

MASCOT 'A' RANCH

FIELD BOOK

361

KEUFFEL & ESSER CO.

DRAWING MATERIALS

AND

SURVEYING INSTRUMENTS.

NEW YORK.

CHICAGO. ST. LOUIS. SAN FRANCISCO. MONTREAL.

TABLES FOR EXCAVATIONS AND EMBANKMENTS.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.

FOR SINGLE TRACK EXCAVATION.

"Copyright, 1895, by Keuffel & Esser Co."

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

Calculated by Julien A. Hall, M. Am. Soc. C. E.

For Keith's Railroad Curve Tables see end of book.

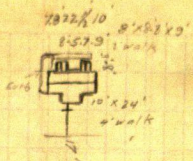
		W.	IV.
Store	N. 2°13' W.	23.1	42.8
Office	N. 3°05' W	113.4	388
Evelyn Villa	N. 2°56' W	215.8	91.6
Dock	S. 7°53' W.	121.5 337.3	5 174.3 to Dock 123 to Boat House 147 End of
Boat House	S. 2°16' W	80.7 418.0	
Lodge.	0°10' E	57 475 4749	N 92.3 93
House	N. 0°40' W	92.2 567.2 Hub 563.7 567 64 627.7 to Fence	N 92 60 to Sea wall 192.4 Hub on Lake
Hub on Hill	-27.5	135.3 699.0 53.6	5.5
Ice House, N.E. Cor.	S. 3° W	752.6 67.9	minus 1'
Power House		820.5 106.1	5.4
Main Barn	N. 1°18' W	926.6 86.3	118.5
Feed House	S. 6°16' E	1012.9 + 0.3 24.6	5 37.6
Lab -	S. 2°34' E N. 4°10' E	1037.5 + 1.0 1012.0 74.0 1086.9 201.5	N 32.6
	143.8' S. 8°05' W	1288.4 68.9	20.3 X 2.0
	31.3 Line with Guard House		
	51.1 To Fence	1357.3	

X 61°25'

22.4 X 36 Porch 6 X 6'

24.2 X 30.2 7.4 X 6.5 - 12.4

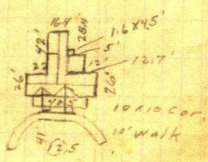
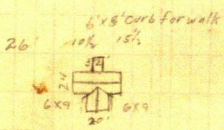
20 X 24.2



78 to F.P.

52' W. 70' W 18' W - 28' Long

28.4
1.6
12.7
42.7



5.22
-5.1
5.8-74
5.4-09
5.1-16
2-82

24' X 32'



20.2 X 22.2



60.4 X 32.3

- 16.5' - 76.6

24 X 36.2



126' lined with boards

60.1' X 14.3

66.7 Run to stop
3' west to west
85.6 to 1st corner
41.4 to point H
6.2 X 7.8' - 1' W.

1.5' x 2.5' Rect

5.49

24.3



6.5' x 10.5' x 10.5'

W - 73.8
N - 19.5
W. 19.5 S. 87°30'W Garage

W - 78
N. 208
E. 110
Porch 9.8
Total 26.2 - 24.2
S. 61°16'E

W - 73
N. 208
N. 110.8 - 318.8 Road East S. 86°15'W

S. 110.7
E. 63
S. 201.4
E. 221.9 + 8.0 S. 68°46'E
S. 538.8 - 30' to Waters Edge.
S. 84°32'E
S. 79°04'E N. 21°14'E

201.4
110.7
90.7

S. 110°20'E
S. 84°51'E - 236' - 198' to West edge of dock

390.28
S. 45°23'
93°52'
S. 48°29'W. to Hub
S. 11°00'W to point
95°51'
84°51'
336.2 - 126.6'
11°00' on point

N. 78°23'E 306.5'
S. 87°41'E 455.0' - 78' to Bank 10'
11°51'
S. 75°50'E. 100-988-11'W 193'-86'-18'
15°05'
S. 60°45'E. 100-768-91'W 200-888-11'
12°43'
S. 48°02'E 206'
44°36'
N. 3°24'W. 153.1 I.M. 1480
52°52'
N. 56°18'W.
40°58'
97°16' S. 82°41'W to Wallis'

W - 73'
N - 19.8' S. 87°30' W Garage
W. 19.5

W - 78'
N. 208' Porch 9.8
E. 110' S. 61°16' E Total 26.2 - 24.2

W - 73
N. 208
N. 110.8 - 318.8 Road East S. 86°15' W.

S. 110.7'
E. 63' S. 84°32' E
S. 201.4
E. 221.9 + 8.0' S. 68°46' E ~~S. 79°04' E~~ N. 21°14' E.
S. 538.8 - 30' to Waters Edge.

201.4
110.7
90.7

S. 110°20' E
S. 84°51' E - 236' - 198' to West edge of dock
39°28'
S. 45°23' 95°51'
93°52' 84°51' 336.2 - 126.6'
S. 48°29' W. to Hub 11°00'
S. 11°00' W to point in point

N. 78°23' E 306.5'
S. 87°41' E 455.0' - 78' to Bank 10'
11°51'
S. 75°50' E. 100-988-11' W 193'-86'-18'
15°05'
S. 60°45' E. 100-768-11' W 200-888-11'
12°43'
S. 48°02' E 206'
44°36'
N 3°24' W. 153.1 I.M. 1480
52°52'
N 56°18' W. 11
40°58'
97°16' = S. 82°41' W to Wall's

18' x 30.4'

68°46'

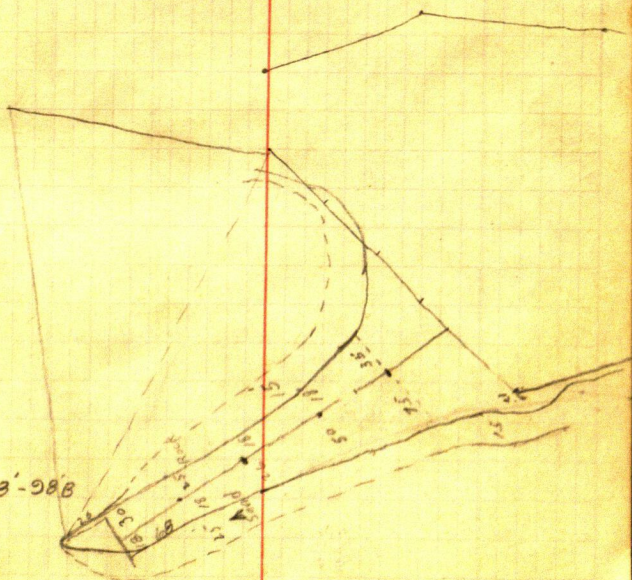
36217-1	93211-7
2219-5	2219-5-8
385953	838898
36217	93211
72434	186422
72434	186422
80365523	206835209

32.2
23.2 - 24'

S. 201.4
4.2' - 32.2' x 24.1' 80.4
281.8

E - 206.8
Porch 10' - Building 22'

269.8' - 988



318.4

lat. 4

93°32'

122.4

□ sp. he

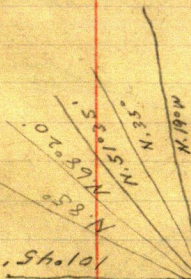
$$\begin{array}{r} 3.75 \\ 3.4 \\ \hline 3.5 \\ 2' \\ \hline 35 \end{array}$$

$$\begin{array}{r} 7.35 \\ 3.75 \\ \hline 3.60 \end{array}$$

$$\begin{array}{r} 133 \\ 135 \\ \hline 168 \end{array}$$

$$\begin{array}{r} 66 \\ 67.5 \\ 73.5 \\ \hline 157 \end{array}$$

$$\begin{array}{r} 7.25 \\ 1.74 \\ \hline 8.51 \end{array}$$



$$\begin{array}{r} 9.25 \\ 1.33 \\ \hline 8.313 \end{array}$$

$$\begin{array}{r} 9.25 \\ 1.66 \\ \hline 1.075 \\ 9.985 \\ \hline 8.515 \\ \hline 1.470 \end{array}$$

3.25

$$\begin{array}{r} 1.33 \\ 1.15 \\ \hline 1.48 \end{array}$$

$$\begin{array}{r} 12.50 \\ 1.50 \\ \hline 14 \end{array}$$

132

$$\begin{array}{r} 1.5 \\ 1.41 \\ \hline 1.47 \end{array}$$

$$\begin{array}{r} 9.25 \\ 1.875 \\ \hline 8.375 \end{array}$$

$$\begin{array}{r} 9.25 \\ 1.66 \\ \hline 8.315 \end{array}$$

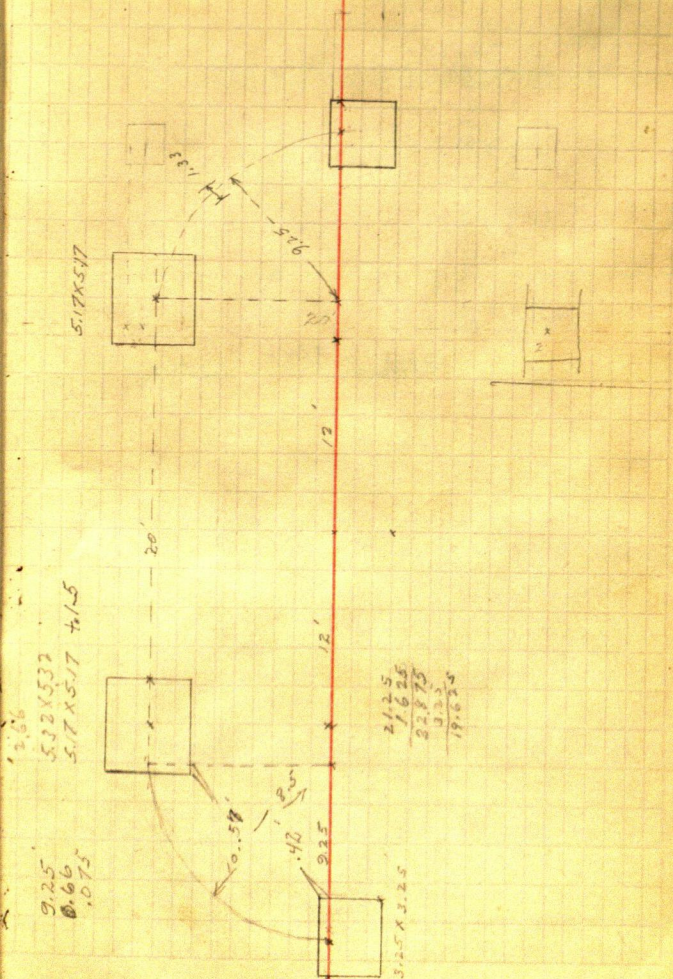
$$\begin{array}{r} 9.25 \\ 1.33 \\ \hline 8.315 \end{array}$$

$$\begin{array}{r} 9.25 \\ 1.66 \\ \hline 1.075 \\ 9.985 \\ \hline 8.515 \\ \hline 1.470 \end{array}$$

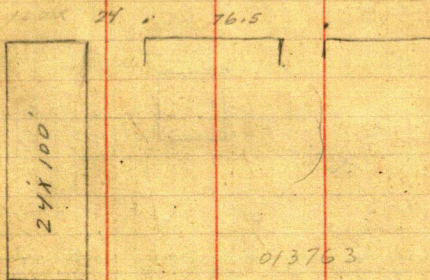
$$\begin{array}{r} 12 \\ 9.25 \\ 1.625 \\ \hline 22.875 \\ 3.25 \\ \hline 7.625 \end{array}$$

$$\begin{array}{r} 9.25 \\ 1.66 \\ 1.075 \\ \hline 9.985 \\ 8.315 \\ \hline 1.61 \end{array}$$

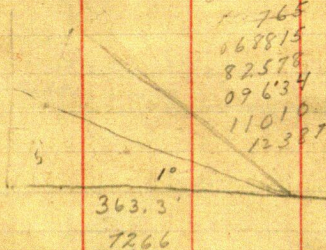
Arch



Machine Shed



$$5 \overline{) 363.3} = 72.66 = 7^{\circ} 50'$$



<u>363.3</u>	5000	013763	- 0°47'	10
	3633		1°35'	20
	13670		2°22'	30
	10899		3°09'	40
	27710		3°57'	50
	25431		4°44'	60
	22790		5°32'	70
	21798		6°19'	80
	9920		7°07'	90
			7°55'	

Road between store and office.

$$\begin{array}{r} 34^{\circ}25' \\ 53^{\circ}37' \\ \hline 88^{\circ}22' \\ 31^{\circ}06' \\ \hline 57^{\circ}16' \end{array}$$

$$183286 \cdot 05445 = 3^{\circ}07'$$

$$\begin{array}{r} 91.64 \overline{) 500.00} \\ 458.20 \\ \hline 41.800 \end{array}$$

$$458.20$$

$$41.800$$

$$36.656$$

$$41.440$$

$$36.656$$

$$478.40$$

$$478.40$$

$$35937$$

$$101.1$$

$$35937$$

$$35937$$

$$359370$$

$$36332307$$

$$\Delta = 53^{\circ}57' = 57^{\circ}14'$$

$$T = 50' \quad 28^{\circ}37'$$

$$R = 50 \times 1.96473$$

$$= 98.2' = 91.6'$$

$$3.5937$$

$$101.1 - 3$$

$$3.5937$$

$$35.937$$

$$35937$$

$$36332307$$

$$\Delta = 34^{\circ}25' \quad 31^{\circ}06'$$

$$T = 88.5' = 101.1'$$

$$R = 88.5 \times 3.22882$$

$$= 285.7 = 363.3$$

$$57.14$$

$$3^{\circ}07'$$

$$6^{\circ}14'$$

$$9^{\circ}21'$$

$$12^{\circ}28'$$

$$15^{\circ}35'$$

$$\text{Def. 4 } 1^{\circ} = 10'$$

$$90.1$$

$$68.4$$

$$4 \quad 2^{\circ} = 20'$$

$$4 \quad 3^{\circ} = 30'$$

$$T = 50'$$

10182

98.2/10000

982

1800

982

8180

7856

2240

5°51' - 10

11°42' - 20

17°33' - 30

23°24' - 40

28°45' - 50

35°06' - 60

40°57' - 70

2°55' - 10

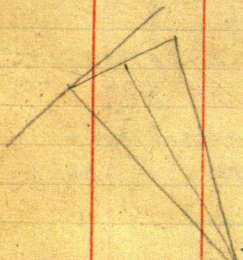
5°51' - 20

8°46' - 30

11°42' - 40

14°22' - 50

17°33' - 60



N. 56°18' W 333.9

37°25'

N. 18°53' W 267.7

25°52'

N. 44°45' W to Bolt 601.9

48°44'

93°29'

S. 86°31' W = 475.3

53°57'

S. 32°24' W

34°25'

S. 151° E S. 1047 E

325

119.6

444.6

S. 68°46'E 403.1

18°38'

S. 87°24'E 357.3

9°57'

97°21'

N. 82°39'E 304.5

221.9

181.2

403.1

101.7

90.1

191.2

S. 86°31'W

57°14'

S. 29°17'W 151.1

31°06'

S. 01°49'E 191.2

East 68.4

S. 89°41'W

21°33'

111°14'

68°46'

74°44'

422

N. 55°E

S. 84°02'E

34°24'

S. 49°38'E

N. 40°22'E



89°18'
S. 87°24'E

N. 1°54'E

N. 84°00'E

N. 76°W 489'

17.5

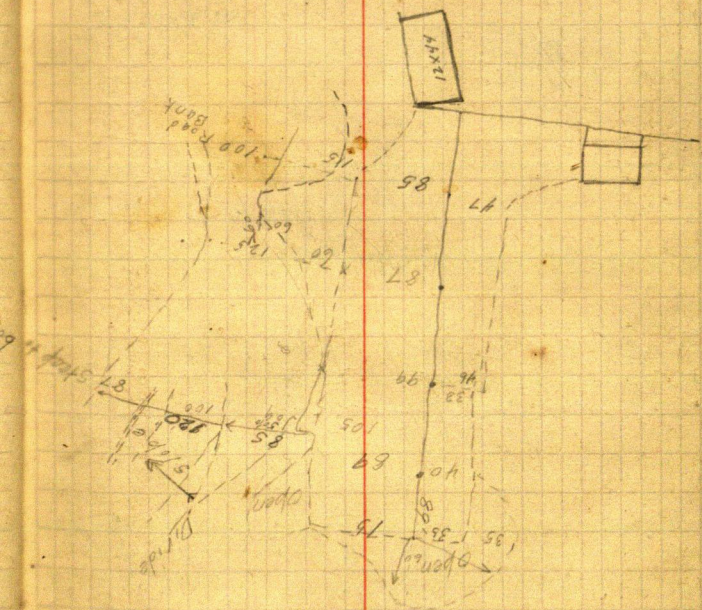
Walls
Poles
32.2

41.5-74 -178

1.7- 44'X12 Barn-Coop.

18.9-40.9

Bag



$$\begin{array}{r}
 23.0 \\
 1.4 \overline{) 32.2} \\
 \underline{28} \\
 42 \\
 \underline{42} \\
 0
 \end{array}
 = 2^{\circ} 29'$$

24

01.018

15

$$\begin{array}{r}
 89^{\circ} 25' \\
 87^{\circ} 24' \\
 \hline
 2^{\circ} 01'
 \end{array}
 \quad
 87^{\circ} 30'$$

$$\begin{array}{r}
 05234 \\
 \underline{3573} \\
 15702 \\
 36638 \\
 26170 \\
 \underline{15702} \\
 18701082
 \end{array}$$

$$\begin{array}{r}
 161.1 \\
 \underline{63.4} \\
 97.7 \\
 \underline{10.1} \\
 107.8
 \end{array}$$

$$\begin{array}{r}
 329 \\
 \underline{59} \\
 388 \\
 \underline{11.4} \\
 376.6 \\
 \underline{107.8} \\
 268.8
 \end{array}$$

$$\begin{array}{r}
 89041 \\
 1002730 \\
 \hline
 7901330
 \end{array}$$

$$\begin{array}{r}
 1002730 \\
 68046 \\
 \hline
 791330 \\
 1004630
 \end{array}$$

$$\begin{array}{r}
 1002730 \\
 100 \\
 \hline
 1004630
 \end{array}$$

403.7
 $\frac{18.38}{186.1}$

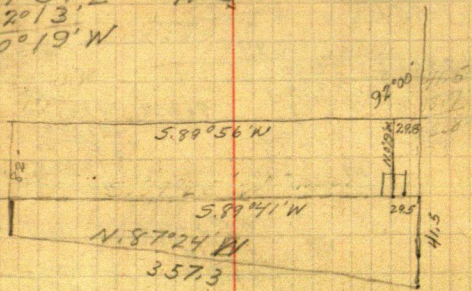
S. 68°46'E (242') 161.1

S. 87°24'E 357.3

N. 1°54'E 41.5

2°13'

N 0°19'W



03871
 $\frac{82}{7742}$
 30968
 317922

N. 1°54'E
 87°24'
 87°18'

29.5
 $\frac{3.2}{32.7}$
 2°13'

89°41' 2°36'
 $\frac{0.13}{20.55}$

05088 41.5
 3573 161.1
 15264

35616
 25440
 15264
 18179427

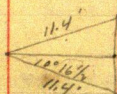
87°24'
 68°46'
 18°38'

$$\begin{array}{r}
 2,53217-2 \\
 \underline{233-8-7} \\
 759651 \\
 759651 \\
 506434 \\
 \hline
 58999561
 \end{array}$$

$$\begin{array}{r}
 36731 \overline{) 23.3000} \quad 63.43 \\
 \underline{220386} \\
 126140 \\
 \underline{110193} \\
 159470. \\
 \underline{146924} \\
 125480
 \end{array}$$

$$\begin{array}{r}
 96238 \overline{) 5470000} \quad 56.9 \\
 \underline{481190} \\
 658100 \\
 \underline{577428} \\
 806720
 \end{array}$$

$$\begin{array}{r}
 84032 \\
 \underline{68046} \\
 15946
 \end{array}$$

$$\begin{array}{r}
 28234-1 \\
 \underline{54.7-7} \\
 197638 \\
 \underline{112936} \\
 141170 \\
 \hline
 615443998
 \end{array}$$


$$\begin{array}{r}
 .178375-4 \\
 \underline{11.4-6} \\
 713500 \\
 \underline{178375} \\
 178375 \\
 \hline
 2,0334750
 \end{array}$$

15.4

10°46'


$$\begin{array}{r}
 18681 \\
 \underline{18718} \\
 37391 \\
 \underline{114} \\
 149564 \\
 \underline{37391} \\
 37391 \\
 \hline
 4262574
 \end{array}$$

98.3

$$\begin{array}{r}
 9987.0 \\
 329.4 \\
 \hline
 39948 \\
 89883 \\
 19974 \\
 29961 \\
 \hline
 52897178
 \end{array}$$

$$\begin{array}{r}
 05088-3 \\
 329-5 \\
 \hline
 45892 \\
 10176 \\
 15264 \\
 \hline
 16.83952
 \end{array}$$

$$\begin{array}{r}
 .09527-5 \\
 98.3-2 \\
 \hline
 28381 \\
 76216 \\
 85743 \\
 \hline
 9.365041
 \end{array}$$

$$\begin{array}{r}
 09527-5-2 \\
 12-3 \\
 \hline
 19054 \\
 9527 \\
 \hline
 114324
 \end{array}$$


$$\begin{array}{r}
 .38854-1 \\
 42-6 \\
 \hline
 77108 \\
 155416 \\
 \hline
 1631868
 \end{array}$$

$$\begin{array}{r}
 40 \\
 16.7 \\
 \hline
 23.3
 \end{array}$$

$$\begin{array}{r}
 93211 \quad 4.5 \\
 420000 \\
 372844 \\
 \hline
 471560 \\
 466055
 \end{array}$$

$$\begin{array}{r}
 90.7 \\
 4.5 \\
 \hline
 86.2
 \end{array}$$

$$\begin{array}{r}
 1.1 \\
 63 \\
 64.1 \\
 9.4 \\
 \hline
 54.7
 \end{array}$$

$$\begin{array}{r}
 99545-5 \\
 983-2 \\
 \hline
 298635 \\
 796360 \\
 895905 \\
 \hline
 97852735 \\
 15.44 \\
 \hline
 113.29
 \end{array}$$

$$\begin{array}{r}
 37027' \quad 132144-6 \\
 1133-8-3 \\
 \hline
 396432 \\
 396432 \\
 132144 \\
 \hline
 132144 \\
 14971915-2 \\
 82 \\
 \hline
 67.7
 \end{array}$$

$$\begin{array}{r}
 221.9 \\
 241.9 \\
 116 \\
 \hline
 243.5 \\
 56.9 \\
 \hline
 186.6 \\
 113.3 \\
 \hline
 73.3
 \end{array}$$

$$\begin{array}{r}
 1.32144 \quad 51.2 \\
 67.70000 \\
 660720 \\
 \hline
 162800 \\
 132144 \\
 \hline
 306560
 \end{array}$$

10°46'30'

92.2

525880

525048

1050928

525464 8-2

107.8-7

4203712

3678248

5254640

566450192

82

484.4

5.25464 484.40 00

4729176

1148240

1050928

983120

74.233

.08041-4

74233

296732

5938640

596907553

15.8 1

.08041

194 15.80

1552

800

776

240

97

102.60

542

74014

5°59'

68°15'

34°07'

2777

3,1416

149.7

219912

282744

125664

31416

470.29752

470.29752

.2062

94059504

282178512

940595040

969.75348624

193950

73.3

267.3

89.1

73.3

15.8

89.1

67.7

62.37

5346

149.7

603207

5988

04407

04491

48073-1

1221-6

48073

96146

96146

48073

58697133

87687

1221-6

87687

175374

175374

87687

107065827

107.1

73.0

34.1

360 $\overline{) 74,2333}$
720
2233
2160
733

67.7

15.8

5416

3385

677

1069.66

10479

2176

149.7

40.3

W-73

N. 206

5.616'E 122.1

208

58.7

149.3

10°46'30"

79°13

98237

820000

785896

341040

294711

463290

392948

703.420

8347

18803
 3.6 677
 36
 317
 288
 290
 288
 100

74°44'
 12°20'
 62°24'
 31°12'
 12°20'
 43°32'

34°24'
 31°12'
 3°12'
 05582
 149'
 50238
 22328
 5582
 831718

2°45 1/2' 3°12'

204.8 99°00'

204.8
 12.3
 217.1
 250.7
 274.8
 250.7
 217.1
 33.6
 04798
 33.6
 22788
 14394
 14394
 1612128

97905

50°52' 81364
 217.1
 81364
 569548
 81364
 162728

176641244 05661 = 3°15' 20' chord

176.64 100000 6°30' 40' chord
 88320
 116800
 105984
 108160
 105984
 21760
 1698

176.64 300000 9°45' 60' chord
 17664
 123360
 105984
 173760
 158276
 147840
 141312

58°03'
 18°32'
 76°35'
 18°32'
 95°07'
 18°32'
 11339

46°21'
 10°54'
 47°47'
 18°10'
 2°39'

17 28
 01 08
 11 02 04 5

33.6
12
45.6

S.61°16'E
2045
S.58°31'E
99°00
340°29'W

$\Delta = 101^{\circ}45'$

T = 217.1

R = 176.6

.04798 - 1

250.7 - 5

33586

239900

9596

2027586

7903

223808

195910

279986

49003

49°31'

118.34

59°17'

N.59°17'

2043

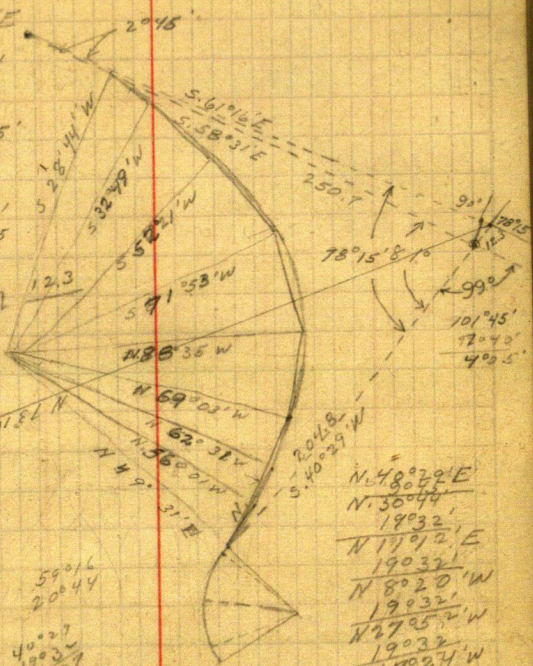
59°16'
2044

40°27'
19°32'
2057

4029
1903
2057

20°57'
19°32'
N 122.5
19032
18007
19032
37933
19032
5791

28°44'
02°46'
2043
30°46'
59°14'



N.48°29'E
N.50°44'
19°32'
N.19°12'E
19032
N.8°20'W
19032
N.27°05'W
19032
N.47°02'W
11°47'
N.59°11'W
2003
N.61°14'W

$$\begin{array}{r}
 10610 \quad 6^{\circ}10' \\
 103.2 \overline{) 10.950} \\
 \underline{1032} \\
 6300 \\
 \underline{6192} \\
 1080 \\
 \underline{1032} \\
 480
 \end{array}$$

$$\begin{array}{r}
 130^{\circ}36' - 114' \\
 \phantom{130^{\circ}36'} \underline{18.4'} \\
 \phantom{130^{\circ}36'} \underline{102.7} \\
 235.1
 \end{array}
 \quad 10.95$$

40°36

N. 40° 36' E
62° 18'

P-0 x R 62° 18' S. 77° 06' E 102° 54'

P-1 x L - 58° 35' 58° 35'
N. 49° 19' E.
65° 06'

P-2 x R - 65° 06' S. 70° 35' E 109° 25'

P-3 x L - 3° 07' 3° 07'
S. 73° 42' E

P-4 x R - 52° 41' 52° 41'
S. 21° 01' E
86° 00'

P-5 x R - 86° 00' S. 64° 59' W.
54° 07'

P-6 x R - 54° 07' 119° 06' N. 60° 54' W.
21° 52'

P-7 x R - 21° 52' N. 39° 02' W.
4° 16'

P-8 x R - 4° 16' N. 34° 46' W.
30° 43'

P-9 x R - 90° S. 55° 14' W. 5. 4° 03' E 40.
96° 58'

P-10 x L - 96° 58' 152° 12' N. 27° 48' W.
32° 47'

P-11 x 32° 47' L. N. 60° 35' W.
65° 42'

P-12 x L - 65° 42' S. 53° 43' W. 126° 17'
6° 17'

P-13 5 chord
x 40' L. - 6° 17' S. 47° 26' W.
191° 57'

P-14 x L. 91° 57' S. 44° 31' E chord

" x L. 50° 33' S. 3° 07' E.

P-15 x R 25° 16' S. 22° 09' W.

x R. 67° 37' S. 89° 46' W.

46.25

205.3'

167.6'

209.1-106.5'

58.5

34.05

34.25

62.3'

40.9-151.4

47.24

3.72

Line Road 151.8' to 4.0'E. - 89.1'

84.0'

315.65

58.2

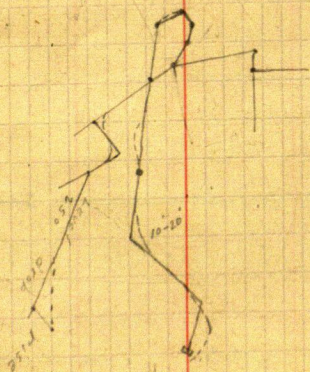
62.2'

106.25

63.1

121.1'





John M. Greene - Trans.

Range line between Birch
Survey for Mascot A Ranch
Began at E. $\frac{1}{4}$ Cor. Sec. 1, sighted
brushed North. $\frac{1}{16}$ Cor. 1. N. - sets
 $\frac{1}{4}$ Cor. U. S. calls for -

Sec. Cor. Sets 16' West of Line @ 1349

Var. N. & S. Line $10^{\circ}15' = S. 10^{\circ}15' E$

Var. E. & W. Line $10^{\circ}35' = N. 79^{\circ}25' E$

Cor. 34 & 35 Spruce 8" N. 40° W. 8
" 7" N. 74° E. 13

39.00 M.P. West side Little Webb.
Aspen 3" N. 41° W. 109

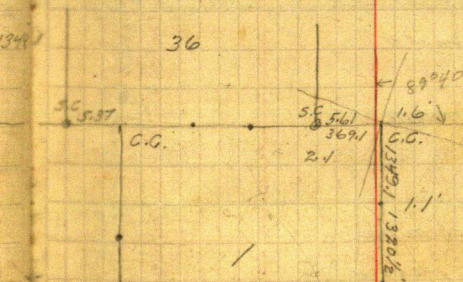
50.00 M.P. East side Little Webb
Aspen 5" N. 70° E. 81
" 5" S. 74° E. 99

S. West $\times 89^{\circ}40'$, ran west. Stan.
at 1320 Hub, 2640 Hub, 3013.9 S.C. $\frac{1}{4}$
in str., 5084.7 Hub 34.6' S of wooden stake
graded., 5293.7 Hub 9.5 North of
730.7' across lake, Hub.

Sept. 15, 1925

Lake and Woodrow Twp.

back to M.C. - Iron Mon capped - and
sets 1.1' west of Line, at 1320.5



Cor. 35 & 36

W. Pine 8" N. 81° W. 77
Ash 9" N. 57° E. 15

1/4 Cor. Aspen 12" N. 75° W. 34

Y. Pine 7" N. 4° E. 34

Cor. 36 & 31

Y. Pine 22" N. 33° W. 25
Maple 6" N. 69° E. 26

Cor. 35 & 36 - 2.1' feet S. of R. Line at 369.1,
sets S. 6.1, at 3960 Hub, 4329 Hub, ft. S. of back
end of road N. & S. Cleared but not
wooden stake. 1928.5 to Hub on East shore.

81.5
1820.0
1901.5

Record C - Field Book 61.

Extract from Notes Rec. 424

Cor. 1 - 2-1-12

Hub 85.5

" 193.4 deserted house 30 ft. Right

720.0 enter meadow

" 890.0 cross creek

1060 W. meadow

Hub 1171

1420 enter marsh

1525 lve. "

Hub 1559.6

" 1669.5 tack in stp.

" 1830 enter meadow

" 2196.8

" 2250.0 10' south of Little Webb.

Offset 60' East

2665.4 True Cor. sets East

4.6' = 64.6 ft.

121.1 tack in W.P. root

250.0 W. lake shore

500. Hub

520 enter meadow

800 W meadow

839.8 Hub

1119.0 Trail to Larson Cottage

1298.6 Hub

1800 "

2000

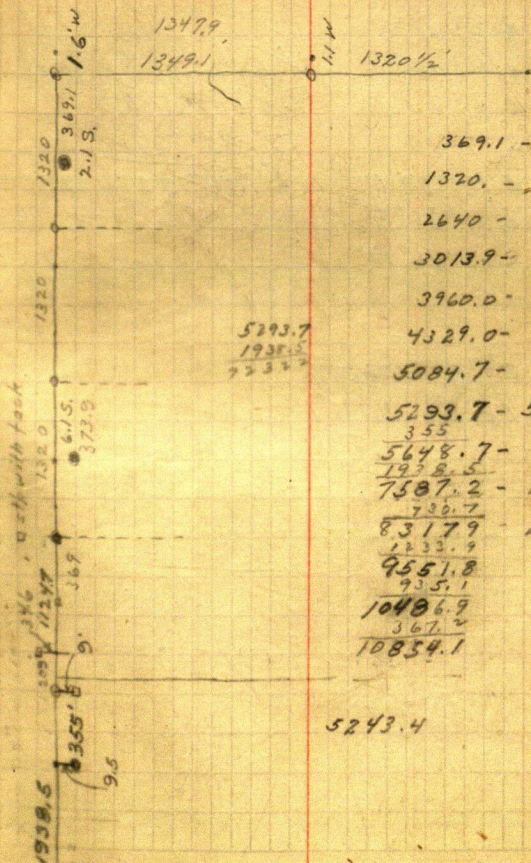
2487 Tack in stp.

2649.6

80.24

19.94
15.48
13.46
19.94
11.00
79.82

3960
1124.7
209
3.7



M.C. #3 West to Cor 1-2-11-12

974 to M.C. + 89.7, thence N. $30^{\circ}06'E$

99.5 on R. Line

217.0 $\times 45^{\circ}30'L$.

712.7 $\times 23^{\circ}10'R$.

464.0 $\times 16^{\circ}08'R$ { $\times 12^{\circ}21'R$ Cor

263.9 $\times 45^{\circ}04'R$. { $\times 107^{\circ}31'L$ "

311.6 $\times 32^{\circ}46'L$ { $\times 85^{\circ}38'L$ \times

251.3 $\times 14^{\circ}51'L$ $\times 146^{\circ}15'L$ \times

246.5 $\times 16^{\circ}10'R$

270.0 $\times 12^{\circ}46'R$

$\times 91^{\circ}50'L$ to Base

N. $89^{\circ}29'E$ 1063.7

N. $30^{\circ}06'E$ 236.3

$$217' + 19.3' = 236.3'$$

Fox Pen

" "

in Fence

" "

2240
295.5
168.6

2665.4

87°15' 39.5'
9740 75.1'

$$64.5 = 0^{\circ}53'$$

15.1 | 974
706
680
604
760
755

974
99.5
1073.5

5279.0

f S	H. I	- S	Obj.	Elev
12.05			30	115.63

29	115.38
----	--------

28	115.13
----	--------

27	114.88
----	--------

26	114.63
----	--------

25	114.38
----	--------

24	
----	--

23	
----	--

22	
----	--

21	
----	--

20	
----	--

19	
----	--

18	
----	--

17	
----	--

16	
----	--

15	
----	--

14	
----	--

13	107.38
----	--------

12	106.63
----	--------

9	105.88
---	--------

8	105.13
---	--------

7	104.48
---	--------

6	103.73
---	--------

5	102.98
---	--------

4	102.23
---	--------

3	101.48
---	--------

	100.73
--	--------

$$\begin{array}{r}
 1.2 \\
 107.38 \\
 \hline
 108.58 \\
 5.85 \\
 \hline
 2.73
 \end{array}$$

$$\begin{array}{r}
 108.58 \\
 6.8 \\
 \hline
 101.78
 \end{array}$$

$$\begin{array}{r}
 8.58 \\
 7.15 \\
 \hline
 1.43
 \end{array}$$

$$\begin{array}{r}
 114.38 \\
 1.2 \\
 \hline
 113.58 \\
 6.8 \\
 \hline
 108.78
 \end{array}$$

$$\begin{array}{r} 55 \\ 12 \overline{) 140} \\ \underline{120} \\ 20 \end{array}$$

$$\begin{array}{r} 466 \\ 12 \overline{) 932} \\ \underline{24} \\ 466 \\ \underline{354} \\ 112 \end{array}$$

$$\begin{array}{r} 6.8 \\ 12 \overline{) 81.6} \\ \underline{24} \\ 466 \\ \underline{354} \\ 112 \end{array}$$

.5

12

$$\begin{array}{r} 6.6 \\ 12 \overline{) 81.6} \\ \underline{24} \\ 466 \\ \underline{354} \\ 112 \end{array}$$

$$\begin{array}{r} 7.5 \\ 12 \overline{) 100} \\ \underline{24} \\ 56 \\ \underline{48} \\ 80 \\ \underline{72} \\ 8 \end{array}$$

$$\begin{array}{r} 1.2 \\ 1.46 \\ \underline{1.46} \\ .46 \\ \underline{2.12} \\ .46 \\ \underline{2.58} \\ .46 \\ \underline{3.04} \\ .46 \\ \underline{3.50} \\ .46 \\ \underline{3.96} \\ .46 \\ \underline{4.42} \\ 46 \\ \underline{4.88} \\ .46 \\ \underline{5.34} \\ .46 \\ \underline{5.80} \\ .46 \\ \underline{6.26} \end{array}$$

20.1
 3672.2
 32.1
 12.4
 035.1
 N. 89° 10' W
 11.8
 West 1978
 34-35
 2-3
 C.C.

1926.6
 13.4
 1940.0

01454.5
 935.1
 3740.4
 4675.5
 3740.4
 935.1
 13596.3
 5339.088
 15.591
 20.935
 11.8
 37.7

$$\begin{array}{r} 79.82 \\ 80.24 \\ \hline 160.06 \end{array}$$

$$\begin{array}{r} 52280 \\ 52280 \\ \hline 104560 \end{array}$$

$$\begin{array}{r} 160.06 \overline{) 1048690} \\ \underline{96036} \\ 88330 \\ \underline{80030} \\ 83000 \\ \underline{80030} \\ 29700 \end{array}$$

$$\begin{array}{r} 65.52 \\ 8024-3 \\ \hline 26208 \\ 13104 \\ \hline 524160 \\ 5257.3248 \\ \hline 5257.3 \\ \hline 10487.1 \end{array}$$

$$\begin{array}{r} 1938.5 \\ 13.4 \\ \hline 1925.1 \end{array}$$

$$\begin{array}{r} 32.7 \\ 39.5 \\ \hline 42.2 \end{array}$$

$$\begin{array}{r} 367.2 \\ 935.1 \\ 1978.0 \\ 1925.1 \\ \hline 5205.4 \end{array}$$

$$\begin{array}{r} 123.35 = 0.028 \\ 42.2 \overline{) 5205.4} \\ \underline{422} \\ 985 \\ \underline{844} \\ 1416 \\ \underline{1266} \\ 1500 \\ \underline{1422} \\ 780 \end{array}$$

$$\begin{array}{r} 1925.1 \\ 00814 \\ \hline 77004 \\ 1925.1 \\ \hline 154008 \\ 15670314 \\ \hline 9.2 \\ \hline 6.2 \end{array}$$

21.8

$$\begin{array}{r} 2764.5 \\ 9.1 \\ \hline 2755.4 \end{array}$$

$$\begin{array}{r} .00791 \\ 21.8000 \\ 192878 \\ 251220 \\ 248386 \\ \hline 28340 \end{array}$$

$$\begin{array}{r} 79120 \\ 1582 \end{array}$$

$$\begin{array}{r} 2241 \\ 791 \\ \hline 2241 \\ 20169 \\ 15689 \\ 791 \\ \hline 18 \\ 6328 \\ 791 \\ \hline 14238 \end{array}$$

$$\begin{array}{r} 791 \\ 2640 \\ 7 \\ \hline 3164 \\ 4746 \\ 1582 \\ \hline 2097 \end{array}$$

$$\begin{array}{r} .791 \\ 121 \\ \hline 791 \\ 1582 \\ 791 \\ \hline .95711 \end{array}$$

$$\begin{array}{r} 791 \\ 3955 \end{array}$$

$$\begin{array}{r} 791 \\ 84 \\ \hline 3164 \\ 6328 \end{array}$$

$$\begin{array}{r} 1289 \\ 791 \\ \hline 1289 \\ 11601 \\ 9023 \\ \hline 102 \end{array}$$

5648.7



$$\begin{array}{r} 5293.7 \\ 14.6 \\ \hline 5279.1 \\ 5257.3 \checkmark \\ \hline 21.8 \end{array}$$

$$\begin{array}{r} 5648.7 \\ 3013.9 \\ \hline 2634.8 \end{array} \quad \begin{array}{r} 774 \\ 238 \\ \hline 254 \\ 238 \\ \hline 166 \end{array}$$

$$\begin{array}{r} 2634.8 \\ \hline 340000 \\ 26348 \\ \hline 76520 \\ 52796 \\ \hline 237240 \\ 237132 \\ \hline \end{array} \quad \begin{array}{r} 129 \\ 129 \\ \hline 35226 \\ 7828 \\ \hline 3914 \\ 404906 \end{array}$$

21.8 - 9.1

$$\begin{array}{r} 5648.7 \\ 369.1 \\ \hline 5279.6 \\ 3 \end{array}$$

$$\begin{array}{r} 5648.7 \\ 5257.3 \\ \hline 391.4 \\ 355. \\ \hline 36.4 \\ 14.6 \\ \hline 21.8 \end{array}$$

$$\begin{array}{r} 391.4 \\ 129 \\ \hline 35226 \\ 7828 \\ \hline 3914 \\ 404906 \end{array}$$

7.62 107.62

100.0 Elev Pond

9.9 97.7

" Big Webb

7.35 100.27

Point N.W.

10.1 110.37

2.95 107.42

6.2 113.62

6.4 107.22

Meadow

5.25 112.47

9.47 103.0

Level

2.05 109.47

11.9 109.6

97.7 Elev Big Webb.

8.3 101.3

10.3 99.3

104.3

10.9
4.3
6.6

Drove stake on shore to 100' for B.M.
Pond. T.P.

Rise 5'

" 2.4

" 1.3

Little Webb

North

N. 0°08' W.

S. 89°40' W. S.

S. 0°20' W.

S. 0°47' W.

S. 1°27' W.

S. 1°21' W.

N. 88°36' E +53' = 89°29'

58°30'
N. 30°06' E

23°10'
N. 53°16' E

16°08'
N. 64°24' E.

43°04'
N. 104°28' E

32°46'
N. 81°42' E

14°51'
N. 66°51' E

16°10'
N. 82°41' E

12°46'
N. 95°37' E

91°50'
N. 3°47' E

91°50'
N. 3°26' E

0°21'

2649.2

2628.7

779

2638.9

1319.4

2711.9

1350.2

1391.9

89°20'

5.88°33'

99°04'

69°28'

5.89°06' W

S. 0°13' W

88°53'

40814

1322

1628

1442

914

1076

2711.9

756

162714

135595

189833

20501964

27

272554

00611

27554

27554

165324

1682

2628.7

20

2649.2

2649.2

94.7

5258.6

2649.2

36

N 3°26' W

272554

00611

27554

27554

165324

1682

2628.7

20

2649.2

2649.2

94.7

5258.6

2649.2

36

517

600

North

N. 52° 52' W

333.9

79723

60367

37° 25'

N. 15° 27' W

267.7

26640

96386

23° 52'

N. 41° 19' W

601.9

66022

75107

48° 44'

N 90° 03' W = 3.89057' W

79723

3339

716507

239169

239169

239169

266194

097

96386

267.7

674702

674702

578316

192772

258.02532

66022

6009

594198

66022

66022

3961370

397386418

106.1

Elev

Cor

5.85

10.025

"

Cerr

99.6

"

End

Eest

266.25

25.8

397.4

689.4

475.3

1164.7

50.

1214.7

119.6

325.0

444.6

1398.3

34

Bolt to 1/16

1164.7

119.6

1284.3

1000 Handle .35

6 Length S.P. 1.50

4m 273 - 5.00

Dumper 1.25

7.10

1324.6

689.4

645

2' 1.50

11.9

1.33 1/3

689.4

3.4

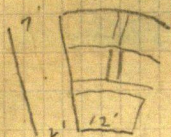
444.6

1134.0

6.05

4.05





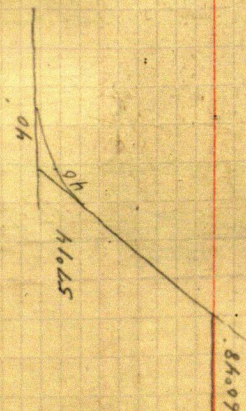
2 pens split
4 ..

166 x
188.5 - 3'
+ 30 - 4'
+ 73 x
+ 100 + 6'
124. + 13'
57.5'

188.5
124.0
57.5

370.0
100.0

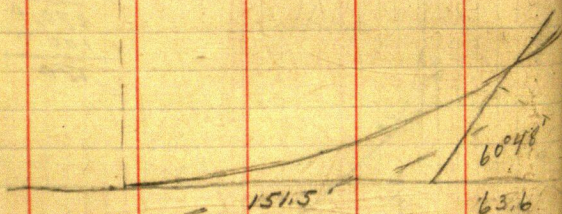
270

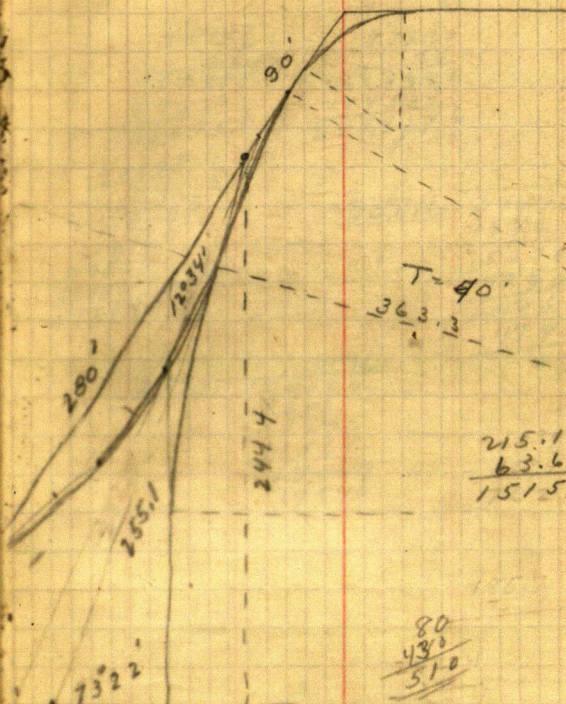


$$\begin{array}{r}
 134405 \\
 \underline{215.1} \\
 134405 \\
 672025 \\
 134405 \\
 \underline{268810} \\
 289105155
 \end{array}$$

1°59' 20
 3°58' 40
 5°57' 60
 6°56' 80
 7°55' 100

$$\begin{aligned}
 T &= 215.1 \\
 R &= 289.10
 \end{aligned}$$





$$\begin{array}{r} 215.1 \\ 63.6 \\ \hline 151.5 \end{array}$$

$$\begin{array}{r} 80 \\ 43.3 \\ \hline 51.0 \end{array}$$

$$\begin{array}{r} 136.6 \\ 73.1 \\ \hline 63.6 \end{array}$$

$$\begin{array}{r} 370' \\ 70' \\ \hline 280' \end{array}$$

$$\begin{array}{r} 48786-1 \\ 28-1 \\ \hline 390288 \\ 97572 \\ \hline 1366008 \end{array}$$

$$\begin{array}{r} 87292-1 \\ 28-1 \\ \hline 698336 \\ 174584 \\ \hline 2444176 \end{array}$$

$$\begin{array}{r} 29875-4 \\ 2444-5 \\ \hline 119500 \\ 119500 \\ \hline 59750 \\ 73014500 \end{array}$$

$$\begin{array}{r} 255.1 \\ \hline 95816 \overline{) 2444000} \\ \underline{191632} \\ 527680 \\ \underline{474080} \\ 486000 \\ \underline{479080} \\ 69200 \end{array}$$

$$\begin{array}{r} .0346 \\ 289.1 \overline{) 100000} \\ \underline{8673} \\ 13270 \\ \underline{11564} \\ 17060 \\ \underline{17346} \end{array}$$

Thur. July 12-1928
P.M. Greene - Patterson - Eggleston

Brushed true line S. Line
Sec. 1-140-30, extended R. Line
west.

Fri. July 13, 1928 same crew
O on Line about 188'
N. of Sec. Cor. on Line
bet. 1+2. Int. $\frac{1}{16}$ Cor.
Run east to small pond

July 16 Mon. Greene - Eggleston - Quick
Continued South Line Sec. 1 west

Tues - Wet

July 17 Tues - P.M - same crew

/

/

/

/

N. 88° 38' E

should be 88° 43'

N. 89° 04' E

N. 88° 54' E

N. 88° 57' W

87° 57'

M.C. #3

N. 89° 29' E

N. 88° 54' E

Flag

Sta. 742

1063.5

0

3

6

9

88° 38'

89° 29'

178 07

89° 04'

1063.5 picket

75
1138.5 pin

1138.5
207.5
304

222
306

1342
222
1568

1242
306

1166.5 picket 1442.5

1346.0 picket in meadow

1442.5 picket edge

1568.

1652

211.5
1863.5

108

1971.5

" across meadow

"

"

N 88° 54' E
120 10
76° 44'

2163.5 pin

384.5

2548.0

92

2640

2644

picket
Oak sto.

* N. to stack 12° 10'

Closing Traverse

		N.	S.	E.	W.
N. 0° 02' W	2393.8	2393.8			1.4
	1319.0	1319.0			0.8
	1445.5	1445.5			0.7
S. 89° 35' W	5257.4		38.2		5257.4
S. 0° 47' W	2755.4		2755.4		37.7
S. 0° 57' W	2665.4		2665.4		44.2
N. 89° 29' E	1063.7	9.9		1063.7	
N. 30° 06' E	236.3	204.4		118.5	
N. 53° 16' E	712.7	426.7		571.2	
N. 69° 24' E	464.0	163.4		434.3	
S. 65° 32' E	263.9	109.3	109.3	240.2	
N. 81° 42' E	311.6	45.0		308.3	
N. 66° 51' E	251.3	98.8		231.1	
N. 83° 01' E	246.5	30.0		244.7	
S. 84° 13' E	270.0		27.2	268.6	
S. 81° 27' E	236.0		35.1	233.4	
S. 41° 59' E	462.8		344.0	309.6	
N. 81° 47' E	306.5	43.8		303.4	
S. 84° 17' E	455.0		45.3	450.7	452.737
S. 72° 26' E	193.0		58.3	184.0	
S. 57° 21' E	269.8		145.6	227.2	
S. 44° 38' E	206.0		146.6	144.7	
N. 0° 02' W	153.1	153.1			0.1
		6332.9	6370.4	5333.6	5342.3
				2666.8	

Sec. 1-140-30

First survey = $N. 3^{\circ} 26' W$

Last " = $N. 0^{\circ} 02' W$

Diff = $3^{\circ} 24'$

Oct. 9, 1930

Int.

Ext.

91°46'

88°14'

107°

73°

All in Govt Lot 3, Sec. 1

187°38'

172°22'

140-30

187°52'

172°08'

187°15'

172°45'

Time

94°31'

85°29'

Oct. 8 P.M.

3/4

175°08'

184°52'

9.

1

124°13'

55°47'

10

1

104°26'

75°34'

2 3/4 days

1261 49

11 29 51

N. 87°08' E

107.9

88°14'

N. 1°06' W

100.9

75°34'

N. 76°40' W

130'

55°47'

13 2° 27

S. 47°33' W

33.5

4°52'

S. 42°41' W

26.6'

85°29'

S. 42°48' E

35.2'

7°15'

S. 35°33' E

35.1

7°52'

S. 27°41' E

34.95

7°38'

S. 20°03' E

9'

73°

93 03

N. 86°57' E

107.9'

S. 27°41' E

9°25'

S. 18°16' E

25.6'

88°26'

N. 70°10' E

26.4'

3°43'

N. 73°53' E

26.2'

N. 2°52' W

2'

N. 87°08' E

52.6'

Mileage

\$20.63

52.6

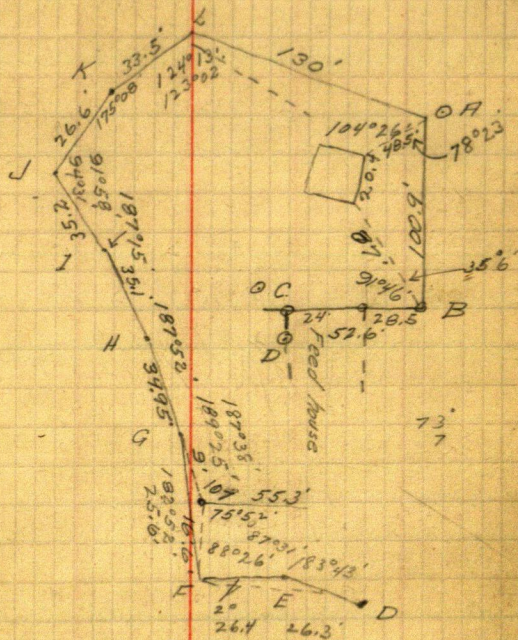
Hotel

\$4.00

Dinner at ranch

.75

\$39.58



$N 1^{\circ}06' W$ $78^{\circ}23'$
 350.6 1006
 $N 36^{\circ}12' W$ $87577^{\circ}17' W$

39.4

62.7

102.1

51.6

3012'

05582
100
0558200

99844

313.9
5.6
308.3

100.16'

99844 $\sqrt{100000}$
99844
156000
99844
561560

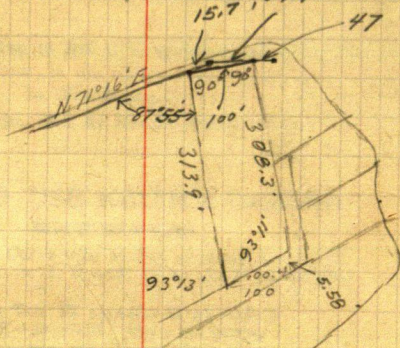
23.
723
208.3

Pine Gables

July 18-1928

Dr. Fairall's Lot 24.4

N. 73° 50' E



87° 55'
71° 16'
16° 39'

93° 13'
16° 39'
109° 52'
70° 08'

KEITH'S RAILROAD CURVE TABLES.

Published by KEUFFEL & ESSER CO., New York.

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HOW TO USE KEITH'S TABLES.

EXAMPLE.

Wanted a Curve with an Ext. of about 12 ft. Angle
of Intersection or I. P.= $23^{\circ} 20'$ to the R. at Station
542+72.

Ext. in Tab. IV opposite $23^{\circ} 20' = 120.87$
 $120.87 + 12 = 10.07$. Say a 10° Curve.

Tan. in Tab. IV opp. $23^{\circ} 20' = 1183.1$
 $1183.1 + 10 = 118.31$.

Tab. V. correction for A. $23^{\circ} 20'$ for a 10° Cur. = 0.16
 $118.31 + 0.16 = 118.47 = \text{corrected Tangent.}$

(If corrected Ext. is required find in same way)
Ang. $23^{\circ} 20' = 23.33^{\circ} + 10 = 2.3333 = \text{L. C.}$

$2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542$	I. P. = sta. 542+72
$4^{\circ} 49\frac{1}{2}' = \text{" " " +50}$	Tan. = 1.18.47
$7^{\circ} 19\frac{1}{2}' = \text{" " " 543}$	B. C. = sta. 541+53.53
$9^{\circ} 49\frac{1}{2}' = \text{" " " +50}$	L. C. = 2.33.23
$11^{\circ} 40' = \text{" " " 543+}$	E. C. = sta. 543+86.86
86.86	

$100 - 53.53 = 46.47 \times 3' (\text{def. for 1 ft. of } 10^{\circ} \text{ Cur.}) = 139.41' =$
 $2^{\circ} 19\frac{1}{2}' = \text{def. for sta. } 542.$

Def. for 50 ft. = $2^{\circ} 30'$ for a 10° Curve.

Def. for 86.86 ft. = $1^{\circ} 50\frac{1}{2}'$ for a 10° Curve

(These tables are published in Field Books of
KEUFFEL & ESSER Co., New York, N. Y.)

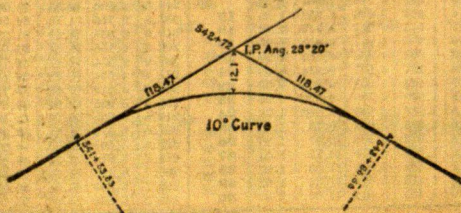


TABLE I. — Minutes in Decimals of a Degree.

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. — Radii, Ordinates and Deflections.

Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Def.	Chd. Def.	Def. for 1 Foot
0° 10'	34377.	.036	.145	.291	0.05	7°	819.0	1.528	6.105	12.21	2.10
20	17189.	.073	.291	.582	0.10	20'	781.8	1.600	6.395	12.79	2.20
30	11459.	.109	.436	.873	0.15	30	764.5	1.637	6.540	13.08	2.25
40	8594.4	.145	.582	1.164	0.20	40	747.9	1.673	6.685	13.37	2.30
50	6875.5	.182	.727	1.454	0.25	50	716.8	1.746	6.976	13.95	2.40
1 0	5729.6	.218	.873	1.745	0.30	20	688.2	1.819	7.266	14.53	2.50
10	4911.2	.255	1.018	2.036	0.35	30	674.7	1.855	7.411	14.82	2.55
20	4297.3	.291	1.164	2.327	0.40	40	661.7	1.892	7.556	15.11	2.60
30	3819.8	.327	1.309	2.618	0.45	50	637.3	1.965	7.846	15.69	2.70
40	3437.9	.364	1.454	2.909	0.50	20	614.6	2.037	8.136	16.27	2.80
50	3125.4	.400	1.600	3.200	0.55	30	603.8	2.074	8.281	16.56	2.85
2 0	2864.9	.436	1.745	3.490	0.60	40	593.4	2.110	8.426	16.85	2.90
10	2644.6	.473	1.891	3.781	0.65	50	573.7	2.183	8.716	17.43	3.00
20	2455.7	.509	2.036	4.072	0.70	20	546.4	2.292	9.150	18.30	3.15
30	2292.0	.545	2.181	4.363	0.75	30	521.7	2.402	9.585	19.16	3.30
40	2148.8	.582	2.327	4.654	0.80	40	499.1	2.511	10.02	20.04	3.45
50	2022.4	.618	2.472	4.945	0.85	50	478.3	2.620	10.45	20.91	3.60
3 0	1910.1	.655	2.618	5.235	0.90	20	459.3	2.730	10.89	21.77	3.75
10	1809.6	.691	2.763	5.526	0.95	30	441.7	2.839	11.32	22.64	3.90
20	1719.1	.727	2.908	5.817	1.00	40	425.4	2.949	11.75	23.51	4.05
30	1637.3	.764	3.054	6.108	1.05	50	410.3	3.058	12.18	24.37	4.20
40	1562.9	.800	3.199	6.398	1.10	20	396.2	3.168	12.62	25.24	4.35
50	1495.0	.836	3.345	6.689	1.15	30	383.1	3.277	13.05	26.11	4.50
4 0	1432.7	.873	3.490	6.980	1.20	40	370.8	3.387	13.49	26.97	4.65
10	1375.4	.909	3.635	7.271	1.25	50	359.3	3.496	13.92	27.84	4.80
20	1322.5	.945	3.718	7.561	1.30	20	348.5	3.606	14.35	28.70	4.95
30	1273.6	.982	3.926	7.852	1.35	30	338.3	3.716	14.78	29.56	5.10
40	1228.1	1.018	4.071	8.143	1.40	40	319.6	3.935	15.64	31.29	5.40
50	1185.8	1.055	4.217	8.433	1.45	50	302.9	4.155	16.51	33.01	5.70
5 0	1146.3	1.091	4.362	8.724	1.50	20	287.9	4.374	17.37	34.73	6.00
10	1109.3	1.127	4.507	9.014	1.55	30	274.4	4.594	18.22	36.44	6.30
20	1074.7	1.164	4.653	9.305	1.60	40	262.0	4.814	19.08	38.16	6.60
30	1042.1	1.200	4.798	9.596	1.65	50	250.8	5.035	19.94	39.87	6.90
40	1011.5	1.237	4.943	9.886	1.70	20	240.5	5.255	20.79	41.58	7.20
50	982.6	1.273	5.088	10.18	1.75	30	231.0	5.476	21.64	43.28	7.50
6 0	955.4	1.309	5.234	10.47	1.80	40	223.3	5.697	22.50	44.99	7.80
10	929.6	1.346	5.379	10.76	1.85	50	214.2	5.918	23.35	46.69	8.10
20	905.1	1.382	5.524	11.05	1.90	20	206.7	6.139	24.19	48.38	8.40
30	881.9	1.418	5.669	11.34	1.95	30	199.7	6.360	25.04	50.07	8.70
40	859.9	1.455	5.814	11.63	2.00	40	193.2	6.583	25.88	51.76	9.00

TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	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	501.26	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.63	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.

Angle	Tangent	External	Angle	Tangent	External	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	8992.8	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	5158.9
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	6514.2	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

Table V. Corrections for use with table IV,

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Δ		For Tangents Add														
ANGLE	CURVE	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	
10°		.03	.06	.09	.13	.16	.10	.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	

For Externals Add

ANGLE	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	.266	.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	.266	.353	.440	.528	.618	.707	.797	.877	.971	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

VIII

Table VI. Deflections for Sub Chords for Short Radius Curves.

Degrees of Curve	Radius 50 sin. def. ang.	$\frac{1}{2}$ sub chord R — sin of def. angle				Length of arc for 100 ft.
		12.5 Ft.	15 Ft.	20 Ft.	25 Ft.	
30°	193.18	1° 51'	2° 17'	2° 58'	3° 43'	101.15
32°	181.39	1° 59'	2° 25'	3° 10'	3° 58'	101.33
34°	171.01	2° 06'	2° 33'	3° 21'	4° 12'	101.48
36°	161.80	2° 13'	2° 41'	3° 33'	4° 26'	101.66
38°	153.58	2° 20'	2° 49'	3° 44'	4° 40'	101.85
40°	146.19	2° 27'	2° 57'	3° 55'	4° 54'	102.06
42°	139.52	2° 34'	3° 05'	4° 07'	5° 08'	102.29
44°	133.47	2° 41'	3° 13'	4° 18'	5° 22'	102.53
46°	127.97	2° 48'	3° 21'	4° 29'	5° 36'	102.76
48°	122.92	2° 55'	3° 29'	4° 40'	5° 50'	103.00
50°	118.31	3° 02'	3° 38'	4° 51'	6° 04'	103.24
52°	114.06	3° 09'	3° 46'	5° 02'	6° 17'	103.54
54°	110.11	3° 16'	3° 54'	5° 13'	6° 31'	103.84
56°	106.50	3° 22'	4° 02'	5° 23'	6° 44'	104.14
58°	103.14	3° 29'	4° 10'	5° 34'	6° 57'	104.43
60°	100.00	3° 35'	4° 18'	5° 44'	7° 11'	104.72

CURVE FORMULAS.

$$T = R \tan \frac{1}{2} I$$

$$T = \frac{50 \tan \frac{1}{2} I}{\sin D}$$

$$\sin D = \frac{R}{50 \tan \frac{1}{2} I}$$

$$\sin D = \frac{50 \tan \frac{1}{2} I}{T}$$

$$R = T \cot \frac{1}{2} I$$

$$R = \frac{50}{\sin D}$$

$$E = R \sec \frac{1}{2} I$$

$$E = T \tan \frac{1}{2} I$$

$$\text{Chord def.} = \frac{\text{chord}^2}{R}$$

$$\text{No. chords} = \frac{\frac{1}{2} I}{D}$$

$$\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$$

The square of any distance, divided by twice the radius, will equal the distance from tangent to curve, very nearly.

Table IV. contains Tangents and External to a 1° curve. Tan. and Ext. to any other radius may be found, nearly enough, by dividing the Tan. or Ext. opposite the given Central Angle by the given degree of curve.

To find Deg. of Curve, having the Central Angle and Tangent: Divide Tan. opposite the given Central Angle by the given Tangent.

To find Deg. of Curve, having the Central Angle and Tangent. Divide Ext. opposite the given Central Angle by the given External.

To find Nat. Tan. and Nat. Ex. Sec. for any angle by Table IV.: Tan. or Ext. of twice the given angle divided by the radius of a 1° curve will be the Nat. Tan. or Nat. Ex. Sec.

To find angle for a given distance and deflection.

Rule 1. Multiply the given distance by .01745 (def. for 1° for 1 ft.), and divide given deflection by the product.

Rule 2. Multiply given deflection by 57.3, and divide the product by the given distance.

To find deflection for a given angle and distance. Multiply the angle by .01745, and the product by the distance.

RIGHT ANGLE TRIANGLES. — Square the altitude, divide by twice the base. Add quotient to base for hypotenuse.

Given Base 100, Alt 10 $10^2 \div 200 = .5$. $100 + .5 = 100.5$ hyp.

Given Hyp. 100, Alt. 25 $25^2 \div 200 = 3.125$. $100 - 3.125 = 96.875 = \text{Base}$.

Error in first example, .002; in last, .045.

To find Tons of Rail in one mile of track: multiply weight per yard by 11, and divide by 7.

Natural Sines

deg.	0'	10'	20'	30'	40'	50'	deg.	100'	0'	10'	20'	30'	40'	50'	deg.
0	0000	0029	0058	0087	0116	0145	89	40	6428	6450	6472	6494	6517	6539	49
1	0175	0204	0233	0262	0291	0320	88	41	6561	6583	6604	6626	6648	6670	48
2	0349	0378	0407	0436	0465	0494	87	42	6691	6713	6734	6756	6777	6799	47
3	0523	0552	0581	0610	0640	0669	86	43	6820	6841	6862	6884	6905	6926	46
4	0698	0727	0756	0785	0814	0843	85	44	6947	6967	6988	7009	7030	7050	45
5	0872	0901	0929	0958	0987	1016	84	45	7071	7092	7112	7133	7153	7173	44
6	1045	1074	1103	1132	1161	1190	83	46	7193	7214	7234	7254	7274	7294	43
7	1219	1248	1279	1305	1334	1363	82	47	7314	7333	7353	7373	7392	7412	42
8	1392	1421	1449	1478	1507	1536	81	48	7431	7451	7470	7490	7509	7528	41
9	1564	1592	1622	1650	1679	1708	80	49	7547	7566	7585	7604	7623	7642	40
10	1736	1765	1794	1822	1851	1880	79	50	7660	7679	7698	7716	7735	7753	39
11	1908	1937	1965	1994	2022	2051	78	51	7771	7790	7808	7826	7844	7862	38
12	2079	2108	2136	2164	2193	2221	77	52	7880	7898	7916	7934	7951	7969	37
13	2250	2278	2306	2334	2363	2391	76	53	7986	8004	8021	8039	8056	8073	36
14	2419	2447	2476	2504	2532	2560	75	54	8090	8107	8124	8141	8158	8175	35
15	2588	2616	2644	2672	2700	2728	74	55	8192	8208	8225	8241	8258	8274	34
16	2756	2784	2812	2840	2868	2896	73	56	8290	8307	8323	8339	8355	8371	33
17	2924	2952	2979	3007	3035	3062	72	57	8387	8403	8418	8434	8450	8465	32
18	3090	3118	3145	3173	3201	3228	71	58	8480	8496	8511	8526	8542	8557	31
19	3256	3283	3311	3338	3365	3393	70	59	8572	8587	8601	8616	8631	8646	30
20	3420	3448	3475	3502	3529	3557	69	60	8660	8675	8689	8704	8718	8732	29
21	3584	3611	3638	3665	3692	3719	68	61	8746	8760	8774	8788	8802	8816	28
22	3746	3773	3800	3827	3854	3881	67	62	8829	8843	8857	8870	8884	8897	27
23	3907	3934	3961	3987	4014	4041	66	63	8910	8923	8936	8949	8962	8975	26
24	4067	4094	4120	4147	4173	4200	65	64	8988	9001	9013	9026	9038	9051	25
25	4226	4253	4279	4305	4331	4358	64	65	9063	9075	9088	9100	9112	9124	24
26	4384	4410	4436	4462	4488	4514	63	66	9135	9147	9159	9171	9182	9194	23
27	4540	4566	4592	4617	4643	4669	62	67	9205	9216	9228	9239	9250	9261	22
28	4695	4720	4746	4772	4797	4823	61	68	9272	9283	9293	9304	9315	9325	21
29	4848	4874	4899	4924	4950	4975	60	69	9336	9346	9356	9367	9377	9387	20
30	5000	5025	5050	5075	5100	5125	59	70	9397	9407	9417	9426	9436	9446	19
31	5150	5175	5200	5225	5250	5275	58	71	9455	9465	9474	9483	9492	9502	18
32	5299	5324	5348	5373	5398	5422	57	72	9511	9520	9528	9537	9546	9555	17
33	5446	5471	5495	5519	5544	5568	56	73	9563	9572	9580	9588	9596	9605	16
34	5592	5616	5640	5664	5688	5712	55	74	9613	9621	9628	9636	9644	9652	15
35	5736	5760	5783	5807	5831	5854	54	75	9659	9667	9674	9681	9689	9696	14
36	5878	5901	5925	5948	5972	5995	53	76	9703	9710	9717	9724	9730	9737	13
37	6018	6041	6065	6088	6111	6134	52	77	9744	9750	9757	9763	9769	9775	12
38	6157	6180	6202	6225	6248	6271	51	78	9781	9787	9793	9799	9805	9811	11
39	6293	6316	6338	6361	6383	6406	50	79	9816	9822	9827	9833	9838	9843	10

deg.	60'	50'	40'	30'	20'	10'	deg.	60'	50'	40'	30'	20'	10'	deg.
80	9848	9853	9858	9863	9868	9872	9	9868	9872	9876	9880	9884	9888	0
81	9877	9881	9886	9890	9894	9898	8	9894	9898	9902	9906	9910	9914	1
82	9903	9907	9911	9914	9918	9922	7	9918	9922	9926	9930	9934	9938	2
83	9925	9929	9932	9936	9939	9942	6	9939	9942	9946	9949	9953	9956	3
84	9945	9948	9951	9954	9957	9959	5	9957	9959	9962	9965	9968	9971	4
85	9962	9964	9967	9969	9971	9974	4	9971	9974	9976	9979	9981	9983	3
86	9976	9978	9980	9981	9983	9985	3	9983	9985	9987	9989	9991	9992	2
87	9986	9988	9989	9990	9992	9993	2	9992	9993	9994	9995	9996	9997	1
88	9994	9995	9996	9997	9997	9998	1	9997	9998	9999	1.0000	1.0000	1.0000	0
89	9998	9999	9999	9999	1.0000	1.0000	0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	0

Natural Cosines

Natural Tangents

sec.	0'	10'	20'	30'	40'	50'	sec. 100.	0'	10'	20'	30'	40'	50'	sec.	
0	0000	0029	0058	0087	0116	0145	89	40	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	88	41	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	87	42	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	86	43	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	85	44	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	84	45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	83	46	1.0355	1.0416	1.0477	1.0533	1.0590	1.0661	43
7	1228	1257	1287	1317	1346	1376	82	47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	81	48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	80	49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	79	50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	78	51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	77	52	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
13	2309	2339	2370	2401	2432	2462	76	53	1.3270	1.3351	1.3452	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	75	54	1.3764	1.3848	1.3934	1.4019	1.4106	1.4193	35
15	2679	2711	2742	2773	2805	2836	74	55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	73	56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	72	57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	71	58	1.6003	1.6107	1.6212	1.6318	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	70	59	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	69	60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	68	61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	67	62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	66	63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4432	4467	4502	4537	4572	4608	65	64	2.0503	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	64	65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	63	66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	62	67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	61	68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	60	69	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	59	70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	58	71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	57	72	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	56	73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	55	74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	54	75	3.7321	3.7760	3.8208	3.8657	3.9136	3.9617	14
36	7265	7310	7355	7400	7445	7490	53	76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2743	13
37	7536	7581	7627	7673	7720	7766	52	77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	51	78	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	50	79	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10
sec.	0'	50'	40'	30'	20'	10'	sec. 100.	60'	50'	40'	30'	20'	10'	sec.	

sec.	0'	10'	20'	30'	40'	50'	sec.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5
85	11.430	11.826	12.250	12.706	13.197	13.727	4
86	14.300	14.924	15.605	16.350	17.169	18.075	3
87	19.081	20.206	21.470	22.903	24.542	26.432	2
88	28.636	31.242	34.368	38.189	42.964	49.104	1
89	57.290	68.750	85.940	114.588	171.895	343.770	0
sec.	60'	50'	40'	30'	20'	10'	

Natural Cotangents

$$\begin{array}{r} 5.75 \\ 5.25 \\ \hline 0.50 \end{array}$$

$$\begin{array}{r} 5.25 \\ 4.05 \\ \hline 1.20 \end{array}$$

$$\begin{array}{r} 5.2 \\ 1.8 \\ \hline 3.4 \end{array}$$

$$\begin{array}{r} 9.05 \\ .55 \\ \hline 8.50 \end{array}$$

$$\begin{array}{r} 26 \text{ sat} \\ \hline \text{Wed} - 16 \text{ th} \end{array}$$

Wed 11
 Thur 17
 Fri 18
 Sat 19
 Sun 20
 Mon 21
 - 22
 - 23
 - 24
 - 25
 - 26

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES 1 1/2 TO 1.

FOR SINGLE TRACK EMBANKMENT.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	7.0	7.2	7.3	7.5	7.6	7.8	7.9	8.1	8.2	8.4	0
1	8.5	8.7	8.8	9.0	9.1	9.3	9.4	9.6	9.7	9.9	1
2	10.0	10.2	10.3	10.5	10.6	10.8	10.9	11.1	11.2	11.4	2
3	11.5	11.7	11.8	12.0	12.1	12.3	12.4	12.6	12.7	12.9	3
4	13.0	13.2	13.3	13.5	13.6	13.8	13.9	14.1	14.2	14.4	4
5	14.5	14.7	14.8	15.0	15.1	15.3	15.4	15.6	15.7	15.9	5
6	16.0	16.2	16.3	16.5	16.6	16.8	16.9	17.1	17.2	17.4	6
7	17.5	17.7	17.8	18.0	18.1	18.3	18.4	18.6	18.7	18.9	7
8	19.0	19.2	19.3	19.5	19.6	19.8	19.9	20.1	20.2	20.4	8
9	20.5	20.7	20.8	21.0	21.1	21.3	21.4	21.6	21.7	21.9	9
10	22.0	22.2	22.3	22.5	22.6	22.8	22.9	23.1	23.2	23.4	10
11	23.5	23.7	23.8	24.0	24.1	24.3	24.4	24.6	24.7	24.9	11
12	25.0	25.2	25.3	25.5	25.6	25.8	25.9	26.1	26.2	26.4	12
13	26.5	26.7	26.8	27.0	27.1	27.3	27.4	27.6	27.7	27.9	13
14	28.0	28.2	28.3	28.5	28.6	28.8	28.9	29.1	29.2	29.4	14
15	29.5	29.7	29.8	30.0	30.1	30.3	30.4	30.6	30.7	30.9	15
16	31.0	31.2	31.3	31.5	31.6	31.8	31.9	32.1	32.2	32.4	16
17	32.5	32.7	32.8	33.0	33.1	33.3	33.4	33.6	33.7	33.9	17
18	34.0	34.2	34.3	34.5	34.6	34.8	34.9	35.1	35.2	35.4	18
19	35.5	35.7	35.8	36.0	36.1	36.3	36.4	36.6	36.7	36.9	19
20	37.0	37.2	37.3	37.5	37.6	37.8	37.9	38.1	38.2	38.4	20
21	38.5	38.7	38.8	39.0	39.1	39.3	39.4	39.6	39.7	39.9	21
22	40.0	40.2	40.3	40.5	40.6	40.8	40.9	41.1	41.2	41.4	22
23	41.5	41.7	41.8	42.0	42.1	42.3	42.4	42.6	42.7	42.9	23
24	43.0	43.2	43.3	43.5	43.6	43.8	43.9	44.1	44.2	44.4	24
25	44.5	44.7	44.8	45.0	45.1	45.3	45.4	45.6	45.7	45.9	25
26	46.0	46.2	46.3	46.5	46.6	46.8	46.9	47.1	47.2	47.4	26
27	47.5	47.7	47.8	48.0	48.1	48.3	48.4	48.6	48.7	48.9	27
28	49.0	49.2	49.3	49.5	49.6	49.8	49.9	50.1	50.2	50.4	28
29	50.5	50.7	50.8	51.0	51.1	51.3	51.4	51.6	51.7	51.9	29
30	52.0	52.2	52.3	52.5	52.6	52.8	52.9	53.1	53.2	53.4	30
31	53.5	53.7	53.8	54.0	54.1	54.3	54.4	54.6	54.7	54.9	31
32	55.0	55.2	55.3	55.5	55.6	55.8	55.9	56.1	56.2	56.4	32
33	56.5	56.7	56.8	57.0	57.1	57.3	57.4	57.6	57.7	57.9	33
34	58.0	58.2	58.3	58.5	58.6	58.8	58.9	59.1	59.2	59.4	34
35	59.5	59.7	59.8	60.0	60.1	60.3	60.4	60.6	60.7	60.9	35
36	61.0	61.2	61.3	61.5	61.6	61.8	61.9	62.1	62.2	62.4	36

Calculated by Julien A. Hall, M. Am. Soc. C. E.

MADE IN GERMANY.