ENGINEERS' FIELD BOOK

No. 10403

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

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

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

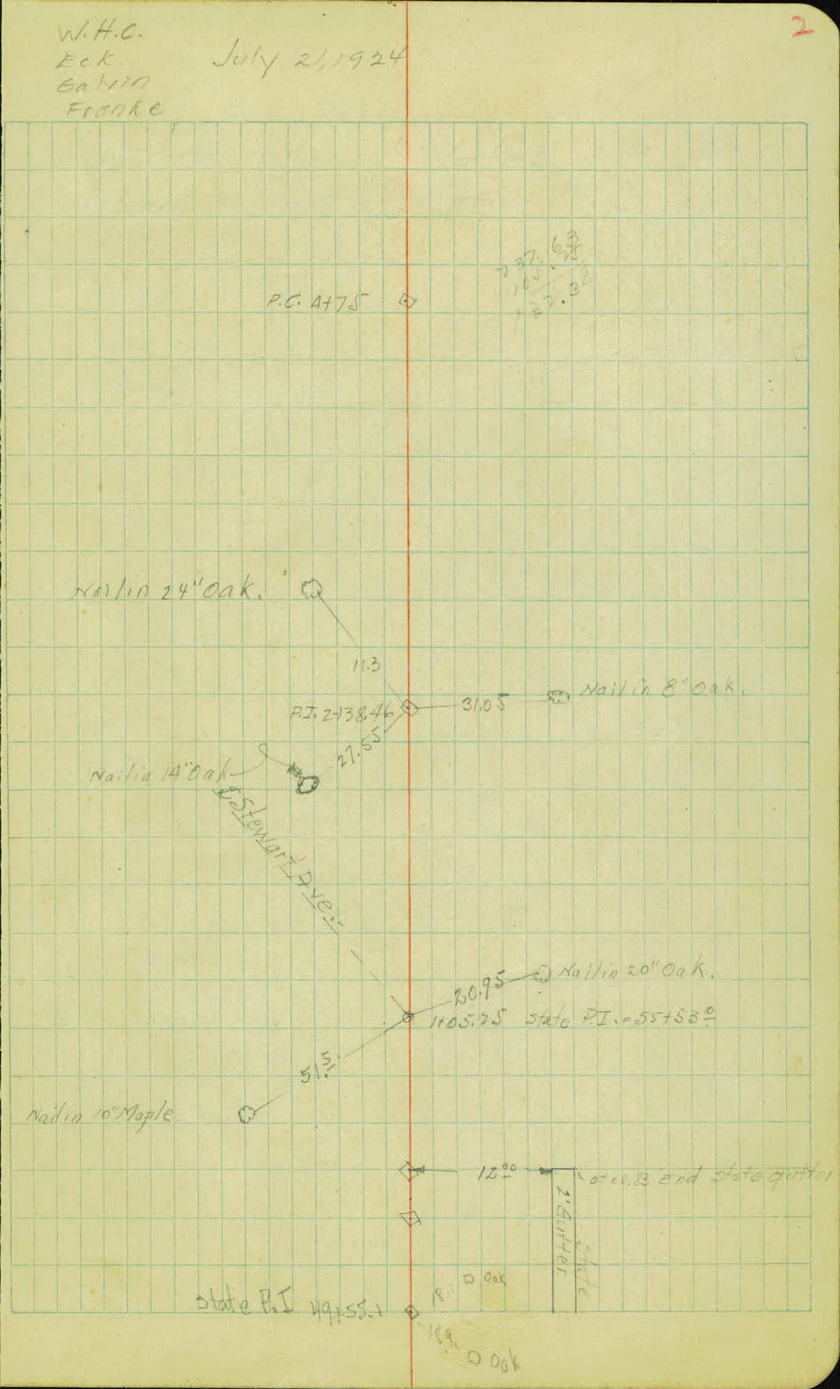
Construction Notes, & Final Topog.

INDEX

Station	Alignment Ft	Lt.	Revision Rt.	
4+75	P.T.		4°44.5'	
4+50			4°29.5'	
4+25			4°14.5'	
4+00			3°59.5'	
3+75			3°44.5'	
3+50			3°29.5'	
3+25			3°14.5'	2° C.R.
3+00			2°59.5'	Δ 9°29'
2+75			2°44.5'	P.I 2+38.46
2+50			2°29.5'	T. 237.63
2+25			2°14.5'	L. 474.17
2+00			1°59.5'	
1+75			1°44.5'	
1+50			1°29.5'	
1+25			1°14.5'	
1+00			0°59.5'	
0+75			0°44.5'	
0+50			0°29.5'	
0+25			0°14.5'	
0+00.83	P.C.		0°00'	
0+00	Beg. Proj.			

W.H.C.
Eck.
Eaton
Franke

July 21, 1924



Check Levels.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	2.20	244.89		242.69	Profile
T.P.	2.44	244.46	2.87	242.02	
B.M. (New)			2.51	241.95	
T.P.	5.79	244.16	6.09	238.37	Profile Elev.
B.M.	6.40	250.16	0.40	243.76	243.79
T.P.	6.45	253.67	2.94	247.22	
T.P.	6.20	256.73	3.14	250.53	
T.P.	2.56	251.51	7.78	248.95	
B.M.			3.00	248.51	248.58
T.P.	1.43	247.56	5.38	246.13	
T.P.	2.90	239.35	11.11	236.45	
T.P.	5.17	239.74	5.38	233.97	
B.M.	4.85	241.40	3.19	236.55	236.51
T.P.	4.47	240.75	5.12	236.28	
T.P.	6.03	242.31	4.47	236.28	
B.M.	2.40	240.48	4.23	238.08	238.12
T.P.	10.22	250.10	6.60	239.88	
B.M.			5.43	244.67	244.65
B.M.			9.14	240.96	

Inst. WHG 6-17-24
Rod. Fork Co.
Chain. Franke

Left	C L	Right
Sp in B.P. 25' Lt. Sta 1+57 – State Elev. 936.45		
	To be moved see page 65	
R.R. Spike in Elec. Lt. Pole N.E. cor. 4th & Johnson St.		
Sp in B.P. 23' Rt. 1+03	24.71	
R.R. Spike in Guy Pole 25' Rt. Sta. 3+20		
R.R. Spike in T.P. 15' Lt. Sta. 5+52		
R.R. Spike in Elec Pole 25' Lt. 7+28		
R.R. Spike in Elec Pole 18' Lt. 8+96 (To be moved)		
" " in 12" Oak 52' Lt. 8+70		

Alignment

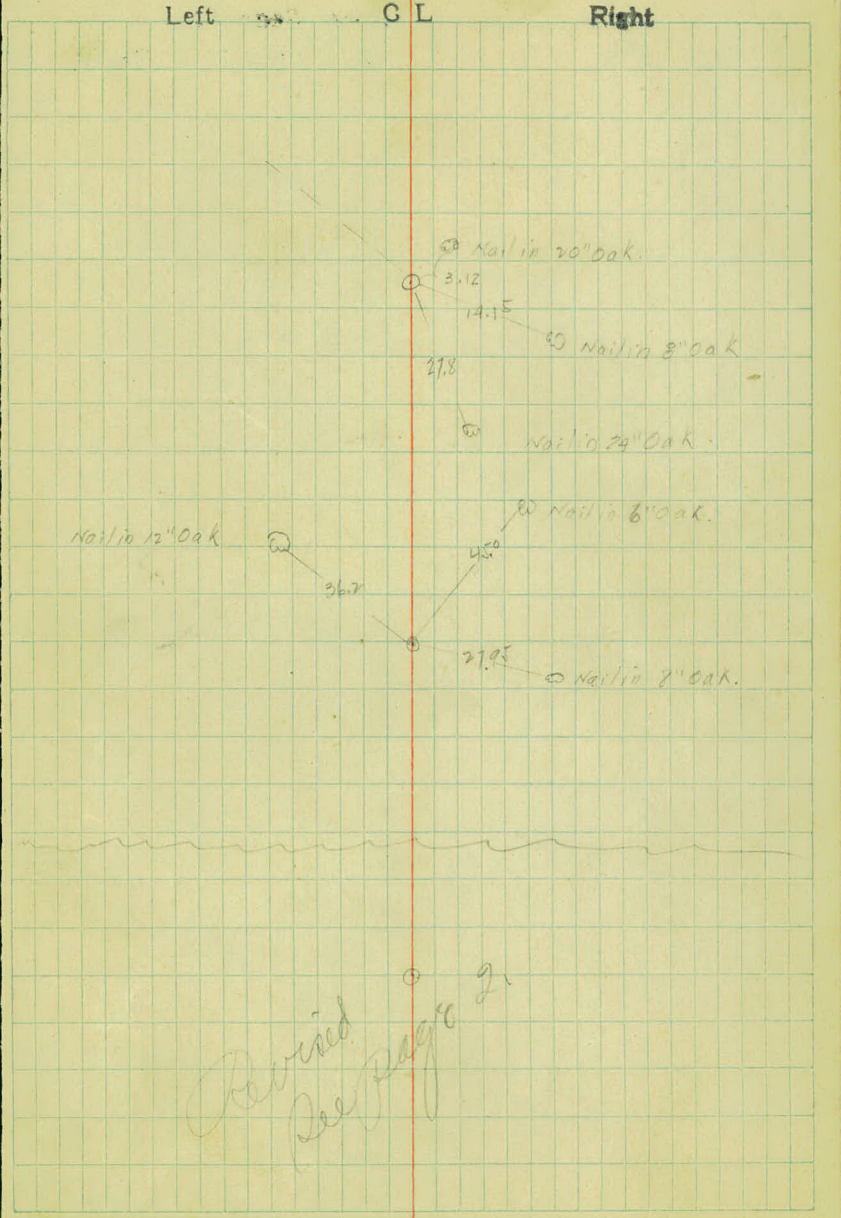
Cross Sections

Sta.	B. S.	H. T.	S	Gr. R.
16+69.4	P.T.	18°-44'		
16+50		17°-40'		
		+25 16°-17½'		
16+00		14°-55'		
		+25 13°-32½'		
15+50		12°-10'		11°-C.L.
		+25 10°-47½'		
15+00		9°-25'		Δ 37°-28'
		+25 8°-03½'		
14+50		6°-40'		P.I 15+05.7
		+25 5°-17½'		T. 176.9
14+00		3°-55'		L. 340.6
		+25 2°-32½'		
13+50		1°-10'		
13+28.8	P.C.	0°-00'		
6+93.9	P.T.		6°-39.5'	1° C.R.
			+25 6°-33.8'	
6+50			6°-26.3'	Δ 12°-19'
			+25 6°-18.8'	P.I 6+28
6+00			6°-11.3'	T. 65.8
			+25 6°-03.8'	
5+62.2	P.C.		6°-00'	L. 131.7
4+16.7	P.T.		4°-46'	
4+50			4°-30'	
4+00			4°-00'	2° C.R.
3+50			3°-30'	Δ 9°-32'
3+00			3°-00'	P.I 3+73.9
2+50			2°-30'	T. 238.9
2+00			2°-00'	L. 476.7
1+50			1°-30'	
1+00			1°-00'	
0+50			0°-30'	
0+00	P.C.		0°-00'	

Inst. Tape
Rod. Pearson & Mahoney
Chain. Martin

July 19-1924
Copied by W.H.C.

Left C L Right



Alignment contd

Sta.	B.S.	H.I.	Cross Sections F.S. Lt.	F.S. Rt.	Grade	Gr. R.
29+21.6	P.T.			3°07'		
29				2°47.6'		3° C.R.
				2°25.1'		
+50				2°07.6'		Δ 6°14'
28				1°42.1'		
				1°17.6'		P.I 25+17.8
+50				0°55.1'		
				0°32.6'		T. 109.00
27+13.8	P.C.			0°10.1'		
				0°00'		L. 207.8
24+98.5	P.T.		0°19.5'			1° C. Lt.
+75			0°12.5'			Δ 6°39'
+50			0°05'			P.I 24+66.0
24+38.5	P.C.		0°00'			T. 32.5
						L. 65.0
20+78.7	P.T.		12°50.5'			
20+75			12°18.5'			29° C.Lt.
20+50			8°41'			Δ 25°41'
20+25			5°03½'			P.I 20+35.5
20+00			1°26'			T. 45.4
19+90.1	P.C.		0°00'			L. 88.6

Inst. [illegible]
Rod. Checked June 1924
Chain. Frank E.

Left	C L	Right

F.P.

Nail in Tree

Started here
Crane Jr. backed up to
Pearson et al
Mahoney July 8, 1924
Martin J copied by
W. H. C.

Hub 40.0 Hub 40.0

10" Oak

10"

23.40 10" Oak

Alignment cont'd

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		L.	RT		
40+11.9	P.T.		4°34'		
40+00			4°22.3'		
+50			+75 4°00.8'		
			3°38.3'		3° C. Rt.
39+00			+25 3°15.8'		
			2°53.3'		Δ 9°-08'
+50			+75 2°30.8'		
			2°08.3'		P.I 38+60.5
38+00			+25 1°45.8'		
			1°23.3'		T. 152.55
37+50			+75 1°00.8'		L 304.45
			0°38.3'		
37+07.45	P.C.		+25 0°15.8'		
			0°00		
36+78.2	P.T.		12°30'		
+50			10°48.7'		3° C. R.
			+25 9°15.7'		
36			7°48.7'		Δ 25°-00'
			+75 6°18.7'		
+50			4°48.7'		P.I 35+75.5
			+25 3°15.7'		
35			1°48.7'		T. 106.0
34+69.8	P.C.		0°00'		L. 200.4
34+38.12	P.T.		3°50'		
			+25 3°-24		
33			2°-58.3'		4° C. R.
			+75 2°-31.3'		
+50			2°-04.3'		Δ 7°40'
			+25 1°-34.3'		
32			1°-04.3'		P.I 32+41.6
31+46.45	P.C.		+75 0°-34.3'		T. 93.15
			0°-00		L. 191.65

Inst. W.H.C.
Rod. Eckstein June, 1924
Chain. Fronce

Left | C L | Right

Nail in Post of 36" Oak

11.57

P.I.

17.31

Nail in 10" Oak

3860.0
3576.8
283.20

Edge of Hedge

Hedge

Hub 6" Stake

Nail in 10" Oak

29.73

30.70

Nail in 10" Oak

Alignment cont'd

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
51+70 PC	ENDR R				
48+03.8					
EQ 48+02.8	P.T.	92 4/8'			
48		9°-35.4'		9° C. L.	
150		+25 8°-27.9'			
		7°-20.4'		Δ 19°-36'	
47+00		+25 6°-12.9'			
		5°-05.4'		P.I 46+96.0	
+50		+25 3°-57.9'			
		2°-50.4'		T. 109.1	
46+00		+25 1°-42.9'			
		0°-35.4'		L. 213.9	
45+86.9	P.C.	0°-00'			
EQ 42+48.4					
42+49.03	P.T.	6°-58'			
42+25		6°-43.6		2° C. L.	
42+00		0°-28.6		Δ 1°-58'	
41+75		0°-13.6		P.I 42+00.7	
41+53.36	P.C.	0°-00'		T. 48.34	
				L. 96.67	

Inst. .....
Rod .....
Chain, ...

Left C L Right

S. Bd. N.P.R.R.

Sta. 5 on Track

Hub Tan. Ext.

Profile Tres.

67.95

67.5

Hubspike 20' Left

43.91

49.96

Nail in 24" Oak

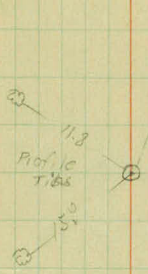
Alignment cont'd

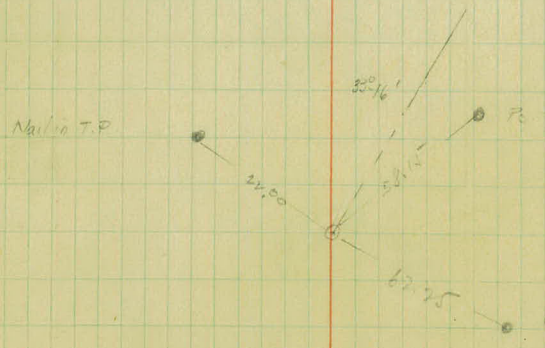
Cross Sections

Eq.	Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
	61+72.4					
	61+61.5	P.T		9°-55.5'	+75 9°-43.5'	
				+25 9°-19.7		
	61			8°-50.9		
				+75 8°-24.7		
	+50			7°-58.4		
				+25 7°-32.7		
	60			7°-05.9		
				+75 6°-39.7		
	+50			6°-13.4		
				+25 5°-47.2		
	59			5°-21.0		3°-30' C.R.
				+75 4°-54.7		
	+50	P.C.		4°-28.4		Δ 14°-51'
				+25 4°-02.2		
	58			3°-35.9		P.I 58+80.9
				+75 3°-09.6		
	+50			2°-43.4		T. 286.5
				+25 2°-17.2		
	57			1°-50.9		L. 567.1
				+75 1°-24.7		
	+50			0°-58.4		
				+25 0°-32.2		
	56			0°-5.9		
	55+94.4	P.C.		0°-00'		
	54+18.21	P.T		16°-38'		
						29° C.R.
	54+00			14°-00'		Δ 33°-16'
	+75			10°-21.3		P.I 53+63.2
	53+53			7°-10'		T. 597
	+25			3°-07.3		L. 1147
	53+13.5	P.C.		0°-00'		

Inst. .....
Rod. .....
Chain. .....

Left C L Right





Alignment cont'd

Cross Sections

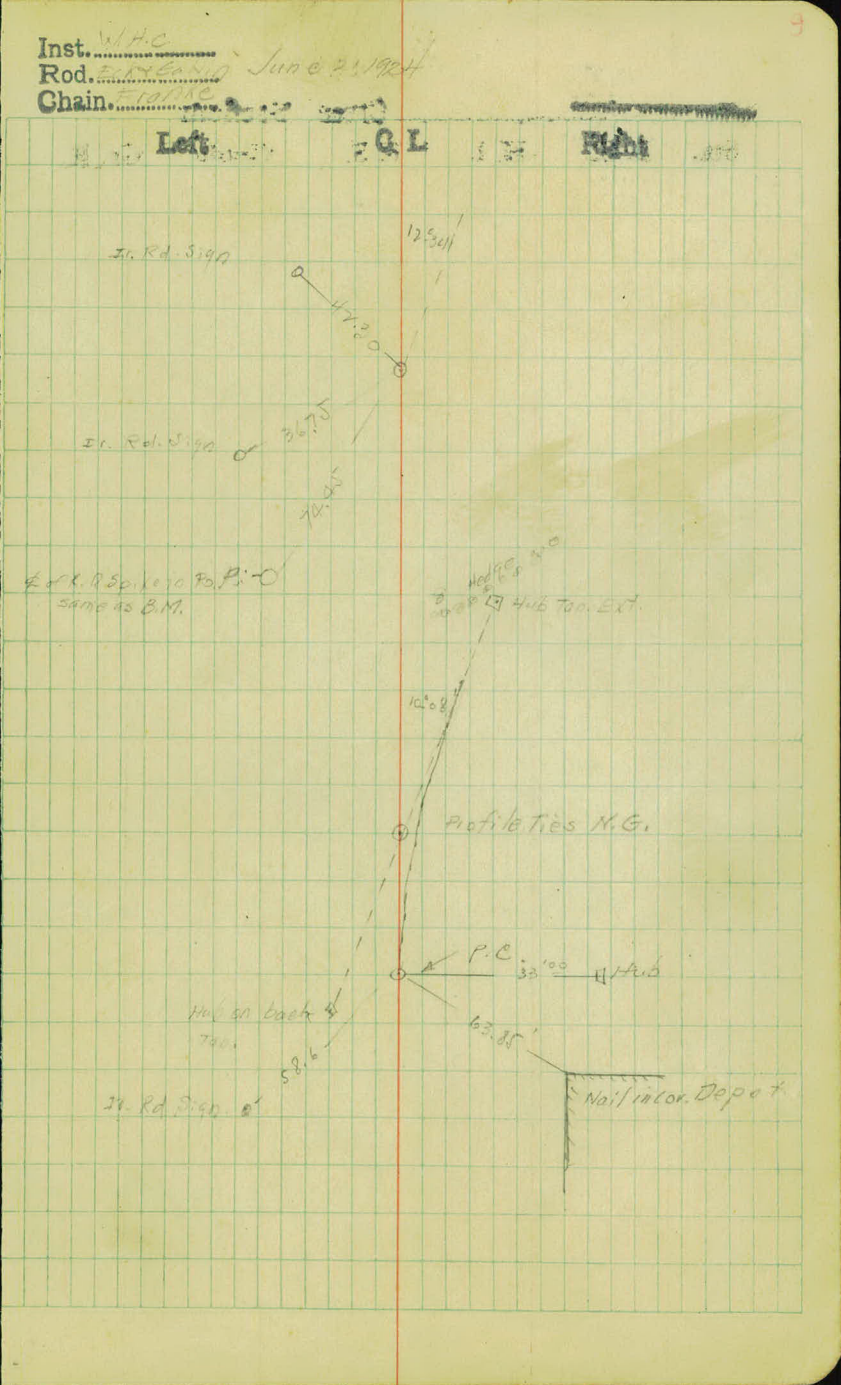
Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
75+79.6	P.T		+76 6°-17'		
			+75 6°-06'		
+50			+25 5°-06		8° C.R.
			+25 4°-06		
75+00			+00 3°-06		Δ 12°34'
			+75 2°-06'		P.I 75+01.7
+50			+50 1°-06		T. 78.9
			+25 0°-06'		
74+22.5	P.C		+22.5 0°-00		L. 157.1
72+27.4	P.T.		5°-04'		
					10° C.R
72+00			3°-41.6'		Δ 10°-08'
+75			2°-26.6		P.T 71+77°
71+50			1°-11.6'		T. 30.86
					L. 161.33
71+26.1	P.C.		0°-00'		

61+72.4 Eq.
61+61.5

Inst. W.H.C.
Rod. Jones
Chain. Frankie

June 21 1904

Left C. L. Right



Alignment End

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
88+70.3	P.O.T.	End of Project.			
86+92.8	P.T.		5°00'		
+50		+75	4°44'		
			· 4°21'		
86		+25	· 3°59'		
			· 3°36'	3°00' C.R.	
+50		+75	· 3°14'		
			· 2°51'	Δ 10°00'	
85		+25	· 2°29'		
			· 2°06'	P.I. 85+26.6	
+50		+75	· 1°44'	T. 167.1	
			· 1°21'	L. 333.3	
84		+25	· 0°59'		
			· 0°36'		
83+54.5	P.C.	+75	· 0°14'		
			0°00'		
Eq 82+02.7					
82+02.22	P.T.		8°22.5'		
82			7°17.8'	7° C.R.	
		+75	7°25.3'		
+50			6°32.8'	Δ 16°-45'	
		+25	5°-40.3'		
81			4°47.8'	P.I. 80+82.5	
		+75	3°55.3'		
+50			3°-02.8'	T. 120.57	
		+25	2°10.3'		
80			1°17.8'	L. 239.29	
79+62.93	P.C.	+75	0°25.3'		
			0°-00'		

Inst. W.H.C.
Rod. Eck & Eaton
Chain. Franks

June 19.24

Hub en Tan, projected.

To Dellwood

Left | C L | Right

Nail in Elec. Po.

55.70

Nail in 14" oak

52.22

26.55

Iron Rd. Sign.

East Co. Line

10°-00'

Nail in Po. P.

20.8

48.4

Found original spike

Nail in 4" oak

52.1

Nail in 8" oak

14°-45'-4

56.0

37.3

Nail in Po. P.

Nail in T. P.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	4.92	249.59			
89				241.00	3.6
18+70.3				241.64	8.0
		- 2.5%			
+80				242.75	6.8
88		⊙		243.50	6.1
+50				244.60	5.0
87		200' V.C. M.O. 6.25		245.37	4.2
+65				245.74	3.9
86		⊙		246.00	3.6
+50				246.00	3.6
85				246.00	3.6
+50		0.0 %		246.00	3.6
84+75				246.00	3.6

Inst. W.H.C.
Rod.
Chain.

June 20, 24

Left	C.L.	Right	
244.67 = R.R. SE KC to FO. R. 18 24 89 +96			
33 / 14.0 / 11.4	39 / 10.1 / 15	15 / 5.4 / 13	40.3
33 / 9.2 / 12	78 / 9.2 / 12	61 / 8.6 / 11	95 / 11.4 / 14	14.9 / 22	19.8 / 17.2	14.6 / 63	40.5
33 / 3.5 / 0.7	15 / 13.3 / 1.5	84 / 8.1 / 1.3	81 / 8.1 / 1.1	29 / 7.1 / 1.1	9.2 / 24	9.4 / 33	41.5
32 / 3.6 / 1.5	25 / 16.0 / 0.0	12 / 6.9 / 0.8	13 / 7.2 / 1.1	26 / 2.9	23 / 7.8 / 1.2	7.8 / 28	6.8 / 33	42.6
34 / 1.6 / 1.4	30 / 4.5 / 0.5	25 / 5.0 / 2.5	13 / 5.6 / 0.6	5.4 / 0.4	5.9 / 0.9	7.0 / 2.0	8.0 / 3.0	44.2
33 / 2.8 / 1.4	28 / 3.8 / 0.4	15 / 4.2 / 0.0	12 / 4.7 / 0.5	4.3 / 0.1	5.2 / 1.0	9.6 / 27	6.8 / 2.6	45.3
33 / 4.5 / 1.4	27 / 1.5 / 2.4	28 / 2.1 / 2.8	14 / 4.2 / 0.3	3.9 / 0.0	4.8 / 0.7	6.0 / 2.1	5.8 / 1.9	45.7
38 / 2.5 / 1.1	24 / 3.4 / 0.5	15 / 3.6 / 0.0	3.4 / 0.2	3.8 / 0.2	15	4.0 / 0.4	4.2 / 0.6	46.2
33 / 2.1 / 2.5	26 / 2.1 / 1.1	12 / 3.6 / 0.0	3.4 / 0.2	3.9 / 0.3	15	3.5 / 0.1	18	4.5 / 0.9	25	4.5 / 0.7	46.2
(9+12)	25 / 3.2 / 0.0										
33 / 4.0 / 0.4	16 / 4.0 / 0.4	3.6 / 0.0	4.3 / 0.7	19	3.9 / 0.3	16.5	5.1 / 1.5	33	46.0
33 / 4.4 / 0.0	15 / 5.2 / 1.6	16 / 5.2 / 1.6	12 / 4.2 / 0.3	3.9 / 0.3	4.2 / 0.7	15	6.0 / 3.0	20.5	6.8 / 2.2	33	45.7
38 / 3.4 / 0.0	25 / 3.6 / 0.0	15 / 3.6 / 0.0	16 / 3.9 / 0.3	3.6 / 0.0	4.2 / 0.4	15	17.3 / 0.7	33	45.8

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		249.59			
T.P.	11.89	257.84	3.64		
84				245.99	11.8
+50				245.72	12.1 (12.2)
T.P.	9.57	255.52	11.89		
83				245.08	10.4 (10.1)
+50				244.10	11.4
T.P.	6.26	252.21	9.57		
82				242.80	9.4
81+70				241.96	10.3 (10.2)
T.P.	2.63	243.37	11.47		
+30				240.89	2.5 (2.6)
81+00				240.0	3.4
+50				238.73	4.6
80				237.7	5.7
+63				237.1	6.3

Inst.
Rod.
Chain.

Left	C.L	Right	
245.95			
45.9			
45.9			
45.4			
44.5			
245.95			
43.1			
42.1			
240.7			
40.6			
39.4			
38.0			
36.7			
36.3			

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		243.37 ✓			
79+00				236.53	6.9
T.P.	6.15	241.80 ✓	7.72		
78+00				236.4	5.4
77				236.8	5.0
76+50		242.47		237.0	4.8
B.M.	4.37	(242.49)	3.70	238.10	38.08
76+00				237.2	5.3
75+80				237.3	5.2
+50				237.4	5.1
75				37.6	4.9
+50				37.8	4.7
74				237.99	4.5
73				38.17	4.3
	4.67	247 (79) 77	4.37	238 (12) 10	

Inst.....
Rod.....
Chain.....

Left C.L Right

36.1

35.8

36.1

36.5

36.8

36.9

37.2

37.4

37.3

37.7

38.1

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		242 (77 / 79)			
72+50				238.08	4.7
72				237.94	4.9
+50				237.74	5.1
71				237.54	5.3
T.P.	3.63	241 (40 / 42)	5.00		
+50				237.34	4.1
70				237.14	4.3
+50				236.94	4.5
69				236.74	4.7
+50				36.69	4.7
68				36.39	5.0
+35				36.2	5.2
T.P.	5.62	240 (87 / 89)	6.15		
67				236.14	4.8

Inst. W.H.C.
Rod. Eckel & Galvin
Chain. Franke

6-25/24

Left	C.L	Right
38.2		
38.4		
39.0		
38.7		
37.0		
34.1		
32.3		
31.3		
34.7		
35.3		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		240.89			
66+50				236.04	4.9 ✓
66				235.94	5.0 ✓
65				235.74	5.2 ✓
64				235.58	5.3 ✓
63				235.61	5.3 ✓
T.P.	3.16	240.57	3.75		
+65				235.67	4.6 ✓
62				235.8	4.5 ✓
Eq. {61+72.4 / 61+61.5}	Short Sta. 81.1			235.9	4.4 ✓
61				235.9	4.4 ✓
+50				235.9	4.4 ✓
60				235.9	4.4 ✓
59 +50				235.9	4.4 ✓

Inst.....
Rod.....
Chain.....

15

Left						C L				Right				
	X									V				
33 / 10.0 -5.1	23.1 / 9.6 -4.7	13 / 4.9 -0.2	2 / 4.9 0.0	21.9 0.0	41.7 +0.2	1 / -	41.9 +0.2	25 / 4.0 +0.9	32	36.0				
	X				35.9									
34 / 10.4 -5.4	23.5 / 10.0 -5.0	19 / 9.6 -4.6	8 / 4.4 -0.0	5.0 0.0	4.9 +0.1	15	5.0 +0.1	4.6 +0.4	25	4.4 +0.2	3.8 +0.2	29	3.8 +0.2	33
	X				36.1		X		X					
33 / 8.3 -4.1	16 / 5.7 -2.9	9 / 4.5 -0.7	9 / 5.1 -0.1	4.8 +0.4	5.2 -0.0	1 / -	4.2 +0.6	20	4.0 +1.2	26	3.8 +1.4	33		
	X					X		X						
33 / 8.8 -3.8	29 / 8.6 -3.3	16 / 5.3 -0.3	17 / 4.7 +0.6	4.7 +0.6	5.0 -0.2	13	5.4 +0.1	25	4.5 +0.8	28	3.8 +1.5	33	36.2	
	X						X							
33 / 9.1 -3.8	V / 9.2 -3.9	20 / 7.5 -2.2	13 / 5.0 +0.3	4.7 +0.6	5.3 -0.0	14	4.1 +0.9	20	4.3 +1.0	26	4.0 +1.3	33	36.2	
237	12 4	- Na / 10 T.P.			RH 54 62 +0.0				0/0 # 768					
	X									X				
30 / 8.5 -3.9	26 / 9.0 -4.4	24 / 7.7 -3.1	13 / 4.4 +0.2	4.0 +0.6	4.5 +0.1	10	4.3 +0.6	19	3.8 +0.8	25	3.4 +1.3	33	36.3	
	X					X		X						
34 / 9.6 -5.1	21 / 7.8 -3.3	8 / 4.4 -2.9	14 / 4.1 +0.4	3.9 +0.6	4.5 -0.0	1 / -	4.1 +0.4	25	3.8 +1.2	33			36.4	
33 / 8.3 -3.9		21 / 8.2 -3.8	12 / 4.4 -0.0	4.0 +0.4	4.4 -0.0	1 / -	4.4 -0.0	25	3.7 +0.7	33			36.3	
	X					X								
30 / 8.3 -3.9	29 / 8.6 -4.2	19 / 6.4 -2.0	11 / 4.8 -0.4	4.4 +0.2	4.6 -0.0	13	5.4 -0.0	21	4.4 +0.0	25	4.3 +0.1	33	36.2	
	X					X								
31 / 7.4 -3.0	24 / 7.4 -3.0	8 / 6.0 -1.6	14 / 5.4 -1.2	12 / 5.0 -0.6	4.4 +0.3	4.6 -0.2	13	5.2 -0.8	24	3.8 +0.6	28	4.0 +0.4	32	36.2
33 / 7.1 -2.7	28 / 7.1 -2.7	15 / 5.4 -1.0	9 / 4.4 +0.2	3.6 +0.5	4.4 -0.0	15	5.0 -0.0	25	4.4 -0.0	33			36.4	
									X					
33 / 6.1 -1.9	16.9 / 5.0 -0.6	11 / 4.0 +0.4	3.5 +0.9	4.3 +0.1	14	3.7 +0.7	19	3.8 +0.6	25.6	5.2 -0.6	33		36.8	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		240 (30) 28			
59+00				235.9	4.4
T.B.M.	4.45	241 (39) 37	3.36		
B.M.	4.26	240.81	4.81		
+50				235.9	4.9
58				235.9	4.9
+50				235.85	4.9
57				235.8	5.0
+50				235.75	5.0
56				235.7	5.1
+50				235.65	5.1
B.M.	3.05	239.60	4.26		
55				235.6	4.0
+50				235.55	4.0
54				235.5	4.1

Inst. W.L.H.C. 6-25/24

Rod. Eck & Galvin

Chain. Frantz

Left. C L Right

37.0

33	5.6 / -1.2	16.8	7.9 / -0.5	13	14.0 / +0.4		8.3 / +1.1		3.9 / +0.5	14	4.8 / -0.4	20	4.6 / -0.5	25	3.1 / +0.7	35	2.7 / -0.4	33							
23.6	9.2 / +1.6																								
23.6	7.6 / +1.6		36.2		2.2																				
33	6.1 / -1.2	26	5.8 / -0.9	15	4.9 / 0.0	14	4.5 / +0.4		3.1 / +1.2		4.7 / +0.2		4.6 / 0.0	15	6.0 / -1.1	21	4.4 / +0.5	24	4.4 / +0.5	25	4.8 / +0.1	33			
33	5.9 / -1.0	16.2	5.1 / -0.2	14	4.2 / +0.7		3.1 / +1.2		4.5 / +0.4	15	4.6 / +0.3	22	4.7 / +0.2	25.2	4.3 / +0.6	33									37.7
33	6.2 / -1.3	20.1	5.7 / +0.8	16	4.9 / 0.0	15	4.4 / +0.5		3.1 / +1.0		4.7 / +0.2	15	4.9 / 0.0	25	6.1 / -1.2	33									36.9
26.1	4.9 / -1.4	23.1	6.2 / -1.2	16	5.0 / 0.0	14	4.7 / +0.3		4.0 / +1.0		5.0 / 0.0	15	5.5 / -0.5	23	8.5 / -3.5	30	8.5 / -3.5	33							36.8
33	5.9 / -0.9	28	5.9 / -0.9	22.1	6.3 / -1.3	17	5.0 / 0.0		4.2 / +0.8		5.0 / 0.0	15	5.6 / -0.6	20	7.0 / -1.4	27	8.0 / -3.0	28							36.6
33	5.0 / -2.9	23	2.5 / -2.4	6.3	1.5 / -0.2		4.6 / +0.5		5.5 / +0.4	11	6.0 / -0.9	17.4	6.8 / -1.7	26	8.4 / -3.0	33									36.2
33	8.8 / -3.7	23	8.0 / -2.9	15.6	5.5 / -0.4		4.7 / +0.4		5.6 / -0.5	13	6.2 / -1.1	16.7	5.9 / -0.8	26	5.0 / +0.1	33									36.1
23.6																									
	5.8 / 33		6.6 / 25	19.9	6.5 / -0.6		4.3 / 12		3.7 / +0.3		4.6 / 14		6.2 / -1.1	19.1	4.9 / 24		4.1 / 33								35.9
	6.4 / 33		7.6 / 29	21.4	7.3 / -2.6		4.5 / 12		4.1 / +0.1		5.2 / 13		6.9 / -1.7	19.2	6.9 / 33		6.6 / 33								35.5 .04 void
	7.0 / 33		7.4 / 29	21.9	7.4 / -3.6		4.7 / 11		4.3 / +0.2		5.2 / 13		7.0 / -2.1	22	7.2 / -3.5	23.6	6.5 / 33								35.3 .04 void

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		239.60			
53+50				235.45	4.1
Temp. B.M.	5.54	239.64	5.50		
53				235.[illegible]	4.2
+50				235.35	4.3
52				235.3[illegible]	4.3
+70				235.24	4.4
+53				235.2	4.4
51				235.1	4.5
50				234.9	4.7
T.P.	5.04	239.33	5.35		
Hg				234.6	4.7
48+50				234.48	4.8
Eq. {48+08.8 / 48+on.}	Short Sta. 99.2				
48+00				234.35	4.9
	4.89	239.18	5.04		

Inst.
Rod.
Chain.

June 26, 24

Left					C L				Right			
8.3 / 33	23.5 / 6.4 / -3.0	5.2 / 16	4.6 / 10	4.6 / -0.5	6.1 / 10	7.1 / -2.1	24.7	6.7 / 29	6.8 / 33		35.0	S° West
234.10 ✓	R.R. Spike in T.P.				LT. 58+62		Pole #478					
7.5 / 33	5.1 / 20	4.5 / 15	5.0 / -0.8	5.7 / 8 / 5.9 / 13		6.8 / -2.0	24.0	7.3 / 35			34.6	S. Hilly
X						X						
9.3 / 33	24.4 / 7.7 / 10.4	7.6 / 26	4.9 / 15	4.5 / -0.3	5.1 / 9	7.1 / 13	7.8 / -3.0	24.5	5.2 / 29	5.1 / 33	35.1	
X												
9.1 / -4.8	23.5 / 9.2 / -5.0	7.2 / -3.9	4.3 / 00	4.0 / +0.3	3.8 / 15	5.9 / +0.8	5.0 / +0.7	26 / 33			35.6	
33 / 8.7 / -2.3	13 / 5.4 / -1.0	6 / 4.4 / +0.0	3.8 / Top of Rock		3.8 / 8	4.0 / Top of Rock	16 / -0.7	24 / -1.3	13		35.8	
X							X					
33 / 8.3 / -3.9	24.5 / 5.9 / -1.8	16 / 4.4 / 0.0	5 / 4.7 / -0.3	4.7 / -0.2	4.4 / 0.0 / 8	4.7 / -0.3	16.5 / -1.1	25 / -2.5	6.9 / 33		34.9	
X							X					
8.2 / -3.7	20.8 / 5.7 / 3.4	13 / 7.3 / -2.1	8 / 5.2 / -0.7	5.2 / +0.7	4.8 / -0.3 / 12		4.9 / +0.4 / 16.6	5.7 / -1.2	25 / -2.8	33	34.4	
X							X					
8.2 / -2.6	21.1 / 8.1 / -3.4	18 / 8.1 / -3.4	8 / 5.4 / -0.7	5.2 / -0.5	5.0 / 9 / -0.3		5.5 / 18 / -0.8	7.2 / -2.6	33		34.4	
234.29 ✓	Nail in T.P.						X				6-30-24	
7.0 / 33	8.2 / 26	20.7 / 7.6 / -2.8	5.0 / 12	5.0 / -0.3	5.6 / 14	7.2 / -2.6 / 19.0		7.8 / 33			34.3	
X							X					
8.3 / 32	19.9 / 7.8 / -2.6	7.2 / 17	5.2 / 13	5.1 / -0.3	5.2 / 12	6.6 / -1.7 / 19.3		7.7 / 33			34.2	
X 1.2 Wide				4.9				X				
8.4 / 33	20.4 / 8.0 / -2.4	7.4 / 19	5.3 / 14	5.1 / -0.2	5.2 / 10	6.4 / 15	-3.0 / 20.5	7.2 / 7.6 / 33			34.4	
234.29 ✓												

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		239.18 ✓			
47+50				234.23	6.1 5.0 4.1
47+00				234.10	6.2 5.1 4.2
46+50				234.15	6.1 5.0 4.1
46+00				234.20	5.8 5.0 4.3
45+50				234.25	5.3 4.9 4.4
45+00				234.30	5.1 4.9 4.7
44+50				234.36	4.8
44+00				234.58	4.6
T. P.	6.83	242.43 ✓	3.58 5.81		

Continued on page 19.

Inst.
Rod.
Chain.

	Left								Right					
							5.10							
							5.0	5.1	6.2	6.8		7.2		34.2
							00	10	13	-2.8	20.7	33		
							5.11							
	8.5			7.9	6.2	5.3	4.9	5.1	6.2	6.6		6.9		34.1
	33	20.7	5.0	18	15	10	+0.2	10	14	-2.4	19.6	33		
							5.10							
			8.0	20.4	7.7	5.3	5.0	4.7	5.11			6.0		34.2
			33		1.6	13	+0.1	10	+0.0	17.4		33		
							5.10							
	7.3		7.9	7.3	0.0	4.8	4.7	4.8	6.3			6.8		34.2
	33		28	17	16.5	12	+0.3	9	-2.0	19.0		33		
							4.9							
			6.4		5.9	4.3	4.6	5.0		6.5		7.2		34.3
			33		22	11	+0.3	12		23		33		
	7.5		7.5	18.5	5.4	4.0	4.5	4.8		6.0		6.0		34.7
	33		22		-0.3	11	+0.4	11		-1.3	17.0	33		
	33	7.3	20	7.0	2	5.0	4.5	4.5	11	5.7	18	5.8	33	34.7
		-2.5		-2.2		-0.2	+0.3	+0.3		-0.9		+1.0		
33	6.7	21	5.7	16.2	5.4	4.3	4.1	4.9	11	5.2	19	5.3	33	35.1
	-2.1		-1.1		-0.8	9	+0.3	-0.3		-0.6		-0.7		

2 | 5.60 ✓

2 | 36.61 .62 R.R. Spike 14" Pop. Pt. 42+05

Cross Sections

Sta.	B.S.	H.I.	F.S.	Grade	Cut or Fill
B.M.	2.14	250.65		248.51	
T.P.	1.03	243.08	8.60	242.05	
B.M.			6.47		
43+62				234.89	8.2 L
43+50				235.08	8.0 L
43				235.75	7.3 L
42+50				236.65	6.4 L
Sta 42+48.4 Equ 42+49.03	Long Sta 100.63'				
42				237.65	5.4 L
41+52				238.60	4.8 L
41+00				239.65	3.7 L
B.M.	7.20	243.81	6.47		
40+50				240.65	3.2 L
T.P.	1.03	249.56	2.28		
40+00				241.65	7.9 L
39+50				242.65	6.9 L
39+25				243.15	6.4 L

Inst.
Rod.
Chain.

Left C L Right

34+20

236.61 — R. P. Sta. 42+00

35+33 | 33 | 8.7 −0.5 | 14 | 8.7 −0.5 | 7.8 +0.4 | 7.8 −0.8 | 11 | 8.1 −0.5 | 17.8 | 9.2 −1.9 | 27 | 9.8 −1.1 | 33

35+33 | 33 | 9.5 −0.5 | 17 | 8.7 −0.7 | 14 | 9.5 −1.4 | 11 | 8.4 −0.4 | 7.6 +0.8 | 8.1 −0.1 | 15 | 9.1 −1.1 | 17 | 9.9 −1.8 | 28 | 9.8 −1.8 | 33

35+88 | 33 | 8.9 −1.6 | 17.3 | 8.5 −1.2 | 10 | 7.5 −0.2 | 7.3 −0.0 | 7.6 −0.3 | 14 | 7.6 −0.3 | 17.5 | 8.2 −0.9 | 26 | 8.6 −1.3 | 33

36+10 | 33 | 7.9 −1.5 | 18 | 6.6 −0.2 | 10 | 6.6 −0.2 | 6.1 +0.3 | 6.8 −0.9 | 12 | 6.1 +0.3 | 16 | 6.9 −1.5 | 23 | 7.9 −1.5 | 33

36+44 | 33 | 7.0 −1.6 | 16 | 5.5 +0.1 | 14 | 5.0 +0.4 | 11 | 5.5 −0.0 | 4.7 +0.7 | 5.5 −0.1 | 12 | 5.1 +0.3 | 16 | 5.2 +0.2 | 22 | 7.2 −1.9 | 33

36+84 | 33 | 7.7 +1.8 | 17 | 2.6 +4.9 | 12 | 3.9 +0.6 | 3.0 +0.8 | 4.3 +0.2 | 10 | 4.1 +0.4 | 16 | 6.0 −1.5 | 28 | 7.1 −2.6 | 33

37+25 | 33 | 1.7 +1.5 | 16 | 2.0 +1.4 | 13 | 3.0 +0.4 | 2.6 +0.5 | 3.1 +0.3 | 14 | 6.9 −3.5 | 21 | 7.8 −4.4 | 28

236.61

37+88 | 33 | 2.5 +0.9 | 12 | 2.1 +1.2 | 9 | 2.6 +0.6 | 2.0 +1.2 | 2.8 +0.4 | 10 | 2.8 +0.4 | 15 | 7.0 −4.8 | 25 | 7.2 −5.0 | 28 | 8.2 −6.0 | 33

241.53

38+24 | 8.6 +2.3 | 13 | 7.4 +0.5 | 7.2 +0.7 | 7.5 +0.4 | 11 | 7.5 +0.4 | 12 | 9.7 −1.8 | 21 | 8.9 −1.0 | 25 | 10.3 −2.4 | 31 | 10.3 −2.4 | 33

38+88 | 33 | 7.9 −1.0 | 14 | 6.7 +0.7 | 9 | 6.2 +0.7 | 5.8 +1.1 | 6.3 +0.6 | 12 | 6.2 +0.7 | 16 | 6.9 +0.0 | 17 | 13.4 −6.5 | 27 | 14.2 −7.3 | 33

39+19 | 33 | 8.8 −2.5 | 14 | 8.6 −2.4 | 8 | 6.1 +0.3 | 5.7 +0.7 | 5.9 +0.5 | 12 | 5.7 +0.7 | 17 | 13.4 −7.0 | 21 | 13.4 −7.0 | 33

Cross Sections

Sta.	B.S.	H. I.	F.S.	Grade	Gr. R.
		249.56			
39+00				243.65	5.9
38+50				244.57	5.0
T.P.	6.26	251.97	3.85		
38+00				245.32	6.7
37+50				245.90	6.1
B.M.	3.50	252.02	3.45		
37+00				246.32	5.7
36+50				246.57	5.5
36+00				246.45	5.6
35+50				246.25	5.7
T.P.	3.38	251.90	3.50		
35+00				246.05	5.8
34+50				246.15	5.7
34+00				246.25	5.6
33+50				246.35	5.5

Inst. W.H.C.
Rod. ECKSDWEIN
Chain. Frank C.

	Left		C L		Right	
4.4	33 / 7.0 / 11	19 / 5.7 / +0.7	9 / 5.3 / +0.6	5.2 / -0.7	5.8 / +0.1 / 5	6.8 / -0.9 / 17	10.1 / -4.2 / 33	13.5 / -7.6 / 38
5.2	33 / 5.4 / 0.4	13 / 4.5 / +0.5	6.1 / +0.6	4.7 / +0.2	5	9.2 / -4.7 / 33	14.9 / -9.9 / 38	
245.7	Rain / in	10' Oak	Rod. 5+a 38+25				July 8, 1924	
5.9	33 / 6.9 / 0.0	9 / 6.9 / +0.3	6.1 / +0.6	6.9 / -0.2 / 12	13.3 / -6.6 / 22	19.1 / -7.4 / 28	11	5.6 / -8.9 / 33
6.4	33 / 6.4 / +0.3	12 / 6.0 / +0.1	5.6 / +0.5	6.1 / 0.0 / 4	9.1 / -3.0 / 15	15.7 / -9.6 / 34		
248.52	A.A. Swi. Rein	Cuy 13/6	X+ 38+20				July 14, 24	
7.10	33 / 5.4 / +0.3	13 / 5.5 / +0.2	5.0 / +0.7	5.8 / -0.1 / 13	5.7 / 0.0 / 19	16.3 / -10.6 / 36		
7.5	33 / 2.9 / +1.6	14 / 4.1 / -0.8	4.5 / +1.0	5.0 / +0.5 / 13	4.8 / +0.7 / 21	5.5 / 0.0 / 24	16.2 / -10.7 / 41	
7.5	33 / 3.4 / +1.9	9 / 3.8 / +1.7	7 / 4.6 / +0.9	4.5 / +1.0	4.7 / +0.8 / 13	4.9 / +0.6 / 19	5.5 / 0.0 / 20	11.0 / -5.5 / 30	12.0 / -6.5 / 34
7.2	33 / 4.3 / +1.4	15 / 4.5 / +1.3	21 / 5.6 / +0.1	18 / 4.8 / +0.9	4.8 / +0.9	4.6 / +1.1 / 13	5.2 / +0.4 / 27	5.7 / 0.0 / 28.6	8.5 / -2.8 / 33
248.52									
7.2	33 / 5.5 / +0.3	11 / 5.2 / +0.6	4.7 / +1.1	4.7 / +1.1 / 13	5.1 / +0.7 / 25	5.8 / 0.0 / 26.7	15.8 / -10.0 / 34	
7.2	33 / 5.0 / +0.7	13 / 5.0 / +0.7	4.7 / +1.0	4.5 / +1.2 / 13	4.8 / +0.9 / 24	5.7 / 0.0 / 28.6	15.7 / -10.7 / 44		
7.1	33 / 4.8 / +0.8	14 / 4.6 / +1.0	4.8 / +0.8	4.6 / +1.0 / 13	5.1 / +0.5 / 18	5.6 / 0.0 / 29.1	16.8 / -10.7 / 45		
7.3	33 / 4.8 / +0.7	11 / 4.2 / +1.3	4.6 / +0.9	4.4 / +1.1 / 13	4.3 / +1.2 / 20	5.5 / 0.0 / 32	16.2 / -10.7 / 37		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		251.90			
33+00				246.55	5.3
32+50				246.95	4.9
32+00				247.45	4.4
T.B.M.	4.35	255.95	0.30		
31+50				247.95	8.0
31+00				248.45	7.5
30+50				248.95	7.0
30+00				249.45	6.5
29+50				249.95	6.00
T.B.M.	4.49	256.46	3.98		
29+00				250.45	6.21
28+50				250.15	6.31
28+00				249.91	6.6
27+50				249.65	6.9

Inst. W.H.C.
Rod. Fake Gavin
Chain. Fake C...

July 14 1924

	Left	C L	Right
47.3	33 / 4.6 +0.7 / 17 / 4.2 +1.1	4.6 +0.7 / 5.1 +1.3 / 13	17.1 - 11.8 / 34.7
48.5	33 / 3.0 +0.9 / 18 / 3.4 +1.5	3.4 +1.5 / 3.6 +2.3 / 14	7.6 +2.3 / 17 - 10.6 / 37.5 / 16.3 - 1.4 / 37
49.5	38 / 2.5 +1.9 / 13 / 2.4 +2.0	2.4 +2.3 / 1.8 +2.6 / 13	4.0 +2.4 / 21 / 4.4 0.0 / 14 - 11.8 / 16.2 / 39
25.1.60 = Nail in Oak St.		47.8 1+90	July 15 1924
49.6	33 / 5.9 +2.1 / 14 / 5.6 +2.4	6.4 +2.6 / 4.7 +3.3 / 15	4.0 +4.4 / 24 / 8.0 0.0 / 31 - 10.7 / 18.7 / 47
50.7	33 / 4.6 +2.9 / 13 / 4.7 +2.8	5.3 +3.2 / 4.4 +3.1 / 13	4.4 +3.1 / 17 / 7.5 0.0 / 27.9 - 8.3 / 15.8 / 28
51.4	33 / 3.3 +2.7 / 14 / 4.3 +2.7	3.6 +2.4 / 5.0 +2.0 / 14	5.3 +2.7 / 20 / 9.2 0.0 / 34
52.4	33 / 2.6 +2.9 / 19 / 3.6 +2.9	4.0 +2.5 / 3.7 +3.3 / 13	4.8 +1.7 / 20 / 6.8 0.0 / 28.5 - 6.3 / 12.8 / 23
51.4	33 / 2.9 +3.1 / 25 / 3.8 +2.2 / 19 / 3.3 +2.2	4.6 +1.4 / 3.9 +3.1 / 14 / 3.7 +2.3 / 22	6.0 0.0 / 26 - 1.7 / 11.7 / 33
25.1.97 = Nail in Oak E.P.		47.3 8+40	
51.5	33 / 4.3 +1.9 / 14 / 5.0 +1.2 / 18 / 4.7 +1.5	5.0 +1.7 / 4.9 +1.8 / 15	6.2 0.0 / 17 - 10.2 / 16.5 / 33
50.2	33 / 4.7 +1.6 / 25 / 5.0 +1.3 / 17 / 4.7 +1.6	6.3 +1.0 / 5.8 +0.5 / 13	6.3 0.0 / 21 - 7.5 / 13.8 / 33
51.3	33 / 5.6 +1.0 / 15 / 4.9 +1.9	5.7 +1.4 / 5.1 +1.5 / 12	3.5 +1.1 / 19 / 6.6 0.0 / 22 - 9.9 / 15.5 / 39
51.4	33 / 4.4 +2.5 / 10 / 4.9 +2.0 / 15 / 5.2 +1.7	5.2 +1.8 / 4.4 +2.5 / 17	6.9 0.0 / 25 - 6.5 / 13.4 / 33

(7.0)

Note: Original Ground Conditions where changed, Residences to be dirt, and Steam shovel removing stumps

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		256.46			
27+00				249.10	7.4
26+50				248.60	7.86
T.B.M.	3.67	253.06	7.06		
26+00				248.10	5.0
25+50				247.60	5.5
25+00				247.13	6.0
24+50				246.85	6.2
24+00				246.60	6.5
23+50				246.35	6.7
T.P.	2.04	251.27	3.83		
23+00				246.10	5.17
22+50				245.85	5.42
22+00				245.60	5.7

Inst. .....
Rod. .....
Chain. .....

	Left				C L				Right			
50.6	23 / 5.8 +1.6	5 / 5.5 +1.9			5.9 +1.5	6.0 +1.9	14	4.7 +2.7	16	7.4 0.0	X / 16.7 -9.3	33
50.3	23 / 6.9 +1.0	13 / 6.0 +1.9			6.2 +1.7	6.7 +1.2	14	7.9 0.0	X / 17.5	16.8 -8.7		33
.40												
49.38	Nail in Tree Lt. sta. 34+88											
49.4	33 / 4.4 +0.6	21 / 3.8 +1.2	10 / 3.2 +1.8		3.7 +1.3	4.5 +0.5	12	4.6 -0.6	X / 5.4	14.8 -9.8		33
48.8	33 / 4.5 +1.0	23 / 4.6 +0.9	12 / 4.0 +1.5		4.3 +1.2	4.3 +1.2	9	4.5 +1.0	16	X / 5.5 0.0	9.5 -3.6	27 / 15.7 -10.2	37
48.8	33 / 4.2 +1.8	14 / 4.3 +1.7	7 / 4.0 +2.0		4.3 +1.7	4.6 +1.4	11	5.3 +0.7	18	X / 6.0 0.0	9.5 -3.5	28 / 15.5 -9.5	38
48.9	33 / 4.2 +1.0		11 / 4.2 +2.0		4.2 +2.0	4.5 +1.7	15	X / 5.2 0.0	23 / 9.4 -4.2				38
48.9	33 / 3.3 +3.2		4 / 4.4 +2.1		4.2 +2.3	4.6 +1.9	12	4.8 +1.7	18	X / 6.5 0.0	21 / 14.8 -8.3		33
48.5	33 / 3.6 +3.1	19 / 3.8 +2.9	16 / 4.2 +1.9		4.6 +2.1	4.7 +2.0	6	3.9 +2.8	7	4.7 +2.0	X / 6.7 0.0	29 / 21.6 -14.9	38
49.23												
47.8	33 / 3.1 +1.7	19 / 3.7 +1.5	7 / 3.2 +2.0		3.5 +1.7	3.7 +1.5	14	4.1 +1.1	21	5.2 0.0	29 / 7.1 -1.9		33
47.5	Side Wk. 21.4 / 3.9 +1.5		15 / 4.1 +1.8		3.8 +1.4	4.4 +1.0	11	3.4 +2.0	24	X / 5.4 0.0	19 / 7.7 -2.3		38
47.3	Side Wk. 20.8 / 4.1 +1.6		12 / 4.5 +1.2		4.0 +1.7	4.3 +1.4	8	4.7 +1.0	15	4.9 +0.8	24 / X / 5.7 0.0	27 / 8.7 -2.8	38

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		251.27			
21+50				245.35	5.9
21+00				245.10	6.2
20+50				244.77	6.5
20+00				244.27	7.0
T.P.	1.81	247.92	5.16		
19+50				243.61	4.3
19+00				242.78	5.1
18+50				241.87	6.0
18+00				240.96	6.9
B.M.	0.99	244.78	4.13		
17+50				240.05	2.7
17+00				239.22	5.6
16+50				238.90	5.9
16+00					

Inst. W.H.C. July 15, 1929
Rod. Eck & Eaton
Chain. Franke

	Left			C L			Right		
6.9	Side Wlk	20 / 4.5 +1.4	12 / 4.8 +1.1	4.4 +1.5	4.7 +1.2	10	4.7 +1.2	21	X 5.9 / 0.0 / 27	9.3 -3.4	33
6.5	Side Wlk.	20 / 4.8 +1.4	10 / 5.2 +1.0	4.8 +1.4	4.7 +1.5	11	4.9 +1.3	20	X 6.2 / 0.0 / 30	7.3 -1.1	33
8 / 4.7 +1.8		21 / 4.7 +1.8	23 / 5.6 +0.9	10 / 5.1 +1.4	5.1 +1.4	5.4 +1.5	12	4.9 +1.6	17	5.8 +0.7	33	46.12
5.9	33 / 4.9 +2.1		18 / 4.8 +2.2	17 / 5.9 +1.1	5.4 +1.6	5.5 +1.5	10	6.6 +0.9	33			
246.11												
5.5	33 / 2.3 +2.0		14 / 1.7 +2.6	11 / 3.1 +1.2	2.4 +1.9	2.7 +1.6	11	2.2 +2.1	14	4.8 0.0	33	
4.2	33 / 2.4 +2.7		19 / 2.6 +2.5	8 / 3.9 +1.4	3.7 +1.4	3.8 +1.3	14	3.3 +1.8	16	4.0 +1.1	33	
3.2	33 / 3.2 +2.8		15 / 4.7 +1.3	7 / 5.4 +0.6	4.7 +1.3	4.8 +1.2	16	6.0 0.0	21	5.9 +0.1	33	
2.1	33 / 4.0 +2.9		24 / 4.0 +1.9	10 / 6.8 +0.1	5.8 +1.1	5.8 +1.1	11	6.6 +0.3	22	5.7 +1.2	24	5.8 +1.1 / 33	Check.
243.79	Spike in R.R.												
0.7	38 / 2.0 +2.7		20 / 2.7 +2.0	12 / 4.4 +0.3	4.1 +0.6	4.4 +0.3	12	5.2 -0.5	24	4.4 +0.3	24	Side Wlk 4.5 / 33	
9.8			23 / 4.7 +0.9	4 / 4.8 +0.8	5.0 +0.6	5.6 0.0	17	6.2 -0.6	28	6.8 -1.2	28		
9.3	33 / 4.4 +4.5		24 / 5.2 +0.1	14 / 5.7 +0.2	5.5 +0.4	5.8 0.0	8	7.0 -1.2	17	7.7 -1.9	33		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		244.78			
16+00				238.66	6.1
15+50				238.42	6.4
15+00				238.18	6.6
T.P.	5.67	244.20	6.25		
14+50				238.00	6.7
14+00			.03	237.97	6.2
13+50			.11	238.08	6.1
13+00			.25	238.33	5.9
12+50			.30	238.68	5.6
12+00			.30	238.93	5.3
11+50			.30	239.23	5.0
11+00			.27	239.50	4.9

Inst. W.H.C.
Rod. Eckstorm July 18, 1924
Chain. Frank C.

Left					C L		Right		
							X		
33 / 4.6 +1.5	22 / 6.5 -0.4	12 / 5.8 +0.3	6.1 0.0	6.7 / 9 -0.6	7.5 +1.4	19.1	7.9 -1.8	33	38.7
					X				
33 / 5.3 +1.1	22 / 6.9 -0.5	15 / 6.3 +0.1	6.2 +0.2	7.1 / 10 -0.7	7.7 +1.3	19.0	8.2 -1.8	33	38.6
					X				
33 / 4.5 +2.1	20 / 6.6 0.0	11 / 6.6 0.0	6.2 +0.3	6.6 0.0 / 7	7.7 +1.1	18.7	8.1 -1.5	33	38.5
238.53									
					X				
33 / 4.4 +1.8	21 / 4.3 +1.9	17 / 6.2 0.0	9 / 6.2 0.0	5.5 +0.7	6.0 +0.2 / 9		7.1 -0.9	18.4 -2.0 / 33	38.7
					X				
33 / 4.1 +2.1	22 / 4.6 +1.6	16 / 6.2 0.0	12 / 5.8 +0.4	5.4 +0.8	6.4 -0.2 / 14		6.8 -0.6	17.9 -1.4 / 33	38.8
					X		X		
	33 / 3.6 +2.1	16 / 5.6 +0.5		5.0 +1.1	5.7 +0.4 / 12		6.1 0.0 / 17	7.5 -1.4 / 33	39.2
	33 / 2.0 +1.9	18 / 3.9 +2.0	17 / 5.3 +0.6	4.8 +1.1	5.5 +0.4 / 15		5.9 0.0 / 16	6.4 -0.5 / 33	39.4
							X		
	33 / 2.4 +3.2	16 / 3.3 +2.3	18 / 5.0 +0.6	4.6 +1.0	5.0 +0.6 / 13		5.6 0.0 / 17	6.4 -0.8 / 33	39.6
3.0 +3.3	21 / 3.5 +1.8	16 / 4.3 +1.0	17 / 4.8 -0.5	4.3 +1.0	5.0 +0.3 / 12		5.3 0.0 / 20	5.8 -0.5 / 33	39.9
							X		
	33 / 4.1 +0.9	13 / 4.1 +0.9		4.0 +1.0	5.2 -0.2 / 14		5.2 -0.2 / 17.3	5.4 -0.4 / 33	40.2
							X		
33 / 3.7 +1.5	12 / 3.8 +0.9	13 / 4.3 +0.4		3.7 +1.6	5.1 -0.4 / 14		4.7 0.0 / 17.0	5.7 -1.0 / 33	40.5

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		244.20			
B.M.	5.03	246.98	2.23		
10+50				239.85	7.1
10+00				240.20	6.8
B.M.	4.60	246.55	5.03		
9+50				240.85	6.0
9+00				240.85	5.7
8+50				241.03	5.6
8+00				241.10	5.5
7+00				240.95	5.6
6+50				240.70	5.9
6+00				240.43	6.2
5+50				240.22	6.4
T.P.	3.33	245.42	4.46		
5+00				240.06	5.3 (5.4)

Inst. .....
Rod. .....
Chain. .....

July 23 1924

Left	C L	Right
41.95		
41.97 ✓	R. R. Spike in Elec. Po. N.E. Cor 4th & Johnson.	
40.6	33 / 6.2 +0.8 — 11 / 4.6 +0.5 — 6.4 +0.7 — 7.1 00 / 13	7.6 -0.5 / 17 — 6.9 +0.2 / 24 — 11.8 -4.1 / 37
41.1	33 / 4.9 +1.9 — 13 / 5.4 +1.2 — 11 / 6.2 +0.6 — 5.9 +0.9 — 6.4 +0.4 / 13	X 6.8 00 / 20 — 8.6 -1.8 / 28 — 14.0 -7.2 / 39
41.495		
1.6	33 / 4.0 +2.0 — 13 / 4.5 +1.5 — 11 / 5.3 +0.7 — 5.0 +1.0 — 5.6 +0.4 / 14	X 6.0 0.0 / 22 — 13.6 -7.6 / 39
1.9	33 / 3.7 +2.0 — 13 / 4.4 +1.3 — 11 / 5.0 +0.7 — 4.7 +1.0 — 5.5 +0.2 / 13	X 5.7 00 / 24 — 13.7 -8.0 / 40
1.9	33 / 3.4 +2.2 — 16 / 4.0 +1.6 — 10 / 4.9 +0.7 — 4.7 +0.9 — 5.5 +0.1 / 14 — 5.0 +0.6 / 16 — 5.6 00 / 27 — 12.8 -7.2 / 42	
2.1	33 / 3.2 +2.3 — 13 / 3.9 +1.6 — 19 / 4.7 +0.8 — 4.5 +1.0 — 5.3 +0.2 / 14 — 4.8 +0.7 / 16 — 5.0 +0.5 / 28 — 5.5 00 / 29.5 — 13.0 -7.5 / 33	X
2.2	33 / 4.0 +1.6 — 12 / 4.6 +1.0 — 11.4 +1.2 — 5.3 +0.3 / 14 — 4.8 +0.8 / 15 — 5.0 +0.6 / 28 — 5.6 00 / 26 — 12.7 -7.1 / 38	X
1.8	33 / 4.4 +1.5 — 13 / 5.0 +0.9 — 11.8 +1.1 — 5.6 +0.3 / 12 — 5.9 00 / 21 — 13.6 -7.7 / 33	X
1.6	33 / 4.4 +1.3 — 14 / 5.2 +1.0 — 5.0 +1.2 — 5.8 +0.4 / 12 — 6.2 00 / 19.5 — 14.2 -8.0 / 33	X
1.3	33 / 4.8 +1.6 — 13 / 5.6 +0.8 — 5.8 +1.1 — 6.1 +0.3 / 10 — 6.4 00 / 19 — 13.3 -6.9 / 33	
1.4	33 / 4.2 +1.2 — 18 / 4.9 +1.2 — 5 / 4.1 +0.7 — 4.9 +1.4 — 4.7 +0.2 / 13 — 5.4 00 / 17 — 10.3 -4.9 / 28 — 12.1 -6.7 / 33	X

4.209 Nail in oak K.T. 57.35

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		245.42			
4+50				239.97	5.4
4+00				239.95	5.4
3+50				239.94	5.5
3+00				239.93	5.5
2+50				239.90	5.5
2+00				239.80	5.6
B.M.	1.40	244.10	2.72		
1+50				239.70	4.4
1+00				239.42	4.7
0+50				238.81	5.3
0+00				238.34	5.8
B.M.				1.22	

Inst. .....
Rod. .....
Chain. .....

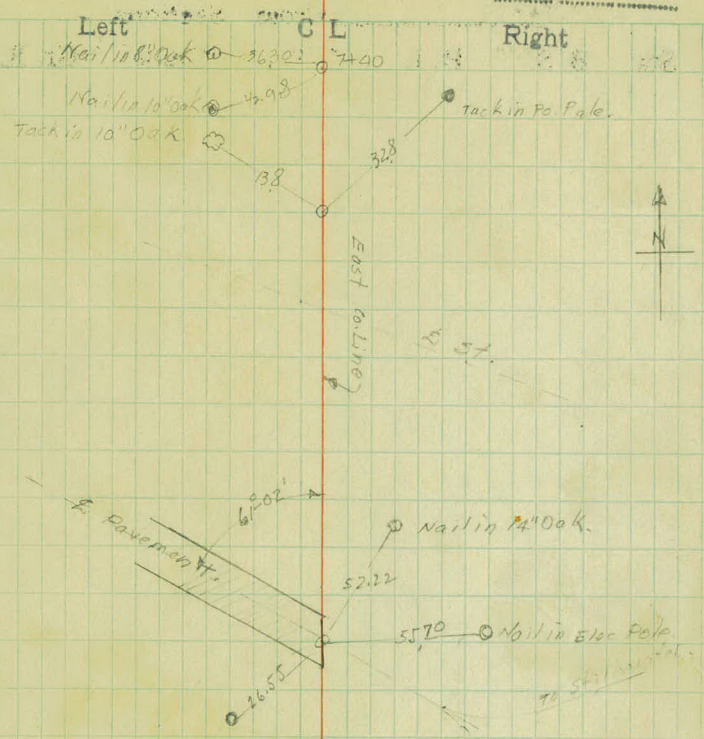
	Left		C L	Right
41.4	33 / 4.0 / +1.4	14 / 4.5 / +0.9	4.0 / +1.4	4.5 / 0	5.4 / 0.0 / 15	4.9 / +0.5 / 18	9.0 / -3.6 / 25	12.9 / -7.5 / 34
41.4	35 / 3.7 / +1.7	16 / 3.7 / +1.7	4.7 / +0.7	4.0 / +1.4	4.6 / +0.8 / 10	X 5.4 / 0.0 / 19	9.0 / -7.6 / 35	
41.1	33 / 2.7 / +2.8	20 / 3.3 / +2.2	14 / 4.7 / +0.8	4.3 / +1.2	5.5 / 0.0 / 15	6.0 / -0.5 / 21	12.3 / -6.8 / 28	
41.2	33 / 1.3 / +1.2	19 / 1.8 / +0.7	13 / 4.7 / +0.8	4.2 / +1.3	4.9 / +0.6 / 13	4.9 / +0.8 / 21	X 5.5 / 0.0 / 25.5	12.3 / -6.8 / 35
41.0	33 / 1.6 / +1.6	19 / 1.7 / +1.3	19 / 4.7 / +0.8	4.4 / +1.1	5.0 / +0.5 / 13	4.0 / +1.5 / 21	X 5.5 / 0.0 / 26	11.8 / -6.3 / 33
40.7	33 / 1.4 / +0.0	22 / 2.1 / +3.4	13 / 5.1 / +0.5	4.9 / +0.9	5.2 / +0.4 / 14	4.5 / +1.1 / 20	X 5.6 / 0.0 / 28	11.8 / +6.2 / 33
42.70 ✓	Sta. 16 24' Pole		25' LT	1+57	State 936.45	To be removed		
41.1	33 / 2.9 / +1.5	21 / 3.5 / +0.9	15 / 4.2 / +0.1	4.0 / +0.4	4.4 / 0.0 / 15	4.4 / 0.0 / 20	10.7 / -6.3 / 31	10.7 / -6.3 / 33
40.7	top State Curb 35 / 31.		19 / 4.8 / -0.1	4.2 / +0.3	4.9 / +0.2 / 12	5.4 / +0.7 / 18	10.0 / -5.3 / 29	10.5 / -5.4 / 33
	top of State Curb 41 / 16		13 / 5.4 / +0.1	5.2 / +0.1	38.9 5.7 / -0.3 / 11	X 6.1 / +0.8 / 17	21.9 / -26 / 20.9	10.6 / +5.3 / 29 / 11.1 / -5.8 / 33
	Top State Curb 5.95 / 13		11 / 5.9 / +0.1	5.8 / 0.0	6.2 / -0.4 / 10	6.2 / +0.4 / 14	10.3 / -4.5 / 24	11.4 / -5.6 / 33 38.3
42.88 ✓ 42.87 Door.	Nail in 24" Oak		24' LT.	1+75				

Alignment
X-Sections for Borrow
East County Line.

Cross Sections

Sta.	B. S.	H. I.	C	Grade	Gr. R.
7+40	P.O.T.				
5+00	P.O.T.				
4+15	℄ St.				
0+00	= 28+70.3 end of Pavement				

Inst. W.H.C.
Rod. Eck & Eakin July 31, 1924
Chain. Franke



X-Sections & Levels

For Borrow Pit - E. County Line

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	8.71	249.67			
0+00 = 88+70.3					
0+60				7.0	242.7
0+93				6.1	243.6
1+00				4.7	245.0
1+40				2.6	247.1
T.P.	9.39	258.14		0.92	
1+80				7.2	250.9
2+00				5.8	252.3
2+60				4.1	254.0
3+00				3.2	254.9
3+50				2.6	255.5
T.P.	5.47	259.05		4.56	
4+00				6.5	252.6
4+15				6.6	252.5
T.P.	1.59	249.47		11.17	
for check B.M.				8.52	

Inst. W.H.C.
Rod. C.L. & Colvin July 31, 24
Chain. Frank K.

Left	C L	Right
West		East

240.96 ✓ R.R. Spike in 12" Oak 5ft Left - 88+70

		5.9 / 40	7.2 / 29	6.6 / 18	7.0 / 0	7.3 / 10	8.5 / 17	11.2 / 33	
	14 / 40	14 / 33	2.4 / 17	4.1 / 13	6.1 / 0	6.3 / 14	8.6 / 29	9.5 / 33	
1.5 / 40	1.5 / 33	1.9 / 21	2.7 / 18	4.1 / 13	4.7 / 0	5.0 / 13	5.8 / 24	5.4 / 27	7.0 / 38
	0.8 / 40	1.1 / 32	1.5 / 17	2.4 / 15	2.6 / 0	3.4 / 10		3.8 / 33	

248.75 ✓

5.6 / 40	5.6 / 33	4.8 / 16	7.0 / 13	7.2 / 0	7.3 / 8	6.1 / 10	6.6 / 33	
6.0 / 40	6.0 / 33	5.2 / 15	6.1 / 13	5.8 / 0	5.8 / 8	4.0 / 11	3.5 / 33	
5.0 / 40	5.0 / 33	3.8 / 15	4.6 / 12	4.1 / 0	4.3 / 10	5.0 / 12	2.4 / 33	
4.2 / 40	4.2 / 33	2.3 / 11	3.7 / 10	3.2 / 0	3.0 / 13	1.8 / 16	1.0 / 33	
1.0 / 40	0.9 / 33	0.8 / 9	2.8 / 6	2.6	2.8 / 16	2.2 / 19	2.2 / 33	

253.58 ✓

4.3 / 40	4.3 / 33	4.9 / 8	5.9 / 4	4.5 / 0	5.8 / 8	6.4 / 16	7.0 / 23	6.6 / 33
7.8 / 40	7.8 / 33	7.5 / 27	7.7 / 9	6.6	6.0 / 9	6.8 / 18	8.0 / 38	

47.88 ✓
40.95 (certified correct)

Contd from p. 28

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	8.58	249.54 ✓			
T.P.	12.03	261.13 ✓	0.44		
4+50			8.1		53.0
4+70			6.8		54.3
T.P.	10.13	270.76 ✓	0.50		
5+00			10.4		60.4
5+40			7.0		63.8
T.P.	11.23	281.41 ✓	0.58		
5+40					
6+00			12.4		69.0
6+50			9.7		71.7
7+00			7.4		74.0
7+40			6.9		74.5
T.P.	3.34	274.65 ✓	10.10		
8+00			4.6		70.1
8+55			7.4		67.3

Inst. 2476
Rod. Oak & Galvin
Chain. Franke

Aug 9. 1924

Left C L Right

240.96 ✓ Spike at 0&K 52 N 88+70

249.10 ✓

9.4	9.1	8.1	8.1	7.4	7.3	7.3	9.4	10.2	
13	21	10	2	8	16	19	21	33	

8.4	7.4	7.9	7.6	6.3	5.9	5.9	6.4	7.8	10.4
33	28	10	3		1.09	15	17	23	33

260.63 ✓

7.0		8.9	9.2	10.4	12.3	11.7	12.0	11.1	11.4	13.3
33		21	10	0	1	7	10	15	19	33

	7.0	7.0	6.8	6.9	5.9	6.4	9.5	
	1.10		6	17	14	22	33	

270.18 ✓

10.1	12.6		
33	7		

7.4	7.5	11.7	12.8	12.4	12.1	12.4	11.9	12.2	10.8	9.9	8.4
33	13	8	8		4	10	11	17	22	26	31 33

5.2	4.0	9.6	9.7	10.4	10.0	9.6	8.7	3.4	3.4
33	16	9		8	9	15	25	34	40

6.9	6.2	7.7	7.4	7.8	7.4	6.2	5.5	6.1
33	14	10		6	8	14	16	33

6.7	5.6	6.9	7.4	6.9	7.3	6.4	6.6	6.6
33	12	10	8	0	7	9	13	33

271.31 ✓

6.7	6.2	5.4	4.8	4.6	4.7	4.7	5.9	
32	15	11	6		9	10	33	

9.3	9.0	7.6	7.7	7.4	7.4	8.0	8.5	8.3	
33	13	7	1		3	9	11	33	

(Contd)

contd from 29

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		274.65			
9+00				8.6	66.0
B.M. Chicking	8.50	277.49		5.66	
T.P.	0.27	266.15		11.61	
T.P.	0.30	254.47		11.98	
T.P.	3.75	248.94		9.28	
B.M.				7.98	

Inst.
Rod.
Chain.

Aug. 4 1924

Left				G L		Right
9.6 / 3	9.1 / 9	8.7 / 5	9.4 / —	1.5 / 3	8.9 / 9	8.1 / 3

268.99 sp. to in Po. Polo Lt 5 Sta. 8+25

265.88

254.17

245.19

240.96 RR. sp. to 12" Oak Lt. 88+70

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod.
Chain.

Left	C L	Right

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst. .....
Rod. .....
Chain. .....

Left	C L	Right

original X-Sections
Eleventh St Intersection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
39+38	+ 12' Lt. = 0+00				
T.B.M.	2.81	248.52		245.71	
2+00			39.5		
1+50			39.4		
1+00			39.0		
0+50			40.5		
0+11			40.8		
0+00					
-0+08					
0+00					

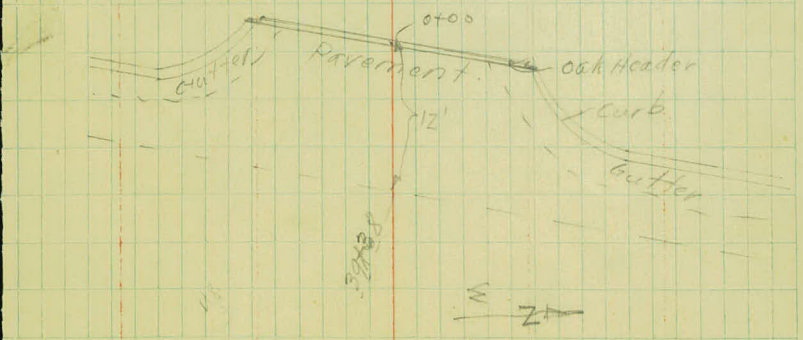
For final Title
see page 23
final Book
Oct 13, 1924

Inst. .....
Rod. .....
Chain. .....

July 23, 1924

Left	C L	Right
Nail in 10" Oak Rt. Sta. 38+45		
7.2 / 33	8.4 / 12	9.0 / 0	9.3 / 15	10.0 / 33
7.3 / 23	8.0 / 20	9.1 / 0	10.3 / 12	12.0 / 33
6.8 / 33	8.3 / 15	9.5 / 0	10.5 / 13	11.8 / 33
5.4 / 33	6.3 / 18	8.0 / 0	9.7 / 18	10.7 / 33
top of curb 4.25 / 18	5.7 / 0	6.6 / 14	8.0 / 33
	4.95		
	5.1 / 18 top of curb	6.2 / 33	

Force Line 30' Lt.



Tenth St. Intersection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

No X-Sections Required

Inst.
Rod.
Chain.

Left C L Right

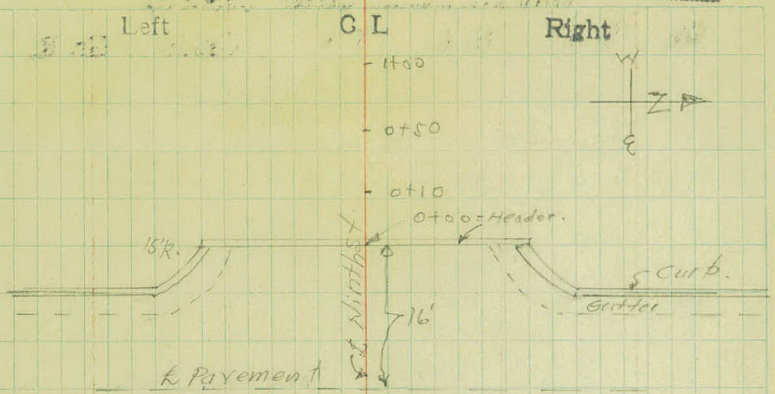
Orig- X-Sections of Ninth St. Intersection.

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
31+13 = 16' Ft. = 0+00					
T. B. M.	2.47	254.07		251.60	Nail in Oak Elev. 314.90
1+00				250.5	
0+50				249.9	
0+10				249.9	
0+00				248.6	

Final X-sec
see page 24
Final Book
Oct 8, 1924

Inst. W.H.C.
Rod. Ecke Galvin July 22, 1924
Chain. Ecke



1.9 / 33	2.9 / 13	3.5 / 11	3.6 / 0	4.4 / 14	4.7 / 33
5.1 / 33	3.6 / 14	4.6 / 10	4.7 / 0	5.1 / 9	5.7 / 19	5.1 / 33
	3.9 / 33	4.3 / 17	4.7 / 0	4.7 / 13	4.9 / 33
	3.8 / 33	4.9 / 18.5	5.5 / 0	5.8 / 18.8	4.9 / 33

To Pof Header. (Top Curb

Original X-Sections
Eight St. Intersection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
28+11 = 16' Lt. = 0+00					
T.B.M.	4.70	256.67 ✓		251.97 ✓	
1+00				50.6	
0+75				50.8	
0+30				51.0	
0+05				51.7	
0+00				250.7	

For final X-Sec
See page 25
Final Book.
Oct 13, 24

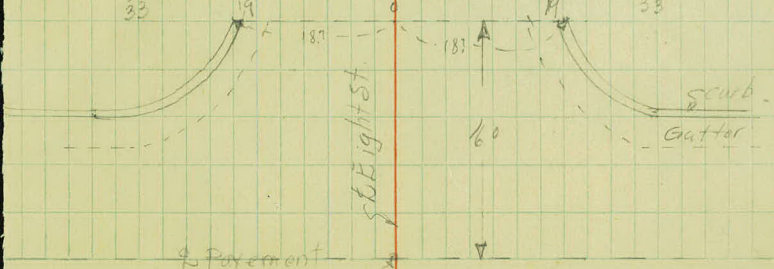
Inst. W.H.C.
Rod. Eckis Eakin
Chain. Franke

July 22, 1924

Left	C L	Right

Nail in cor. F.P. 24 28+40

6.0 / 33	5.5 / 13	6.3 / 11	6.1	6.2 / 13	5.3 / 15	5.6 / 33
5.4 / 33	5.2 / 14	6.1 / 12	5.9 / 0	6.1 / 14	5.4 / 15	5.5 / 33
4.8 / 33	4.9 / 14	5.8 / 11	5.7 / 0	5.8 / 12	5.0 / 20	4.9 / 33
5.6 / 33	5.4 / 18		5.0 / 0		5.7 / 18	5.3 / 33
5.6 / 33	5.9 / 19		6.0 / 0		5.5 / M	5.0 / 33



Original X. Sections
Seventh St. Intersection

Cross Sections

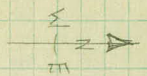
Sta.	B. S.	H. I.	F. S.	Grade	Gr. F
24+43 - 16' Lt. = 0+00					
T. B. M.	4.41	253.80		249.39	
1+00				249.8	
0+50				49.4	
0+10				49.2	
0+00				247.3	

For Final Xsec
See page 10, Final Book
Sec 13, 14 N 4

Inst. W.H.C.
Rod. Eck & Galvin July 22, 1924
Chain. Franke

Left | C L | Right

Nail in Tree at Sta. 2+48

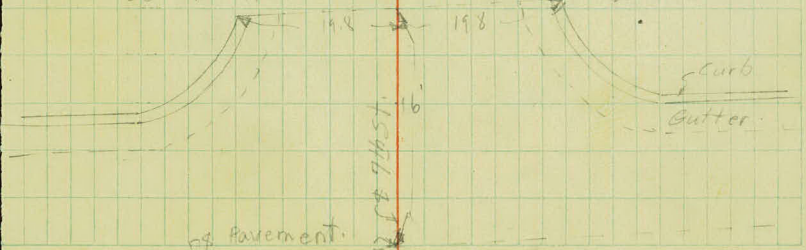


S.W. = 4.0 / 25 | 4.1 / 17 | 4.7 / 16 | 4.0 | 4.3 / 13 | 3.9 / 14 | 3.6 / 22 = S.W.

S.W. = 4.08 / 25 | 4.2 / 18 | 5.0 / 16 | 4.4 / 0 | 4.8 / 13 | 4.2 / 15 | 4.87 / 22 = S.W.

S.W. = 4.51 / 25 | 4.7 / 19 | 5.1 / 17 | 4.6 / 0 | 5.0 / 14 | 4.3 / 16 | 4.04 / 22 = S.W.

4.9 / 33 | 5.0 / 21 | 5.26 / 19.8 | 6.3 / 0 | 5.73 / 19.8 | 4.8 / 33



Original X-Sections
Sixth St. Intersection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
20+75 - 16' Lt. = 0+00					
T.B.M.	3.86	251.28	250.78	247.42	
1+00				45.7	
0+50				245.7	
0+00				246.2	

Master:
No Work Done.
WTH. Oct 13, 1924

Inst. W.H.C.
Rod. Zack & Calvin
Chain. Frank

July 22, 1924

Left | C L | Right

Ha[illegible] 30' Oak 47-57 21-11

N
W E
S

4.1 / 0

5.5 / 33 | 5.4 / 10 | 4.1 | 5.0 / 10 | 5.1 / 16 | 5.0 / 29 | 4.83 / 24 = S.W.

5.6 / 33 | 5.58 / 18.7 | 5.1 / 0 | 5.15 / 18.7 | 4.85 / 24 = S.W.

18.7 | 18.7

E Sixth St.

Curb

Gutter

16

E Pavement

20+79.5

Original X. Section
Manitou Island Rd Intersection

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
18+40 = 16' Rt. = 0+00					
B.M.	3.95	247.71		243.76	
1+00					
0+40					
0+20					
0+00					

Note:
No Work Done
W.H.B. Oct 13/1921

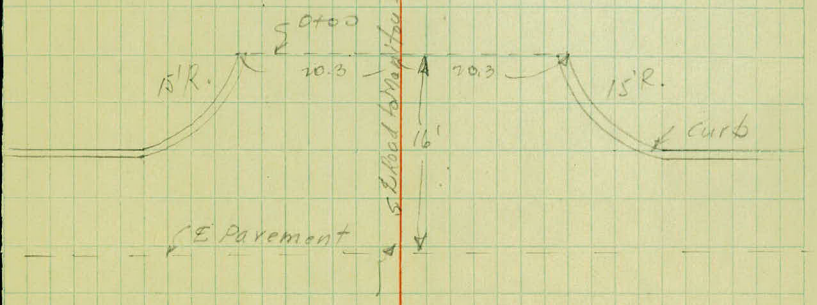
Inst. .....
Rod. .....
Chain. .....

July 22, 1924

Left | C L | Right

Spokane Power Pole 28' Rt 18+03

9.4 / 33	9.3 / 22	9.9 / 14	8.8 / 0	9.5 / 13	8.7 / 14	8.6 / 19	= S.W.
5.4 / 33	6.2 / 15	7.0 / 12	6.7 / 0	7.2 / 12	6.2 / 15	6.1 / 19	= S.W.
4.7 / 33	5.1 / 21	6.0 / 11	5.6 / 0	6.6 / 20	5.7 / 24	5.6 / 28	= S.W.
4.3 / 33	4.8 / 21	4.8 / —		5.2 / 21	5.9 / 33		

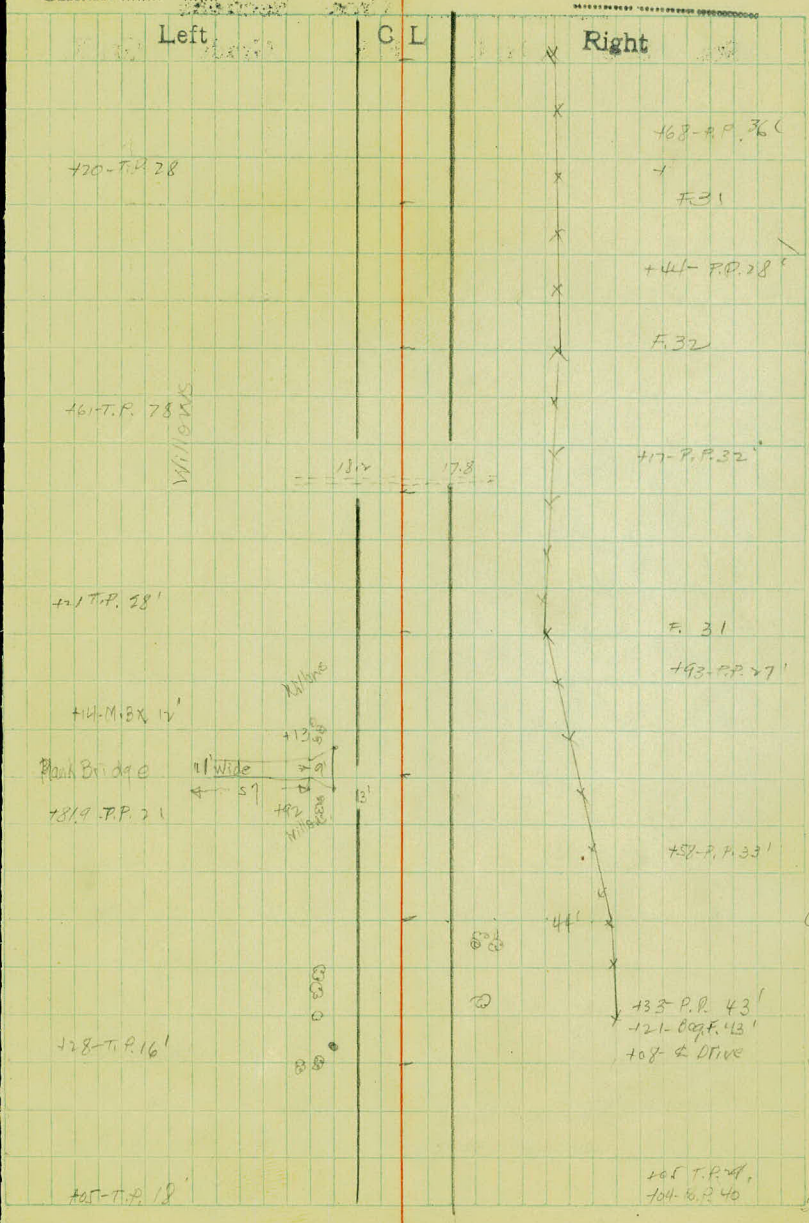


..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
		Final Art. Topog.			
64+02	24" R.C.				
Eq	61+7x.4 = 61.61				

continued from page 77

Inst. ..... Wilk.
Rod. ..... Wilson Parsons Oct, 11, 1924
Chain. ..... Franke



Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

71+36 Int of Buffalo St
71+16 – Int of Road

–71+00

Inst.
Rod.
Chain.

Left	C L	Right
74+90 Brd 15" dia. 34'	10° – 11°	Fen. 42'
74+80 Tr Rd Dg. 37'	10 – 11 74+50	164 – T.P. 21'
74+29 – P.P. 23		161 – Sup P. 40
	10° – 11°	159 – T.P. 28
167 – P.P. 25'	10° – 10°	104 – T.P. 31
	10° +50	Fen. 41' +50
180 Gas Sta 25'	10° – 11°	
173 – P.P. 39'	10° 11° +50	153 – Bgf. 37'
		148 – T.P. 29'
184 – Str. Sta. 20'	10° – 10°	144 – Fen Dapo 55'
167 – P.P. 31'		146 Fen Dapo 52'
		120 – T.P. 27
188 – P.P. 19'	10° – 10°	
133 – Bank Wall 73' ? White		115 – P.P. 23'
		102 T.P. 25
199 T.P. 38'		152 – P.P. 24'
		120 Bgf. 41

75 74 73 72 71 70 69 68 67

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
7+81	G.B. Lt & Rt.				
7+09	℄ Portland Ave.				

Inst.
Rod.
Chain.

Left — C L — Right

+85 - P.P. 21'

+71 P.P. 12'
+61 Guy Pole 12'
+53 P.P. 12'
Small curve

+48 - P.P. 13'

+24 P.P. 14'

21.8 — 21.6

+98 - P.P. 14'
+94 - Beg Int Curb

+73 - P.P. 13'

10.8
10.2 — 10.2
10.8 10.7

+52 - T.P. 14'
+41 - T. Rail Sign 19'
+29 - End N. "C.M. 32'

Fen. 42'

+71 - T.P. 31'

F. 41.

+67 - T.P. 29'

+75 - F. 35'
+73 - T.P. 27'

+51 - T.P.
+10 - F. 36

+20 - T.P. 31'

F. 37
+98 - Beg Int. curb

+69 - T.P. 30'
F. 38'

+74 T.P. 29'

+68 - End 15" C.M. 22.5

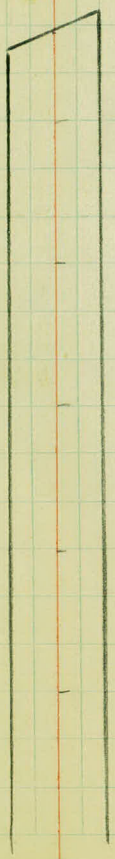
83
84
81
80
79
78
77
76
75

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
89+77	End Pave Rt.				
89+70.3	End Pave ℄				
88+63.6	End Pave. Lt.				18" C.M.

Inst.
Rod.
Chain.

Left	C L	Right
+79- 16' Sag K 52'		
+70- End Curv. 50'		
+70 Shoulder of C 40'		
+41 " " 60'		
+18 " " 30'		
+17- End Curv. 32'		
+93- P.T. 21'		
+64- P.P. 24		
+41- P.T. 19'		
+20- P.P. 15'		
83 +99.5 End Int Curb		
		+94- Tr. Rd. Sign 14'
		+49 Tr. Rd. Sign 16'
		+15- T.T. 22'
		+46- T.P. 22'
		+25- T.P. 31
		+61- End T. 42'
		+25- T.P. 33
		+01.5- End Int. Curb 94'



89
88
87
86
85
84
83

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.....
Rod.....
Chain..... .....

Left	C L	Right

Blue Tops for Paving

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	6.29	250.96		Sub Grade	
88+77				241.57	
88+70.3					
88+63.6				241.91	
88+50				242.25	
88+25				242.87	
88+00				243.50	
87+75				244.09	
+50				244.60	
+25				245.03	
87+00				245.37	
86+92.8					
+75				245.65	
+50				245.84	
+25				245.96	
86+00				246.00	
+75				"	
+50				"	
+25				"	
85+00				"	
+75				"	
+50				"	
+25				"	
84+14.3				246.00	

Inst. W.H.C.
Rod. Eck & Gavin
Chain. Smith & [illegible]

June 27 1924

End of Project
88+703
88+636
88+77

Left			C L		Right
24467 R.R. Spike Elev. To. VA 87+96 →					
+0.33	Top of curb Elev. Rim of Inlet 241.90	10' Curb	Gr. Prod. 9 06	10'	End of Pavement Right only.
		10'		10'	End of Pave. L.
+0.33	242.24		8 72		End of Pave Left only.
+0.33	42.58		8 38		
+0.33	43.20		7 76		
+0.33	43.83		7 13		
+0.33	44.42		6 54		
+0.33	44.93		6 03		
+0.33	45.36		5 60		
+0.33	45.70		5 26		
					P.T. a
+0.33	45.96		5 00		
+0.33	46.17		4 79		
+0.33	46.29		4 67		
+0.33	46.33		4 63		
+0.33	"		"		
+0.33	"		"		
+0.33	"		"		
+0.33	"		"		
+0.33	"		"		
+0.33	"		"		
+0.33	"		"		
+0.33	246.33	10'	4 63	10'	End of V. Curve.

Width of Pavement

Staking Method.

Stakes set here

0.33

2" Crown

Bit. Macadam

6" Concrete

Sub Grade

Sta. 88+77 to Sta. 55+68

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		250.96		Sub Grade	
T.P.	2.54	248.47	5.03		
84+00				245.99	
+75				245.89	
83+59.5					
T.P.	2.55	248.48	2.54		
83+50				245.72	
+25				245.45	
83+00				245.08	
82+75				244.65	
+50				244.10	
+25				243.50	
82+00				242.83	
+75				242.05	
+50				241.30	
+25				240.55	
81+00				239.80	
80+75				239.13	
+50				238.52	
+25				238.00	
80+00				237.53	
79+75				237.13	
T.P.	4.37	241.52	11.33		

Inst. W.H.C.
Rod. Ecks Galvin June 30, 24
Chain. Frank E.

Left			C L		Right
	Top of curb Edge Pave w/in Curb	Width Pave	Ch Rod.	Width Pave	Point
245.93					
+0.33	246.32	10.0	2 15	10.0	End of 4" Curb Lt. & Rt.
+0.33	246.22	10.0	2 25	10.0	
					P.C. of 3°C.R.
245.93	Nail in T. Pole.		Pt 257+25		
+0.33	246.05	10.0	2 43	10.0	
✓	245.78	✓	2 70	✓	
✓	245.41	✓	3 07	✓	
✓	244.98	✓	3 50	✓	
✓	244.43	✓	4 05	✓	
✓	243.83	✓	4 65	✓	Eq. 82+07 = 82+07.22 = P.T.
✓	243.13	✓	5 35	✓	
✓	242.38	✓	6 10	✓	
✓	241.63	✓	6 85	✓	
✓	240.88	✓	7 60	✓	
✓	240.13	✓	8 35	✓	
✓	239.46	✓	9 02	✓	
✓	238.86	✓	9 62	✓	
✓	238.33	✓	10 15	✓	
✓	237.86	✓	10 62	✓	
✓	237.46	10.0	11 07	10.0	
					794+21.93 R.C. 7°C.
237.15	Nail in T.P.		794+25 Ft.		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		241.52		5.16 Grade	
79+50				236.80	
79+25				236.53	
79+00				236.33	
+75				236.20	
+50				236.13	
+25				236.13	
78+00				236.20	
+50				236.40	
77+00				236.60	
76+50				236.80	
+25				236.90	
76+00				237.00	
B.M.	4.21	242.28	3.45		
75+75				237.10	
75+50				237.20	
75+25				237.30	
75+00				237.40	
74+75				237.50	
74+50				237.60	
74+22.5				237.71	
74+00				237.79	
73+75				237.84	
73+50				237.89	

Inst. W.A.C. June 3024
Rod. Ed. Eakin
Chain. Frankel

	Left		G L		Right	
	70 ft. of curb to edge of mid-walk out curb	W.	Gr. Rod.	W.	Point	
70.33	237.13	10	4 39	10.00		
✓	236.86	✓	4 66	✓		
✓	236.66	✓	4 86	✓		
✓	236.53	✓	4 99	✓		
✓	236.46	✓	5 06	✓		
✓	236.46	✓	5 06	✓		
✓	236.53	✓	4 99	✓	End of Curb Lt & Rt.	
✓	236.73	✓	4 79	✓		
✓	236.93	✓	4 59	✓		
✓	237.13	✓	4 39	10 00		
✓	237.23	✓	4 29	10.10	76+29.6 B.W.T.	
✓	237.33	10 29	4 19	10.35		
238.07	K.R. Strike in Elec. Pole			25' Lt. 7+28		
70.33	237.48	10 00	4 85	11.15	75+79.6 P.T. 8° C.	
✓	237.53	10 05	4 75	11.80		
✓	237.63	10 02	4 65	12 00	75+29.6 E.W.T.	
✓	237.73	10	4 55	12 00		
✓	237.83	10	4 45	12 00		
✓	237.93	10	4 35	11.80	74+72.5 E.W.T.	
✓	238.04	10	4 24	11 00	P.C - 8° C.	
✓	238.12	10	4 16	10.30		
	238.17	10	4 11	10.05	73+72.5 E.W.T.	
	238.22	10	4 06	10.00		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
		242.28		Sub Grade	
73+25				237.98	
73+00				237.99	
72+77.5				237.95	
72+50				237.90	
72+27.47				237.78	
72+00				237.74	
71+75				237.64	
71+50				237.54	
71+26.14				237.44	
71+00				237.24	
70+75				237.24	
70+50				237.14	
70+00				236.94	
T.P.	2.04	240.84	3.78		
69+50				236.74	
69+00				236.54	
68+50				236.35	
68+00				236.19	
67+50				236.05	
67+00				235.94	
66+50				235.84	
66+00				235.74	
65+50				235.64	

Inst.
Rod.
Chain.

Left			C L		Right
	Top of Curb Inside Edge of Curb	W.	Gr. Rod	W.	Point.
+0.33	238.26	10	4.07	10	
✓	238.30	10	3.91	10	
✓	238.26	10	4.00	10	B.W.T.
✓	238.23	10	4.05	10.30	
✓	238.11	10	4.17	11.00	P.T. 10°C. Rt.
✓	238.07	10	4.21	12.20	
✓	237.97	10	4.31	12.30	
✓	237.87	10	4.41	12.00	
✓	237.77	10	4.51	11.80	P.C. 10°C. Rt.
✓	237.67	10	4.61	10.3	
✓	237.57	10	4.71	10	B.W.T.
✓	237.47	10	4.81	10	
	237.27	10	5.01	10	
238.50	Nail in T.P.		1+ Sta. 70+70		July 7, 1914
+0.33	237.07	10	3.47	10	
	236.87	✓	3.67	✓	
	236.68	✓	3.86	✓	
	236.52	✓	4.02	✓	
	236.38	✓	4.16	✓	
	236.27	✓	4.27	✓	
	236.17	✓	4.37	✓	
	236.07	✓	4.47	✓	
	235.97	10	4.57	10	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr.
		240.54		Sub Grade	
T.P.	4.72	240.69	4.57		
65+00				235.54	
64+50				235.44	
64+00				235.38	
63+50				235.37	
63+00				235.41	
62+50				235.50	
62+00				235.60	
Eq. 61+76.5 = 61+61.5				235.70	
T.P.	2.59	240.00	3.28		
61+50				235.75	
61+25				35.78	
61+00				235.80	
60+75				35.83	
60+50				35.85	
60+25				35.88	
60+00				235.90	
59+75				"	
59+50				"	
59+25				"	
59+00				"	
58+75				"	
58+50				235.90	

Inst. W.H.C.
Rod. Eck & Gahin
Chain. Franke

July 2, 1924

	Left		C L		Right
	To Foot of Witness Stone	W.	Gr. Rd	W	Point
235.97					
10.33	235.87	10	4.87	10	
"	235.77	"	4.92	"	
"	235.71	"	4.98	"	
"	235.70	"	4.97	"	
"	235.74	"	4.93	"	
"	235.83	"	4.86	"	
"	235.93	"	4.76	"	
"	236.03	"	4.66	"	P.T. 32°30' C.L.
237.41	Nail in	6" Oak			
10.33	236.08	10	3.92	10	
"	236.11	"	3.89	"	
"	236.13	"	3.87	"	
"	236.16	"	3.84	"	
"	236.18	"	3.82	"	
"	236.21	"	3.79	"	
"	236.23	"	3.77	"	
"	"	"	3.77	"	
"	"	"	3.77	"	
"	"	"	3.77	"	
"	"	"	3.77	"	
"	"	"	3.77	"	
10.33	236.73	10	3.17	10	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr.
		240.00		Sub Grade	
58+25				235.90	
58+00				235.90	
57+75				235.87	
57+50				236.85	
57+25				236.82	
57+00				236.80	
56+75				235.77	
56+50				235.75	
56+25				235.72	
55+99.4				235.69	
T. P.	5.47	240.29	5.18		
B.M.	6.43	240.55	6.17		
55+68				235.66	
55+25				235.63	
55+00				235.60	
54+75				235.58	
54+68					
54+50				235.55	
54+25				235.53	
54+18.2					
54+00				235.50	
53+75				235.48	

Inst. .....
Rod. ..... July 3, 24
Chain. .....

Left		W	C L Gr. Rod	W	Right Point
+0.37	236.23	10	3.77	10	
"	236.23	10	3.77	10	
"	236.20	✓	3.80	✓	
"	236.18	✓	3.82	✓	
"	236.15	✓	3.85	✓	
"	236.13	✓	3.87	✓	
"	236.10	✓	3.90	✓	
"	236.08	✓	3.92	✓	
"	236.05	✓	3.95	✓	
+0.33	236.02	✓	3.98	✓	P.C. 3°30' Q. Rt
234.82					
234.12	R.S. Spike in Pole		Lt Sta.		Pole 478
+0.33	235.99	10	4.13	10	B.S.T.
			Gr. Rod.		55+68 End of 4" Int. Curb
6" Pave	Top & Pave.		Ht. & Ft.		Superelev.
+0.50	236.13	10	0.00 4.13 -0.26	10	
+0.50	236.10	10	+0.10 4.13 -0.23	10	
+0.50	236.08	10	+0.20 4.13 -0.40	10	
					B.W.T.
+0.50	236.05	10	+0.30 4.50 -0.42	10.35	
+0.50	236.03	10	+0.42 4.53 -0.49	11.75	
		10		12.50	P.T.
+0.50	236.00	10	+0.50 4.55 -0.72	14.10	
+0.50	235.98	10	+0.59 4.57 -0.88	14.98	W.T.

6" Concrete — +0.50 for top pave.
2 Sub Grade
Staking Method Sta. 55+75 to 48+75

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
		240.55		Sub Gr.	
53+53				235.45	
53+25				235.43	
53+03.5				235.40	
	5.84	239.96	6.43		
52+75					
52+50					
52+25					
51+94.7					
52+00		Note: Pavement Stated 2" Below Top of Rail			
51+75					
51+63.5					
51+76					
51+45					
51+00				235.10	
50+50				234.97	
50+00				234.85	
49+50				234.73	

Inst. W.H.C. July 7, 1924
Rod. Eck & Dwelly
Chain. Frankson

Left			C L			Right	
H. of Pave.	Top of Pavement	W			W		
+0.50	235.95	10	4.02	+0.93	15	E.W.T. E.S.T.	
+0.50	235.93	10	4.07	-0.72	14.35		
+0.50	235.90	10	4.05	-0.55	12.50	P.C. 29°C. R4.	
234.12							
		10	3.84		4.46	10.60	
			3.96		4.50	B.W.T.	
			4.08		4.46	= top of concrete without curb.	
					4.00	End of Pave. Rt. R4.	
			4.20			2" below top of Rail	
			4.39			Sta 51+05 Beg Int. Curb R4.	
			4.00			End of Pave. Left	
					4.06	End of Pave. Rt. R4	
		10.05	4.38		4.38	10.05	End Pave. Left
						No Crown.	
							51+94.7
							51+76.0
						N.R.R.R.-L	51+76
						51+63.5	
						51+45.5	
						2" Crown	
+0.50	235.60	10	-0.17	4.26	-0.17	10	
+0.50	235.47	10	-0.17	4.49	-0.17	10	
+0.50	235.35	10	-0.17	4.61	-0.17	10	
+0.50	235.28	10	-0.17	4.73	-0.17	10	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
		239.96		Sub Grade	
T.P.	4.70	239.00	5.66		
49+25				234.66	
49+00				234.60	
48+75				234.54	
48+50				234.48	
48+25				234.41	
Eq. 48+38 = 48+07.8				234.35	
47+75				234.29	
47+50				234.23	
47+25				234.16	
47+00				234.10	
T.P.	4.62	238.92	4.70		
46+75				234.13	
46+50				234.15	
46+25				234.18	
46+00				234.20	
45+86.9	P.C.				
45+75				234.23	
45+50				234.25	
45+37					
45+25				234.28	
45+00				234.30	

Inst. .....
Rod. .....
Chain. .....

July 7, 1924

Left			C L		Right
Thot Pave.	Top of Concrete.	W	Gr. Rod.	W	Point
234.30					
+0.50	235.16	10	-0.72 3.34 -0.04	10	
+0.50	235.10	10	-0.78 3.40 +0.02	10	48+53.8 B.W.T.
"	235.05	10	-0.83 3.45 +0.07	10	48+54 + End of Int. Curb Lt.
"	234.98	10	-0.88 3.52 +0.14	10	
"	234.91	10 1/2	-0.93 3.59 +0.21	10	
"	234.85	11.50	-0.98 3.65 +0.27	10	P.T.
"	234.79	11.95	-1.05 3.71 +0.33	10	
"	234.72	12.15	-1.15 3.77 +0.39	10	
+0.50	234.66	12 1/2	-1.15 3.84 +0.46	10	
+0.50	234.60	12 1/2	-1.15 3.90 +0.52		
234.30					
+0.50	234.63	12 1/2	-1.15 3.87 +0.49	10	
+0.50	234.65	12 1/2	-1.15 3.83 +0.45	10	
+0.50	234.68	12.10	-1.10 3.84 +0.46	10	
+0.50	234.70	11.55	-1.01 3.83 +0.45		
		11.05		10	P.C.
+0.50	234.73	10.60	-0.95 3.79 +0.41	10	
+0.50	234.70	10.05	-0.90 3.87 +0.49		
		10.00		10	Beg Int curb Left. B.W.T. Left.
+0.50	234.78	10	-0.85 3.74 +0.30	10	
+0.50	234.80	10	-0.80 3.74 +0.30		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		238.92			
44+75				234.32	
44+50				234.36	
44+25				234.44	
44+00				234.58	
43+75				234.78	
	4.31	242.13	1.10		
B.M.			5.50		

Inst. W.H.C. July 7 1924
Rod. Eck & Galvin
Chain. Franke

	Left		C L		Right
	Top of B Concrete	W	℄ Gun Rod	W	Point
40.50	234.82	10	-0.05 41.9 0.09	10	
40.50	234.86	10	-0.20 41.06 -0.10	10	
40.50	234.94	10	-0.17 39.98 -0.17	10	44+37 - 3.57 ℄
40.50	235.08	10	-0.17 39.84 -0.17	10	
40.50	235.28	10	-0.17 39.64 -0.17	10	
237.82					
236.63 = 36.61	RR. spike in 14" Pop				R.R. 42+05

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Inst.
Rod.
Chain.

Left	C L	Right

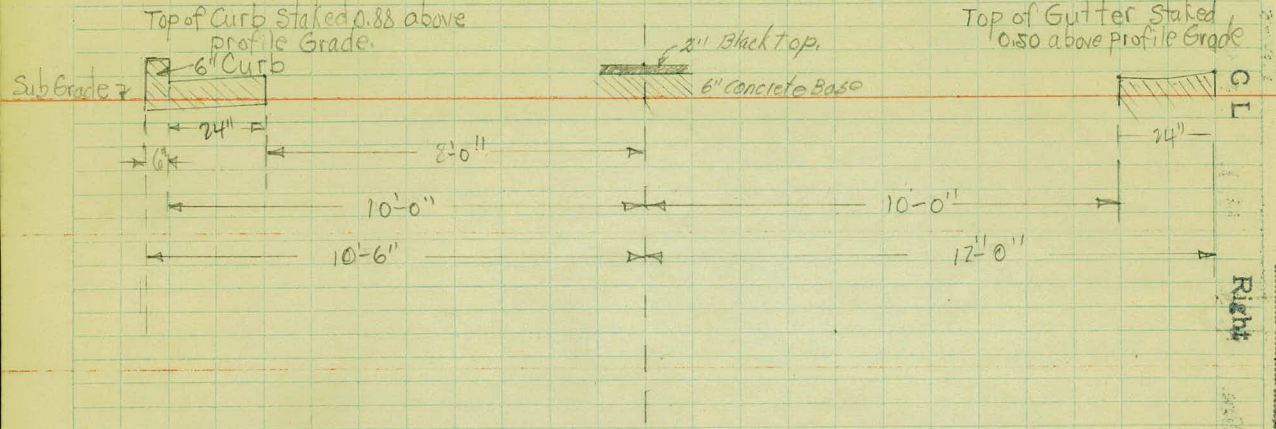
Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

Method of Staking
Combined Curb & Gutter and
Gutter.

Inst.
Rod.
Chain.

Left & Right



Blue Tops for Curb & Gutter

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
B.M.	2.14	250.65			
T.P.	1.03	243.08	8.60		
B.M.	6.33	242.94	6.47		Sub Grade
43+62				234.89	8.05
43+50				235.08	7.86
43+25				235.35	7.59
43+00				235.75	7.19
42+75				236.16	6.78
42+50				236.65	6.29
42+25				237.15	5.79
42+00				237.65	5.29
41+75				238.15	4.79
41+52.36				238.60	4.34
41+00				239.65	3.29
B.M.	7.20	243.81			
40+50				240.65	3.16
T.P.	8.03	249.56	2.28		
40+00				241.65	7.91
39+75				242.15	7.41
39+50				242.65	6.91
39+25				243.15	6.41
39+00				243.65	5.91
38+75				244.13	5.43
38+50				244.57	4.99

Inst. W.H.C. July 1, 1924
Rod. Eck & Calvin
Chain. Franke

Left	C L	Right
248.51 R.R. Spike Guy Pole 25 Ft. So. 3472K		
242.05		
236.61 R.R. Spike 14" Pop. Rt. 42+05		
For Top of Curb + .88		+ .88 for Top of Gutter
7.86 − .88 = 6.98	8.05 − .55 = 7.50	7.84 − .5 = 7.34
7.59 − .88 = 6.71	7.59 − .5 = 7.09	7.19 − .51 = 6.68
7.10 − .88 = 6.22	6.78 − .5 = 6.28	6.29 − .5 = 5.79
6.78 − .88 = 5.90	5.79 − .5 = 5.29	5.29 − .5 = 4.79
6.29 − .88 = 5.41	4.79 − .5 = 4.29	4.84 − .5 = 4.34 P.C. 2°6.4'
5.79 − .88 = 4.91	3.79 − .5 = 3.29	
5.29 − .88 = 4.41		
4.79 − .88 = 3.91		
4.34 − .88 = 3.46		
3.79 − .88 = 2.91		
236.61		
3.16 − .88 = 2.28	3.16 − .5 = 2.66	
241.53		40+11.9 R.T.
7.41 − .88 = 7.03	7.91 − .5 = 7.41	
7.41 − .88 = 6.53	7.41 − .5 = 6.91	
6.91 − .88 = 6.03	6.91 − .5 = 6.41	
6.41 − .88 = 5.53	6.41 − .5 = 5.91	
5.91 − .88 = 5.03	5.91 − .5 = 5.41	
5.43 − .88 = 4.55	5.43 − .5 = 4.93	
4.99 − .88 = 4.11	4.99 − .5 = 4.49	

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		249.56			
T.P.	6.26	251.97	3.85		
38+25				244.97	7.05
38+00				245.32	6.65
37+75				245.63	6.34
37+50				245.90	6.07
37+25				246.14	5.83
37+07.5	P.C. 3° C. Rt.				
37+00				246.32	5.65
36+78.2	P.T. 12° C. Rt.			246.45	5.52
36+50				246.57	5.40
36+25				246.63	5.34
36+00				246.65	5.32
35+75				246.65	5.32
35+50				246.65	5.32
35+25				246.68	5.29
35+00				246.70	5.27
34+75				246.73	5.24
34+69.8	P.C. 12° C. Rt.				
34+50				246.75	5.22
34+00				246.80	5.17
B.M.	3.24	251.76	3.45		

Grade changed

See following Page. Grade changed.

Inst. WH G
Rod. Eck & Darby
Chain. Franks

July 3, 1964

Left	C L	Right
24597 No 1 to 10" Oak Lt. Sta 38+85		
7.00 / -.88 / 6.12	7.00 / -.50 / 6.50	
		6.65 / -.50 / 6.15
6.05 / -.88 / 5.17		
6.34 / -.88 / 5.46	6.34 / -.8 / 6.34	
		6.07 / -.50 / 5.57
6.07 / .88 / 5.19		
5.88 / .83 / 5.05	5.83 / -.5 / 5.33	
	5.65 / -.50 / 5.15	
5.45 / -.88 / 4.57		
		5.52 / -.50 / 5.02
5.87 / -.88 / 4.99		
5.40 / -.88 / 4.52	5.46 / -.5 / 4.96	
5.84 / -.88 / 4.96		5.38 / -.50 / 4.88
5.32 / -.88 / 4.44	5.37 / -.84 / 4.53	
5.33 / -.88 / 4.45		5.32 / -.50 / 4.82
5.38 / -.88 / 4.50	5.32 / -.5 / 4.82	
		5.29 / -.50 / 4.79
5.41 / -.88 / 4.53	5.27 / -.50 / 4.77	
5.24 / -.88 / 4.36		5.24 / -.50 / 4.74
5.27 / -.88 / 4.39		5.22 / -.50 / 4.72
5.17 / -.88 / 4.29	5.21 / -.50 / 4.71	
7-18-64 R.R. Spike in Guy Pole Sta 38+26		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		251.76			
36+25				246.51	5.25
36+00				246.45	5.31
35+75				246.35	5.41
35+50				246.25	5.51
35+25				246.15	5.61
35+00				246.05	5.71
34+75				246.10	5.66
34+69.8	P.C. 12°.				
34+50				246.15	5.61
34+00				246.25	5.51
~~33+80~~					
B.M.	3.88	252.40			
33+50				246.30	6.06
33+25				246.43	5.93
33+00				246.55	5.85
32+75				246.75	5.65
32+50				246.95	5.45
32+25				247.20	5.20
32+00				247.45	4.95
31+75				247.70	4.70
31+50				247.95	
31+46.45				247.99	4.41

Inst. W.H.L. July 9, 1924
Rod Eck Pivelly
Chain. Froom Ke

Left	C L	Right
5.55 − .88 = 4.67	5.75 − 5 = 4.75	
5.76 − .88 = 4.43		5.91 − 5 = 4.91
5.91 − .88 = 4.53	5.41 − 5 = 4.41	
5.81 − .88 = 4.63		5.91 − 5 = 5.01
	5.61 − 5 = 5.11	
5.71 − .88 = 4.83		5.71 − 5 = 5.71
5.66 − .88 = 4.79	5.66 − 5 = 5.16	
5.61 − .88 = 4.73	5.61 − 5 = 5.11	
5.51 − .88 = 4.63		5.51 − 5 = 5.01
248.52		
6.05 − .88 = 5.17	6.25 − 5 = 5.25	
5.97 − .88 = 5.09		5.97 − 5 = 5.97
5.85 − .88 = 4.97	5.85 − 5 = 5.25	
5.65 − .88 = 4.77		5.65 − 5 = 5.15
5.43 − .88 = 4.57	5.45 − 5 = 4.95	
5.30 − .88 = 4.37		5.20 − 5 = 4.70
4.95 − .88 = 4.07	4.95 − 5 = 4.48	
4.70 − .88 = 3.82		4.70 − 5 = 4.20
4.41 − .88 = 3.53		4.41 − 5 = 3.91

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		252.40			
T. B. M.	5.59	257.70	- 0.29		
31+00				248.95	9.25
30+50				248.95	8.75
30+25				249.20	8.50
30+00				249.45	8.25
29+75				249.70	8.00
29+50				249.95	7.75
T. B. M.	3.73	255.92	5.51		
29+21.6				250.15	5.77
29+00				250.25	5.67
28+75				250.25	5.67
28+50				250.15	5.77
28+25				250.05	5.87
28+00				249.91	6.01
27+75				249.78	6.14
27+50				249.60	6.32
27+25				249.35	6.57
27+00				249.10	6.82
26+50				248.60	7.32
26+00				248.10	7.82
25+50				247.60	8.32
25+00				247.18	8.74
	8.12	252.51	6.53		

Inst. W.T.G. July 18 1924
Rod. Fair & Evenly
Chain. Fairly

Left	C L	Right
252.11 - Hydrant Iron Gate Post. Lt. Sta. 31+10		
375 1.97 see page 59		
375 Prop. No. 10 Var. Ft. B. 309 Sta. 28+40 Post has been burned.		
249.89 No. 10 Tree Lt. Sta. 24+88		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		252.51			
24+75				247.02	5.51
24+50				246.85	5.66
24+33.5				246.77	5.74
24+00				246.60	5.91
23+50				246.35	6.16
23+00				246.10	6.41
22+50				245.85	6.66
22+00				245.60	6.91
21+50				245.35	7.16
21+00				245.10	7.41
T. P.	2.88	250.30	5.09		
20+75				244.97	5.33
20+50				244.77	5.53
20+25				244.55	5.75
20+00				244.27	6.03
19+75				243.96	6.34
19+50				243.61	6.69
19+25				243.22	7.08
19+00				242.78	7.52
18+75				242.33	7.97
18+50				241.89	8.41
18+25				241.42	8.88
18+00				240.96	9.34

Inst. ..... July 12, 1924
Rod. .....
Chain. .....

Left	C L	Right
5.51 − .88 = 4.63	5.51 − .50 = 5.01	
		5.66 − .50 = 5.16
	5.74 − .50 = 5.24	
5.91 − .88 = 5.03		5.91 − .50 = 5.41
6.16 − .88 = 5.28	6.16 − .50 = 5.66	
6.41 − .88 = 5.53		6.41 − .50 = 5.91
6.66 − .88 = 5.78	6.66 − .50 = 6.16	
6.91 − .88 = 6.03		6.91 − .50 = 6.41
7.68 − .88 = 6.78	7.16 − .50 = 6.66	
7.41 − .88 = 6.53		7.41 − .50 = 6.91
247.42	Nail in 36" Oak	47 Sta. 21+11 July 14-1924
	5.33 − .50 = 4.83	
		5.53 − .50 = 5.03
5.75 − .88 = 4.87	5.75 − .50 = 5.25	
6.00 − .88 = 5.13		6.03 − .50 = 5.53
6.34 − .88 = 5.46	6.34 − .50 = 5.84	
6.69 − .88 = 5.81		6.69 − .50 = 6.19
7.08 − .88 = 6.20	7.08 − .50 = 6.58	
7.53 − .88 = 6.64		7.52 − .50 = 7.02
7.97 − .88 = 7.09	7.97 − .50 = 7.47	
8.45 − .88 = 7.64		
8.88 − .88 = 8.00		
9.34 − .88 = 8.46		7.34 − .50 = 6.84

r=40.8 Deg Curb 50.00 − 44.69 = 5.31
G.R. − 5.63 − .88 = 4.75

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R
		250.30			
17+75				240.51	9.79
T.P.	0.15	243.92	6.53		
17+50				240.05	3.87
17+25				239.59	4.33
17+00				239.22	4.70
16+75				239.02	4.90
16+58	Sq Rad Curb.				
16+50				238.90	5.02
T.P.	3.86	242.72	5.06		
16+25				238.78	3.94
16+00				238.66	4.06
15+75				238.54	4.18
15+50				238.42	4.30
15+25				238.30	4.42
15+00				238.18	4.54
14+75				238.05	4.67
14+50				238.00	4.72
14+25				237.98	4.74
14+00				237.97	4.75
13+75				238.01	4.71
B.M.	2.05	244.00	0.15		
13+50				238.08	5.92
13+25				238.18	5.82
13+00				238.33	5.67

Inst.
Rod.
Chain.

July 16, 1924

Left	C L	Right
	9.79 .88 = 8.91	4.79 .5 = 9.29
243.77 Spike in Pa 28' RT 18+02		
	3.87 .88 = 2.99	3.81 .5 = 3.31
4.33 .88 = 3.45		4.33 .5 = 3.83
	4.70 .50 = 4.20	
4.90 .88 = 4.02		4.90 .5 = 4.40
	5.07 .5 = 4.57	
5.02 .88 = 4.14		
238.86 Nail in Fo. Pole RT. Sta. 16+00		July 17, 1924
	3.94 .88 = 3.06	3.94 .5 = 3.44
4.06 .88 = 3.18		4.06 .5 = 3.56
	4.18 .5 = 3.68	
4.18 .88 = 3.30		
4.30 .88 = 3.42		4.30 .5 = 3.80
	4.47 .5 = 3.97	
4.42 .88 = 3.54		
4.54 .88 = 3.66		4.54 .5 = 4.04
	4.67 .5 = 4.17	
4.67 .88 = 3.79		
4.72 .88 = 3.84		4.72 .5 = 4.22
	4.74 .5 = 4.24	
4.74 .88 = 3.86		
4.75 .88 = 3.87		4.75 .5 = 4.25
	4.71 .5 = 4.21	
4.71 .88 = 3.83		
241.95		
	5.92 .50 = 5.42	
5.92 .88 = 5.04		
		5.82 .5 = 5.32
5.86 .88 = 4.98		
	5.47 .5 = 4.97	
5.48 .88 = 4.60		

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		244.00			
12+75				238.48	5.52
12+50				238.63	5.37
12+25				238.78	5.22
12+00				238.93	5.07
11+75				239.08	4.92
11+50				239.23	4.77
11+25				239.38	4.62
11+00				239.50	4.50
10+50				239.85	4.15
10+00				240.15	3.85
9+50				240.42	3.58
T.P.	3.76	246.09	6.67		
9+00				240.65	5.44
8+50				240.83	5.26
8+00				241.00	5.09
7+50				241.12	4.97

Grade changed
See page 64

5.37 − .88 = 4.49
5.37 − .50 = 4.87
5.27 − .88 = 4.39
5.22 − .50 = 4.72
5.07 − .88 = 4.19
5.07 − .50 = 4.57
4.97 − .5 = 4.47
4.77 − .50 = 4.27
11+18 — Beg Rad Curb 3.72
4.58 − .88 = 3.70
4.67 − .5 = 4.17
4.50 − .5 = 4.00
10+87.5 Beg Rad. curb 3.58
4.15 − .5 = 3.65
3.85 − .88 = 2.97
3.85 − .5 = 3.35
3.58 − .88 = 2.70
3.58 − .5 = 3.08
24+2.33 Radius Rd. Pole Lt. Sta. 9+55
5.44 − .88 = 4.56
5.44 − .5 = 4.94
5.26 − .88 = 4.38
5.26 − .50 = 4.76
5.09 − .88 = 4.21
5.09 − .5 = 4.59
4.97 − .88 = 4.09
4.97 − .5 = 4.47

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		246.09			
7+00				241.20	4.89
6+75				241.22	4.87
6+50				241.25	4.84
6+25				241.24	4.85
6+00				241.23	4.86
5+75				241.22	4.87
5+50				241.22	4.87
T.P.			4.03		

Grade change
See page

4.89
-.88
4.01

4.87
.88
3.99

4.89
-.88
3.96

4.85
.88
3.97

4.87
.88
3.99

4.87
.88
3.99

4.89
-.5
4.39

4.87
-.5
4.37

4.89
-.5
4.34

4.85
-.5
4.35

4.86
-.5
4.36

4.87
-.5
4.37

4.87
-.5
4.37

245.06 No. 1 in Oak Lt. 5735

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
	4.43	246.76			
10+00				240.20	6.56
9+50				240.55	6.21
9+00				240.85	5.91
8+50				241.03	5.73
8+00				241.10	5.66
7+50				241.09	5.67
7+00				240.95	5.81
6+75				240.80	5.96
6+50				240.70	6.06
6+25				240.56	6.20
6+00				240.43	6.33
5+75				240.31	6.45
5+50				240.22	6.54
5+25				240.13	6.63
T. P.	3.08	245.14	4.70		

242.33 Nail in Po. Pole 4. Sta 9+55

6.56 − .88 = 5.68

6.56 − .5 = 6.06

6.71 − .88 = 5.83

6.21 − .5 = 5.71

5.91 − .88 = 5.03

5.91 − .5 = 5.41

5.73 − .88 = 4.85

5.73 − .5 = 5.23

5.66 − .88 = 4.78

5.66 − .5 = 5.16

5.67 − .88 = 4.79

5.67 − .5 = 5.17

5.81 − .88 = 4.93

5.81 − .5 = 5.31

5.96 − .88 = 5.08

5.96 − .5 = 5.46

6.06 − .88 = 5.18

6.06 − .5 = 5.56

6.70 − .5 = 5.70

6.33 − .5 = 5.83

6.45 − .88 = 5.57

6.45 − .5 = 5.95

6.54 − .88 = 5.66

6.54 − .5 = 6.04

6.63 − .88 = 5.75

6.68 − .5 = 6.13

247.06 Nail in Oak 4+57.35

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
		245.14			
5+00				240.06	5.08
4+75				240.01	5.13
4+50				239.97	5.17
4+25				239.96	5.18
4+00				239.95	5.19
3+75				239.94	5.20
3+50				239.94	5.20
3+25				239.93	5.21
3+00				239.93	5.21
2+75				239.92	5.22
2+50				239.90	5.24
2+25				239.85	5.29
2+00				239.80	5.34
1+75				239.75	5.39
1+50				239.70	5.44
B.M.	1.05	243.74	2.45		
1+25				239.62	4.12
1+09					
1+00				239.42	4.32
0+75				239.17	4.57
0+50				238.81	4.93
0+25				238.51	5.23
0+00				238.34	5.40
B.M. (new)			0.87		

W. H. C.
Eck
Calvin
Franke

July 21, 1924

5.16 −.88 4.30
5.08 −.5 4.58
5.13 −.88 4.25
5.13 −.5 4.63
5.17 −.88 4.29
5.17 −.5 4.67
5.18 −.88 4.30
5.18 −.5 4.68
5.19 −.88 4.31
5.19 −.5 4.69
5.20 −.88 4.32
5.20 −.5 4.70
5.28 +.88 4.32
5.30 −.5 4.70
5.21 −.88 4.33
5.21 −.5 4.71
5.21 −.88 4.33
5.21 −.5 4.71
5.22 −.5 4.72
5.24 −.88 4.36
5.24 −.5 4.74
5.19 −.88 4.31
5.19 −.5 4.69
5.24 −.88 4.36
5.24 −.5 4.74
5.20 −.88 4.32
5.20 −.5 4.70
Beg. Rad. Curb
To be removed
242.69 Sta. 10 + 24.8 & 25' Lt. 17.57 Sta. 10 + 24.8 & 1' Lt. 936.45
3.17 3.40 20' Radius 3.64 3.88 3.11
3/4 1/2 1/4
3.67
10'
10'
10.3
11.00
11.55
11.90
12.00
P.I.
Gutter
Top Stake Curb 4.35
Top Stake Curb 4.58
4.87
4.07
4.03
4.35 = diff in Curb & Gutter
4.90 0+08.83 End of St. Gutter
242.87 Willis 24" oak Lt. 14.75

Final Topog. Proj 24-53

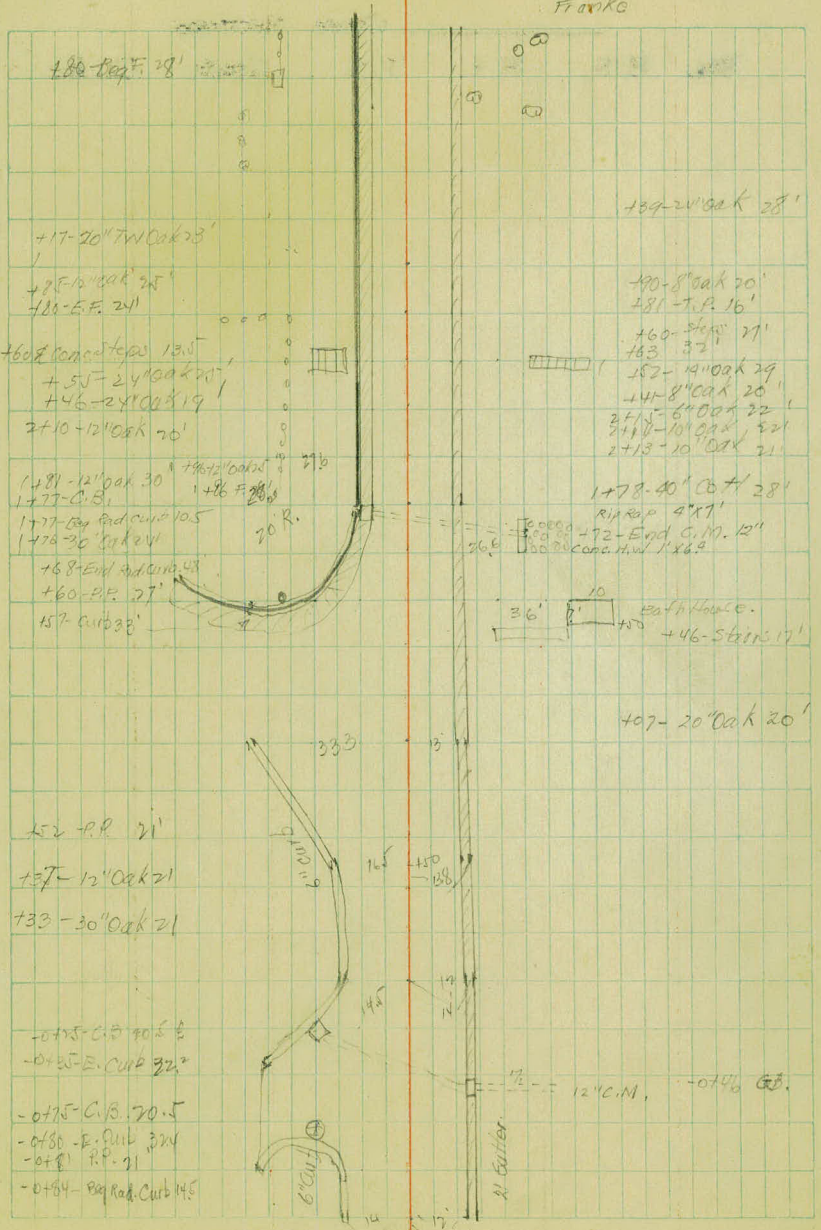
Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
4+00					
3+00					
2+00					
1+00					
0+00					
-1+00					

W.H.C.
Wilshusen
Persons
Franke

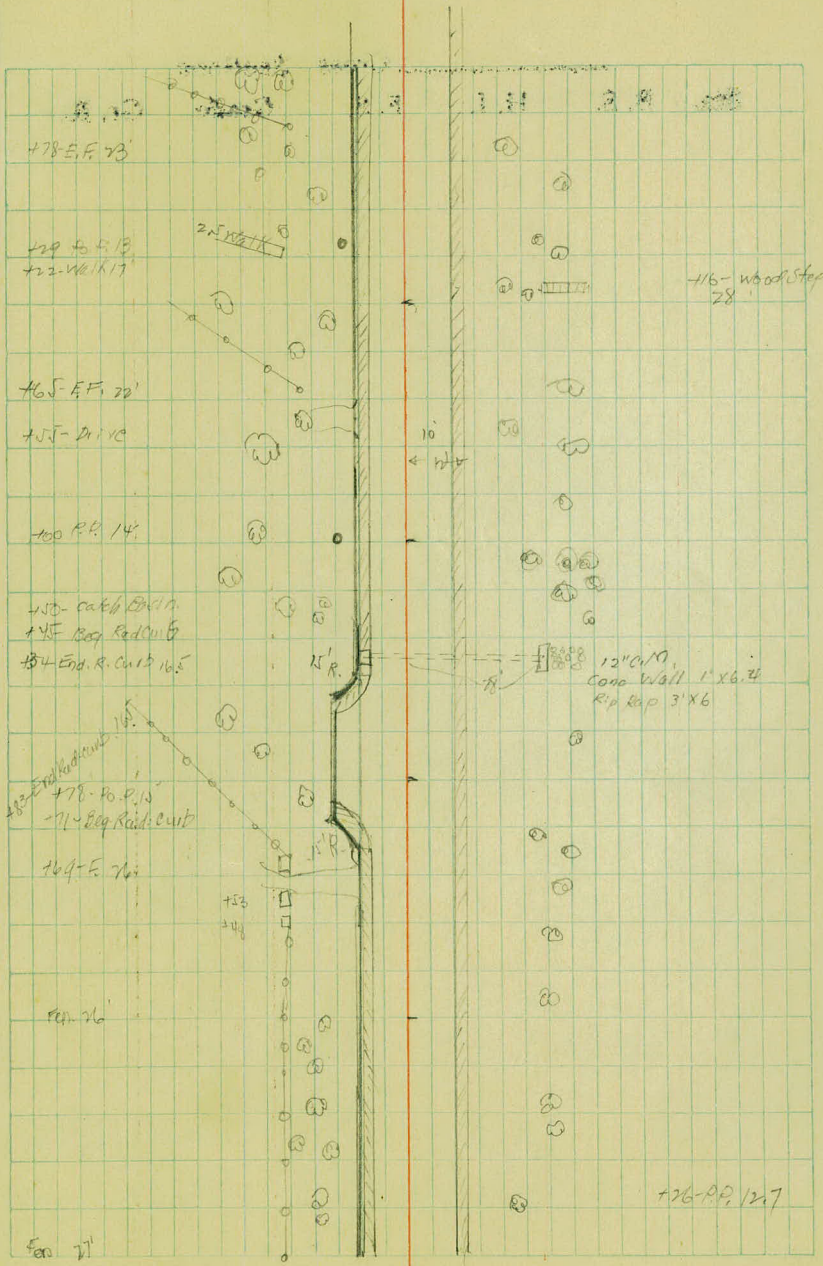
66

Oct. 10, 1924



9+00 ..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
8+00					
7+00					
6+00					
5+00					
4+00					

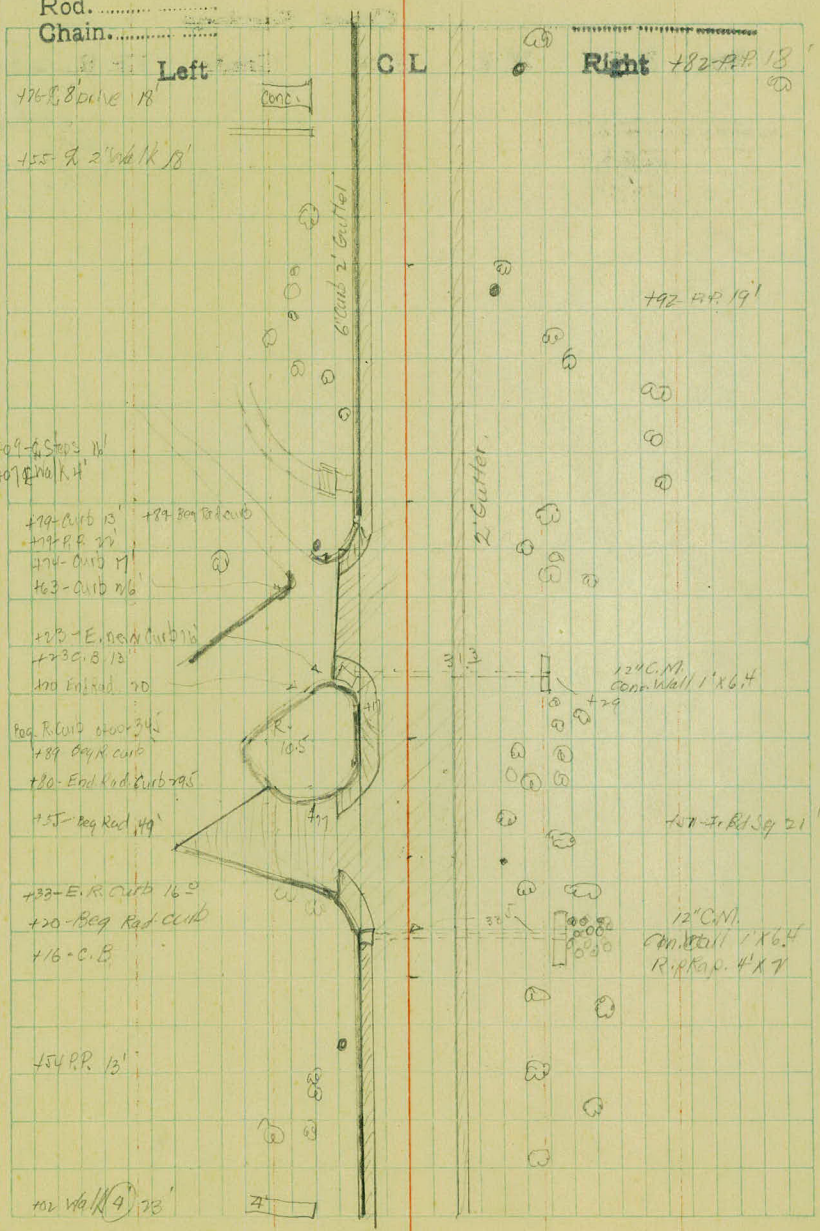

478-E.F. 73'
+29 to E.P.
+22-Walk 17
25' Walk
+16- Wood Steps
28'
46.5-E.F. 79'
+35-Drive
10'
+44
+100 P.P. 14'
+30- Curb Radius
+35 Beg Rad Curb
+34-End R. Curb 16.5
15' R.
12" C.M.
Conc Wall 1'X6.4
Rip Rap 3'X6
16'
+33 End Radius
478-to P.P.
-71-Beg Radius Curb
15' R.
164-E. 76'
+53
+48
Beg. 76'
+26-P.P. 12.7
End 27'

14+00

..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
13+00					
12+00					
11+00					
10+00					
9+00					

Inst. .....
Rod. .....
Chain. .....



19 ..... Cross Sections .....

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

18

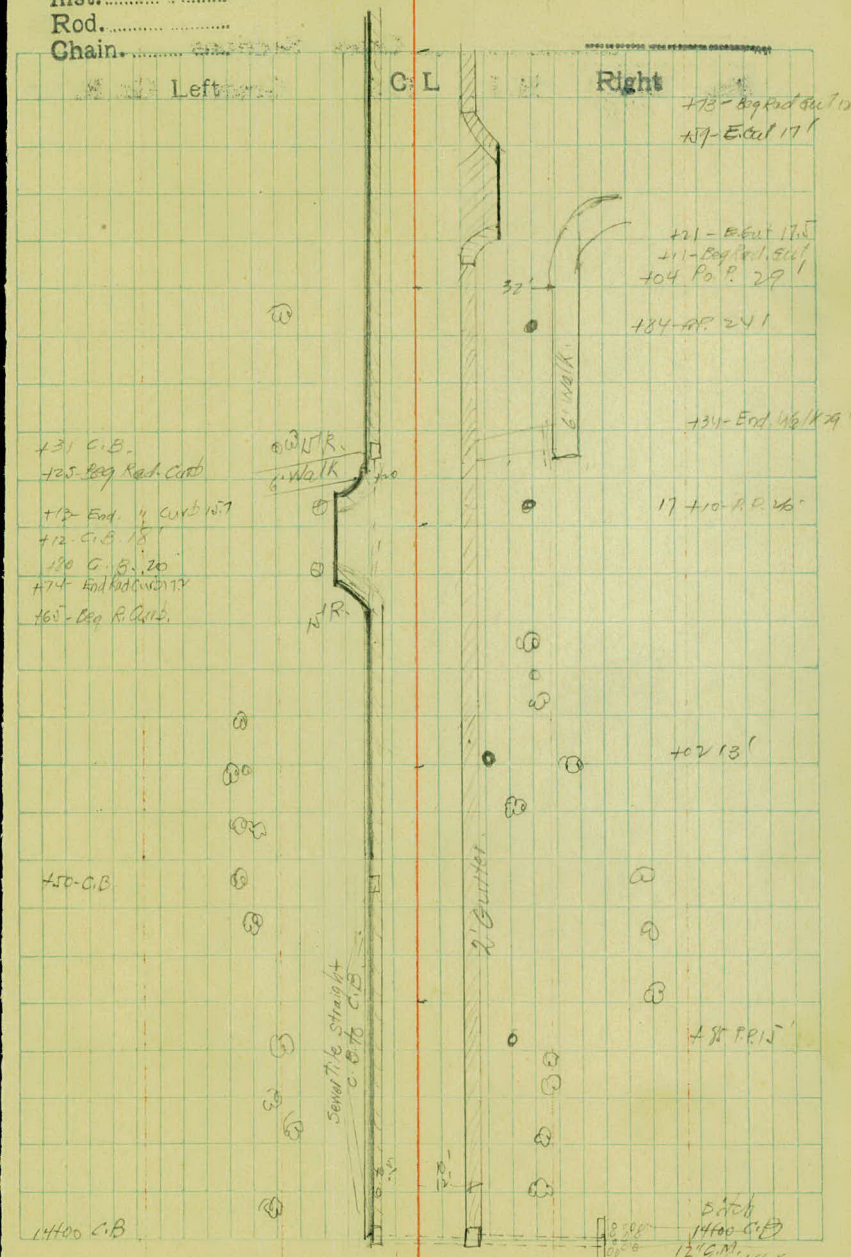
17

16

15

14

Inst.
Rod.
Chain.



24

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

23

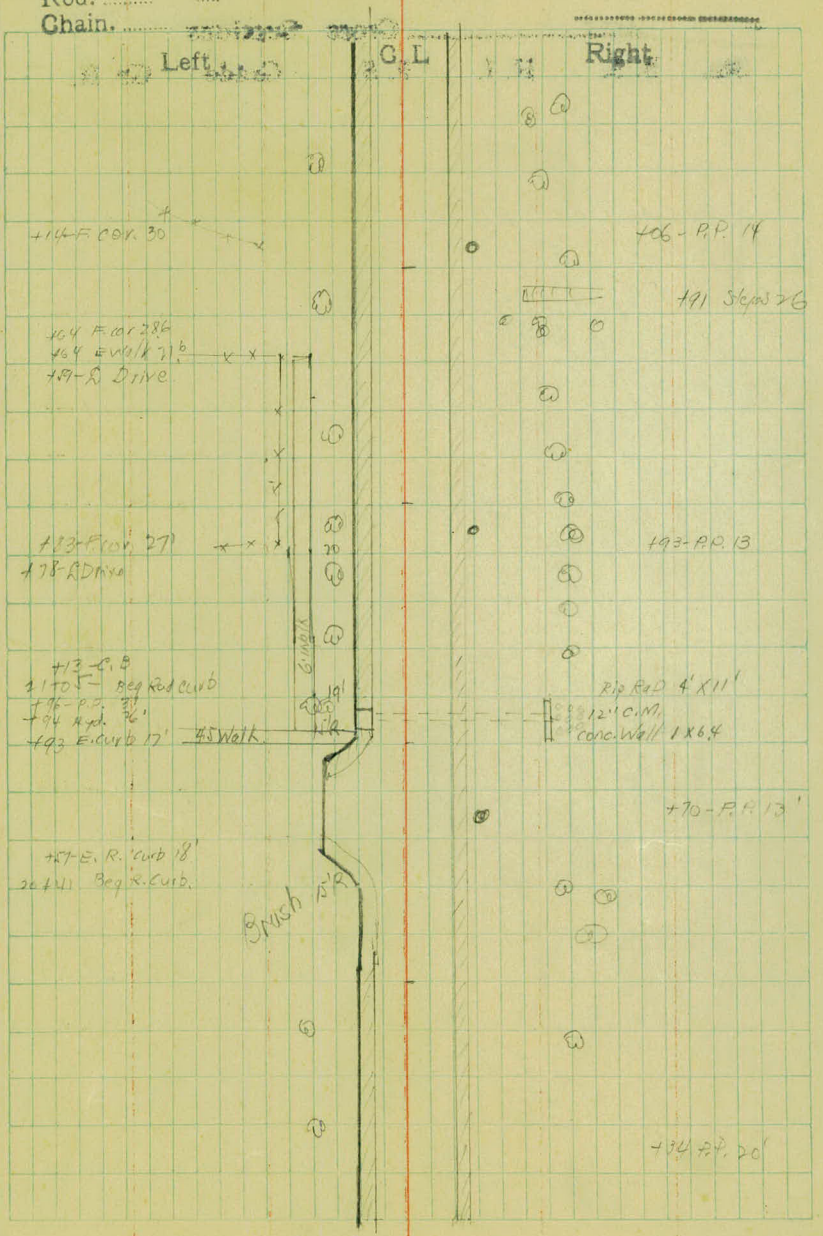
22

21

20

19

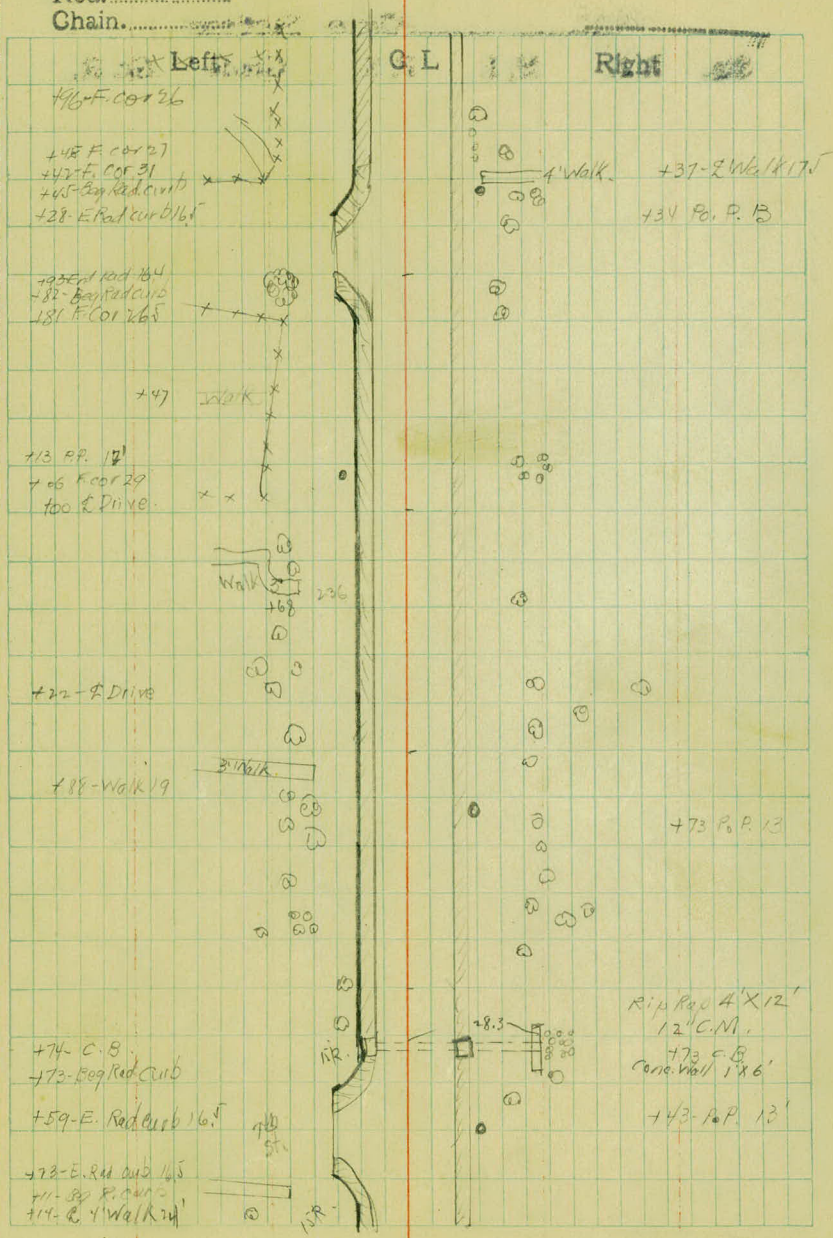
Inst. .....
Rod. .....
Chain. .....



29 _____ Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
28					
27					
26					
25					
24					

Inst.
Rod.
Chain.



34

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

33

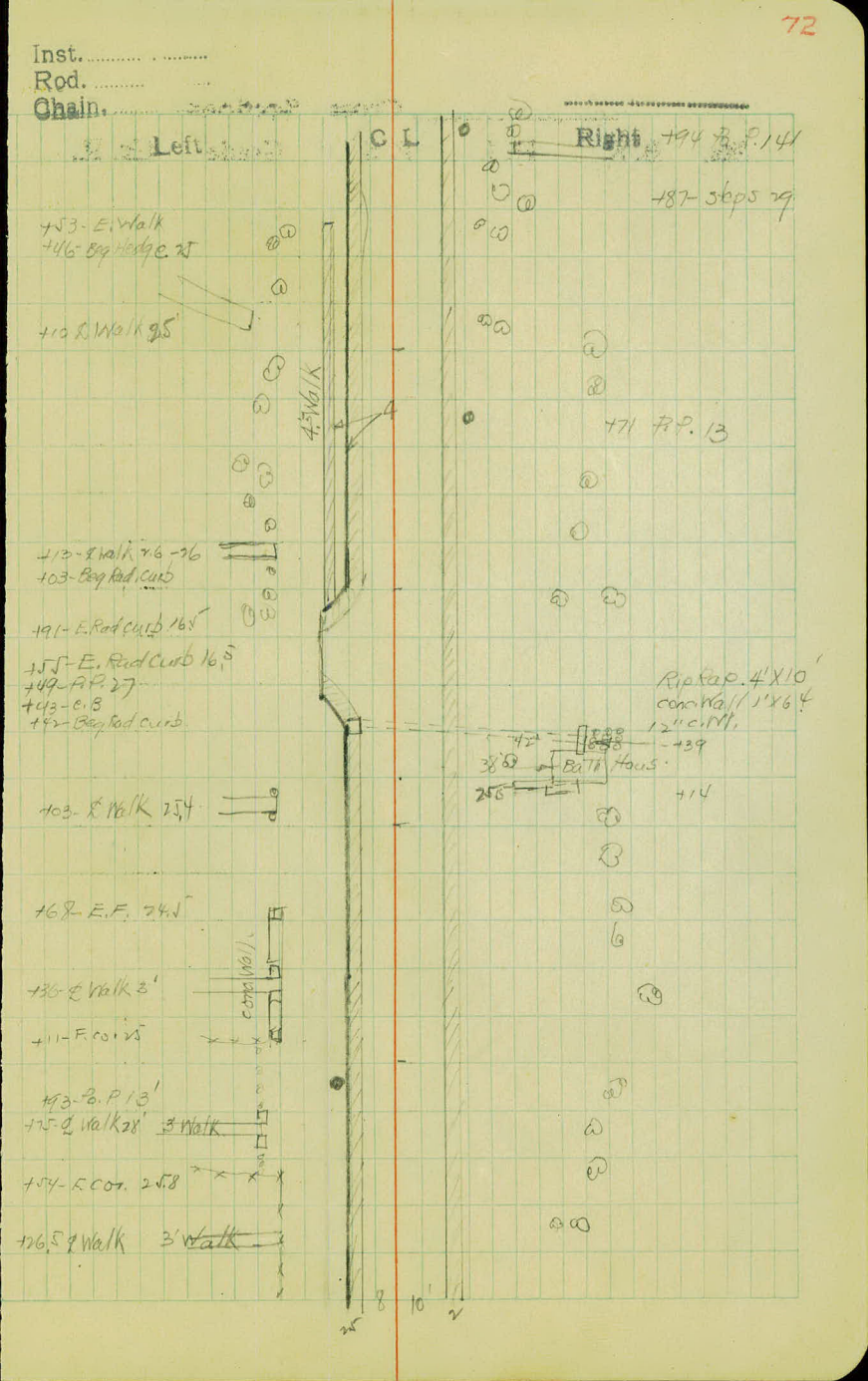
32

31

30

29

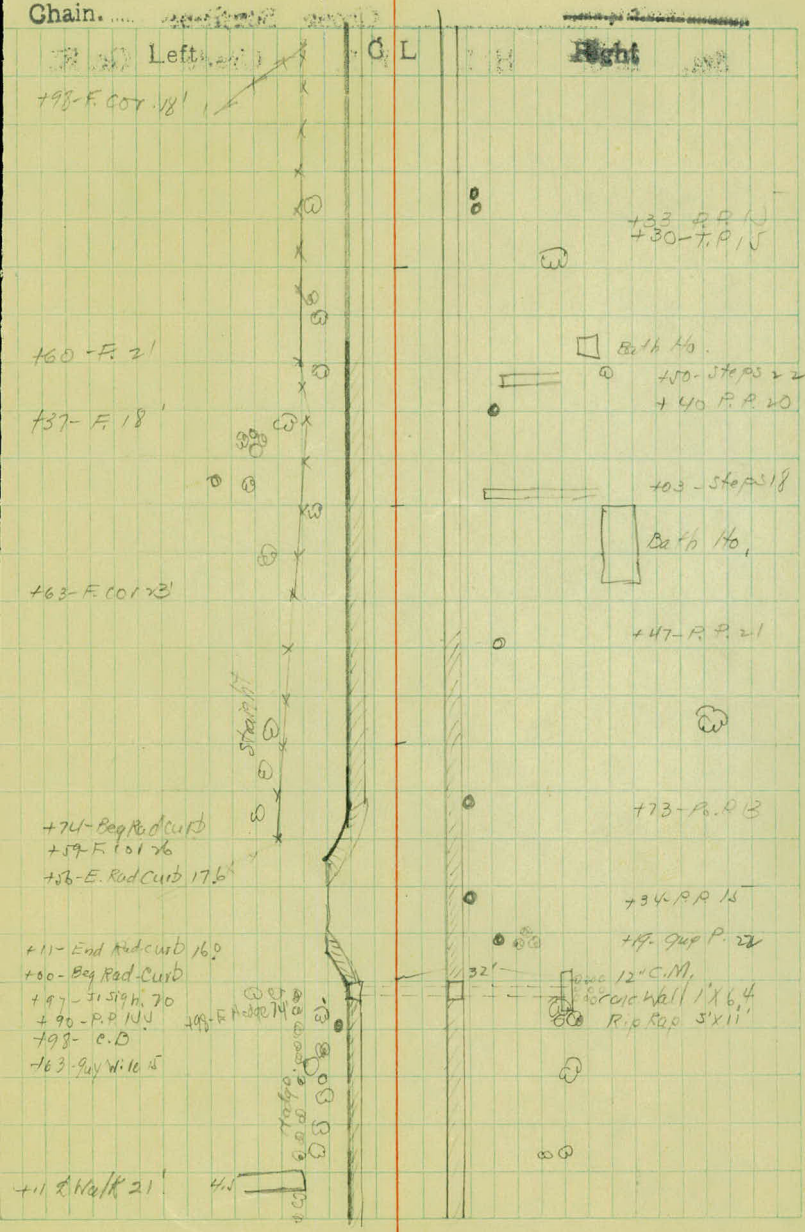
Inst.
Rod.
Chain.



39 ..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
38					
37					
36					
35					
34					

Inst.
Rod.
Chain.



44

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
+95	℄ of St. Lt.				

43

42

41

40

39

Inst.
Rod.
Chain.

20'

Left | C L | Right

+80 - Pave. 10

+80.4 P.20'

+73 - Log in Fall

+53 - E. Curb
+50 C.B.

18" Conc.

+57 E. Gutter
+51 C.B.
Ditch.
18" Conc.

+31 - T.P. 15

+33 - T.P. 19

Will 30°

167

Brush

+46 - T.P. 17'

+23 E.C. 20'

+19 - T.P. 14

+33 - T.P. 17

+62 - Walk 19

Brick

+43 - T.P. 17'

+04 T.P. 12'

+89 - P. 16

+66 - Walk

+64 - 25

+29 - T.P. 18'

F. 16'

+93 - P. 13'

+91 - 26 - 96

+67 Beg F/3'
+69 - Beg Rod.
+54 E. No. 1 11.2

+72 - T.P. 11 - Light

+35 - T.P. 18

+74 E. Rad Curb 11.7
+12 - Beg Rod
+08 C.B.
39+01 + P.P. 1.3'

12" C.M.
d. Conc. Walk 1'X6.4'
Rip Rap 4'X8'

25.7

49 ..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
48					
47					
46					
45					
44					

Inst. .....
Rod. .....
Chain. .....

Left | C L | Right

+85 - RR Xing Sign 19

+54 - End Int. curb.

+35 - T.P. 40'

+27 - T.P. 50'

+00 E.B. : 12" C.M. conc. wall 1'x6.4

3' Lines 24" con. x 36'

+20 - T.P. 50'

+46 - Beg Int. Curb

+02 - T.P. 31'

+95 - Ice shute 18'

+26 - T.P. 17'

+11 - Cor Ice Ho.

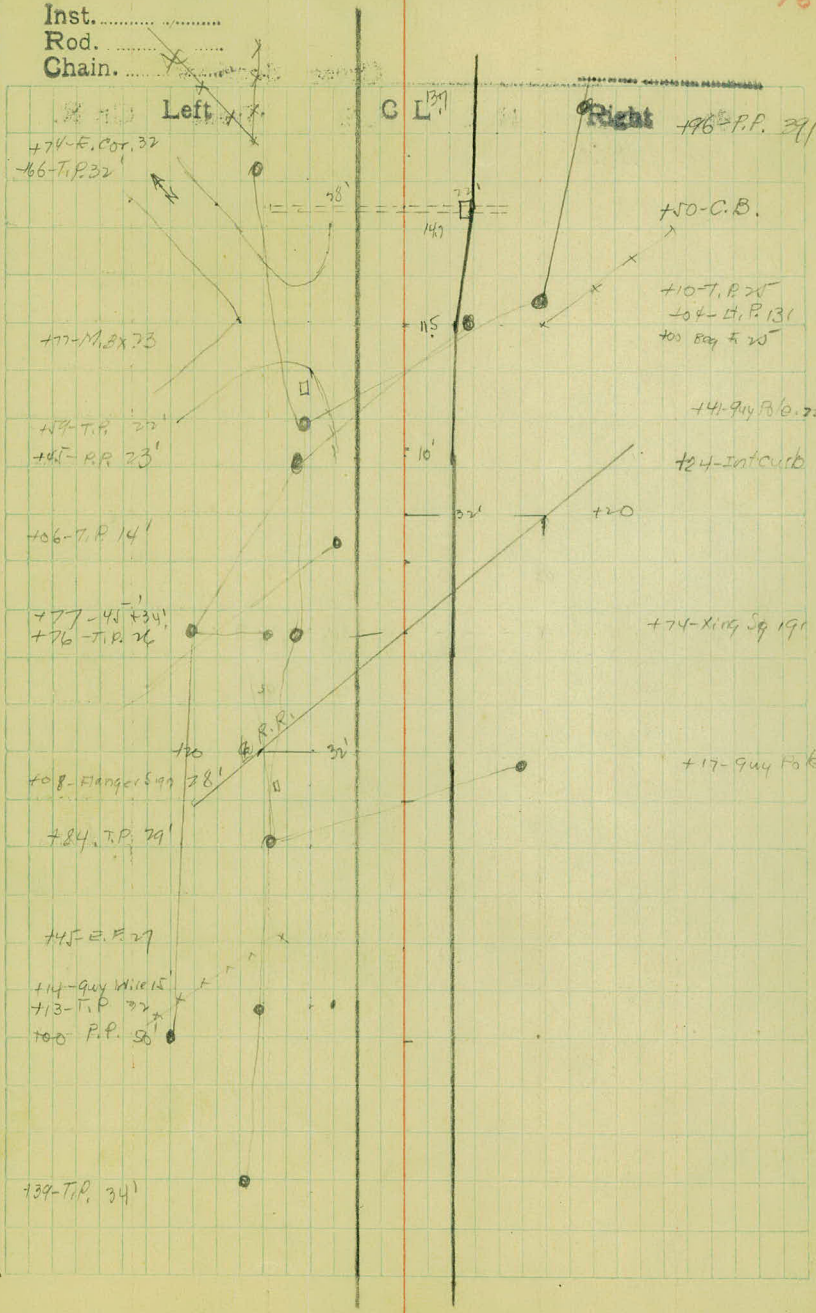
+31 - T.P. 20'

Spillway

51 Cross Sections

Sta.	B.S.	H. I.	F. S.	Grade	Gr. R.
53+00	E. F. Ent. Lt.				
+47	Ent. Road North				
52					
+10	C R. R.				
51					
50					
49					

Inst. .....
Rod. .....
Chain. .....

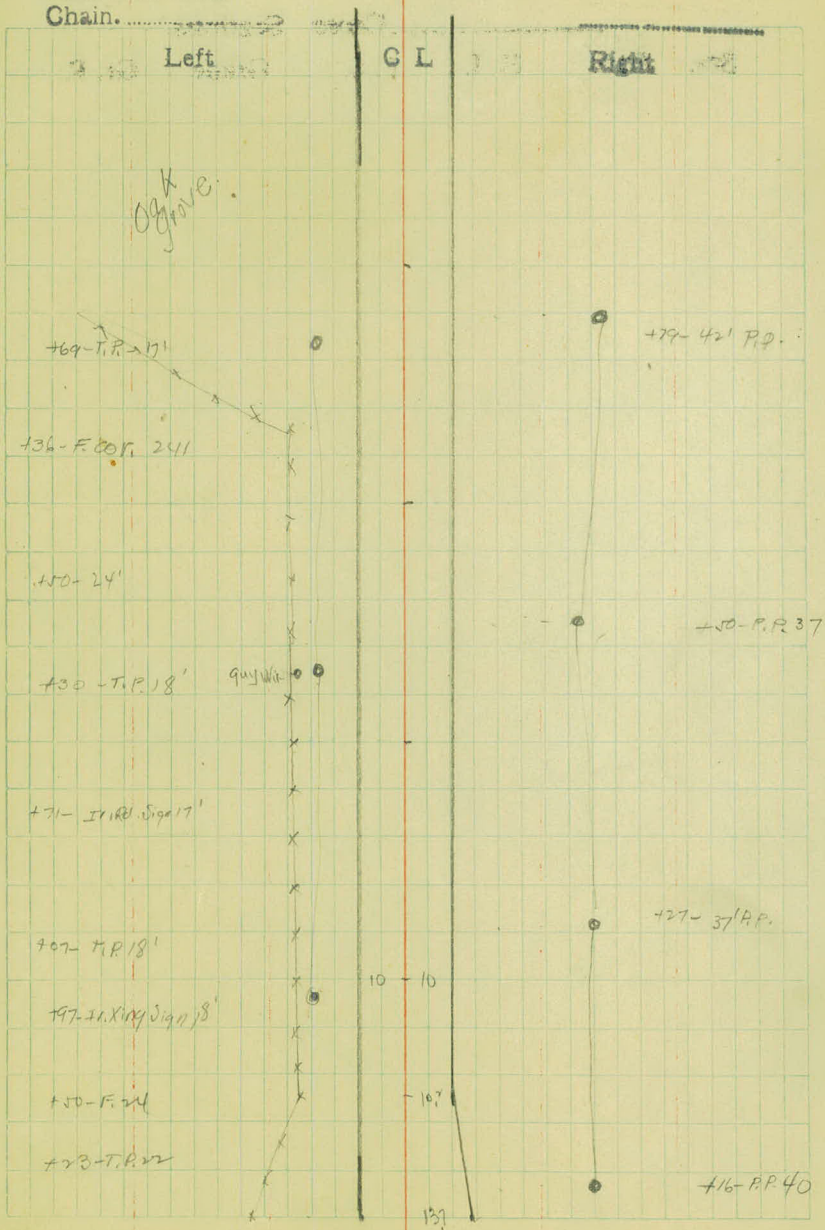


Continued on page 40.

59 ..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
58					
57					
56					
55					
54					

Inst.
Rod.
Chain.



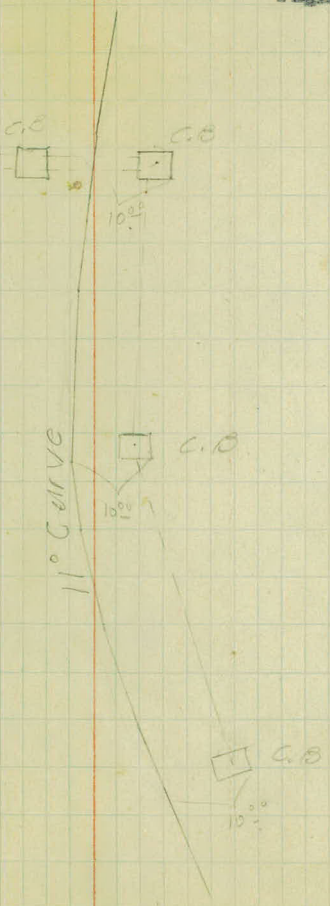
12" V.T. Sewer Pipe

Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	0.00	243.76		243.76	
T.P.					
				Bl Rod.	
				5.21	Flow Line
14+00 = 0+00	Catch Basin	End of V.T. Pipe		7.71	236.05
0+25				7.65	236.11
0+50				7.59	236.17
0+75				7.53	236.23
1+00				7.47	236.29
1+25				7.41	236.35
1+46 = 5+50	Place Catch Basin.		Top of casting	4.87	236.39
1+75				7.04	236.50
2+00				6.95	236.60
2+25				6.46	236.71
2+50				6.17	236.81
2+75				5.88	236.91
3+03				8.93	237.10
17+30 =					

Inst. W.H.C. July 19 1924
Rod. Ecks Dwelly
Chain. Franke

Left C L Right

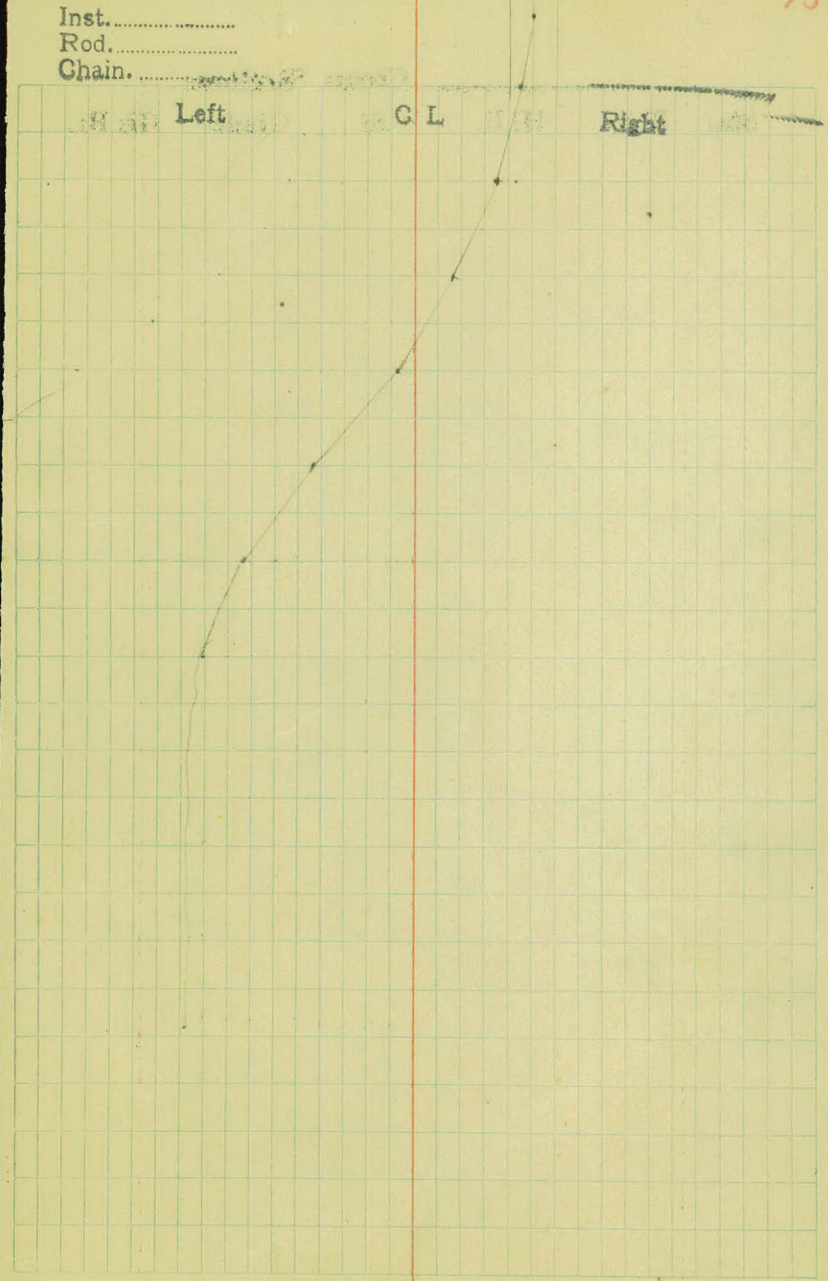


Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.
B.M.	2.70	740.78		738.08	
	P. 24" x 42" P.3				
78+02		24' Lt. Inv. Elev. Left.		733.00	7.7
		21' Rt. " " Right		732.70	8.0
		Elev. Water Left.	8.1	732.7	
	24"x36' P.3				
	3.83	740.97		737.14	
64+03					
		18' Rt. Inv. Elev.		733.3	7.7
		18 Lt.		732.7	8.3

Inst.....
Rod.....
Chain.....

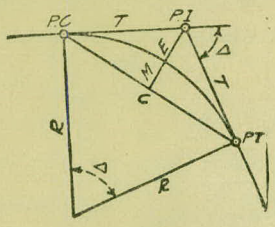
Left C L Right



..... Cross Sections

Sta.	B. S.	H. I.	F. S.	Grade	Gr. R.

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

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

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

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

External=E=Ttan$\frac{\Delta}{4}$ (7) =R÷cos.$\frac{\Delta}{2}$—R(8)=Rexsec$\frac{\Delta}{2}$(9)

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

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161+60.35 to find Sta. of P. C. and P. T. Δ=62° 10′ D=8° 20′. From Table IV for 1° curve T=3454.1 and÷8⅓=414.49 ft. From Table V correction=.36 or T=414.85 ft. P. C.=Sta. P.I.—T=157+45.50. Also from (4) L=746.00 and P. T.=Sta. P. C.+L=164+91.50.

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

Deflections.—Deflection angle=½ D for 100 ft., ¼ D for 50 ft., etc. For c ft.=(in minutes) .3 x C x D° or=defl. for 1 ft. from Table III x C. For Sta. 158 of above curve=.3 x 54.5 x 8⅓=136.2′ or 2° 16.2′, or=2.50 x 54.5=136.2′ from Table III. For Sta. 159 deflection angle=2° 16.2′+8° 20′÷2=6° 26.2′, etc.

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve E=960.6 for 8° 20′=960.6÷8⅓=91.27 and from Table V correction=.10 or E=91.37 ft. Or suppose Δ=32° and E is measured and found to be 42 ft. What is D? From Table IV E=230.9 and÷42=5.5 or D=5° 30′.

Table I.—Minutes in Decimals of a Degree.

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

Table II.—Inches in Decimals of a Foot.

1–16	3–32	1/8	3–16	1/4	5–16	3/8	1/2	5/8	3/4	7/8
.0052	.0078	.0104	.0156	.0208	.0260	.0313	.0417	.0521	.0625	.0729

1	2	3	4	5	6	7	8	9	10	11
.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167

Table III.—Radii, Ordinates and Deflections.

Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan Offset	Def. for 1 Foot
0° 10′	34377.5	.036	.145	0.05′	7°	819.02	1.528	6.105	2.10′
20	17188.8	.073	.291	0.10	20′	781.84	1.600	6.395	2.20
30	11459.2	.109	.436	0.15	30	764.49	1.637	6.540	2.25
40	8594.42	.145	.582	0.20	40	747.89	1.673	6.685	2.30
50	6875.55	.182	.727	0.25					
					8	716.78	1.746	6.976	2.40
1	5729.65	.218	.873	0.30	20	688.16	1.819	7.266	2.50
10	4911.15	.255	1.018	0.35	30	674.69	1.855	7.411	2.55
20	4297.28	.291	1.164	0.40	40	661.74	1.892	7.556	2.60
30	3819.83	.327	1.309	0.45					
40	3437.87	.364	1.454	0.50	9	637.28	1.965	7.846	2.70
50	3125.36	.400	1.600	0.55	20	614.56	2.037	8.136	2.80
					30	603.80	2.074	8.281	2.85
2	2864.93	.436	1.745	0.60	40	593.42	2.110	8.426	2.90
10	2644.58	.473	1.891	0.65					
20	2455.70	.509	2.036	0.70	10	573.69	2.183	8.716	3.00
30	2292.01	.545	2.181	0.75	30	546.44	2.292	9.150	3.15
40	2148.79	.582	2.327	0.80	11	521.67	2.402	9.585	3.30
50	2022.41	.618	2.472	0.85	30	499.06	2.511	10.02	3.45
					12	478.34	2.620	10.45	3.60
3	1910.08	.655	2.618	0.90	30	459.28	2.730	10.89	3.75
10	1809.57	.691	2.763	0.95	13	441.68	2.839	11.32	3.90
20	1719.12	.727	2.908	1.00	30	425.40	2.949	11.75	4.05
30	1637.28	.764	3.054	1.05	14	410.28	3.058	12.18	4.20
40	1562.88	.800	3.199	1.10	30	396.20	3.168	12.62	4.35
50	1494.95	.836	3.345	1.15					
					15	383.07	3.277	13.05	4.50
4	1432.69	.873	3.490	1.20	30	370.78	3.387	13.49	4.65
10	1375.40	.909	3.635	1.25	16	359.27	3.496	13.92	4.80
20	1322.53	.945	3.718	1.30	30	348.45	3.606	14.35	4.95
30	1273.57	.982	3.926	1.35	17	338.27	3.716	14.78	5.10
40	1228.11	1.018	4.071	1.40	18	319.62	3.935	15.64	5.40
50	1185.78	1.055	4.217	1.45	19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.362	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1.75					
					25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	859.92	1.455	5.814	2.00	30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10′	58.34	.30	10′	560.11	27.31	10′	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164 86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179 72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571 0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10′	1598.0	218.7	10′	2151.7	390.7	10′	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32	1643.0	230.9	42	2199.4	407.6	52	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33	1697.2	246.1	43	2257.0	428.5	53	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34	1751.7	261.8	44	2314.9	450.0	54	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35	1806.6	278.1	45	2373.3	472.1	55	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.8	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36	1861.7	294.9	46	2432.1	494.8	56	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.6	20	2451.8	502.5	20	3067.9	769.7
30	1889.4	303.5	30	2461.7	506.4	30	3078.7	774.7
40	1898.6	306.4	40	2471.5	510.3	40	3089.4	779.8
50	1907.9	309.3	50	2481.4	514.3	50	3100.2	784.9
37	1917.1	312.2	47	2491.3	518.2	57	3110.9	790.1
10	1926.4	315.2	10	2501.2	522.2	10	3121.7	795.2
20	1935.7	318.1	20	2511.2	526.1	20	3132.6	800.4
30	1945.0	321.1	30	2521.1	530.1	30	3143.4	805.6
40	1954.3	324.1	40	2531.1	534.2	40	3154.2	810.9
50	1963.6	327.1	50	2541.0	538.2	50	3165.1	816.1
38	1972.9	330.2	48	2551.0	542.2	58	3176.0	821.4
10	1982.2	333.2	10	2561.0	546.3	10	3186.9	826.7
20	1991.5	336.3	20	2571.0	550.4	20	3197.8	832.0
30	2000.9	339.3	30	2581.0	554.5	30	3208.8	837.3
40	2010.2	342.4	40	2591.0	558.6	40	3219.7	842.7
50	2019.6	345.5	50	2601.1	562.8	50	3230.7	848.1
39	2029.0	348.6	49	2611.2	566.9	59	3241.7	853.5
10	2038.4	351.8	10	2621.2	571.1	10	3252.7	858.9
20	2047.8	354.9	20	2631.3	575.3	20	3263.7	864.3
30	2057.2	358.1	30	2641.4	579.5	30	3274.8	869.8
40	2066.6	361.3	40	2651.5	583.8	40	3285.8	875.3
50	2076.0	364.5	50	2661.6	588.0	50	3296.9	880.8
40	2085.4	367.7	50	2671.8	592.3	60	3308.0	886.4
10	2094.9	371.0	10	2681.9	596.6	10	3319.1	892.0
20	2104.3	374.2	20	2692.1	600.9	20	3330.3	897.5
30	2113.8	377.5	30	2702.3	605.3	30	3341.4	903.2
40	2123.3	380.8	40	2712.5	609.6	40	3352.6	908.8
50	2132.7	384.1	50	2722.7	614.0	50	3363.8	914.5

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
61°	3375.0	920.2	71°	4086.9	1308.2	81°	4893.6	1805.3
10′	3386.3	925.9	10′	4099.5	1315.6	10′	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1322.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1330.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1337.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1345.1	50	4966.1	1852.6
62	3442.7	954.8	72	4162.8	1352.6	82	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1360.1	10	4995.4	1871.8
20	3465.4	966.5	20	4188.5	1367.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1375.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1382.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1390.4	50	5054.3	1910.7
63	3511.1	990.2	73	4239.7	1398.0	83	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1405.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1413.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1421.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1429.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1436.8	50	5143.9	1970.3
64	3580.3	1026.6	74	4317.6	1444.6	84	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1452.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1460.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1468.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1476.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1484.4	50	5234.9	2031.4
65	3650.2	1063.9	75	4396.5	1492.4	85	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	1500.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	1508.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	1516.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	1524.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	1533.1	50	5327.4	2094.1
66	3720.9	1102.2	76	4476.5	1541.4	86	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	1549.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	1558.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	1566.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	1574.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	1583.1	50	5421.4	2158.4
67	3792.4	1141.4	77	4557.6	1591.6	87	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	1600.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	1608.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	1617.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	1625.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	1634.4	50	5517.0	2224.3
68	3864.7	1181.6	78	4639.8	1643.0	88	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	1651.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	1660.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	1669.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	1678.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	1686.9	50	5614.2	2292.0
69	3937.9	1222.7	79	4723.2	1695.8	89	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	1704.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	1713.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	1722.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	1731.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	1740.8	50	5713.0	2361.5
70	4011.9	1265.0	80	4807.7	1749.9	90	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	1759.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	1768.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	1777.4	30	5779.9	2408.9
40	4061.8	1293.6	40	4864.8	1786.7	40	5796.7	2420.9
50	4074.4	1300.9	50	4879.2	1796.0	50	5813.6	2432.9

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10′	5847.3	2457.1	10′	6971.8	3294.1	10′	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	102	7075.5	3374.9	112	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	5808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

Table V.—Corrections for Tangents and Externals.

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

For Tangents Add

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

For Externals Add

Central Angle.	Degree of Curve													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.265	.277	.290	.315	.341
45°	.030	.060	.093	.119	.153	.184	.216	.254	.289	.325	.351	.378	.411	.445
50°	.037	.075	.116	.151	.189	.227	.266	.305	.345	.384	.425	.467	.508	.550
55°	.046	.093	.142	.188	.236	.283	.332	.381	.420	.479	.530	.582	.641	.700
60°	.056	.112	.168	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.711	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.286	.383	.480	.578	.678	.777	.877	.977	1.07	1.18	1.29	1.39
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.985	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
110°	.268	.536	.806	1.08	1.35	1.63	1.91	2.20	2.48	2.76	3.05	3.35	3.66	3.96
120°	.360	.721	1.08	1.45	1.82	2.19	2.57	2.95	3.33	3.72	4.11	4.50	4.91	5.32

Table VI.—Corrections for Sub-Chords and Long Chords.

FOR SUB-CHORDS ADD										Excess of arc per 100 ft.	LONG CHORDS				
D	10	20	30	40	50	60	70	80	90		D	200	300	400	500
4°	.00	.00	.01	.01	.01	.01	.01	.01	.00	.02	1	199.99	299.97	399.92	499.85
6	.00	.01	.01	.02	.02	.02	.02	.01	01	.05	2	199.97	299.88	399.70	499.39
8	.01	.02	.02	.03	.03	.03	.03	.02	.01	.08	3	199.93	299.73	399.32	498.63
10	.01	.03	.03	.04	.05	.05	.05	.04	.02	.13	4	199.88	299.51	398.78	497.57
12	.02	.04	.05	.06	.07	.07	.07	.05	.03	.18	5	199.81	299.24	398.10	496.20
14	.02	.05	.07	.08	.09	.10	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
16	.03	.06	.09	.11	.12	.12	.12	.09	.05	.33	7	199.63	298.51	396.28	492.57
18	.04	.08	.11	.14	.15	.16	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.18	.15	.09	.51	9	199.38	297.54	393.86	487.75
22	.06	.12	.17	.21	.23	.24	.22	.18	.10	.62	10	199.24	296.96	392.42	484.90
24	.07	.14	.20	.25	.28	.28	.26	.21	.12	.74	12	198.90	295.63	389.12	478.34
26	.09	.17	.24	.29	.32	.33	.31	.25	.15	.86	14	198.51	294.06	385.22	470.65
28	.10	.19	.27	.34	.37	.38	.36	.29	.17	1.00	16	198.05	292.25	380.76	461.86
30	.11	.22	.31	.39	.43	.44	.41	.33	.19	1.15	18	197.54	290.21	375.74	452.02
32	.13	.25	.36	.44	.49	.50	.47	.38	.22	1.31	20	196.96	287.94	370.17	441.15
34	.15	.28	.40	.50	.55	.57	.53	.43	.25	1.48	22	196.32	285.44	364.06	429.30
36	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.63	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.86	26	194.87	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.06	276.59	342.69	388.43
42	.23	.44	.62	.76	.85	.87	.81	.65	.38	2.28	30	193.18	273.20	334.61	373.20
44	.25	.48	.68	.84	.94	.96	.89	.72	.42	2.50	32	192.25	269.61	326.08	357.28
46	.27	.52	.75	.92	1.02	1.05	.98	.78	.46	2.74	34	191.26	265.81	317.12	340.73
48	.30	.57	.81	1.00	1.12	1.14	1.06	.86	.50	2.99	36	190.21	261.80	307.77	323.61
50	.32	.62	.89	1.09	1.21	1.24	1.15	.93	.55	3.24	38	189.10	257.60	298.03	305.99
52	.35	.67	.96	1.18	1.31	1.35	1.25	1.01	.59	3.52	40	187.94	253.21	287.94	287.94
54	.38	.73	1.04	1.28	1.42	1.46	1.35	1.09	.64	3.80	42	186.72	248.63	277.51	269.54
56	.41	.78	1.12	1.38	1.53	1.57	1.46	1.17	.69	4.09	44	185.44	243.87	266.78	250.85
58	.44	.84	1.20	1.48	1.65	1.69	1.57	1.26	.74	4.40	46	184.10	239.93	255.78	231.95
60	.47	.91	1.29	1.59	1.76	1.81	1.68	1.35	.80	4.72	48	182.71	233.83	244.51	212.92

Note.—When a chord of less than 100 ft. is used the corrections given in the above table should be added to the nominal length of chord to get the length which should be used in order that the 100 ft. points will check with those obtained by using the standard 100 ft. chord. Thus in locating a 14° curve by 25 ft. chords measure 25′.06 for each chord. Long chords are useful in passing obstacles.

Table VII.—Middle Ordinates for Rails in Feet.

Deg. of Curve	LENGTH OF RAILS							Deg. of Curve	LENGTH OF RAILS.						
	32	30	28	26	24	22	20		32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.037	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.486	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424	.361	.303	.250
15	.334	.295	.257	.223	.188	.159	.131	30	.660	.583	.508	.438	.374	.313	.259

SLOPE REDUCTIONS.

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

TRIGONOMETRICAL FORMULAS.

See fig. (a).

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

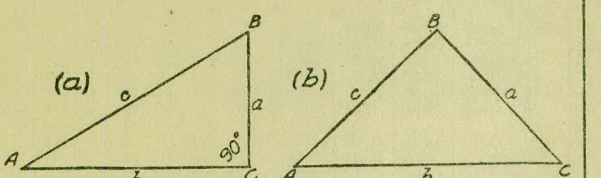
cos. $A=\frac{b}{c}$

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

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

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

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



Formula for Solving Triangles.

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

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
° ′						° ′					
0	0	0	00	1	90	8	.1392	.1405	7.115	.99027	82
10	.0029	.0029	343.8	I	50	10	.1421	.1435	6.968	.98986	50
20	.0058	.0058	171.9	.99998	40	20	.1449	.1465	6.827	.98944	40
30	.0087	.0087	114.6	.99996	30	30	.1478	.1495	6.691	.98902	30
40	.0116	.0116	85.94	.99993	20	40	.1507	.1524	6.561	.98858	20
50	.0145	.0145	68.75	.99989	10	50	.1536	.1554	6.435	.98814	10
1	.0175	.0175	57.29	.99985	89	9	.1564	.1584	6.314	.98769	81
10	.0204	.0204	49.10	.99979	50	10	.1593	.1614	6.197	.98723	50
20	.0233	.0233	42.96	.99973	40	20	.1622	.1644	6.084	.98676	40
30	.0262	.0262	38.19	.99966	30	30	.1650	.1673	5.976	.98629	30
40	.0291	.0291	34.37	.99958	20	40	.1679	.1703	5.871	.98580	20
50	.0320	.0320	31.24	.99949	10	50	.1708	.1733	5.769	.98531	10
2	.0349	.0349	28.64	.99939	88	10	.1736	.1763	5.671	.98481	80
10	.0378	.0378	26.43	.99929	50	10	.1765	.1793	5.576	.98430	50
20	.0407	.0407	24.54	.99917	40	20	.1794	.1823	5.485	.98378	40
30	.0436	.0437	22.90	.99905	30	30	.1822	.1853	5.396	.98325	30
40	.0465	.0466	21.47	.99892	20	40	.1851	.1883	5.309	.98272	20
50	.0494	.0495	20.21	.99878	10	50	.1880	.1914	5.226	.98218	10
3	.0523	.0524	19.08	.99863	87	11	.1908	.1944	5.145	.98163	79
10	.0552	.0553	18.07	.99847	50	10	.1937	.1974	5.066	.98107	50
20	.0581	.0582	17.17	.99831	40	20	.1965	.2004	4.989	.98050	40
30	.0610	.0612	16.35	.99813	30	30	.1994	.2035	4.915	.97992	30
40	.0640	.0641	15.60	.99795	20	40	.2022	.2065	4.843	.97934	20
50	.0669	.0670	14.92	.99776	10	50	.2051	.2095	4.773	.97875	10
4	.0698	.0699	14.30	.99756	86	12	.2079	.2126	4.705	.97815	78
10	.0727	.0729	13.73	.99736	50	10	.2108	.2156	4.638	.97754	50
20	.0756	.0758	13.20	.99714	40	20	.2136	.2186	4.574	.97692	40
30	.0785	.0787	12.71	.99692	30	30	.2164	.2217	4.511	.97630	30
40	.0814	.0816	12.25	.99668	20	40	.2193	.2247	4.449	.97566	20
50	.0843	.0846	11.83	.99644	10	50	.2221	.2278	4.390	.97502	10
5	.0872	.0875	11.43	.99619	85	13	.2250	.2309	4.331	.97437	77
10	.0901	.0904	11.06	.99594	50	10	.2278	.2339	4.275	.97371	50
20	.0929	.0934	10.71	.99567	40	20	.2306	.2370	4.219	.97304	40
30	.0958	.0963	10.39	.99540	30	30	.2334	.2401	4.165	.97237	30
40	.0987	.0992	10.08	.99511	20	40	.2363	.2432	4.113	.97169	20
50	.1016	.1022	9.788	.99482	10	50	.2391	.2462	4.061	.97100	10
6	.1045	.1051	9.514	.99452	84	14	.2419	.2493	4.011	.97030	76
10	.1074	.1080	9.255	.99421	50	10	.2447	.2524	3.962	.96959	50
20	.1103	.1110	9.010	.99390	40	20	.2476	.2555	3.914	.96887	40
30	.1132	.1139	8.777	.99357	30	30	.2504	.2586	3.867	.96815	30
40	.1161	.1169	8.556	.99324	20	40	.2532	.2617	3.821	.96742	20
50	.1190	.1198	8.345	.99290	10	50	.2560	.2648	3.776	.96667	10
7	.1219	.1228	8.144	.99255	83	15	.2588	.2679	3.732	.96593	75
10	.1248	.1257	7.953	.99219	50	10	.2616	.2711	3.689	.96517	50
20	.1276	.1287	7.770	.99182	40	20	.2644	.2742	3.647	.96440	40
30	.1305	.1317	7.596	.99144	30	30	.2672	.2773	3.606	.96363	30
40	.1334	.1346	7.429	.99106	20	40	.2700	.2805	3.566	.96285	20
50	.1363	.1376	7.269	.99067	10	50	.2728	.2836	3.526	.96206	10
					82						74
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
o′						o′					
16	.2756	.2867	3.487	.96126	74	24	.4067	.4452	2.246	.91355	66
10	.2784	.2899	3.450	.96046	50	10	.4094	.4487	2.229	.91236	50
20	.2812	.2931	3.412	.95964	40	20	.4120	.4522	2.211	.91116	40
30	.2840	.2962	3.376	.95882	30	30	.4147	.4557	2.194	.90996	30
40	.2868	.2994	3.340	.95799	20	40	.4173	.4592	2.177	.90875	20
50	.2896	.3026	3.305	.95715	10	50	.4200	.4628	2.161	.90753	10
17	.2924	.3057	3.271	.95615	73	25	.4226	.4663	2.145	.90631	65
10	.2952	.3089	3.237	.95545	50	10	.4253	.4699	2.128	.90507	50
20	.2979	.3121	3.204	.95459	40	20	.4279	.4734	2.112	.90383	40
30	.3007	.3153	3.172	.95372	30	30	.4305	.4770	2.097	.90259	30
40	.3035	.3185	3.140	.95284	20	40	.4331	.4806	2.081	.90133	20
50	.3062	.3217	3.108	.95195	10	50	.4358	.4841	2.066	.90007	10
18	.3090	.3249	3.078	.95106	72	26	.4384	.4877	2.050	.89879	64
10	.3118	.3281	3.048	.95015	50	10	.4410	.4913	2.035	.89752	50
20	.3145	.3314	3.018	.94924	40	20	.4436	.4950	2.020	.89623	40
30	.3173	.3346	2.989	.94832	30	30	.4462	.4986	2.006	.89493	30
40	.3201	.3378	2.960	.94740	20	40	.4488	.5022	1.991	.89363	20
50	.3228	.3411	2.932	.94646	10	50	.4514	.5059	1.977	.89232	10
19	.3256	.3443	2.904	.94552	71	27	.4540	.5095	1.963	.89101	63
10	.3283	.3476	2.877	.94457	50	10	.4566	.5132	1.949	.88968	50
20	.3311	.3508	2.850	.94361	40	20	.4592	.5169	1.935	.88835	40
30	.3338	.3541	2.824	.94264	30	30	.4617	.5206	1.921	.88701	30
40	.3365	.3574	2.798	.94167	20	40	.4643	.5243	1.907	.88566	20
50	.3393	.3607	2.773	.94068	10	50	.4669	.5280	1.894	.88431	10
20	.3420	.3640	2.747	.93969	70	28	.4695	.5317	1.881	.88295	62
10	.3448	.3673	2.723	.93869	50	10	.4720	.5354	1.868	.88158	50
20	.3475	.3706	2.669	.93769	40	20	.4746	.5392	1.855	.88020	40
30	.3502	.3739	2.675	.93667	30	30	.4772	.5430	1.842	.87882	30
40	.3529	.3772	2.651	.93565	20	40	.4797	.5467	1.829	.87743	20
50	.3557	.3805	2.628	.93462	10	50	.4823	.5505	1.816	.87603	10
21	.3584	.3839	2.605	.93358	69	29	.4848	.5543	1.804	.87462	61
10	.3611	.3872	2.583	.93253	50	10	.4874	.5581	1.792	.87321	50
20	.3638	.3906	2.560	.93148	40	20	.4899	.5619	1.780	.87178	40
30	.3665	.3939	2.539	.93042	30	30	.4924	.5658	1.767	.87036	30
40	.3692	.3973	2.517	.92935	20	40	.4950	.5696	1.756	.86892	20
50	.3719	.4006	2.496	.92827	10	50	.4975	.5735	1.744	.86748	10
22	.3746	.4040	2.475	.92718	68	30	.5000	.5774	1.732	.86603	60
10	.3773	.4074	2.455	.92609	50	10	.5025	.5812	1.720	.86457	50
20	.3800	.4108	2.434	.92499	40	20	.5050	.5851	1.709	.86310	40
30	.3827	.4142	2.414	.92388	30	30	.5075	.5890	1.698	.86163	30
40	.3854	.4176	2.394	.92276	20	40	.5100	.5930	1.686	.86015	20
50	.3881	.4210	2.375	.92164	10	50	.5125	.5969	1.675	.85866	10
23	.3907	.4245	2.356	.92050	67	31	.5150	.6009	1.664	.85717	59
10	.3934	.4279	2.337	.91936	50	10	.5175	.6048	1.653	.85567	50
20	.3961	.4314	2.318	.91822	40	20	.5200	.6088	1.643	.85416	40
30	.3987	.4348	2.300	.91706	30	30	.5225	.6128	1.632	.85264	30
40	.4014	.4383	2.282	.91590	20	40	.5250	.6168	1.621	.85112	20
50	.4041	.4417	2.264	.91472	10	50	.5275	.6208	1.611	.84959	10
					66						58
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

Table VIII.—Natural Trigonometrical Functions.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
° /						° /					
32	.5299	.6249	1.600	.84805	58	38	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.590	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84495	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30						
40	.5398	.6412	1.560	.84182	20	39	.6293	.8098	1.235	.77715	51
50	.5422	.6453	1.550	.84025	10	10	.6316	.8146	1.228	.77531	50
						20	.6338	.8195	1.220	.77347	40
33	.5446	.6494	1.540	.83867	57	30	.6361	.8243	1.213	.77162	30
10	.5471	.6536	1.530	.83708	50	40	.6383	.8292	1.206	.76977	20
20	.5495	.6577	1.520	.83549	40	50	.6406	.8342	1.199	.76791	10
30	.5519	.6619	1.511	.83389	30						
40	.5544	.6661	1.501	.83228	20	40	.6428	.8391	1.192	.76604	50
50	.5568	.6703	1.492	.83066	10	10	.6450	.8441	1.185	.76417	50
						20	.6472	.8491	1.178	.76229	40
34	.5592	.6745	1.483	.82904	56	30	.6494	.8541	1.171	.76041	30
10	.5616	.6787	1.473	.82741	50	40	.6517	.8591	1.164	.75851	20
20	.5640	.6830	1.464	.82577	40	50	.6539	.8642	1.157	.75661	10
30	.5664	.6873	1.455	.82413	30						
40	.5688	.6916	1.446	.82248	20	41	.6561	.8693	1.150	.75471	49
50	.5712	.6959	1.437	.82082	10	10	.6583	.8744	1.144	.75280	50
						20	.6604	.8796	1.137	.75088	40
35	.5736	.7002	1.428	.81915	55	30	.6626	.8847	1.130	.74896	30
10	.5760	.7046	1.419	.81748	50	40	.6648	.8899	1.124	.74703	20
20	.5783	.7089	1.411	.81580	40	50	.6670	.8952	1.117	.74509	10
30	.5807	.7133	1.402	.81412	30						
40	.5831	.7177	1.393	.81242	20	42	.6691	.9004	1.111	.74314	48
50	.5854	.7221	1.385	.81072	10	10	.6713	.9057	1.104	.74120	50
						20	.6734	.9110	1.098	.73924	40
36	.5878	.7265	1.376	.80902	54	30	.6756	.9163	1.091	.73728	30
10	.5901	.7310	1.368	.80730	50	40	.6777	.9217	1.085	.73531	20
20	.5925	.7355	1.360	.80558	40	50	.6799	.9271	1.079	.73333	10
30	.5948	.7400	1.351	.80386	30						
40	.5972	.7445	1.343	.80212	20	43	.6820	.9325	1.072	.73135	47
50	.5995	.7490	1.335	.80038	10	10	.6841	.9380	1.066	.72937	50
						20	.6862	.9435	1.060	.72737	40
37	.6018	.7536	1.327	.79864	53	30	.6884	.9490	1.054	.72537	30
10	.6041	.7581	1.319	.79688	50	40	.6905	.9545	1.048	.72337	20
20	.6065	.7627	1.311	.79512	40	50	.6926	.9601	1.042	.72136	10
30	.6088	.7673	1.303	.79335	30						
40	.6111	.7720	1.295	.79158	20	44	.6947	.9657	1.036	.71934	46
50	.6134	.7766	1.288	.78980	10	10	.6967	.6713	1.030	.71732	50
						20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											°
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

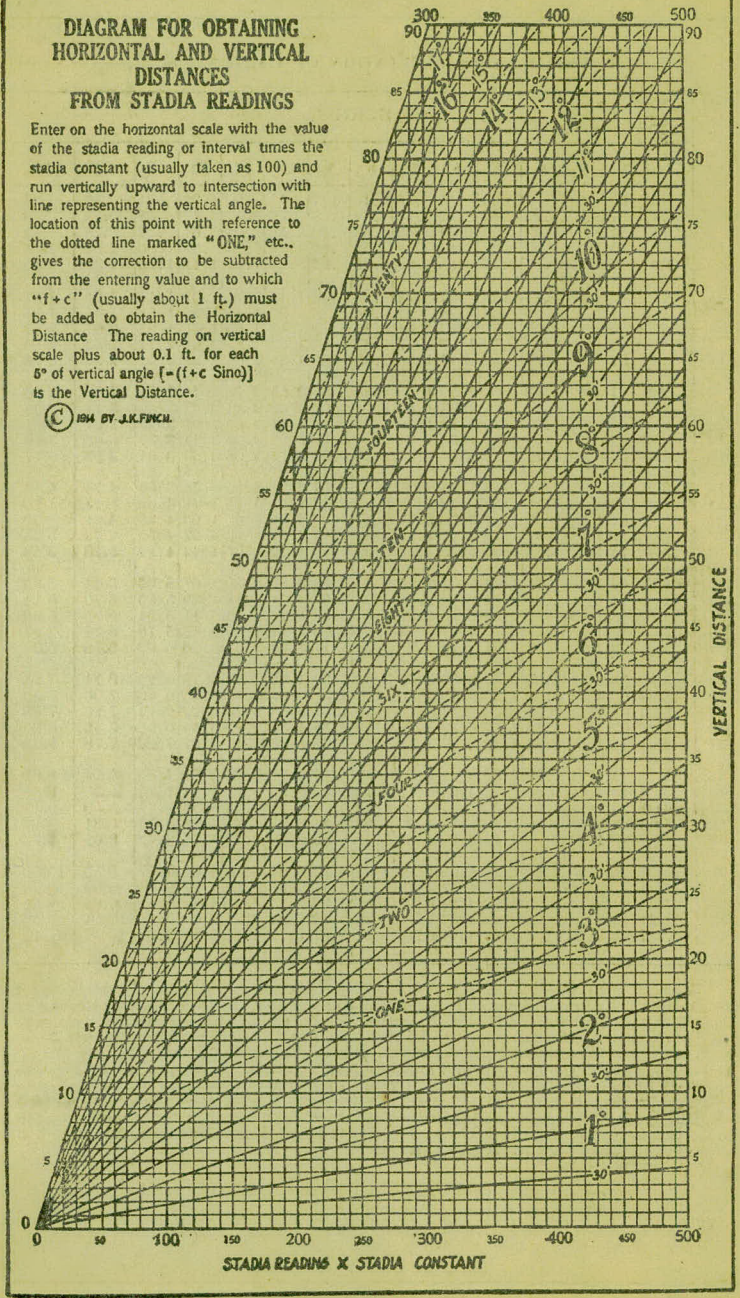
Table IX.—Calculation of Earthwork.

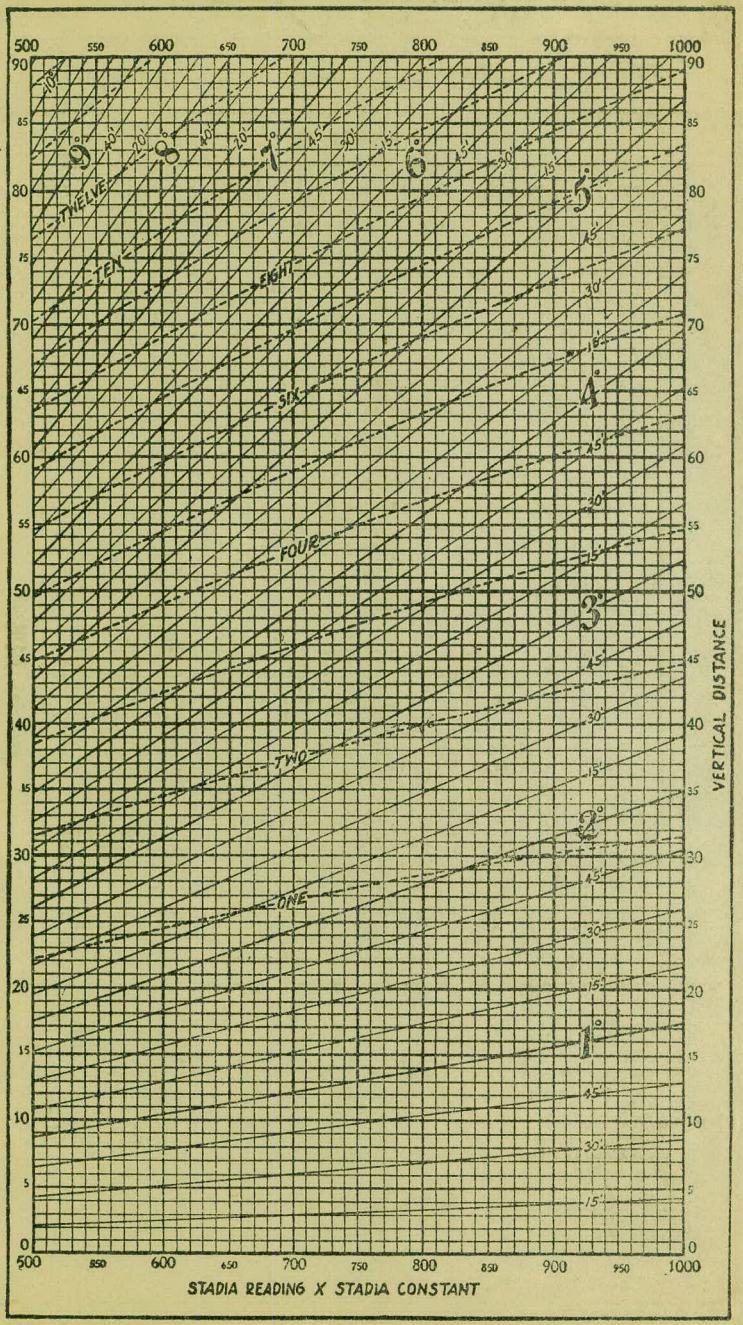
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	1.04	1.11
5	.09	.19	.28	.37	.46	.56	.65	.74	.83	.93	1.02	1.11	1.20	1.30	1.39
6	.11	.22	.33	.44	.56	.67	.78	.89	1.00	1.11	1.22	1.33	1.44	1.55	1.67
7	.13	.26	.39	.52	.65	.78	.91	1.04	1.16	1.30	1.42	1.55	1.68	1.81	1.94
8	.15	.30	.44	.59	.74	.89	1.04	1.19	1.33	1.48	1.63	1.78	1.92	2.08	2.22
9	.17	.33	.50	.67	.83	1.00	1.17	1.33	1.50	1.67	1.83	2.00	2.17	2.33	2.50
10	.18	.37	.56	.74	.93	1.11	1.30	1.48	1.67	1.85	2.04	2.22	2.41	2.59	2.78
11	.20	.41	.61	.82	1.02	1.22	1.43	1.63	1.83	2.04	2.24	2.44	2.65	2.85	3.06
12	.22	.44	.67	.89	1.11	1.33	1.56	1.78	2.00	2.22	2.44	2.67	2.89	3.11	3.33
13	.24	.48	.72	.96	1.20	1.44	1.68	1.92	2.16	2.41	2.65	2.89	3.13	3.37	3.61
14	.26	.52	.78	1.04	1.30	1.55	1.81	2.08	2.33	2.59	2.85	3.11	3.37	3.63	3.89
15	.28	.56	.83	1.11	1.39	1.67	1.94	2.22	2.50	2.78	3.06	3.33	3.61	3.89	4.17
16	.30	.59	.89	1.18	1.48	1.78	2.07	2.37	2.67	2.96	3.26	3.56	3.85	4.15	4.44
17	.31	.63	.94	1.26	1.57	1.89	2.20	2.52	2.83	3.15	3.46	3.78	4.09	4.41	4.72
18	.33	.67	1.00	1.33	1.67	2.00	2.33	2.67	3.00	3.33	3.67	4.00	4.33	4.67	5.00
19	.35	.70	1.06	1.41	1.76	2.11	2.46	2.82	3.17	3.52	3.87	4.22	4.57	4.92	5.28
20	.37	.74	1.11	1.48	1.85	2.22	2.59	2.96	3.33	3.70	4.07	4.44	4.81	5.18	5.56
21	.39	.78	1.17	1.55	1.94	2.33	2.72	3.11	3.50	3.89	4.28	4.67	5.06	5.44	5.83
22	.41	.81	1.22	1.63	2.04	2.44	2.85	3.26	3.67	4.07	4.48	4.89	5.30	5.70	6.11
23	.43	.85	1.28	1.70	2.13	2.56	2.98	3.41	3.83	4.26	4.68	5.11	5.54	5.96	6.39
24	.44	.89	1.33	1.78	2.22	2.67	3.11	3.56	4.00	4.44	4.89	5.33	5.78	6.22	6.67
25	.46	.92	1.39	1.85	2.31	2.78	3.24	3.70	4.17	4.63	5.09	5.56	6.02	6.48	6.94
26	.48	.96	1.44	1.92	2.41	2.89	3.37	3.85	4.33	4.82	5.30	5.78	6.26	6.74	7.24
27	.50	1.00	1.50	2.00	2.50	3.00	3.50	4.00	4.50	5.00	5.50	6.00	6.50	7.00	7.50
28	.52	1.04	1.55	2.07	2.59	3.11	3.63	4.15	4.67	5.18	5.70	6.22	6.74	7.26	7.78
29	.54	1.07	1.61	2.15	2.68	3.22	3.76	4.30	4.83	5.37	5.91	6.44	6.98	7.52	8.06
30	.56	1.11	1.67	2.22	2.78	3.33	3.89	4.44	5.00	5.55	6.11	6.67	7.22	7.78	8.33
31	.57	1.15	1.72	2.30	2.87	3.44	4.02	4.59	5.17	5.74	6.32	6.89	7.46	8.04	8.61
32	.59	1.18	1.78	2.37	2.96	3.56	4.15	4.74	5.33	5.92	6.52	7.11	7.70	8.30	8.89
33	.61	1.22	1.83	2.44	3.05	3.67	4.28	4.89	5.50	6.11	6.72	7.33	7.94	8.55	9.17
34	.63	1.26	1.89	2.52	3.15	3.78	4.40	5.04	5.67	6.29	6.93	7.56	8.18	8.81	9.44
35	.65	1.30	1.94	2.59	3.24	3.89	4.53	5.18	5.83	6.48	7.13	7.78	8.42	9.08	9.72
36	.67	1.33	2.00	2.67	3.33	4.00	4.66	5.33	6.00	6.67	7.33	8.00	8.67	9.33	10.00
37	.68	1.37	2.06	2.74	3.42	4.11	4.79	5.48	6.17	6.85	7.54	8.22	8.91	9.59	10.28
38	.70	1.41	2.11	2.82	3.52	4.22	4.92	5.63	6.33	7.03	7.74	8.44	9.15	9.85	10.56
39	.72	1.44	2.17	2.89	3.61	4.33	5.05	5.78	6.50	7.22	7.95	8.67	9.39	10.11	10.83
40	.74	1.48	2.22	2.96	3.70	4.44	5.18	5.92	6.67	7.41	8.15	8.89	9.63	10.37	11.11

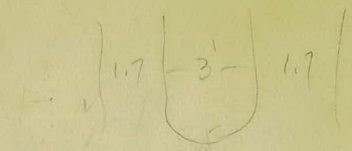
Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths. Thus if w =16.2 and h =5.3, cu. yds. =1.48+.028+.089 =1.597 cu. yds. or practically 160 cu. yds. per 100 ft. If w exceeds 40 ft., use one half and multiply result by 2, if both w and h are large use one half of each and multiply result by 4. Any cross-section may be divided into triangles by the following rule. To the triangle of the sum of the outside cuts (or fills) =h, and ½ the roadbed =w, add the triangles formed by taking the distance out to each break in turn (=w's) by the difference between the cuts (or fills) on each side of it (=h's) always subtracting the outer from the inner.

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

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




500 550 600 650 700 750 800 850 900 950 1000
90 85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5 0
10'
9° 40' 8° 40' 7° 45' 30' 15' 6° 45' 30' 15' 5° 45' 30' 15' 4° 45' 30' 15' 3° 45' 30' 15' 2° 45' 30' 15' 1° 45' 30' 15'
TWELVE
TEN
EIGHT
SIX
FOUR
TWO
ONE
VERTICAL DISTANCE
STADIA READING X STADIA CONSTANT



35+75.80
33+38.10
1+37.70
96.15-
3+33.85

35+75.80
33+38.10
1 37.70
96.15-
3 33.85

33+42.46
96.15
31+46.31
1 91.65
38+37.96
3+37.70
35+75.66

24-53

High water Contour of White Bear Lake

Sta.	B.S.	H.I.	F.S.	R.R.	Elev.
U.S.B.M. #16	9.53	938.10 ✓			928.57 ✓
	5.62	941.90 ✓	1.82		936.28 ✓
	2.75	932.76 ✓	11.89		930.01 ✓
26 +50				5.76	927.0 ✓
27				"	"
+13.8				"	"
+50				"	"
28				"	"

17.90
13.71
4.19

13.71

932.76
928.57
4.19

3-2-25

T. HOK.
R. ORVK.
C. - RJW.

Sp. in T.P. 200' W. of Manitou Is. Bridge.-

70' Rt. to 97.0 contour

72.2' " " " "

75.3' " " " "

79.' " " " "

78.5' " " " "

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1½.

For Single Track Embankment.

H	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	H
0	8.0	8.2	8.3	8.5	8.6	8.8	8.9	9.1	9.2	9.4	0
1	9.5	9.7	9.8	10.0	10.1	10.3	10.4	10.6	10.7	10.9	1
2	11.0	11.2	11.3	11.5	11.6	11.8	11.9	12.1	12.2	12.4	2
3	12.5	12.7	12.8	13.0	13.1	13.3	13.4	13.6	13.7	13.9	3
4	14.0	14.2	14.3	14.5	14.6	14.8	14.9	15.1	15.2	15.4	4
5	15.5	15.7	15.8	16.0	16.1	16.3	16.4	16.6	16.7	16.9	5
6	17.0	17.2	17.3	17.5	17.6	17.8	17.9	18.1	18.2	18.4	6
7	18.5	18.7	18.8	19.0	19.1	19.3	19.4	19.6	19.7	19.9	7
8	20.0	20.2	20.3	20.5	20.6	20.8	20.9	21.1	21.2	21.4	8
9	21.5	21.7	21.8	22.0	22.1	22.3	22.4	22.6	22.7	22.9	9
10	23.0	23.2	23.3	23.5	23.6	23.8	23.9	24.1	24.2	24.4	10
11	24.5	24.7	24.8	25.0	25.1	25.3	25.4	25.6	25.7	25.9	11
12	26.0	25.2	26.3	26.5	26.6	26.8	26.9	27.1	27.2	27.4	12
13	27.5	27.7	27.8	28.0	28.1	28.3	28.4	28.6	28.7	28.9	13
14	29.0	29.2	29.3	29.5	29.6	29.8	29.9	30.1	30.2	30.4	14
15	30.5	30.7	30.8	31.0	31.1	31.3	31.4	31.6	31.7	31.9	15
16	32.0	32.2	32.3	32.5	32.6	32.8	32.9	33.1	33.2	33.4	16
17	33.5	33.7	33.8	34.0	34.1	34.3	34.4	34.6	34.7	34.9	17
18	35.0	35.2	35.3	35.5	35.6	35.8	35.9	36.1	36.2	36.4	18
19	36.5	36.7	36.8	37.0	37.1	37.3	37.4	37.6	37.7	37.9	19
20	38.0	38.2	38.3	38.5	38.6	38.8	38.9	39.1	39.2	39.4	20
21	39.5	39.7	39.8	40.0	40.1	40.3	40.4	40.6	40.7	40.9	21
22	41.0	41.2	41.3	41.5	41.6	41.8	41.9	42.1	42.2	42.4	22
23	42.5	42.7	42.8	43.0	43.1	43.3	43.4	43.6	43.7	43.9	23
24	44.0	44.2	44.3	44.5	44.6	44.8	44.9	45.1	45.2	45.4	24
25	45.5	45.7	45.8	46.0	46.1	46.3	46.4	46.6	46.7	46.9	25
26	47.0	47.2	47.3	47.5	47.6	47.8	47.9	48.1	48.2	48.4	26
27	48.5	48.7	48.8	49.0	49.1	49.3	49.4	49.6	49.7	49.9	27
28	50.0	50.2	50.3	50.5	50.6	50.8	50.9	51.1	51.2	51.4	28
29	51.5	51.7	51.8	52.0	52.1	52.3	52.4	52.6	52.7	52.9	29
30	53.0	53.2	53.3	53.5	53.6	53.8	53.9	54.1	54.2	54.4	30
31	54.5	54.7	54.8	55.0	55.1	55.3	55.4	55.6	55.7	55.9	31
32	56.0	56.2	56.3	56.5	56.6	56.8	56.9	57.1	57.2	57.4	32
33	57.5	57.7	57.8	58.0	58.1	58.3	58.4	58.6	58.7	58.9	33
34	59.0	59.2	59.3	59.5	59.6	59.8	59.9	60.1	60.2	60.4	34
35	60.5	60.7	60.8	61.0	61.1	61.3	61.4	61.6	61.7	61.9	35
36	62.0	62.2	62.3	62.5	62.6	62.8	62.9	63.1	63.2	63.4	36
37	63.5	63.7	63.8	64.0	64.1	64.3	64.4	64.6	64.7	64.9	37
38	65.0	65.2	65.3	65.5	65.6	65.8	65.9	66.1	66.2	66.4	38
39	66.5	66.7	66.8	67.0	67.1	67.3	67.4	67.6	67.7	67.9	39
40	68.0	68.2	68.3	68.5	68.6	68.8	68.9	69.1	69.2	69.4	40

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

Made in Germany.