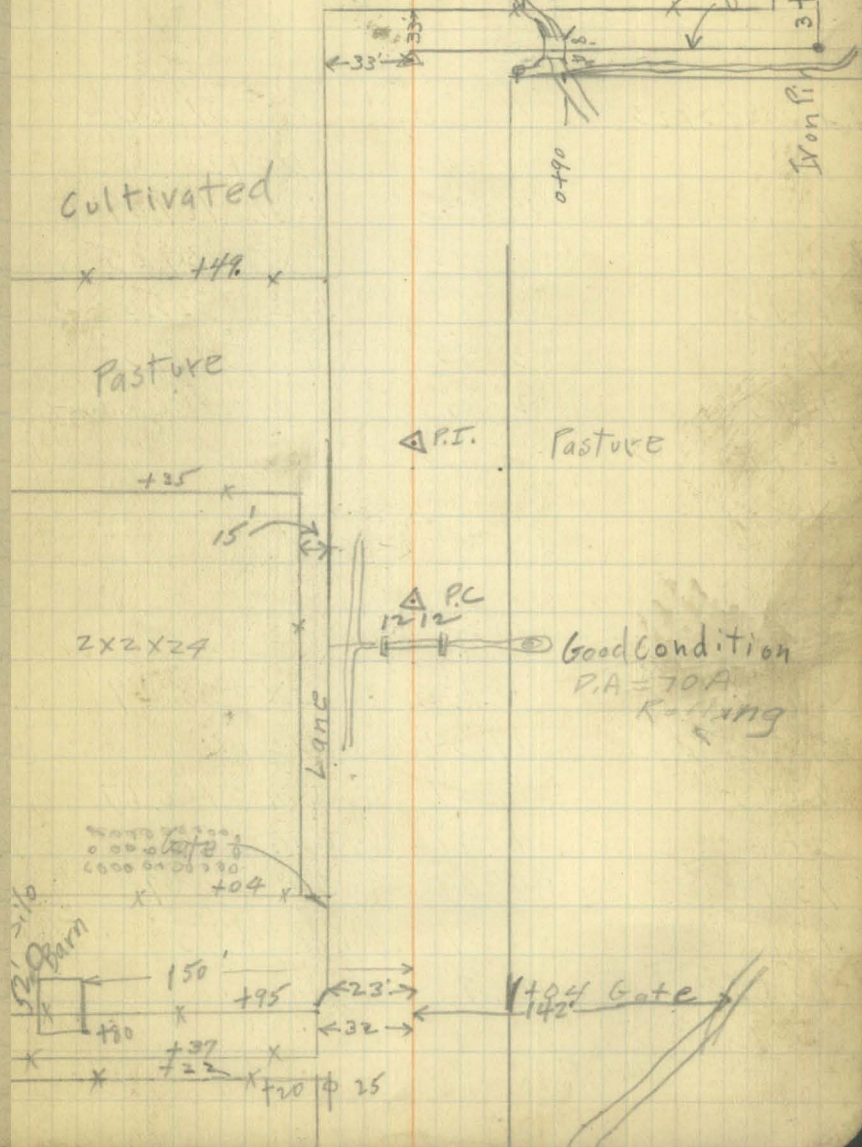
90

89

Δ 88 +02 Drive Lt
+00 $\angle$ 0°36' Right

89 +30 ϕ Drive Lt,

D.A. = 900A
Rolling
Build 10x6 Box



Dec. 12, 1921 38

P.T. 100+29.23

19°-30' $\Delta = 39^{\circ}00'$

100

17°-45' $D = 12^{\circ}$

99+50

14°-45' $\text{Tan.} = 169.09$

99

11°-45' $\text{Ext.} = 29.05$

98+50

8°-45' $\text{L.C.} = 325.0$

98

5°-45' $\text{Rad.} = 477.5$

97+50

2°-45'

P.C. 97+04.23

Defl.

P.T. 95+21.42

19°14' $\Delta = 38^{\circ}29'$

95

17°57' $D = 12^{\circ}$

94+50

14°57' $\text{Tan} = 166.67$

94

11°57' $\text{Ext.} = 28.27$

93+50

8°57' $\text{L.C.} = 320.69$

93

5°57' $\text{Rad.} = 477.5$

92+50

2°57'

P.C. 92+00.73

P.I.

93+67.4

I Bridge

P.T.
100+29.23P.I.
98+73.32

Ditch Xing

P.C. 97+04.23

P.T. 95+21.42

P.C. 92+00.73

111/ $\Delta +95.85$ $\angle 0^\circ 40'$ Right sec. Cor.
 Note Cor Stone = Sta 95+69.6
 = " 98+94.3

110

109

108

107

106

105

104

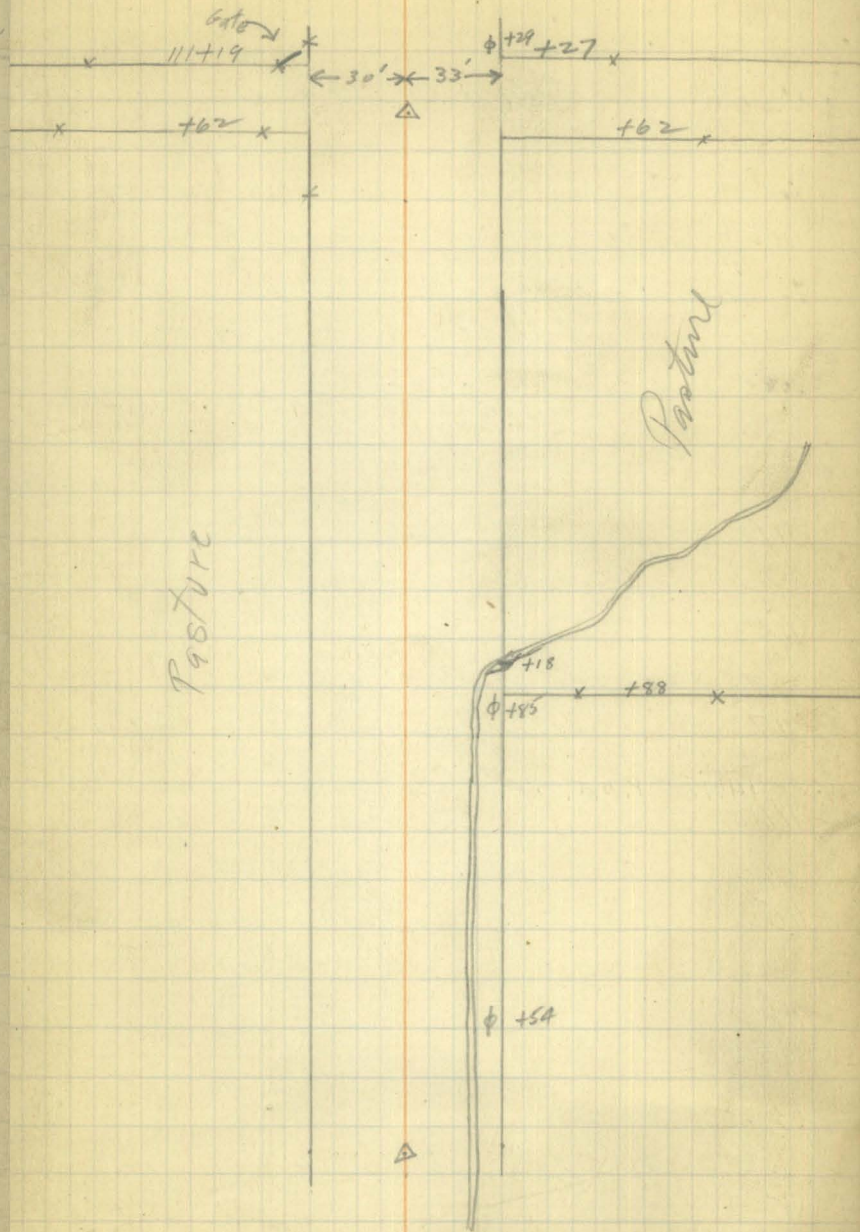
103

102

101

PT
 00+24.23

6/6/22



123

122

121

120

119

118

117

△ +41.75 P.O.T.
116

115

114

113

112

Cultivated

φ +75

△

Cultivated

136

135

134

133
+76.6 $\pm$ 2x2x24 Concrete Culvert

132

131

130

129

128

127

126

125

124⁺²⁶ Gate & Culv. 20'x12" corr. pipe Left

2x2x24
Good Condition
D.A. = Flat

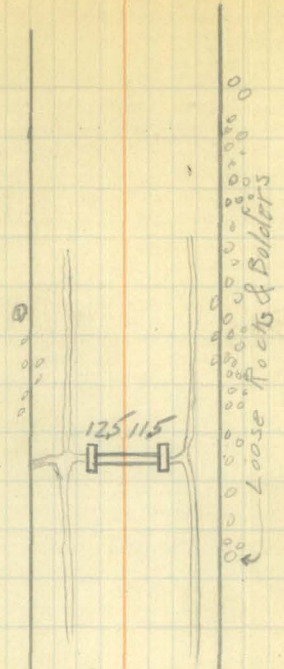
Cultivated

26 ϕ +20

Cultivated

24x14

$\leftarrow 29' \rightarrow$
 $\leftarrow 29' \rightarrow$
26 ϕ +14 Fence



148

147

146

+50 Wood Bridge 16'x16'

145

144

+02 Big Willow 31' Left
143

142

141

+2.6 Drive & Gate

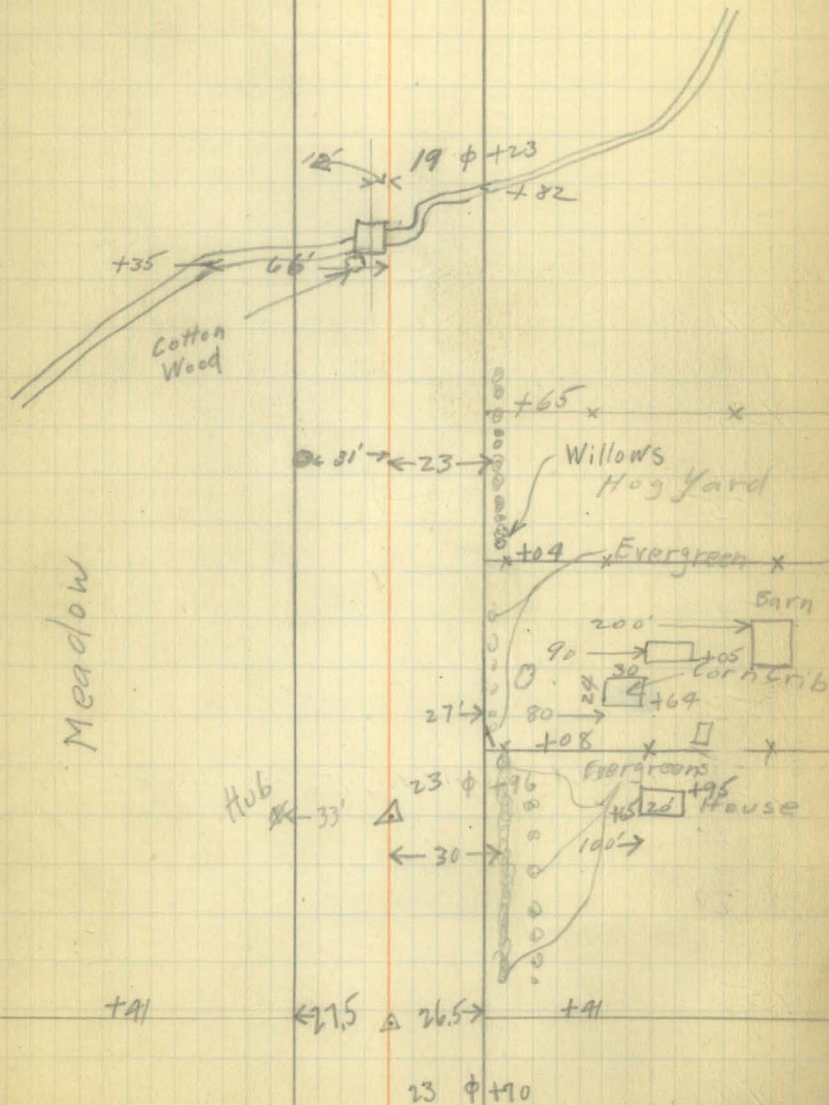
140

+65 South Side House
Δ +49.05 P.O.T.

139

138

Δ 137 +40.0 L 0° 17' Right 1/4 Cor. Stone



161

160

159

158

157

156

155

154

153

152⁺²⁹

Culv. Right 20'x12" Corr. Pipe

151

150

149

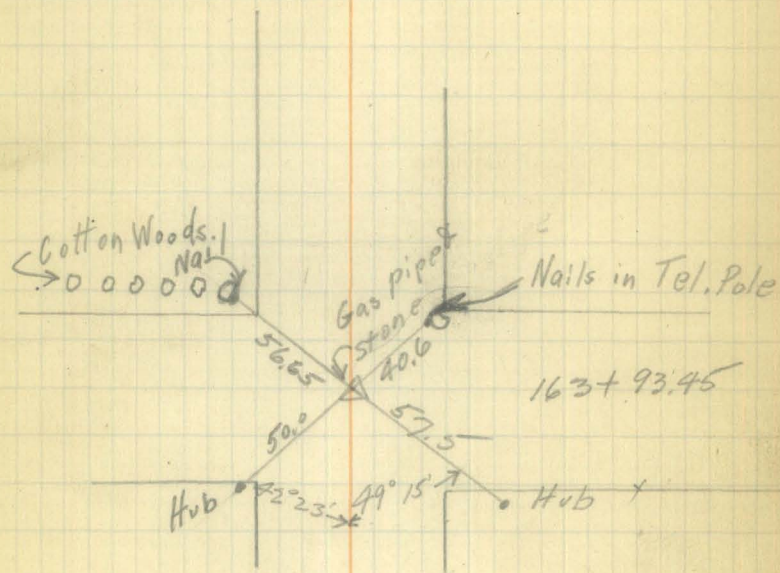
22' ϕ +0017-21' Corn
+08 $\pm$ 6 c

+36 x

Pasture

19' ϕ +07

Cultivated

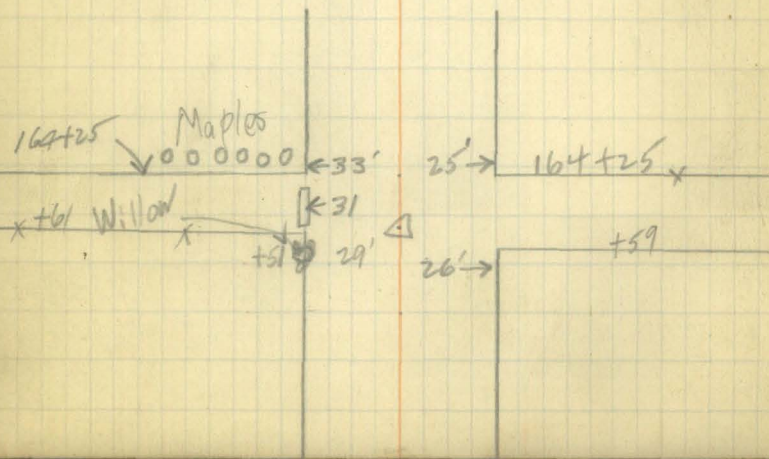


$$= 163 + 91.5 \quad 6/9/22$$

△ +93.45 Gas Pipe 15" x 29' sheet Iron Culv. Left

163

162



Proposed Re-location

Dec. 15, 1921
Spencer
Hoff
Strover
Bodke

46

C 11

10

9

8

str. 180' Rt.

7

6

str. 137' Right

5

+09

Fence

stream 109' Right

+68

stream

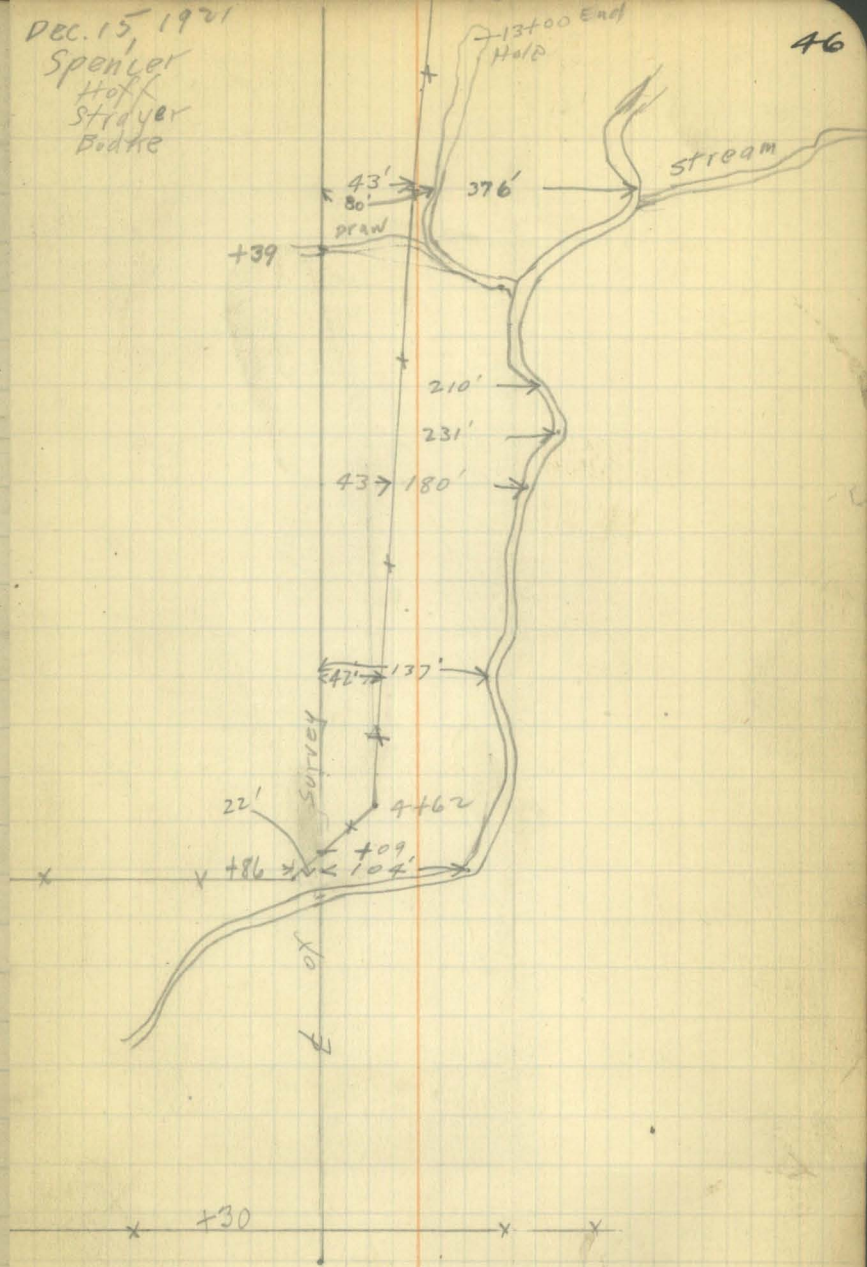
3

2

C 1

C 0+00

210' 40' Left
a point 33' West of 56+23.6



24

23

22

21

20

C 19

18

17

16

15

14

13

C 12



X 187 X

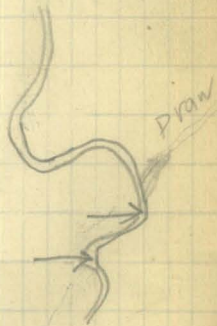
X

X

44

623'
500'

X

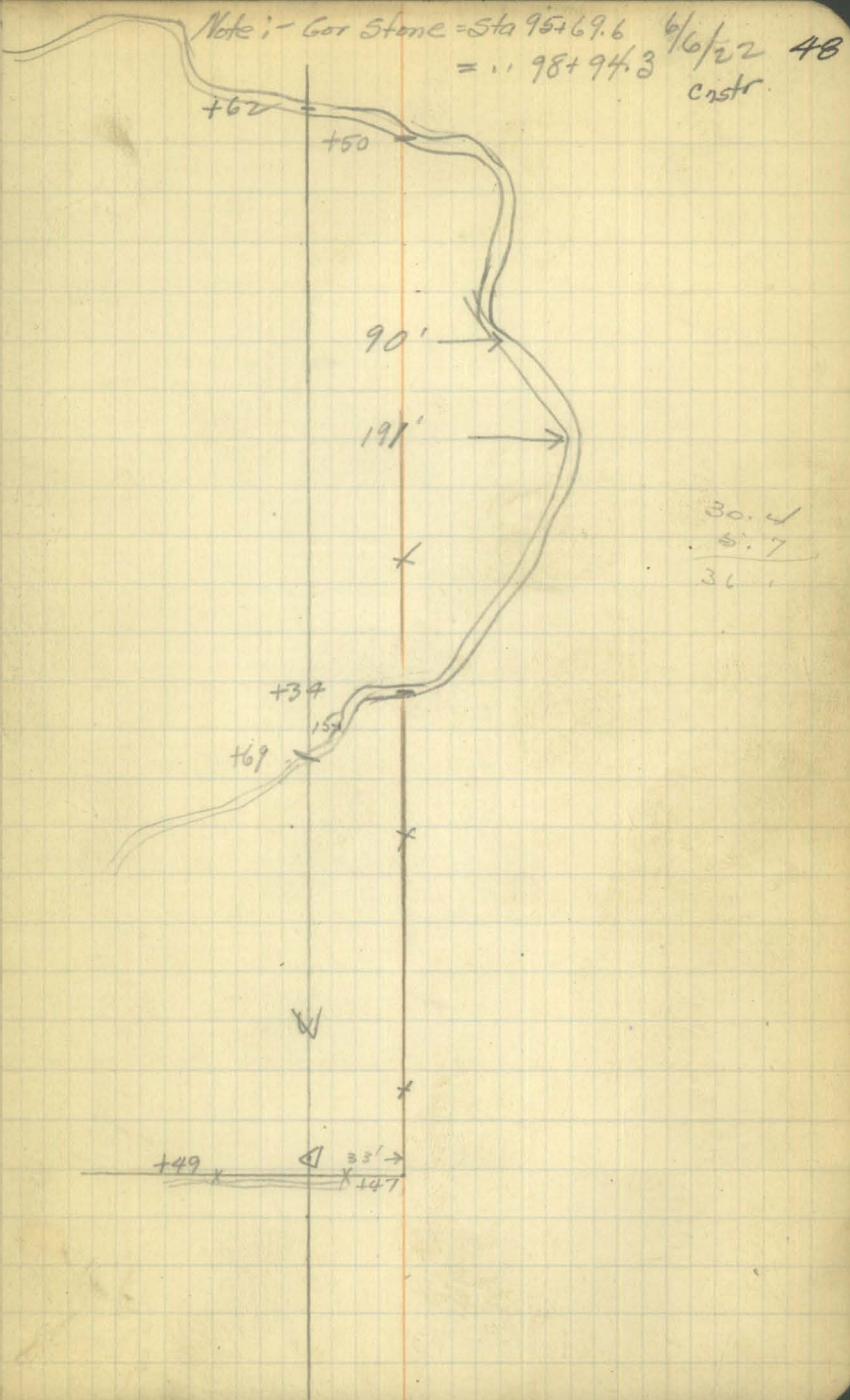


39+42.7 9 points 33' West of 1/4 Sta.
 38+83 Fence E & W.

37
 36
 35
 34
 33
 32
 31
 30
 29
 28
 27
 26
 25

stream crosses Fence

$\angle 0^{\circ} 0\frac{1}{2}' \angle$ exX



956.8 ✓

	954.64	✓
2.16	954.62	✓

139

138

11.90	956.78	0.95	944.88	✓
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136

134

133

32 + 76.6 $\pm$ Colv.

B.M. #11	5.29	945.83	940.54	L
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Cont. from Book 24 Page 28

95.28

4.0
33

95.31
33

2.7
33

95.41
33

4.3
31

95.2.5

2.6
28

95.2

4.6
23

95.2.8

5.6
22

95.1.5

5.3
18

95.0.9

5.9
11

95.3.0

3.1
9

95.3.7

2.9
9

95.3.9

4.4
15

95.2.4

3.1
19

95.3.7

2.1
23

95.4.7

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T.P. 7.90 958.31 2.93 950.41 ✓
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T.P. 9.95 953.34 1.83 943.39 ✓
31#13 4.58 945.22 4.54 940.67 940.64 ✓
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109

12" X 20' Cor Col'd 17' R+

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T.P. 7.79 945.25^m 2.82 937.46 ✓
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940.28 ✓

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165400

164 + 10 N. Hwy OLWC E+W. Hwy

13 May 14

T.P.	8.93	963.94	3.30	95501
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958.31 ✓

Handwritten calculations on a grid background, showing various numbers and fractions. The calculations are organized into columns and rows, with some numbers written in a larger, bolder font. The numbers include:

- 9564, 957.3, 957.5, 956.6, 956.1, 955.6, 953.9, 952.6, 953.5, 953.1, 952.9, 951.9, 951.7, 951.5, 951.1, 951.0, 950.9, 950.8, 950.7, 950.6, 950.5, 950.4, 950.3, 950.2, 950.1, 950.0, 949.9, 949.8, 949.7, 949.6, 949.5, 949.4, 949.3, 949.2, 949.1, 949.0, 948.9, 948.8, 948.7, 948.6, 948.5, 948.4, 948.3, 948.2, 948.1, 948.0, 947.9, 947.8, 947.7, 947.6, 947.5, 947.4, 947.3, 947.2, 947.1, 947.0, 946.9, 946.8, 946.7, 946.6, 946.5, 946.4, 946.3, 946.2, 946.1, 946.0, 945.9, 945.8, 945.7, 945.6, 945.5, 945.4, 945.3, 945.2, 945.1, 945.0, 944.9, 944.8, 944.7, 944.6, 944.5, 944.4, 944.3, 944.2, 944.1, 944.0, 943.9, 943.8, 943.7, 943.6, 943.5, 943.4, 943.3, 943.2, 943.1, 943.0, 942.9, 942.8, 942.7, 942.6, 942.5, 942.4, 942.3, 942.2, 942.1, 942.0, 941.9, 941.8, 941.7, 941.6, 941.5, 941.4, 941.3, 941.2, 941.1, 941.0, 940.9, 940.8, 940.7, 940.6, 940.5, 940.4, 940.3, 940.2, 940.1, 940.0, 939.9, 939.8, 939.7, 939.6, 939.5, 939.4, 939.3, 939.2, 939.1, 939.0, 938.9, 938.8, 938.7, 938.6, 938.5, 938.4, 938.3, 938.2, 938.1, 938.0, 937.9, 937.8, 937.7, 937.6, 937.5, 937.4, 937.3, 937.2, 937.1, 937.0, 936.9, 936.8, 936.7, 936.6, 936.5, 936.4, 936.3, 936.2, 936.1, 936.0, 935.9, 935.8, 935.7, 935.6, 935.5, 935.4, 935.3, 935.2, 935.1, 935.0, 934.9, 934.8, 934.7, 934.6, 934.5, 934.4, 934.3, 934.2, 934.1, 934.0, 933.9, 933.8, 933.7, 933.6, 933.5, 933.4, 933.3, 933.2, 933.1, 933.0, 932.9, 932.8, 932.7, 932.6, 932.5, 932.4, 932.3, 932.2, 932.1, 932.0, 931.9, 931.8, 931.7, 931.6, 931.5, 931.4, 931.3, 931.2, 931.1, 931.0, 930.9, 930.8, 930.7, 930.6, 930.5, 930.4, 930.3, 930.2, 930.1, 930.0, 929.9, 929.8, 929.7, 929.6, 929.5, 929.4, 929.3, 929.2, 929.1, 929.0, 928.9, 928.8, 928.7, 928.6, 928.5, 928.4, 928.3, 928.2, 928.1, 928.0, 927.9, 927.8, 927.7, 927.6, 927.5, 927.4, 927.3, 927.2, 927.1, 927.0, 926.9, 926.8, 926.7, 926.6, 926.5, 926.4, 926.3, 926.2, 926.1, 926.0, 925.9, 925.8, 925.7, 925.6, 925.5, 925.4, 925.3, 925.2, 925.1, 925.0, 924.9, 924.8, 924.7, 924.6, 924.5, 924.4, 924.3, 924.2, 924.1, 924.0, 923.9, 923.8, 923.7, 923.6, 923.5, 923.4, 923.3, 923.2, 923.1, 923.0, 922.9, 922.8, 922.7, 922.6, 922.5, 922.4, 922.3, 922.2, 922.1, 922.0, 921.9, 921.8, 921.7, 921.6, 921.5, 921.4, 921.3, 921.2, 921.1, 921.0, 920.9, 920.8, 920.7, 920.6, 920.5, 920.4, 920.3, 920.2, 920.1, 920.0, 919.9, 919.8, 919.7, 919.6, 919.5, 919.4, 919.3, 919.2, 919.1, 919.0, 918.9, 918.8, 918.7, 918.6, 918.5, 918.4, 918.3, 918.2, 918.1, 918.0, 917.9, 917.8, 917.7, 917.6, 917.5, 917.4, 917.3, 917.2, 917.1, 917.0, 916.9, 916.8, 916.7, 916.6, 916.5, 916.4, 916.3, 916.2, 916.1, 916.0, 915.9, 915.8, 915.7, 915.6, 915.5, 915.4, 915.3, 915.2, 915.1, 915.0, 914.9, 914.8, 914.7, 914.6, 914.5, 914.4, 914.3, 914.2, 914.1, 914.0, 913.9, 913.8, 913.7, 913.6, 913.5, 913.4, 913.3, 913.2, 913.1, 913.0, 912.9, 912.8, 912.7, 912.6, 912.5, 912.4, 912.3, 912.2, 912.1, 912.0, 911.9, 911.8, 911.7, 911.6, 911.5, 911.4, 911.3, 911.2, 911.1, 911.0, 910.9, 910.8, 910.7, 910.6, 910.5, 910.4, 910.3, 910.2, 910.1, 910.0, 909.9, 909.8, 909.7, 909.6, 909.5, 909.4, 909.3, 909.2, 909.1, 909.0, 908.9, 908.8, 908.7, 908.6, 908.5, 908.4, 908.3, 908.2, 908.1, 908.0, 907.9, 907.8, 907.7, 907.6, 907.5, 907.4, 907.3, 907.2, 907.1, 907.0, 906.9, 906.8, 906.7, 906.6, 906.5, 906.4, 906.3, 906.2, 906.1, 906.0, 905.9, 905.8, 905.7, 905.6, 905.5, 905.4, 905.3, 905.2, 905.1, 905.0, 904.9, 904.8, 904.7, 904.6, 904.5, 904.4, 904.3, 904.2, 904.1, 904.0, 903.9, 903.8, 903.7, 903.6, 903.5, 903.4, 903.3, 903.2, 903.1, 903.0, 902.9, 902.8, 902.7, 902.6, 902.5, 902.4, 902.3, 902.2, 902.1, 902.0, 901.9, 901.8, 901.7, 901.6, 901.5, 901.4, 901.3, 901.2, 901.1, 901.0, 900.9, 900.8, 900.7, 900.6, 900.5, 900.4, 900.3, 900.2, 900.1, 900.0, 899.9, 899.8, 899.7, 899.6, 899.5, 899.4, 899.3, 899.2, 899.1, 899.0, 898.9, 898.8, 898.7, 898.6, 898.5, 898.4, 898.3, 898.2, 898.1, 898.0, 897.9, 897.8, 897.7, 897.6, 897.5, 897.4, 897.3, 897.2, 897.1, 897.0, 896.9, 896.8, 896.7, 896.6, 896.5, 896.4, 896.3, 896.2, 896.1, 896.0, 895.9, 895.8, 895.7, 895.6, 895.5, 895.4, 895.3, 895.2, 895.1, 895.0, 894.9, 894.8, 894.

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Ditch

892.01 ✓

+23.6

End Culr.

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+90.2

End Culr. & Ditch

+63

Drive Lt.

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End Wings

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B.M.O 0.72 892.73

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$$23 + 74 = \text{POT}$$

T.P. 47. 936.52 0.83 931.82 ✓

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$$2172.6 \pm \text{C.O.V.}$$

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T.P. 3.12 932.65 11.84 929.53 ✓

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B.M.#1 3.68 941.37 937.69 ✓

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4.69 937.75 ✓

942.44

931.2	931.5	932.1	932.8	934	931.0	932.4	931.5	930.8	932.4	933.9	56
2 31.2	5.0	4.4	3.7	6.1	5.5	4.1	5.6	5.7	4.1	2.6	2.6
3 33	33	27	21	16	13	13	13	16	19	26	33
129.2	931.9	932.0	932.9	930.5	931.7	932.9	932.2	931.7	932.3	931.1	934.3
5 129.2	4.6	4.5	3.6	6.0	4.8	4.3	4.8	4.2	4.2	2.4	2.4
33 33	30	29	19	16	12	12	12	16	18	23	26
125.5	931.5	932.2	930.3	928.5	930.3	931.0	931.1	930.2	931.0	932.9	931.1
2 125.5	7.0	6.3	6.0	7.4	5.0	1.7	1.3	1.7	1.7	0.2	0.2
33 33	26	28	18	16	9	4.4	4.5	5.9	4.4	3.6	3.0
920.5	924.4	925.4	925.2	925.3	927.0	927.9	927.5	925.7	925.8	927.6	928.2
12.2	8.3	7.3	7.1	7.5	7.4	5.7	5.2	7.0	6.2	5.1	4.5
100 33	22	20	17	10	11	4.8	11.6	11.5	16	20	26
924.6	925.5	925.7	925.1	926.9	927.7	927.4	926.0	927.5	928.2	928.9	929.7
8.1	7.2	7.0	7.6	5.8	5.0	5.3	6.7	5.2	4.5	3.8	3.8
33 33	22	20	17	11	11	11	17	19	26	33	33
925.8	925.9	926.3	926.2	927.8	928.6	928.0	928.8	928.6	929.2	929.7	929.7
6.2	6.8	6.5	6.4	4.8	4.1	4.7	5.2	4.1	3.5	3.0	3.0
33 33	27	23	20	18	11	10	16	20	26	33	33
930.1	930.7	931.0	931.3	930.8	931.4	930.7	929.2	930.9	931.1	932.2	932.2
11.3	10.1	10.2	10.1	10.6	10.4	10.7	12.2	9.5	8.1	9.2	9.2
33 33	24	20	17	11	11	12	17	22	28	33	33
935.0	936.2	936.2	934.1	935.6	936.2	935.7	935.7	935.0	936.2	936.8	936.8
6.4	5.4	5.2	7.5	5.8	5.2	5.7	7.6	6.4	5.2	4.6	4.6
33 33	30	21	17	11	11	11	18	22	24	27	27
931.7	931.6	931.6	931.9	931.8	931.7	931.6	931.3	931.2	931.1	931.1	931.1
4.6	3.8	3.8	3.5	3.6	3.6	3.6	5.1	4.2	3.3	3.1	3.1
33 33	29	25	22	18	12	12	17	22	24	27	27
937.3	937.5	937.1	935.9	937.5	938.3	937.7	936.4	936.6	936.3	936.3	936.3
4.6	4.1	3.9	3.7	3.7	3.7	3.7	5.0	4.8	3.1	3.1	3.1
33 33	29	25	22	20	12	11	15	20	23	27	27
931.3	933.9	934.5	934.4	932.1	933.5	934.7	934.1	933.2	934.0	934.9	934.9
18.5	7.9	7.9	8.0	10.3	8.6	8.3	8.3	8.7	6.4	7.5	7.5
33 33	26	26	21	18	12	11	14	17	27	32	32

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+24

Colr

33

B/M #3

5.71

914.64

9.00

908.89

908.93

32

31

30

29

+17

Colr

28

B/M #2

2.55

917.89

11.0

915.39

915.34

27

26

T.P

2.72

926.39

12.85

923.67

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905.9	906.2	906.1	906.0	906.4	907.4	906.8	905.9	906.5	907.3	907.1	907.0
5.7	8.1	5.5	9.6	8.2	7.2	7.5	8.7	5.1	7.3	7.5	7.6
33	25	20	5.5	9	13	13	19	21	26	30	33
906.2	903.9	904.4	905.5	907.3	908.2	908.1	908.9	908.6	908.8	908.8	908.8
8.4	10.7	10.2	6.1	7.2	7.5	10.6	11.8	12.5	10.1	10.1	10.2
200	100	21	8	7.5	9.0	9.8	12	17	21	24	33
904.3	905.0	904.5	906.2	906.7	906.1	906.1	906.1	906.1	906.1	906.1	906.1
10.3	9.6	10.1	5.4	13.3	13.3	13.3	13.3	13.3	13.3	13.3	13.3
33	21	17	11	13	13	13	13	13	13	13	13
906.8	906.8	906.8	906.8	906.8	906.8	906.8	906.8	906.8	906.8	906.8	906.8
11.1	11.1	11.1	12.6	10.7	10.6	10.6	10.6	10.6	10.6	10.6	10.6
33	27	21	18	10	12	12	17	21	24	33	33
910.2	910.7	910.6	908.9	910.0	910.9	910.1	908.6	910.7	912.0	911.8	911.6
17	12	13	9.0	7.9	7.8	7.8	7.3	7.2	6.9	6.1	6.3
33	24	22	18	13	11	11	16	18	24	28	33
911.9	912.4	912.7	911.1	912.6	913.8	913.4	911.9	914.8	915.4	915.2	915.2
8.0	5.3	5.2	6.8	5.3	4.1	4.1	6.2	3.1	2.6	2.7	2.7
33	30	23	19	13	11	11	16	19	22	33	33
906.6	906.6	906.6	906.6	906.6	906.6	906.6	906.6	906.6	906.6	906.6	906.6
13.3	9.1	8.7	8.4	7.0	5.1	5.1	5.2	4.5	3.4	3.4	3.4
200	100	30	24	18	17	17	15	18	25	33	33
910.9	911.2	911.0	911.6	913.4	914.1	914.1	914.1	914.1	914.1	914.1	914.1
10.0	6.7	6.9	6.3	4.5	3.8	3.8	3.7	6.2	4.2	3.8	3.8
33	31	25	22	15	38	38	8	17	25	33	33
914.0	914.5	914.4	912.9	915.0	916.0	915.5	914.0	914.8	915.5	915.7	915.7
12.4	11.9	12.0	13.5	11.4	10.4	10.9	12.4	11.6	10.9	10.7	10.7
33	30	25	20	13	10	9	16	18	25	30	33
919.1	919.3	919.8	919.7	920.0	920.8	919.8	919.8	919.8	920.1	920.8	920.8
7.3	6.6	5.6	8.0	6.7	7.0	7.0	7.8	6.6	5.7	5.6	5.6
33	29	20	18	13	13	13	17	19	25	33	33
926.1	926.6	927.2	926.8	925.2	925.8	924.9	924.2	925.6	927.1	927.3	927.4
10.4	9.9	9.3	11.9	11.3	11.6	11.6	12.3	10.9	9.4	9.2	9.1
33	28	18	16	13	107	13	17	18	23	26	33

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T.P. 1.84 914.59 7.35 912.75 ✓

39

+29 Gate Left

38

37 Drive Rt

+71 Driveway Left

36

T.P. 5.61 920.10 0.15 914.49 ✓

35+12 15'x20' car culv Rt

35

34+24 Field Entrance Left

914.64 ✓

907.7 907.9 908.0 906.9 908.4 909.3 908.9 907.4 908.7 910.4 910.6
 $\frac{6.9}{33} + \frac{6.7}{32} \frac{6.6}{25} \frac{7.7}{20} \frac{6.2}{14} \frac{5.7}{13} \frac{7.2}{17} \frac{5.9}{20} \frac{4.2}{25} \frac{4.0}{33}$ ✓
 908.4 908.8 908.6 907.9 907.4 910.6 910.1 908.4 909.0 911.2 911.9 912.1
 $\frac{6.2}{33} + \frac{5.8}{31} \frac{6.0}{25} \frac{6.7}{20} \frac{5.2}{14} \frac{4.0}{13} \frac{4.2}{18} \frac{5.6}{20} \frac{3.6}{26} \frac{2.7}{30} \frac{2.5}{33}$
 910.9 911.3 910.8 909.9 911.5 912.9 912.1 910.0 911.2 913.1 913.9 914.2 913.5
 $\frac{3.7}{33} + \frac{3.3}{30} \frac{3.8}{24} \frac{4.7}{19} \frac{3.1}{13} \frac{2.5}{17} \frac{4.6}{19} \frac{3.6}{20} \frac{1.5}{24} \frac{0.7}{28} \frac{0.4}{31} \frac{1.1}{33}$ ✓
 912.1 912.6 912.5 911.8 913.5 914.7 914.4 912.6 913.6 916.0 916.6 917.2
 $\frac{5.0}{33} + \frac{7.5}{29} \frac{7.6}{21} \frac{8.3}{17} \frac{6.6}{11} \frac{5.7}{14} \frac{7.5}{19} \frac{6.5}{21} \frac{4.1}{27} \frac{3.5}{30} \frac{2.9}{33}$ ✓
 908.5 912.3 913.0 912.9 914.3 915.0
 $\frac{11.6}{100} + \frac{7.8}{29} \frac{7.1}{21} \frac{7.2}{17} \frac{5.8}{9} \frac{5.1}{51}$ ✓
 912.2 912.5 913.3 912.9 914.0 915.1 914.7 913.9 914.3 916.6 917.4 918.0
 $\frac{7.9}{33} + \frac{7.6}{29} \frac{6.8}{20} \frac{7.2}{17} \frac{6.1}{11} \frac{5.0}{16} \frac{5.2}{21} \frac{6.2}{21} \frac{5.3}{26} \frac{3.5}{29} \frac{2.7}{32} \frac{2.1}{33}$ ✓
 913.9 914.1 914.1 915.7 915.9 917.2 919.9
 $\frac{6.2}{33} + \frac{6.0}{28} \frac{6.0}{16} \frac{4.4}{14} \frac{4.2}{21} \frac{2.9}{35} \frac{0.3}{100}$ ✓
 Left
 914.6 914.9 913.6 914.1 914.9 914.1 913.9 915.7 916.0 914.4 914.4 911.8
 $\frac{5.5}{33} \frac{5.2}{21} \frac{6.8}{16} \frac{6.0}{13} \frac{5.2}{14} \frac{5.1}{19} \frac{4.4}{21} \frac{4.1}{26}$ ✓
 914.6 914.9 913.6 914.1 914.9 914.1 913.9 915.7 916.0 914.4 914.4 911.8
 $\frac{5.5}{33} \frac{5.2}{21} \frac{6.8}{16} \frac{6.0}{13} \frac{5.2}{14} \frac{5.1}{19} \frac{4.4}{21} \frac{4.1}{26}$ ✓
 909.3 909.6 909.6 908.0 909.2 910.6 910.4 908.0 910.8 909.9 911.0
 $\frac{5.3}{33} + \frac{5.0}{20} \frac{5.0}{17} \frac{6.6}{15} \frac{5.4}{11} \frac{4.4}{14} \frac{4.8}{14} \frac{5.1}{19} \frac{4.3}{22} \frac{3.7}{33} \frac{3.6}{30}$ ✓
 905.9 907.4 906.2 907.6 909.6 910.6 910.2 909.8 910.1 910.3 910.3
 $\frac{5.7}{100} \frac{7.2}{20} \frac{8.4}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15} \frac{9.0}{15}$ ✓
 914.6 914.9 913.6 914.1 914.9 914.1 913.9 915.7 916.0 914.4 914.4 911.8
 $\frac{5.5}{33} \frac{5.2}{21} \frac{6.8}{16} \frac{6.0}{13} \frac{5.2}{14} \frac{5.1}{19} \frac{4.4}{21} \frac{4.1}{26}$ ✓

✓ 54

✓ 53

T.P 430 900.81 3.90 900.51 ✓

✓ 52

51

50

49

48

T.P 47 310 900.41 10.48 901.31 ✓

47

46

45

44

B.M. 44

43

0.37 911.79 3.17 911.42 ✓

914.59 ✓

87.899.0 898.7 891.7 896.9 899.0 899.8 899.1 897.2 898.3 899.5 900.0 900.1
 6.1 5.8 6.1 7.1 7.9 5.8 5.7 7.6 6.5 5.3 4.8 4.7
 33 29 25 22 20 14 50 10 16 17 20 26 33 ✓

898.4 898.4 898.9 897.2 898.9 899.6 899.0 897.6 899.4 899.8 899.8
 6.4 6.0 6.0 7.6 6.9 6.2 5.8 7.2 5.4 5.5 5.0
 31 28 26 21 15 62 10 15 17 26 33 ✓

898.5 898.7 898.9 897.1 899.1 899.8 899.0 897.9 899.6 900.0 900.0
 5.9 5.7 5.5 7.3 5.3 5.4 6.4 6.5 4.8 4.4 4.4
 33 29 25 21 14 46 10 17 17 26 33 ✓

900.0 898.8 898.7 897.6 899.1 899.7 899.2 899.0 899.7 900.2 900.2
 6.1 5.6 5.2 6.8 6.3 5.2 5.2 6.4 4.7 4.2 4.2
 33 30 24 20 14 47 10 14 17 25 33 ✓

898.4 898.7 899.0 898.0 898.9 899.9 899.5 898.1 899.7 900.3 900.2 900.2
 6.0 5.7 5.4 6.4 5.5 5.9 6.3 6.7 4.1 4.2 4.2
 33 32 25 20 16 45 11 15 17 20 28 33 ✓

899.2 899.2 899.3 898.2 899.3 900.1 899.3 898.5 900.0 900.4 900.4 900.4
 5.2 5.2 5.1 6.2 5.1 5.1 5.9 4.4 4.0 4.0 4.0
 33 32 26 21 16 43 11 15 17 25 30 33 ✓

899.4 899.4 899.6 898.6 900.2 900.7 900.0 898.9 899.9 900.2 900.1 900.1
 5.0 5.0 4.8 5.8 4.2 4.4 5.2 4.5 4.2 4.3 4.3
 33 31 24 21 14 37 11 15 17 25 30 33 ✓

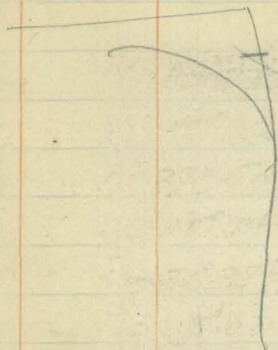
899.4 900.0 900.2 899.7 901.0 901.5 901.1 900.1 901.6 901.6 901.7
 5.0 11.8 4.6 7.2 10.1 10.2 10.7 11.7 10.2 10.2 10.1
 33 32 25 21 15 103 10 14 16 25 33 ✓

903.4 903.4 902.9 901.3 902.8 903.6 902.9 901.7 904.4 904.4 905.3
 8.1 8.4 8.9 10.5 9.0 8.9 8.9 10.1 6.9 6.9 6.5
 33 31 25 21 16 82 9 15 16 25 33 ✓

905.2 905.3 905.3 904.3 905.4 906.3 905.6 904.3 907.0 907.4 907.4
 6.6 6.5 6.5 7.5 6.4 6.2 7.5 4.8 4.4 4.4 4.4
 33 32 27 21 16 55 11 15 17 25 37 ✓

905.9 906.1 906.2 905.1 906.4 907.0 906.5 905.4 907.8 908.4 908.4
 5.9 5.7 5.6 6.7 5.6 5.3 6.4 4.0 3.4 3.4 3.4
 33 32 26 21 16 48 11 15 18 24 30 33 ✓

907.3 907.3 907.0 905.9 907.2 908.0 907.7 906.1 908.6 909.3 909.4
 7.3 7.3 7.6 8.7 7.4 6.9 8.5 6.0 5.3 5.2
 33 32 25 21 15 66 12 17 19 24 33 ✓



$L = 2$
 $L = 2$
 $L = 2$
 $L = 2$

0.00

0.00

BM#5-

0.35 904.46 ^{corr} 904.55 ✓

564.23.6 Δ Corner Stone

W 55-

904.81

✓

900.7	901.4	903.2	905.8	
41	3.4	1.6	-1.00	Δ
100	100	200	300	
19.0	899.2	899.0	897.3	899.2
58	27.6	5.8	7.5	5.6
33	27	24	20	13
	4.7	5.1	7.5	6.8
	10	16	48	19
				26
				33
				5.01
				899.8

+ 485 W Cor.
+ 36 N.W. Cor.
+ 25 S.E. Cor. + 30 E Br.
+ 13 N.E Cor.

58+20

58+04.0

58

57+14.43 P.T.

56+80 ✓

56+40

56

55+60

55+20 ✓

54+80

Calc. F.L. at 55+88 on Tan.

B.M. #5 0.65 905.20

904.55 ✓

893.7 894.1 894.2 894.5
11.5 11.1 11.0 12
200 100 33 893.8
897.6 898.2 898.7 898.0 901.2 901.8 893.3
1.6 7.0 6.5 1.2 4.0 3.4 11.9
33 31 23 18 11 3.4 N.E
901.3 900.8 898.1 895.4 896.7 897.9
3.9 4.4 2.1 2.8 2.5 7.3
10 18 20 21 26
898.1 895.4 896.7 897.9 897.9 897.7
7.1 2.8 2.5 7.3 7.5 7.5
18 20 21 26 31 33
899.6 899.9 899.7 897.9 896.5 900.1 900.2 899.8 898.3 896.8 898.1 898.9 898.7 900.0 900.2
5.6 5.3 5.5 1.3 8.7 5.1 5.2 5.0 6.3 1.7 6.5 5.2 5.0
33 30 25 21 17 17 16 11 18 21 27 31 35 39
899.1 899.7 898.4 896.9 897.6 899.1 899.2 899.3 898.9 897.4 899.7 900.0 900.7 899.6
6.1 5.5 4.8 8.3 7.6 6.1 6.1 6.1 6.3 7.8 5.5 5.2 4.5 5.6
33 16 7 2 1.6 5.5 5.9 11 19 23 30 39 47 72
899.1 899.2 898.1 897.4 897.8 900.9 901.2 899.5 899.5
6.1 6.0 6.1 7.8 7.4 4.3 4.0
33 6.0 6 10 16 24 45
899.0 899.2 899.1 897.2 899.5 899.6 900.3 897.7 897.3 898.5 899.5
6.2 6.0 6.1 8.0 5.7 5.6 4.9 5.5 7.9 6.7 5.7
33 18 15 9 3 11 23 29 34 38
899.1 899.3 897.3 899.1 900.3 899.7 897.2 899.4 900.1 899.9
6.1 5.9 7.9 6.1 4.9 5.5 8.0 5.8 5.1 5.3
33 25 19 13 11 17 21 27 33
Lt: 896.55
8.65
896.45
F.L. RT. 8.75 ✓

Dec. 13, 1921

67

Cont. in Book 24 Page 20

65

64

T.P. 12.11 918.17 2.30 906.06 ✓

63

62

61

60

Profile of Twp. Road

59+12.8 P.T.

59 ± Culv. Sec. on ± Culv.

58+90

58+70

58+50 End Wings

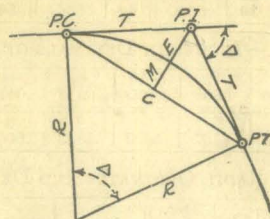
B.M.#5 3.81 908.36

904.55 ✓

911.0 910.1 907.9 909.2 909.9 909.2 907.1 908.5 908.2
 $\frac{7.2}{32} \frac{7.5}{22} \frac{10.3}{15} \frac{9.0}{11} \frac{8.2}{8.2} \frac{9.0}{14} \frac{10.5}{18} \frac{9.7}{25} \frac{10.0}{33}$ ✓
 909.9 908.6 905.7 906.8 907.6 901.0 906.7 906.6 907.1
 $\frac{9.2}{32} \frac{9.6}{23} \frac{12.5}{16} \frac{11.4}{12} \frac{10.6}{10.6} \frac{11.2}{14} \frac{12.5}{17} \frac{11.6}{24} \frac{11.1}{33}$ ✓
 906.2 906.4 903.8 904.7 905.7 905.1 903.9 904.7 905.0
 $\frac{2.2}{32} \frac{2.0}{23} \frac{4.6}{17} \frac{3.7}{12} \frac{2.7}{12} \frac{3.3}{14} \frac{4.5}{18} \frac{3.7}{24} \frac{3.4}{33}$ ✓
 904.8 904.7 902.5 903.6 904.7 904.4 902.6 903.3 902.9
 $\frac{3.6}{32} \frac{3.7}{24} \frac{5.9}{17} \frac{4.8}{12} \frac{4.0}{12} \frac{5.8}{19} \frac{5.1}{24} \frac{5.5}{33}$ ✓
 903.3 903.4 901.6 902.5 903.3 903.1 901.5 902.4 902.1
 $\frac{5.1}{32} \frac{5.0}{25} \frac{6.8}{17} \frac{5.9}{12} \frac{4.6}{12} \frac{5.3}{17} \frac{6.9}{24} \frac{6.3}{33}$ ✓
 901.8 902.0 900.9 900.4 901.7 902.1 901.2 899.9 900.5 901.5 901.0
 $\frac{6.6}{33} \frac{6.4}{26} \frac{7.5}{22} \frac{8.0}{17} \frac{6.7}{12} \frac{6.3}{13} \frac{7.2}{20} \frac{8.5}{23} \frac{7.9}{26} \frac{6.9}{33} \frac{7.4}{33}$ ✓
 903.8 902.4 901.0 901.1 P.I. ✓
 $\frac{4.6}{300} \frac{6.0}{200} \frac{7.4}{100} \frac{7.3}{100}$ ✓
 900.5 901.8 918.7 900.4 900.9 900.2 898.5 897.3 898.6 900.2
 $\frac{7.9}{32} \frac{7.3}{25} \frac{9.1}{20} \frac{8.0}{12} \frac{7.5}{11} \frac{8.2}{11} \frac{7.9}{21} \frac{11.1}{24} \frac{9.8}{25} \frac{8.2}{33}$ ✓
 901.2 901.0 898.1 898.1 901.2 901.0 900.2 897.4 896.5
 $\frac{7.2}{34} \frac{7.4}{27} \frac{10.3}{21} \frac{10.3}{18} \frac{7.2}{17} \frac{7.4}{14} \frac{8.2}{14} \frac{11.0}{15} \frac{11.9}{27}$ ✓
 901.9 901.0 901.0 900.4 898.9 897.0 897.3 898.5
 $\frac{6.5}{39} \frac{7.4}{17} \frac{7.4}{13} \frac{8.0}{15} \frac{9.3}{15} \frac{11.4}{19} \frac{11.1}{27} \frac{8.9}{32}$ ✓
 899.2 898.0 901.2 901.3 901.8 901.1 901.0 899.2 896.3 899.2 899.6
 $\frac{9.2}{40} \frac{10.4}{35} \frac{7.2}{23} \frac{7.1}{14} \frac{6.6}{12} \frac{7.3}{12} \frac{7.4}{18} \frac{10.2}{23} \frac{12.1}{25} \frac{9.2}{28} \frac{8.8}{33}$ ✓
 899.0 898.8 898.6 899.3 901.4 902.0 901.7 901.5 899.2 896.5 899.2
 $\frac{9.4}{39} \frac{8.9}{31} \frac{10.0}{26} \frac{11.8}{24} \frac{7.1}{17} \frac{7.0}{11} \frac{6.4}{12} \frac{6.7}{14} \frac{6.9}{18} \frac{8.2}{18}$ ✓
 899.2 896.5 899.2 899.2 899.2 899.2 899.2 899.2 899.2 899.2 899.2

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

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CURVE FORMULAS

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

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

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

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

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

EXPLANATION AND USE OF TABLES

Stations.—Given P. I. = Sta. 161 + 60.35 to find Sta. of P. C. and P. T. $\Delta = 62^\circ 10'$ $D = 8^\circ 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{3} = 414.49$ ft. From Table V correction = .36 or $T = 414.85$ ft. P. C. = Sta. P. I. $- T = 157 + 45.50$. Also from (4) $L = 746.00$ and P. T. = Sta. P. C. $+ L = 164 + 91.50$.

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

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

Externals.—May be found in similar manner to tangents. Thus E for curve above is 115.37 For from Table IV for 1° curve $E = 960.6$ for $8^\circ 20' = 960.6 \div 8\frac{1}{3} = 115.27$ and from Table V correction = .10 or $E = 115.37$ Or suppose $\Delta = 32^\circ$ and E is measured and found to be 42 ft. What is D? From Table IV $E = 230.9$ and $\div 42 = 5.5$ or $D = 5^\circ 30'$.

6.46 924.80 915.34

11.07 932.43 921.36

4.14 935.20 1.37 931.06

Rt. 9.02 926.18 925.80

Lt. 9.60 925.60 925.30

2.18 942.82 940.64

Rt. 10.64 932.18 931.6

Lt. 7.32 935.50 930.9

Item No. 6

B.M. 1.71 916.31 914.60

Rt. 6.23 910.08 907.2

Lt. 5.39 910.92 907.5

Item No. 7

B.M. 1.34 913.11 911.77

Rt. 6.82 906.29 906.4

Lt. 7.72 903.39 901.7

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

TABLE III.—RADI, ORDINATES AND DEFLECTIONS.

Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan Offset	Def. for 1 Foot	
0°	10'	34377.5	.036	.145	0.05'	7°	819.02	1.528	6.105	2.10'
	20	17188.8	.073	.291	0.10	20'	781.84	1.600	6.395	2.20
	30	11459.2	.109	.436	0.15	30	764.49	1.637	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					
1		5729.65	.218	.873	0.30	8	716.78	1.746	6.976	2.40
	10	4911.15	.255	1.018	0.35	20	688.16	1.819	7.266	2.50
	20	4297.28	.291	1.164	0.40	30	674.69	1.855	7.411	2.55
	30	3819.83	.327	1.309	0.45	40	661.74	1.892	7.556	2.60
	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
2		2864.93	.436	1.745	0.60	30	603.80	2.074	8.281	2.85
	10	2644.58	.473	1.891	0.65	40	593.42	2.110	8.426	2.90
	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	7934.5	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99°	6708.6	3092.7	109°	8032.7	4137.1	119°	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100°	6828.3	3184.1	110°	8182.8	4259.7	120°	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

TABLE V.—CORRECTIONS FOR TANGENTS AND EXTERNALS.

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

FOR TANGENTS ADD

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

FOR EXTERNALS ADD

Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.032	.035	.039	.043	.047	.051	.055
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.068	.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	.429	.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	.771	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.266	.353	.430	.518	.607	.697	.777	.877	.977	1.07	1.18	1.29
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.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	.885	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	235.83	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	.223	.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

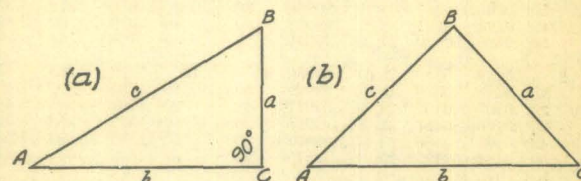
SLOPE REDUCTIONS.

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 $4^\circ 20'$ from Table VIII Cos=.99714 and correction= $1 - .99714 = .00286$ per foot or total of $.286 \times 2\frac{1}{2}$ (near enough)=.57 and horizontal distance= $248.7 - .57 = 248.13$ ft.

See fig. (a).

TRIGONOMETRICAL FORMULAS.

$$\begin{aligned}\sin. & A = \frac{a}{c} \\ \cos. & A = \frac{b}{c} \\ \tan. & A = \frac{a}{b} \\ \cot. & A = \frac{b}{a} \\ \sec. & A = \frac{c}{b} \\ \operatorname{cosec.} & A = \frac{c}{a}\end{aligned}$$



FORMULA FOR SOLVING TRIANGLES.

Given	Sought.	Right triangles. See fig. (a).
a, c	A, B, b	$\sin. A = \frac{a}{c}, \cos. B = \frac{b}{c}, b = \sqrt{(c+a)(c-a)}$
a, b	A, B, c	$\tan. A = \frac{a}{b}, \cot. B = \frac{b}{a}, c = \sqrt{a^2 + b^2}$
A, a	B, b, c	$B = 90^\circ - A, b = a \cot. A, c = \frac{a}{\sin. A}$
A, b	B, a, c	$B = 90^\circ - A, a = b \tan. A, c = \frac{b}{\cos. A}$
A, c	B, a, b	$B = 90^\circ - A, a = c \sin. A, c = c \cos. A$
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	$\left\{ \begin{aligned} \text{If } s = \frac{1}{2}(a+b+c), \sin. \frac{1}{2} A &= \sqrt{\frac{(s-b)(s-c)}{bc}} \\ \cos. \frac{1}{2} A &= \sqrt{\frac{s(s-a)}{bc}}, \tan. \frac{1}{2} A &= \sqrt{\frac{(s-b)(s-c)}{s(s-a)}} \\ \sin. A &= \frac{2V(s-a)(s-b)(s-c)}{bc} \end{aligned} \right.$
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	00	1	90	8°	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	.99998	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99996	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	3.073	.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
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242
30	.5373	.6371	1.570	.84339	30	39	.6293	.8098	1.235
40	.5398	.6412	1.560	.84182	20	10	.6316	.8146	1.228
50	.5422	.6453	1.550	.84025	10	20	.6338	.8195	1.220
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199
30	.5519	.6619	1.511	.83389	30	40	.6428	.8391	1.192
40	.5544	.6661	1.501	.83228	20	10	.6450	.8441	1.185
50	.5568	.6703	1.492	.83066	10	20	.6472	.8491	1.178
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157
30	.5664	.6873	1.455	.82413	30	41	.6561	.8693	1.150
40	.5688	.6916	1.446	.82248	20	10	.6583	.8744	1.144
50	.5712	.6959	1.437	.82082	10	20	.6604	.8796	1.137
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117
30	.5807	.7133	1.402	.81412	30	42	.6691	.9004	1.111
40	.5831	.7177	1.393	.81242	20	10	.6713	.9057	1.104
50	.5854	.7221	1.385	.81072	10	20	.6734	.9110	1.098
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079
30	.5948	.7400	1.351	.80386	30	43	.6820	.9325	1.072
40	.5972	.7445	1.343	.80212	20	10	.6841	.9380	1.066
50	.5995	.7490	1.335	.80038	10	20	.6862	.9435	1.060
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042
30	.6088	.7673	1.303	.79335	30	44	.6947	.9657	1.036
40	.6111	.7720	1.295	.79158	20	10	.6967	.9713	1.030
50	.6134	.7766	1.288	.78980	10	20	.6988	.9770	1.024
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006
							.7071	1.	1.
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.
									Sine.
									Angle.

TABLE IX.—CALCULATION OF EARTHWORK.

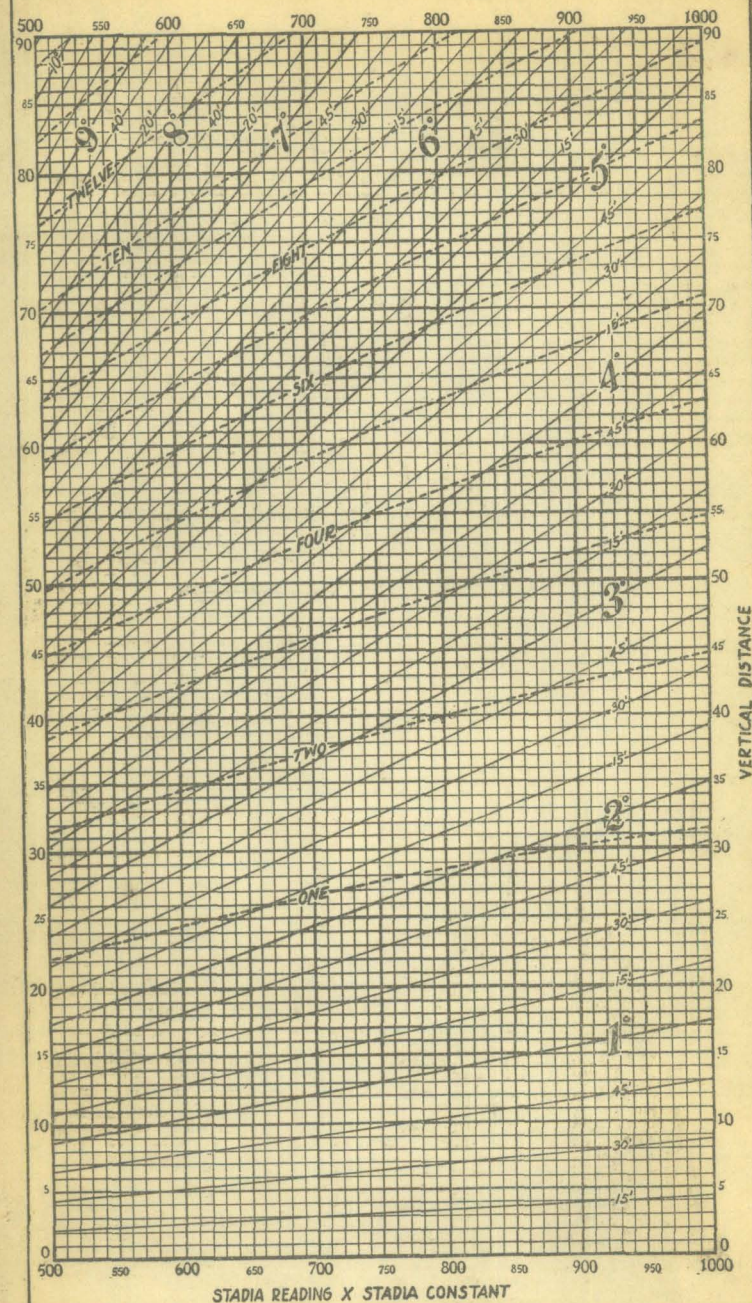
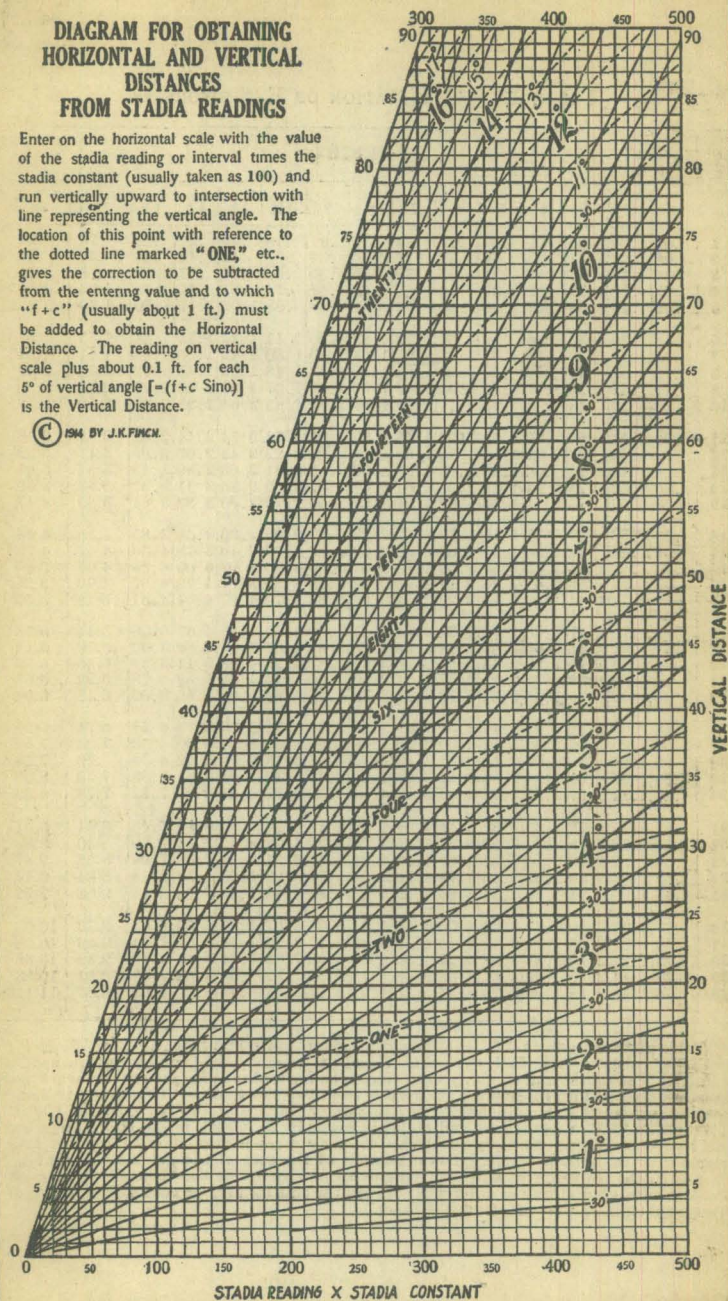
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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	3.13	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	2.83	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 $\frac{1}{2}$ the roadbed $= w$, add the triangles formed by taking the distance out to each break in turn ($= w$'s) by the difference between the cuts (or fills) on each side of it ($= h$'s) always subtracting the outer from the inner.

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

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

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$$L = 6.06$$

$$W = 3.00$$

$$H = 1.65$$

7

6.06

8

18.18

1.65

9090

10908

1818

299970

7.21

1818

20.604

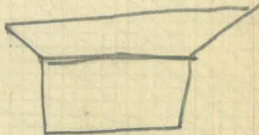
.35

37207

103020

61812

7.21140



X

