

← LETTER →
J. P. Johnson 1919

STANLEY BRIDGE
EGGERS BRIDGE
MACKAY BRIDGE
JAKE O'NEAL BRIDGE
JULIA REESE
MILTON COOK
SAM MCCOUN
TICKET
WALLACE
TERRELL
JOHN BRADFORD
DAVIS
CUMMINGS BRIDGE
BUSBY BRIDGE
MUD CREEK
SHIELDS
KISTER
COOPER
HODSON FORD
FRITSCHER FORD
IDA HOUSE
MAY HADLEY ET AL DITCH.

KEUFFEL & ESSER CO.

DRAWING MATERIALS

AND

SURVEYING INSTRUMENTS.

NEW YORK.

CHICAGO. ST. LOUIS. SAN FRANCISCO. MONTREAL.

Tables for Excavations and Embankments.

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 18 FEET WIDE. SIDE SLOPES 1 TO 1.

FOR SINGLE TRACK EXCAVATION.

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

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

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

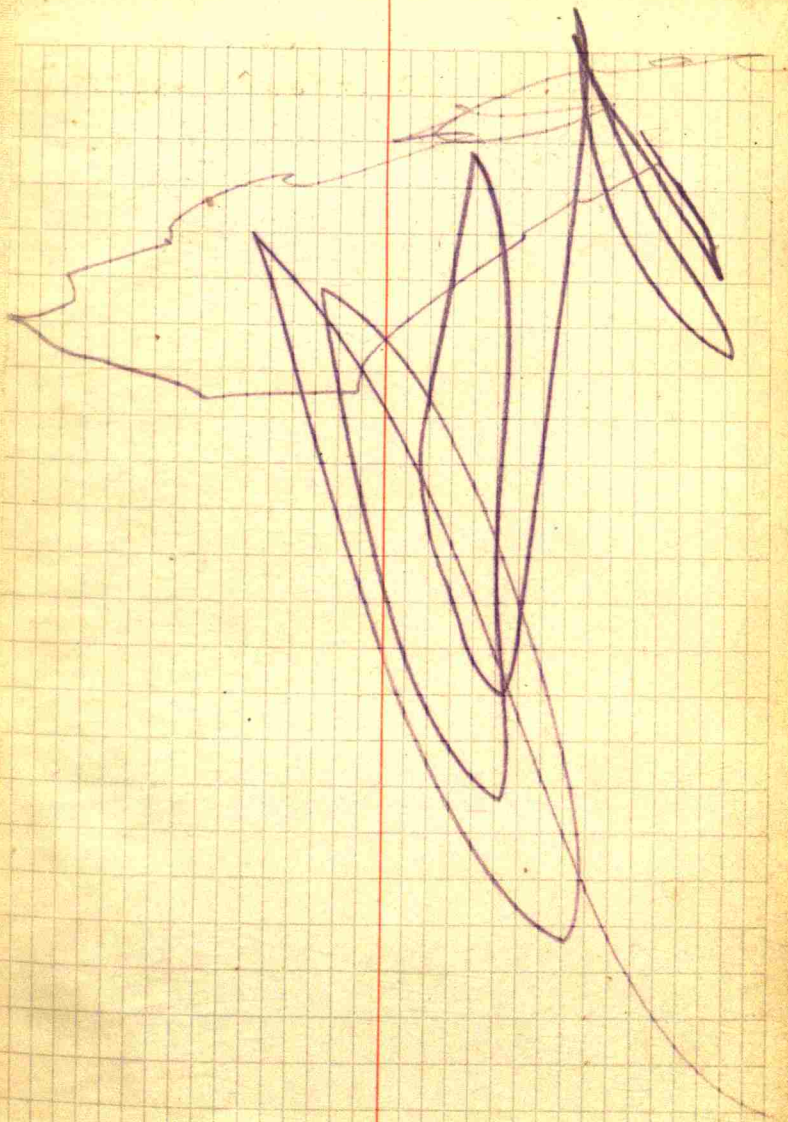
FOR KEITH'S RAILROAD CURVE TABLES SEE END OF BOOK.

If lost please return to

J.P. Johnson,

Surveyor H. Co.

Danville Ind.



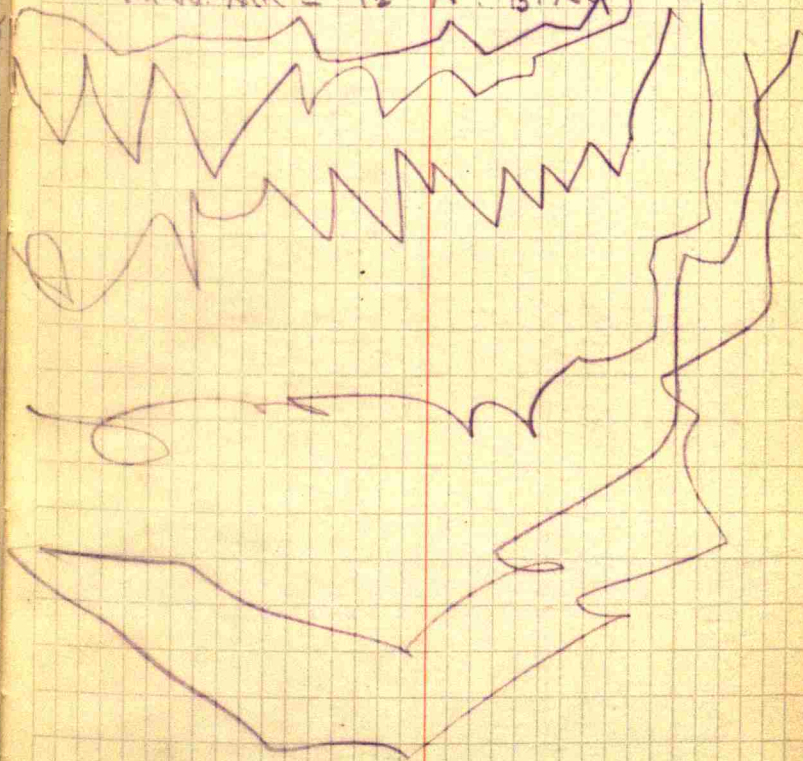
6

Sta	+	∞	-	El	Footings
B.M.	1.57	101.57		100.00	85.55
o. Red stream			11.02	90.55	14.45
0 + 100 S			5.75	95.82	5.01
1 #50			4.25	97.32	10.27
2 -			4.17	97.40	11.77
2 + 50			3.41	98.16	11.85
3			1.15	100.42	12.61
3 + 15			0.00	101.57	14.81
0 - 90 - N			6.88	94.69	16.02
-1 - 50			4.10	97.47	9.14
-2			2.48	99.09	11.92
-2 - 50			1.96	100.21	13.54
H.W.Mk			0.50	101.07	14.66
					15.51

Stanley Bridge 16-14-1E.

B.M. Walnut stump flush with ground - 70' N of stream

H.W.Mk - 12' N B.M.



Eggers Bridge - Union

footing -

3'

88.61

	t	x	-	Et	88.69
B.M	1.62	101.62		100	11.31
B. Post			4.50	97.12	8.43
water			9.13	91.69	3.00
road E			4.17	97.45	8.76
" W			4.17	97.45	8.76

500⁰⁰ - N⁴ 16-17-1 W.

B.M Fence post s. road
SE by edge

SPAN - 8 to 10'

side ditch deep + close

road 31' wide - slight
grade down to E

14

Mackey Bridge - Center

Sta	X	X	EI	3'-footing
B.M	3.82	108.82	-	100.00
S. side bidge			11.78	92.04
Floor pres	07.2	109.50		10.94
ent bridge			5.42	98.38
road over				9.34
bridge			4.55	99.21
N. side bridge			17.76	92.04

\$1500⁰⁰ - 8-15-1W.

15

present bridge - 16' road way - 1x'span
 " " water way - 5.8'
 stream at rt. & ford.
 good fall on stream.

Bench mark - top of straight fence
 post S of road & SE of bridge.

Flat top. improved road
 Bed stream to road way - 7.23 - ✓

18 Jake O'Neal Bridge - Clayfoot

1000 = 37.15 26

Sta	+	π	-	EI
B.M.	3.05	103.07		100 10.28
s. edge bridge			10.75	93.22 3.00
roadway			10.65	97.75 8.53
			5.32	

89.72

B.M. is E. parapet of culbert:
at corner taken at S. end.

at present - boiler shell a concrete
arch culbert, $3\frac{1}{2}$ x $8\frac{1}{2}$ each.

road level - practically
95° skew

width road 37'

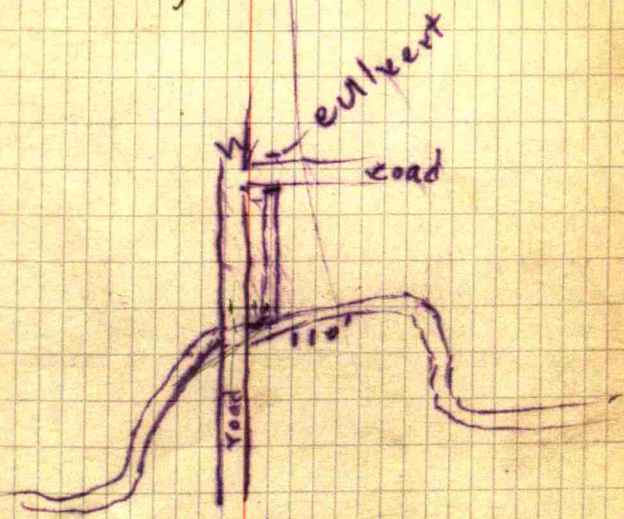
present arch - 18,

total rise - bed stream to rdwy - 5'-6.3"

slab - 12" dirt - 6" available rise 4'-0"

span - 10'-0"

clear roadway - 20'



122

Julia Reese - Franklin

Sta	+	∇	-	E1	
B.M.	1.97	101.97		100	13.95
Bed stream			12.02	89.95	3.50
Bridge floor present			6.60	95.31	8.92
N (0+25)			4.85	97.12	10.67
S (0-25)			7.62	94.35	7.90
(0-50)			4.52	97.45	11.00

3 1/2 foot
86.45
86.95

1200⁰⁰ 15 + 16 - 14 - 2 W

975

23

5075

B.M. □ Cor. fence post NW
Bridge - W side road

Built up grade - 22'

Span - 20' present rise - 5.42

rise - 7.50' rise - 5.75'

span - 22'

Wings - 45° 4'-0" out. 4'-0" back

dropped - 2'-0"

sloab - 21"

clear roadway - 16'-0"

26 Milton Cook - Liberty

3' foot in
91.36

Sta	+	-	El	
BM.	2.85	109.85	100	2.64
0 + 100 E			2.98	99.87
0 + 50 E			5.00	97.85
0 + Bed Stream			8.49	94.36
0 - 75 W			5.73	97.12
0 - 60 W			3.90	99.55

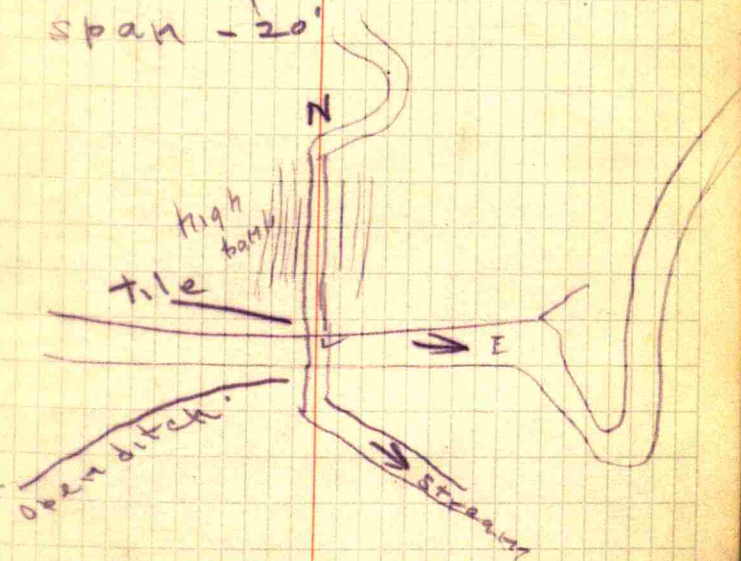
1200⁰⁰ - 20-14-18.

27

BM top square corner post
SE bridge site -

root square more running NW-

gravel near - south -
roadway - 30 -
span - 20'



30

Sam McCoun - Center $3\frac{1}{2}$ feet

Sta	+	X	-	El.	
B.M.	3.20	103.20		100	87.86
a. Bridge Floor		98.69	4.51		1.31
0+14 p stream		90.86	12.34		9.14
0+50 " "		91.28	11.92		
1 " "		91.55	11.65		
1+50 " "		91.55	11.65		
2+30 " "		93.65	9.55		
0-10		90.74	12.46		
B.M.	4.84	104.84		100	12.14
0 floor		5.58	98.76	10.90	
Road. 0+10.5		5.40	98.94	11.08	
0+50 S		4.55	99.79	11.93	
1		2.90	101.44	13.58	
1+50		0.68	103.66	15.80	
1+75		0.25	104.09	16.23	
0-50		5.67	98.67	10.81	
-1		5.10	99.24	11.38	
-1-50		3.60	100.74	12.88	
-2		1.34	103.00	15.14	
-2-50		7.50	104.84	16.98	
Bed stream			90.86	3.00	

1600⁰⁰ 32-16-1W.

31

B.M. Top of braced fence post N.E. bridge

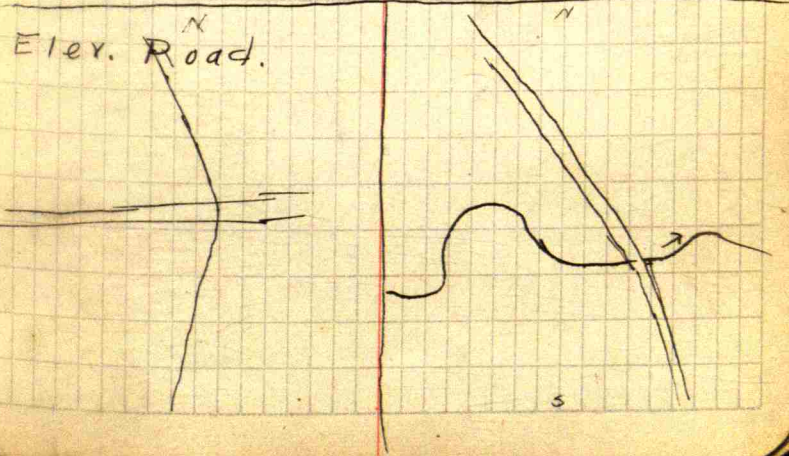
Present span - 15'

Between fences - 31' N side -

34' S. "

Present width of bridge - 16'

From cen. present bridge to W. fence. 20'



Picket - Center -

Sta	+	∞	-	EI.
B.M.	1.77	101.77		100
0			8.67	93.10
0+15 W			7.28	94.49
0+40 "			5.28	96.49
1+20 "			2.20	99.57
2+50 "			1.12	100.65
0-10 E			6.98	94.79
0-40 "			4.45	97.32
-1-50			1.85	99.92
-1				

9.5

7.0

3.90

2200⁰¹ - 19-15-1W.

B.M. Nail in root of large
elm S. bridge site.

60' span.

36

Wallace - Franklin - 3' foot

south Christian church.

sta	T	R	E	96.22
BM	7.42	107.42	100	3.18
Bridge floor			5.35	109.02
Red stream			8.20	99.22
Road			4.95	104.51
				6.35

300⁰⁰33⁰

- 14 - 2 W

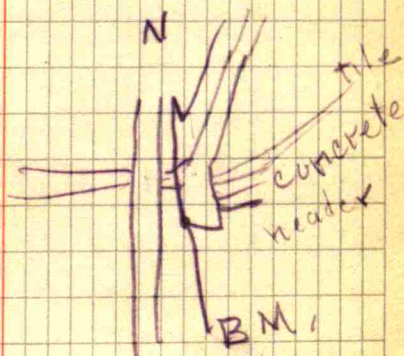
37

B.M. top concrete box-ditch

header - S W cor. bridge

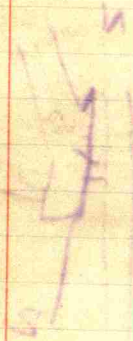
no grade

width road - 33' - 20' rdwy.

~~20' rdwy.~~

38 Terrell - Franklin - 3' footing

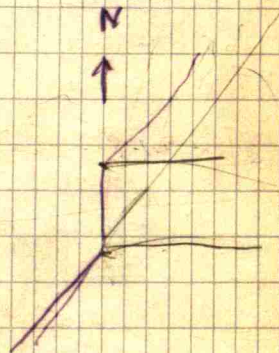
Sta	+	λ	-	Sum	Mill
BM	1.50	104.50	100	90.90	
Bridge floor		4.85	96.65	5.95	
Bed stream		7.60	93.90	3.00	
Road W		4.40	97.10	6.20	



300⁰⁰ 34° 22' 14-2 W See Greg.

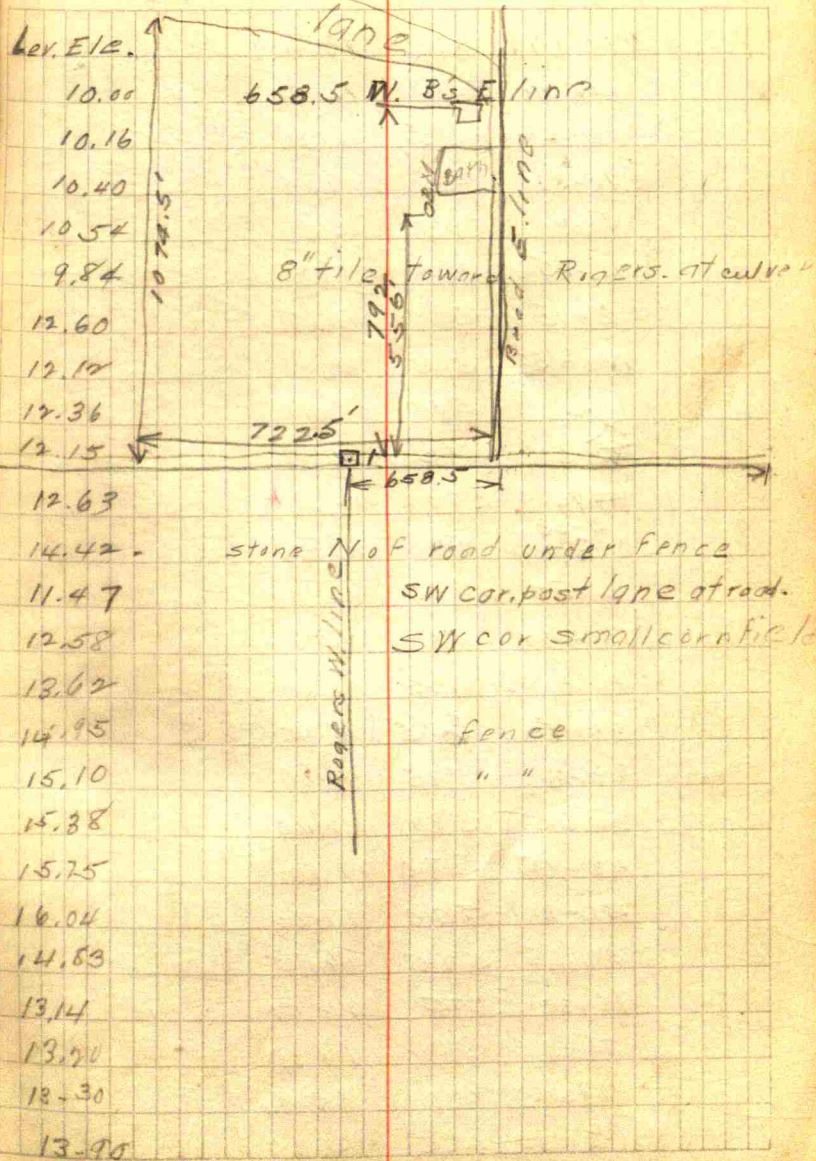
BM - 1st post - W of corner
past white fence - N side road
Kate Halls yard.

ditch.
45° skew -



Jan n Bradford

Sta.	SS.	Azimuth	Vert.	Hori.	Sta. Dis.	Mid. H.
□ 1	A.	1	S. 64° W.	48	2.95	3.94
	B.	2	S. 88° W.	6	2.01	
	C.	3	46°	10'	165	
	d.	4	59°	51	165	
	e.	5	88°	50 W	154	
	f.	6	77°	16	152	
	g.	7	64°	14	93	
	H.	8	28°	50	93	
	I.	9	13°	11	93	
	J.	10	3°	35	100	
	B.M.	11	N 2°	58 W	95	
		12	N-83°	39 E	115	
		13	75°	35	150	
		14	29°	83	70	
		15	16°	20 E	140	
		16	13°	49	248	
		17	7°	24	300	
		18	N 1°	34 W	300	
		19	2°	25 W	245	
		20	4°	4 W	245	
		21	19°	W	160	
		22	71°	55	30	
		23	81°	15	95	
		24	83°	46	220	
					310	

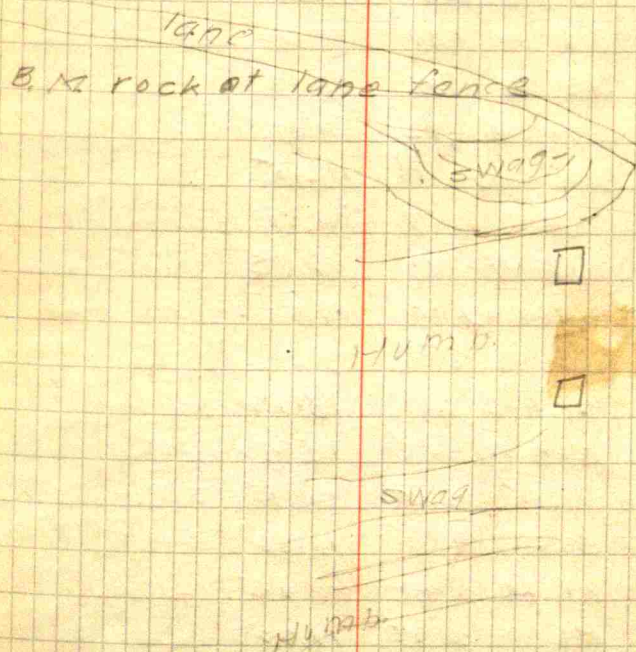


Sta	Azimuth	Sta. Dis.	Elev
25	N 63 W	290	14.00
26	44-30	287	14.70
27	24 -	315	16.19
28	14-30	338	16.00
29	5-30	365	15.80
30	4-15	430	15.58
31	3-15	518	14.09
32	N 2-15 E	515	13.20
33	11-	510	13.10
34	11 -30	575	15.00
35	# 9- E	570	16.00
36	⁴⁻³⁵ N 5-70 W	570	14.50
37	2-45	670	16.10
38	0-45 W	680	15.90
39	14-0 W	675	16.00
40	31-45	605	15.05
41	28-30	595	15.80
42	34-45 W	589	16.40
43	43-15	570	16.90
44	51-30	590	17.33
45	59-45	570	16.85
46	70-30	575	16.00
47	81-0	580	16.80
48	87-45	600	16.75
49	81-45	455	14.60

B.M. Rock SW cor. barn.

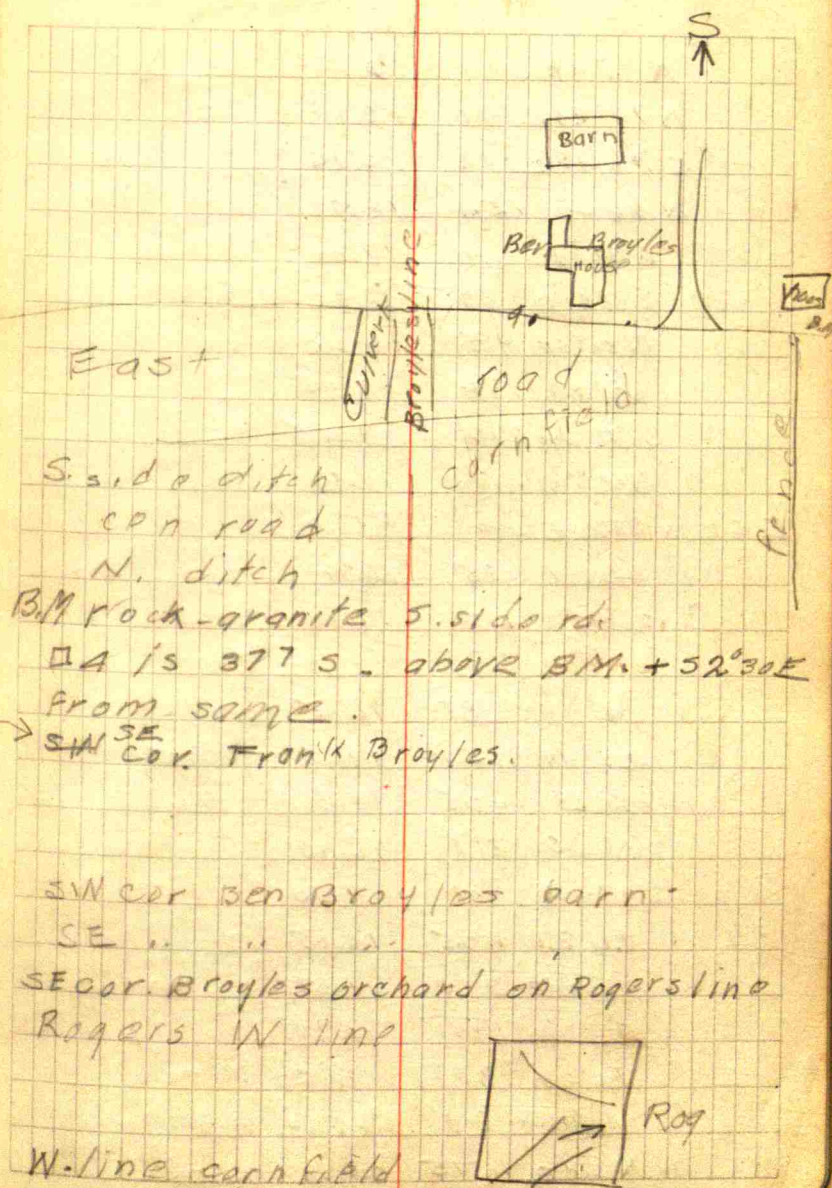
Sta.	AZIM	Stadis	Elev
			14.40
50	51-15	395	14.72
□ 2	BM. s. side	51	16.50
1	N 3° - E	105	14.40
2	2° - 30	135	12.50
3	N 16° W	218	11.34
4	34°	335	12.95
5	33-15	350	13.85
6	44	285	15.42
7	71-45	210	16.75
8	80-0	210	16.50
9	S 67°-20W	222	14.40
10	65	133	14.40
11	N 69 W	96	16.18
12	21-30	67	15.90
13	22-00	125	13.35
14	45-15	475	15.40
15	61-30	355	17.00
16	61-38	440	17.60
17	72-15	550	18.20
18	511	445	19.25
□ 3	BM. on R. rd N 86 15 E	210	Elev.
1	87-30	49	13.73
2	79-45	50	11.04
3	865-35 E	40	12.39

At N. end of barn - 50' N. B.M. at corner
SW cor N. barn.
NW & N barn.



□ 3 is in road 210' W. of BM + □ 1
@ BM. road at culvert
ditch N. side road
Broyle's NE cor.

Sta.	Azi.	Sta. dis.	Elev.	
				18.11
				19.43
				1.32
4	S 36 45 E	75	11.98	
5	14-30	163	12.85	
6	35-30	159	11.05	
7	S 1-30 E	170	13.55	
8	S 2-31 E	310	12.95	
9	S 14-30 E	³²⁰ 270	11.90	
10	S 32-00 W	270	15.00	S.E. cor Broyles barn
11	S 31-00 W	98	13.99	
12	S 78-30 W	112	14.50	
13	S 72-30 W	99	13.45	
14	W	99	14.52	
15	N 183 W	102	17.75	
16	S-88 45 W	400	018.11.	(set 19.43 cor)
□ 4		377	-1.32	
1.	N 44 45 E	288	18.27	16.90 ?
2	S-30 E	200	15.52	14.20
3	18-15	215	14.95	13.63
4	S 8 30	185	14.82	13.01
5	S 6 15	2.65	16.20	14.93
6	S 9 30	2.90	16.77	14.20
7	S 63-30 E	580	13.55	14.23
8	N 88 30 E	575	11.82	10.50
9	S 82 30 E	575	9.90 ?	8.58
10	74-	580	11.32	10.00
11	75.30	272	15.50	14.28

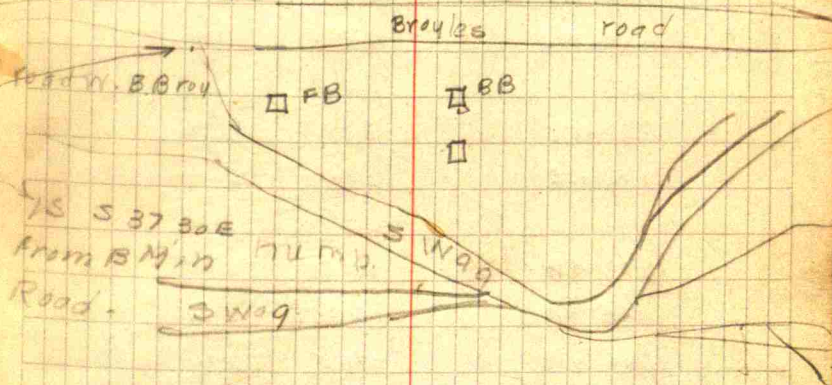


A S D E I

12	N 85 15E 268	13.25	11.93	
B	N 79 30E 190	13.10	11.78	
14	S 76 15E 173	15.75	14.43	
15	N 66 - 154	18.50	17.18	
16	N 38 ³⁰ E 40	17.05	15.68	
17	S 80 80W 89	17.20	15.88	
18	N 53 15W 95	16.40	15.08	
19	67 80 176	17.15	15.83	
20	S 85 W 212	17.45	16.13	field cor
21	N 22 45W 418	18.30	16.98	
□ 5 to BM	S 87.30E 480	0 18.11		
1	S 27 30E 435	16.32		side ditch
2	28.15 E 420	17.90		con road W
3	S 13 30E 390	16.88		W. BM side ditch
4	" 380	18.45		con road does
5	S 29 W 452	19.19	18.25	
6	33.30 425	19.90		
7	S 19.45W 377	18.90		
8	S 12 15E 360	17.55		
9	34 E 425	16.85		SECOR field
10	S 47 45E 310	17.85		E fence
11	7 30W 195	19.78		
12	S 13 0W 308	19.60		W fence
13	N 7 45W 250	22.25		W fence
14	N 45 E 75	20.35		N 05

down SWag coming from S -
is 12.25 50' on North

Erratum - Set turn pt. at 19.43
instead of 18.11

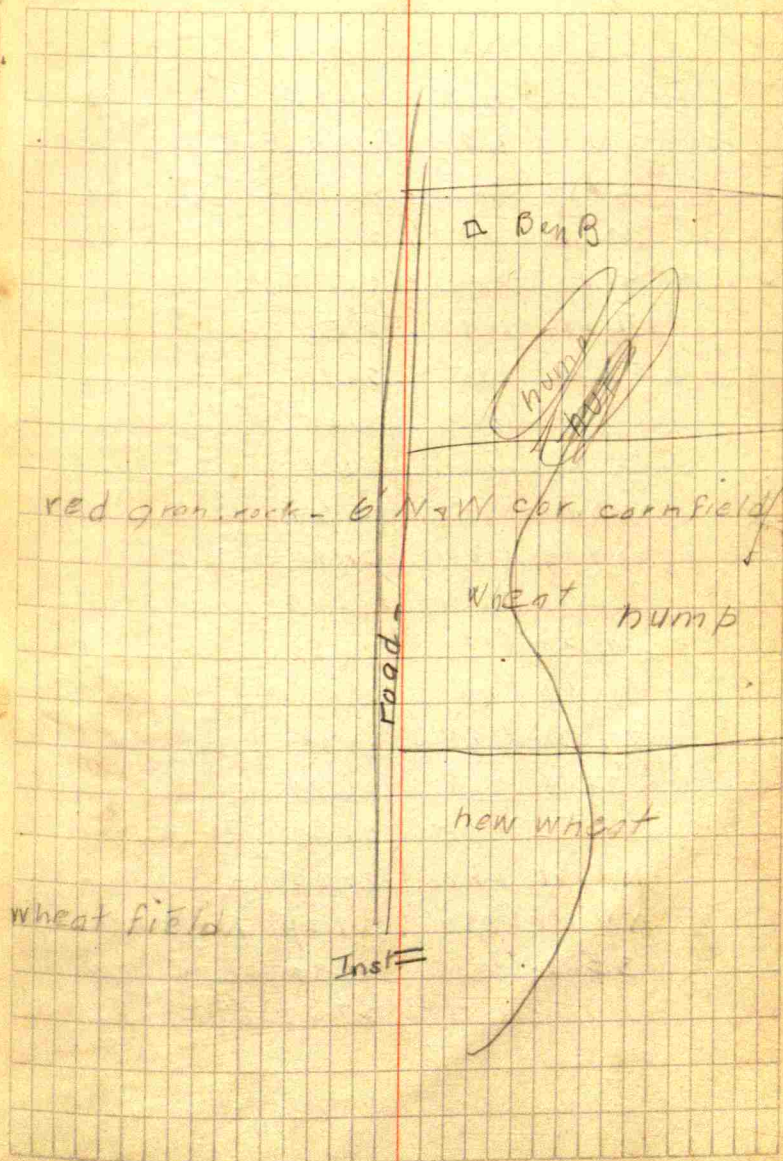


	A	S	D	E	
15	N 72-15 E		249	19.20	
16	N 43-30 E		340	18.80	
17	N 29-0 E		475	20.20	
18	N 5-0 E		430	21.32	
19	N 35-30 W		375	24.10	
20	N 27-30 W		330	23.70	
Wagon	S 53°30 E		95		
1	S 82-45 E		48	24.15	
2	N - 45 W		235	23.90	
3	N		355	23.70	Nw. Cor
4	N 21-45 E		377	23.90	field
5	N 53-45 E		600	20.00	N.E. Cor
6	N 1°-0 E		395	24.50	
7	N 27°-0 W		395	24.05	
8	N 45 ⁹⁸ -55 W		550	25.55	
9	N 66°-45 W		485	23.70	
10	N 62°-30 W		400	24.20	
11	N 46-15 W		225	22.80	
12	N 24-0 W		170	22.70	
13	S 78-30 W		69	23.30	
14	S 87.30 W		172	22.05	
15	S 88-0 W		225	22.60	
16	S 87-45 W		355	22.00	
17	S 87-15 W		450	21.90	B.M.?
18	S 73-0 W		470	22.20	fence line - N. side

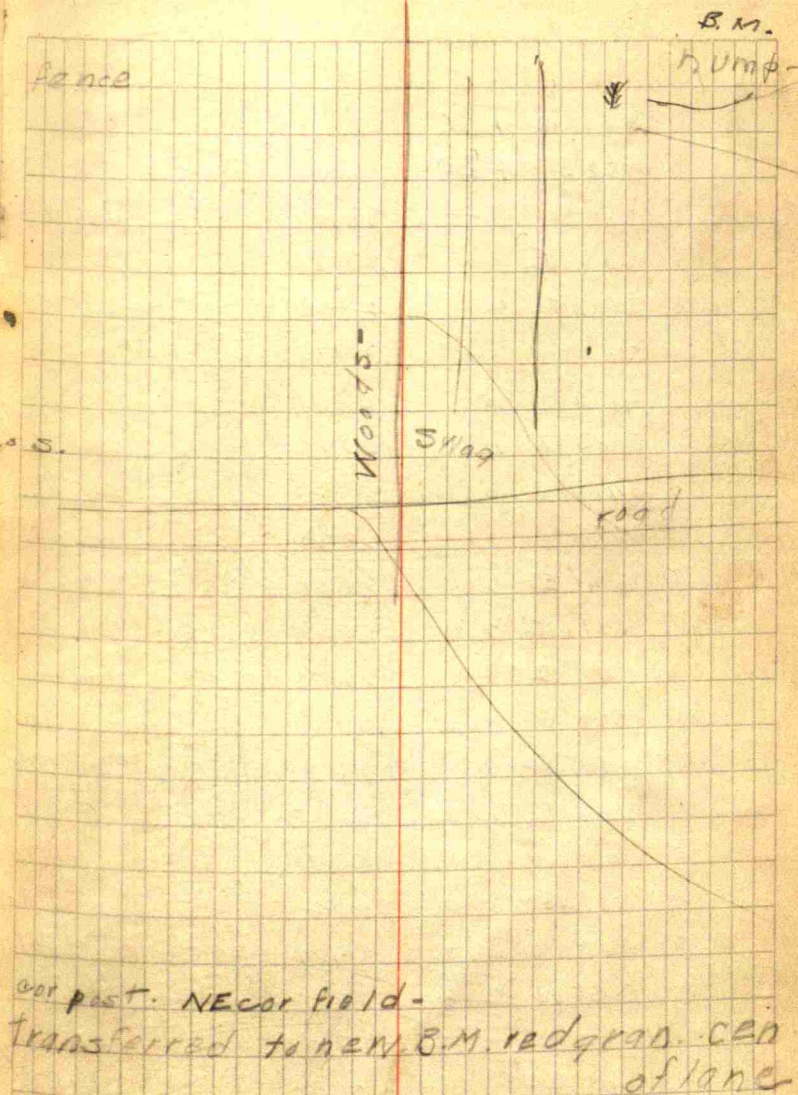
	A	D	E	
19	S 67-45 W	410	28.00	
20	S 60-0 W	285	21.60	
21	S 28-0 W	175	22.60	
22	S 13-30 W	365	22.00	
23	S 29-15 W	395	21.90	
24	S 45-0 W	475	22.00	
25	S 54-0 W	580	22.20	
26	S 44-0 W	790	22.15	
27	S 7-30 280 EW	510	21.90	
28	S 6-0 W	640	21.60	
⊙ BM	S 3-15 W	720	22.45	SE. cor cornfield
		440	22.60	20.70
□ 7-road at SW cor. corn field -				
1	N 84 E	198	23.30	hump 21.60
2	N 78 30 E	189	22.95	21.25
3	N 24 30 E	25	22.80	21.10
4	89 30 E	195	23.80	hump 22.16
5	85 30 E	195	20.60	S. ditch 1890
6	S 80 45 E	195	22.72	" 21.02
7	S 1 30 E	195	21.55	S. S. ditch 1985
8	S 24 E	215	21.15	1945
9	S 50	315	21.25	1955
10	85. 30	245	22.70	21.00
11	N 29 W	18	22.93	21.23
12	W	375	23.80	22.10

22.60
20.92
1.68 call - 1.70

21.02



	A	D	E		
13	S 84° W	275	22.85	N. along Woods	21.10
14	W-	415	24.25		22.55
15	N 72° 30' W	430	24.25		22.55
16	49 30 W	540	24.48		22.78
17	38 15 W	400	25.40	E-	23.70
18	21 45 W	440	25.15	N	23.75
19	S 74 40 E	400	To O		
1	S 7 W	345	24.90		23.20
2	S 18 30 W	415	24.45	small SW 90° S.	22.75
3	27 15	440	24.35		22.65
4	S 47 W	275	25.20		23.50
5	S 1 30 W	183	24.90		23.20
6	S 40 15 E	218	24.90		23.20
7	N 73 15 E	163	26.30		24.60
8	N 4 15 W	46	25.58		23.88
9	N 74 W	170	26.32		24.62
10	N 77 W	208	26.30		24.67
11	N 37 15 W	325	26.60		24.90
12	N 1 W	260	26.35	N. inst	24.65
13	N 56 45 E	330	27.25	NE cor field	25.55
	35-30	335	28.32	BM. rock by	26.60
			27.70	BM.	26.00



In N clover field.

II 9.	A	D	EI-		
1	S 3° 15' W	4 22			
2	S 34° E	4 70	25 50	cor	23 90
3	S 20° E	4 20	26 40		24 70
4	S 0 30' E	3 92	27 10		25 90
5	S 26 45' W	4 10	26 90		25 20
6	S 31 30' W	4 50	26 40		24 70
7	S 54° W	5 51	28 10	cor	25 40
8	S 63° W	4 70	27 70	fence	26 00
9	S 49 45' W	8 85	27 25		26 55
10	S 27 30' W	2 84	27 35		25 65
11	S 41° E	2 30	26 50		24 80
12	S 27 45' E	2 70	25 90		24 20
13	S 49° E	3 52	26 90	fence	25 20
14	S 66° E	2 95	27 00	"	25 30
15	S 48 45' E	1 68	26 60		24 90
16	S 15° E	1 70	27 15	S	25 45
17	S 50° W	1 70	27 70		26 00
18	S 69 45' W	3 12	27 20		25 50
19	S 85 30' W	4 07	27 00	fence	25 30
20	N 85° W	3 90	27 30	"	25 60
21	N 83° W	2 97	27 40		25 70
22	N 68 45' W	1 06	28 25		26 55
23	N 12 30' E	4 0	27 65		26 15
24	N 70° E	1 40	27 70		26 00
25	N 80 30' E	2 73	26 90	FD	28 20

	A	D	E		
26	N5345E	331	2780		2610
27	N3115E	220	2780		2610
28	15°W	205	2810		2640
29	22°W	244	2765		2595
30	44°W	305	2760		2590
31	60 30W	442	2770	F	2600
32	4645W	530	2830	"	2660
33	3125W	445	2860		2690
34	N1445W	375	2980		2760
35	330E	362	2835		2645
36	28 E	397	2840		2670
37	30° E	460	2850	F	2710
38	28 56 E	554	2890	"	2720
39	16 E	500	2840	" N line	2670
40	15°W	458	2820	"	2650
41	16°W	495	2920	"	2750
42	29 30W	570	2830	"	2660
43	3730W	620	2810	CDV.	2640
					NW

DN	S	Clov	F. d		
1	N24 34E	330	2740	FE	2590
2	N 15°E	310	2610		2440
3	N2845W	340	2710		2540
7	4310W	240	2680		2510

	A	D	E	
5	N 30 W	172	2620	24.50
6	1 80 E	168	2560	23.90
7	N 33 E	200	2675	25.05
8	S 2 21 E	203	2680	25.10
9	S 81° E	211	24.60	24.290
10	S 67.15 E	248	24.60	22.80
11	S 52 30 E	253	2470	23.60
12	S 46 -	183	2485	23.15
13	S 66 E	140	2470	23.00
14	N 71 15 E	138	2565	23.95
15	N 34 E	135	26.00	24.30
16	N 50 30 E	55	25.40	23.70
17	S 21 01 E	103	25.20	23.50
18	S 10 15 E	179	25.18	23.40
19	S 11 30 E	245	2530	23.60
20	N 13 15 W	110	2610	24.40
21	N 4 00 W	110	2550	23.80
22	N 25 30 W	139	2610	24.40
23	N 70 W	179	26.50	24.50
24	N 61 W	123	25.75	24.05
25	N 47 30 W	85	26.20	24.50
26	S 55 11	77	25.60	24.90
27	S 58 W	105	25.15	23.75
28	S 65 W	168	25.60	23.90
29	S 49 15 W	306	25.90	23.20
30	S 44 16 W	250	25.00	23.30

	A	D	E	
31	S 33 30 W	220	24.80	2310
32	S 25 30 W	210	24.70	2300
33	S-10 W	200	20.10	2340
34	S 11 15 W	295	24.80	2310
35	S 16 30 W	315	24.30	2260
36	S 21 45 W	335	24.40	2270
37	S 29 4 W	360	24.80	P- 2310
38	S 23 30 W	430	24.20	" 2310
39	S 17 W	410	24.20	2250
40	S 12 30 W	400	24.20	2250
41	S-8 15 W	392	20.00	2330
42	S-10 W	500	24.10	2290
43	S 13 15 W	522	23.80	2210
44	S 19 45 W	555	24.45	2275
45	S 15 30	645	24.20	2260
46	S 11 45 W	620	23.40	2170
47	S 6 W	610	23.35	2160
48	S 5 15 W	695	23.90	2220
49	S 20 N	568	24.20	2250
50	S 13 15 W	360	25.10	2390
51	S 29 5 W	278	24.20	2250
52	S 54 45 E	377	24.10	2290

TODAY POST B M

10 64

	A	D	E		
1	N 51 30 W	96	24.10	→	2290
2	S 30 W	78	23.55	→	2185
3	"	160	22.90		2260
4	S 29 15 E	12	23.20		2150
5	N 15 W	86	23.70		2220
6	S 46 30 E	87	23.15		2145
7	S 46 45 E	160	22.70		2100
8	S 46 45 E	246	22.15		2095
9	S 47 30 E	372	21.30		1960
10	"	448	20.80	This	1910
[7] 11		190	22.60	B.M.	2090
1	N 81 15 E	156	21.20		2010
2	N 74 45 E	74	22.00		2050
3	N 30 30 E	130	22.30		2060
4	N 22 30 E	182	22.00		2030
5	N 16 30 E	245	22.30		2050
6	N 6 45 E	288	22.40		2070
7	N 5 30 W	235	22.70		2100
8	N 22 15 W	248	22.90		2120
9	N 31 15 W	283	23.10		2140
10	N 49 W	128	23.20		2150
11	N 78 W	94	23.40	F	2170
12	20 W	21	23.15	"	2145
13	44 SW	112	22.70		2100

Acres

Total E-W - 2060'

225
1335 65

1	680' x 930' = 1030 x 14.24 = 14 2/3 A.	14.67
2	405' x 1050' = 6.13 x 15.91 = 9 3/4 A.	9.75
3	corn 450' x 1050' 6.82 x 15.91 = 10.85	10.85
4	480' x 1050' = 7.97 x 15.91	11.56
5	725' x 1050' + 785 = 11 1/2 x 13.19	15.48
	1335' x 1050' + #5 ≠ #1 = 911.	67.11
	20 32.18	

175 N. can road at E line corn field

can road, 190' W SE cor. corn

3-4 - NE cor. NW field -

4-6 - N side along lane.

13-17 at barn -

10-12 thru sewer ..

10-12 Just S. Boyles -

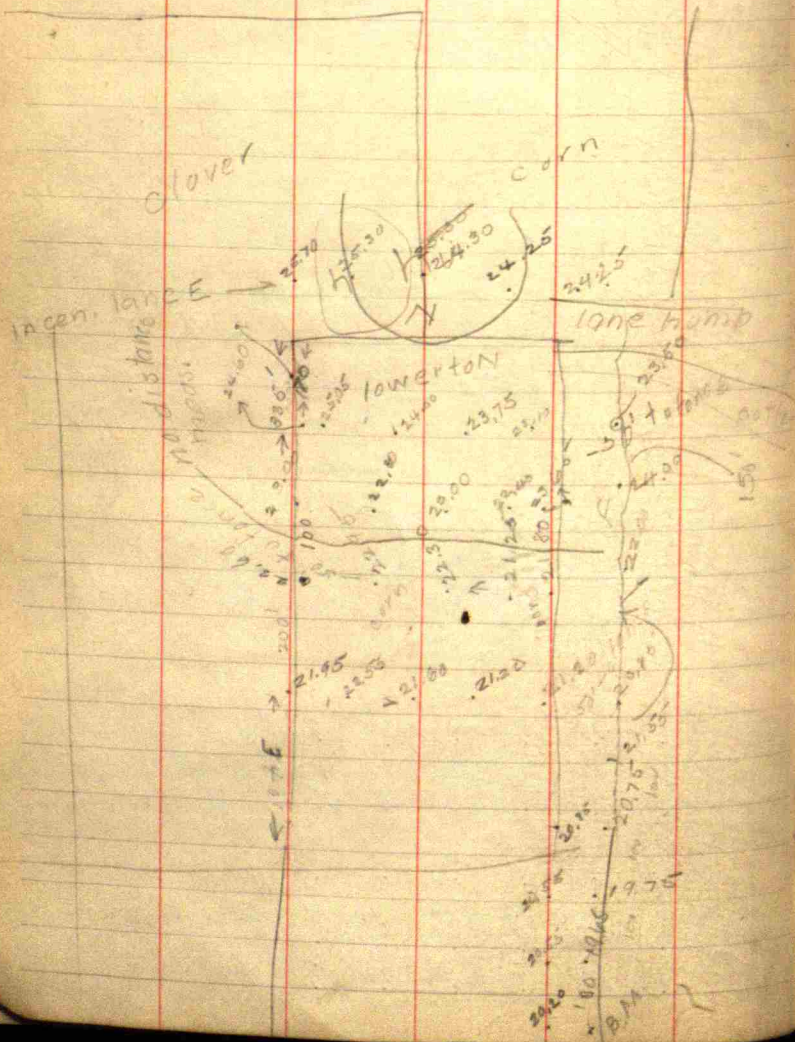
10-12 thru Huffman.

	A	D	E	
14	722.45E	115	22.70	2040
15	747.80E	168	22.10	2040
16	578.00E	115	21.80	2370
17	543.5E	160	21.80	2070
18	526.30E	230	21.10	1990
19	518.45E	320	21.60	1990
20	537.80E	400	20.00	1830
21	544.15E	350	19.70	1800
22	561.10E	295	20.60	1890
23	569.80E	413	20.20	1850 hump
24	560.80E	450	18.90	1720
25	552.8E	505	19.50	1780
26	550.8E	545	18.60	1690
27	564.8E	569	17.90	1620
28	569.2E	520	18.80	1710
29	577.80E	610	18.30	1660
30	583.20E	510	18.30	1660
31	587.45E	508	19.50	1680
32	620.40E	332	20.50	1880 f
33	579.10E	134	21.50	1950
34	584.5E	23	22.60	2090 cor.
35	543.00W	116	22.50	2080
36	524.4W	220	21.40	1970
37	525.80W	287	21.10	1930
38	525.4W	390	22.10	2050

1 sq mi. drainage area requires 1000
 waterway: if 6" falls in 24 hr
 2/3 being in 6-8 hr; run off = 1 in q
 172 cu. per sec. Velocity = 1 in q
 4 mi. per hr. or 6' per sec.

~~in line with W. Briggs house 14000
 on hump
 2 1/2 ft~~

24.10.4
72



face N in W.
clover
field.

0 M. 26.75

194 W. from #10 face

334 N " " " "

219 E " " "

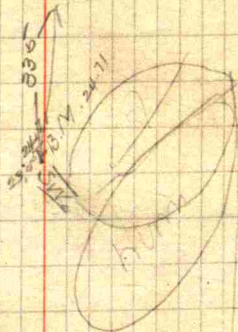
400' W. S. E. W.

500' W.

21.50	0	102.70	0	101.70
22.70	1	102.70	1	101.95
23.15	2	102.98	2	101.80
23.50	3	103.48	3	102.80
23.70	4	104.50	4	103.77
23.90	5	104.80	5	103.20
24.50	6	103.80	6	103.90
24.90	7	104.90	7	104.25
25.78	8	105.10	8	105.00
	9	106.40		

600' W.

0	102.40
1	103.03
2	102.75
3	103.88
4	105.20
5	104.67
6	104.99
7	105.90
8	106.10



Davis - Cen - Middle line -
 Width road - 32' - fresh
 Present bridge is broken
 rise 15° to 20° skew -

Sta. Elev.	El.
Bed at cen bridge	0.00
Rdw 4" "	6.36
" 100' E " "	6.26
Top ^{cor.} post SW bridge	11.00 BTM

Cummings Bridge
 Rise from bed 12.9 - pres.

Pres. span 40' - New 24'

Width of road - 30' - deep fill
 plenty wing needed -

2-45 at cul -

8+12 - 4" -

10+04 - 4" -

13+14 - 3" - dead -

14+63 - 4" -

15+32 - 4" -

level -
 gravel - fairly for 1/4 mi. both ways
 down arch - 6'-6" span, 5'-3"

S side ditch 24' between
 shoulders - N side 16'.
 Bed stream 5' wide - 1' water
 at bridge

Sta.	812' W - Tile outlet	1000' W - 1200' W	75' tile	15+32
0	103.35	105.95	106.99	106.28
1	104.60	105.05	106.41	106.63
2	105.45	105.65	106.30	107.73
3	105.76	105.98	106.75	108.03
4	106.20	106.70		108.58
5	106.65	107.50		108.68
6	107.65	107.45		108.48
7	107.93	108.85		108.68
8	107.90	108.90		109.78
9		108.35		110.78
10				111.38
11				110.78
12				110.08

76

1918

Bus. by Bridge - Liberty

Pres. rise - $6'-7\frac{1}{2}"$ ✓
 " span $10'-0"$
 " roadway $-16'-0"$
 no skew

make $15'$ roadway -
 wings $4'$ out $4'-0"$ back
 $3'-6"$ down -
 gravel 3^{mi} East of
 Hazlewood.

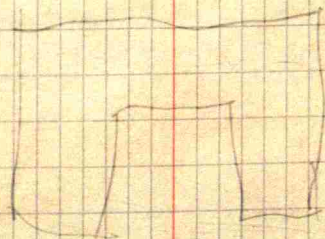
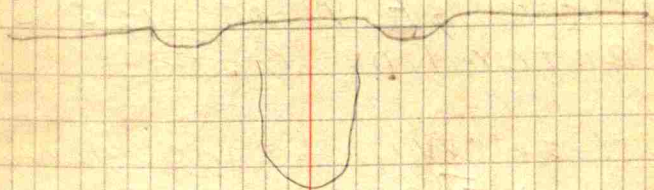
16'

77

Flat top -

$10'$ span - $17"$ slab - $5'-4"$ rise
 $16'$ roadway between hubquads
 standard rail - wings $4'$ out -
 $4'$ back - $3'-6"$ down - no skew.

Coping /



Mud Creek -

Pres. rise 12.4'
 roadway 13.5'
 span 40.3'

skew-rt. wheel first.

6' 1" in - 12.5' about 30' OK
 could take a little more.

8" tile SW wing - 12.5' S,
 center line road.

18'-20' wing conc. now,
 in NE cor

W

E



Shields -

rise pres. 4'-9"
 pres span 14'-6" no rail
 roadway 13'-6" no rail
 backed - road level
 skew - left wheel first
 20°

Kaiser -

rise 8'-7"
 6' box - 1
 16' roadway - 28'
 strt. wings -

flat top - span - 12' - slab - 12"
 rise - 3'-4" roadway - 16' between
 hub guards. 20° left skew.
 wings 4' out + 4' back. 30° rail.
 3' footings no coping -

Kaiser

Box culvert - 8" slab -
 2'-8" rise - 6' span - 6" walls
 and floor - 20' roadway - ~~28'~~
 24" rail - plain - 4' wings || to rdwy.

	Comp	ET
B.M.	4.54	104.54
100'E	5.40	99.14
50'E		95.99
B.L.O.	9.55	94.04
	17.50	
50'W	9.50	95.04
100'W	3.48	101.06
H.W.M.	5.75	98.79

Base of concrete N side road, W.S.
High water 6' deep - 7

High water mark - 5.75
See Bridge at Nat. Road.

Hodson - Ford.

- HI + E1

Bed	8.76		93.04
E 50'	5.39		96.41
E 100'	2.28		99.52
B.M	1.80	- 101.80	100
Q	0.88	100.20	
0	1.58	108.36	8 JA
E 150	4.20	100	104.16
190	- 0	bottom rod	108.36
		top	112.00
W 50.	11.22		97.14
100	5.56		102.80
150	6.50		109.86
	9.20	Ordinary	99.16

60' arch.

Bottom wire cor. post SE bridge

86

Fritsche - for 2

- Λ + E!

BM

100.53

~~E!~~ 100B ed - 8.⁴⁰~~55~~

W 50' 6.10

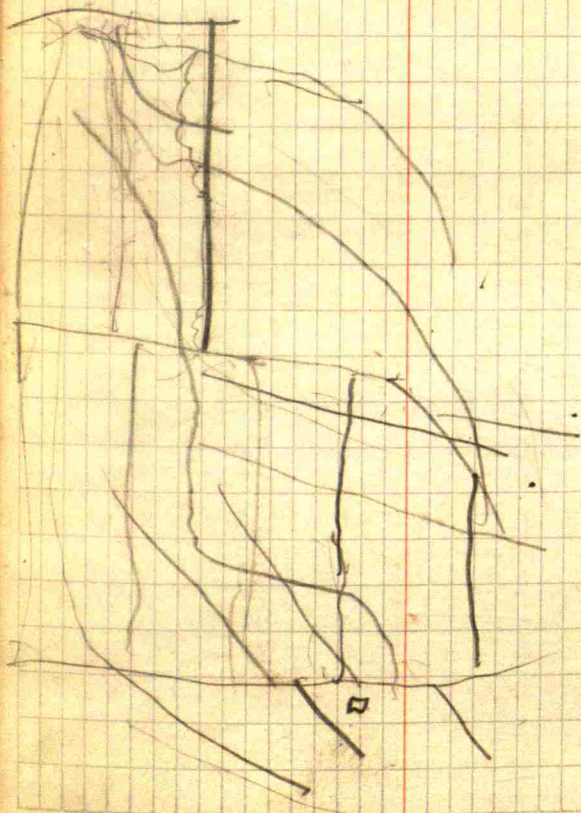
W 100 2.25

W 150 .56

87

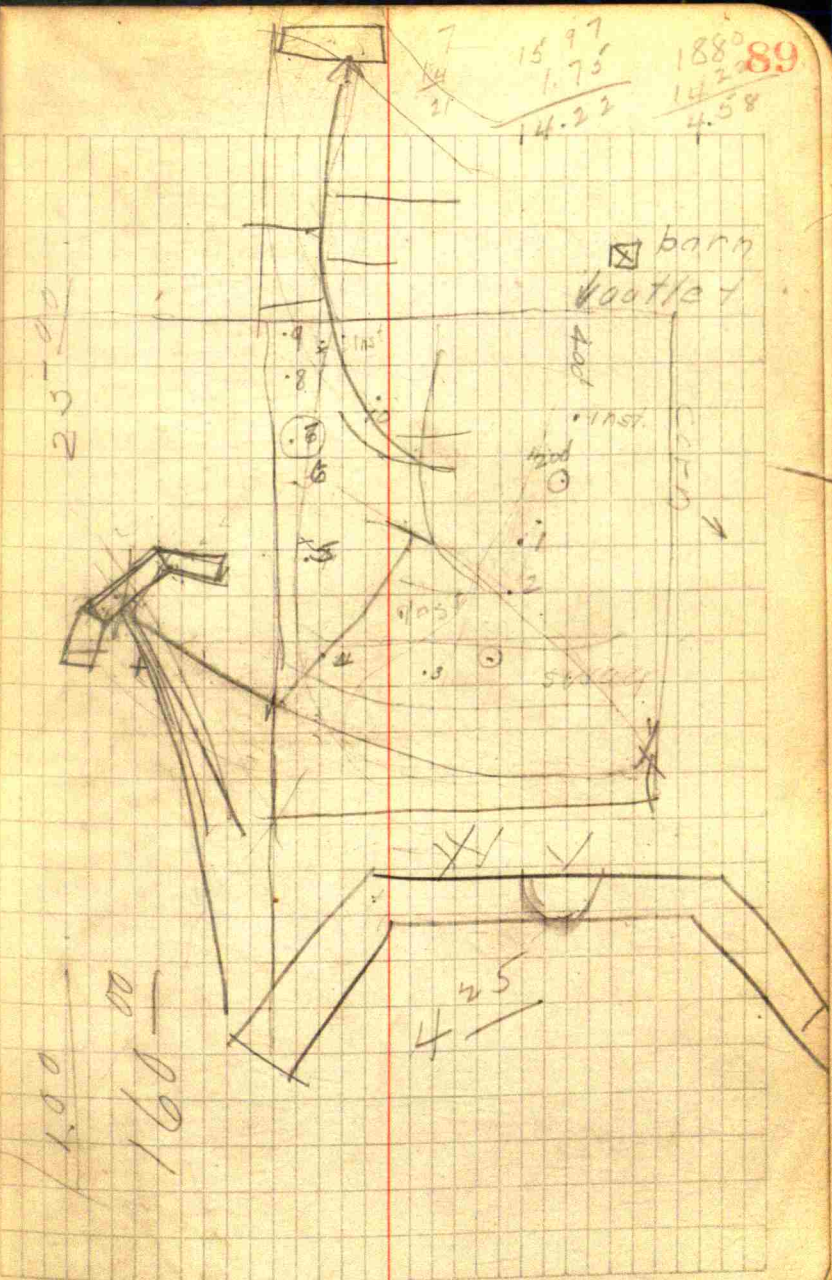
Top 1st fence post W on N side str

+ 3'



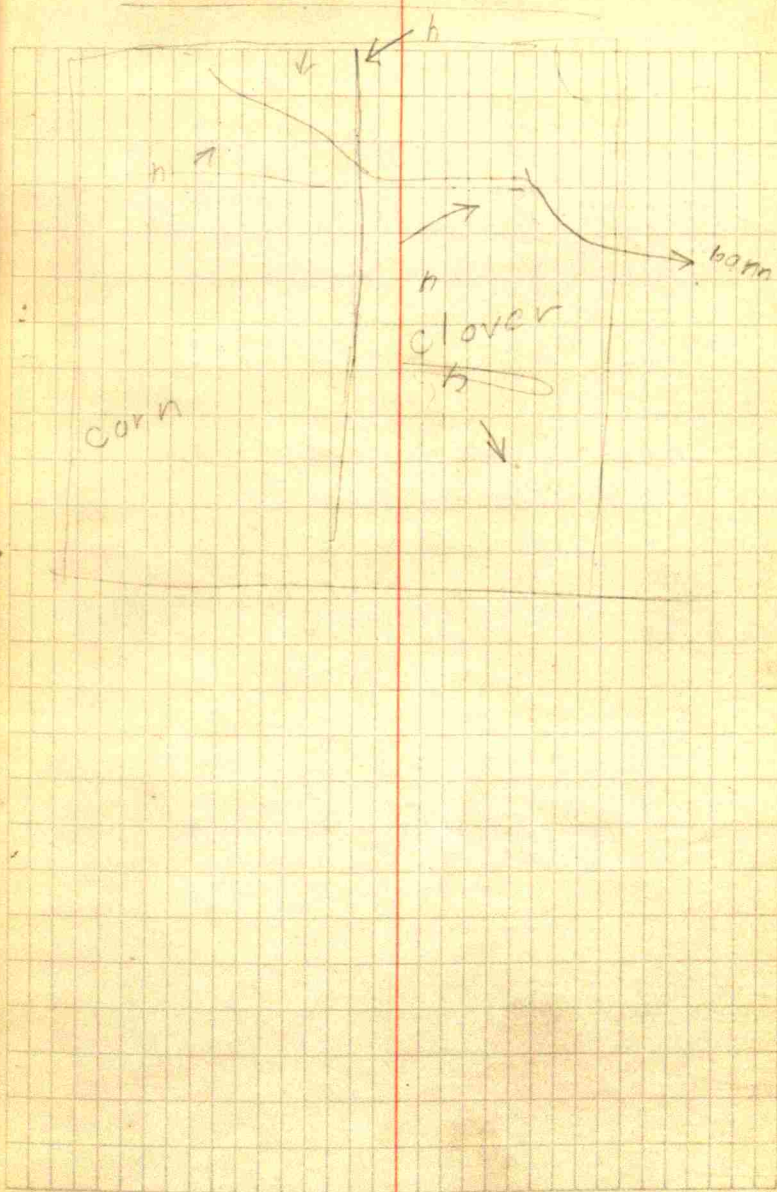
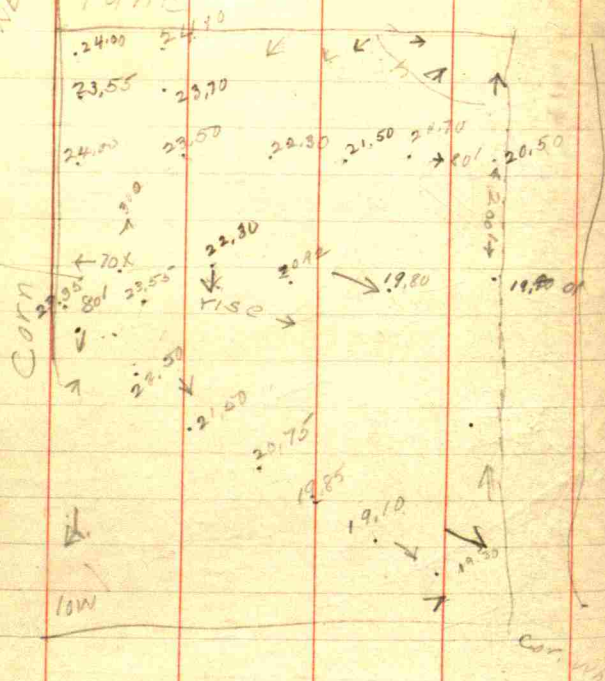
88 Ida House -
Outlet near barn -

Q	10.00
	20.58
1	21.57
2	21.31
3	19.34
4	18.24
6	15.97
6	18.80
6	18.28
7 0	17.90
8	18.14
9	17.67
10	18.58



measured by
 slope 80° N. N. E. 45°

19hc



Begin sewer	Rdwy	N fence	
	15.62	11.10	
1	14.10	13.18	
2	14.80	14.51	
3	15.55	14.70	
4	16.85	16.10	
5	17.83	17.07	hump
6	18.20	17.20	
7	18.42	17.80	
8	19.04	18.34	
9	19.58	19.80	
10	20.25	20.65	
11	20.20	20.50	
12	22.20	21.04	hump
13	21.82	20.75	
14	21.57	20.84	10' N.E. SW
15	21.65	21.50	
16	21.85	21.80	
17	21.70	22.10	
18	22.10	23.25	hump
100' to rd. back rd		22.11	
100' E from there		21.91	
To rd. 30'		22.60	
200' E		21.75	
		22.50	

Returns see 10 ^{with} rays, ^{has} which is on back in
along the road then away

hump

100' E from 100' E. 35' N. C. Rd

94

May Hadley et al. Private

Sta	E/Bol	Stake	Grade
0+00	0.00	1.82	0+00
1+00		3.16	0.67
2+00		4.88	1.33
3+00		6.05	2.00
4+00		6.20	2.67
5+00		6.75	3.33
6+00 ⊙		7.27	4.00 6+50 - fence
7+00		8.41	4.18
8+00		9.45	4.36
9+00		10.05	4.54
10+00		10.58	4.73
11+00		10.20	4.91
12+00		9.95	5.09
13+00		9.80	5.27
14+00		10.20	5.45
15		10.20	5.64
16		9.90	5.82
17		9.75	6.00
17+25		7.90	
18+00		8.65	6.52
19		8.95	7.04
20		9.65	7.56
21		10.50	8.08
22		11.45	8.61
23		12.10	9.13
24		12.65	9.65

95

Hl	Red.	C.		
8.06	8.06	8.06		2'
8.06	8.00	8.00	1.06	2'-7"
	6.93	9.19	1.13	4.1"
	4.51	11.61	3.53	7"
			3.92	8'

$$\begin{array}{r} 806 \\ 693 \\ \hline 113 \end{array}$$

$$\begin{array}{r} 806 \\ 113 \\ \hline 919 \end{array}$$

$$\begin{array}{r} 806 \\ 451 \\ \hline 355 \end{array}$$

$$\begin{array}{r} 806 \\ 414 \\ \hline 392 \end{array}$$

113.00	106.50 O.K.
94.00	15.00 Fleece
150.00	36.25 Mc
172.51	15.00 Buckert
6.68	172.75
7.50	Fleece
54.50	Sums -
15.00	
2.50	172.75
17.50	175.00
2.81	150.00
133.11	30.00
22.38	10.00
15.00	<u>537.75</u>
30.00	
16.96	
41.34	
30.00	

\$892.79

14.50

\$907.29

537.75

\$369.54

KEITH'S RAILROAD CURVE TABLES.

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HOW TO USE KEITH'S TABLES.

EXAMPLE.

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

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

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

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

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

$2^{\circ} 19\frac{1}{2}' =$ def. for sta.	542	I. P. = sta.	542+72
$4^{\circ} 49\frac{1}{2}' =$ " " "	+50	Tan. =	1.18.47
$7^{\circ} 19\frac{1}{2}' =$ " " "	543	B. C. = sta.	541+53.53
$9^{\circ} 49\frac{1}{2}' =$ " " "	+50	L. C. =	2.33.33
$11^{\circ} 40' =$ " " "	543+	E. C. = Sta.	543+86.86

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

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

Def. for 36.86 ft. = $1^{\circ} 50\frac{1}{2}'$ for a 10° Curve.

(These tables are published in Field Books of
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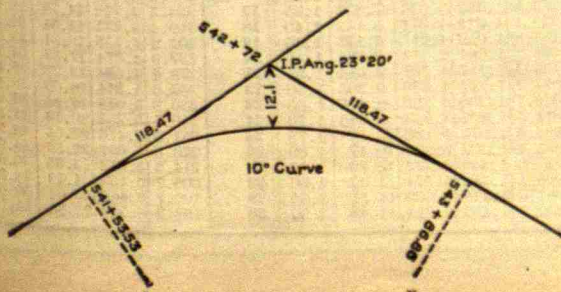


TABLE IV. — Tangents and Externals to a 1° Curve.

Angle	Tangent	External	Angle	Tangent	External	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.

Angle	Tangent	External	Angle	Tangent	External	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'	3768.4	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'	3888.9	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.

Angle	Tangent	External	Angle	Tangent	External	Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10'	5847.5	2457.1	10'	6971.3	3294.1	10'	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	102	7075.5	3374.9	112	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

TABLE V. Corrections for use with Table IV.

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For Tangents Add

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.03	.06	.09	.13	.16	.19	.22	.25	.28	.31	.34	.38	.42	.46
15°	.04	.10	.14	.19	.24	.29	.34	.39	.45	.51	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.79	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.49	4.98	5.38	5.83
100°	.43	.86	1.30	1.74	2.18	2.62	3.06	3.50	3.95	4.40	4.88	5.37	5.85	6.34

For Externals Add

Int. Angle	Curve 5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.029	.032	.035	.039	.043	.047	.051
20°	.006	.011	.017	.022	.028	.034	.038	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.127	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.086	.109	.131	.153	.175	.197	.213	.230	.247	.264
40°	.023	.046	.070	.093	.117	.141	.172	.203	.234	.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	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96

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

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

$T = R \tan \frac{1}{2} I$
 $T = 50 \tan \frac{1}{2} I$
 $\frac{\text{Sin. D}}{\text{Sin. D} = 50} = \frac{R}{T}$
 $\text{Sin. D} = 50 \tan \frac{1}{2} I$

CURVE FORMULAS

$R = T \cot. \frac{1}{2} I$
 $R = \frac{50}{\text{Sin. D}}$
 $E = R \text{ ex. sec } \frac{1}{2} I$
 $E = T \tan \frac{1}{2} I$

$\text{Chord def.} = \frac{\text{chord}^2}{R}$
 $\text{No. chords} = \frac{\frac{1}{2} I}{D}$
 $\text{Tan. def.} = \frac{1}{2} \text{ chord def.}$

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

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

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

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

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

To find angle for a given distance and deflection.

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

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

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

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

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

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

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

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

Natural Sines

Deg.	0'	10'	20'	30'	40'	50'	dg.	dg.	0'	10'	20'	30'	40'	50'	Deg.
0	0000	0029	0058	0087	0116	0145	89	40	6428	6450	6472	6494	6517	6539	49
1	0175	0204	0233	0262	0291	0320	88	41	6561	6583	6604	6626	6648	6670	48
2	0349	0378	0407	0436	0465	0494	87	42	6691	6713	6734	6756	6777	6799	47
3	0523	0552	0581	0610	0640	0669	86	43	6820	6841	6862	6884	6905	6926	46
4	0698	0727	0756	0785	0814	0843	85	44	6947	6967	6988	7009	7030	7050	45
5	0872	0901	0929	0958	0987	1016	84	45	7071	7092	7112	7133	7153	7173	44
6	1045	1074	1103	1132	1161	1190	83	46	7193	7214	7234	7254	7274	7294	43
7	1219	1248	1279	1305	1334	1363	82	47	7314	7333	7353	7373	7392	7412	42
8	1392	1421	1449	1478	1507	1536	81	48	7431	7451	7470	7490	7509	7528	41
9	1564	1593	1622	1650	1679	1708	80	49	7547	7566	7585	7604	7623	7642	40
10	1736	1765	1794	1822	1851	1880	79	50	7660	7679	7698	7716	7735	7753	39
11	1908	1937	1965	1994	2022	2051	78	51	7771	7790	7808	7826	7844	7862	38
12	2079	2108	2136	2164	2193	2221	77	52	7880	7898	7916	7934	7951	7969	37
13	2250	2278	2306	2334	2363	2391	76	53	7986	8004	8021	8039	8056	8073	36
14	2419	2447	2476	2504	2532	2560	75	54	8090	8107	8124	8141	8158	8175	35
15	2588	2616	2644	2672	2700	2728	74	55	8192	8208	8225	8241	8258	8274	34
16	2756	2784	2812	2840	2868	2896	73	56	8290	8307	8323	8339	8355	8371	33
17	2924	2952	2979	3007	3035	3062	72	57	8387	8403	8418	8434	8450	8465	32
18	3090	3118	3145	3173	3201	3228	71	58	8480	8496	8511	8526	8542	8557	31
19	3256	3283	3311	3338	3365	3393	70	59	8572	8587	8601	8616	8631	8646	30
20	3420	3448	3475	3502	3529	3557	69	60	8660	8675	8689	8704	8718	8732	29
21	3584	3611	3638	3665	3692	3719	68	61	8746	8760	8774	8788	8802	8816	28
22	3746	3773	3800	3827	3854	3881	67	62	8829	8843	8857	8870	8884	8897	27
23	3907	3934	3961	3987	4014	4041	66	63	8910	8923	8936	8949	8962	8975	26
24	4067	4094	4120	4147	4173	4200	65	64	8988	9001	9013	9026	9038	9051	25
25	4226	4253	4279	4305	4331	4358	64	65	9063	9075	9088	9100	9112	9124	24
26	4384	4410	4436	4462	4488	4514	63	66	9135	9147	9159	9171	9182	9194	23
27	4540	4566	4592	4617	4643	4669	62	67	9205	9216	9228	9239	9250	9261	22
28	4695	4720	4746	4772	4797	4823	61	68	9272	9283	9293	9304	9315	9325	21
29	4848	4874	4899	4924	4950	4975	60	69	9336	9346	9356	9367	9377	9387	20
30	5000	5025	5050	5075	5100	5125	59	70	9397	9407	9417	9426	9436	9446	19
31	5150	5175	5200	5225	5250	5275	58	71	9455	9465	9474	9483	9492	9502	18
32	5299	5324	5348	5373	5398	5422	57	72	9511	9520	9528	9537	9546	9555	17
33	5446	5471	5495	5519	5544	5568	56	73	9563	9572	9580	9588	9596	9605	16
34	5592	5616	5640	5664	5688	5712	55	74	9613	9621	9628	9636	9644	9652	15
35	5736	5760	5783	5807	5831	5854	54	75	9659	9667	9674	9681	9689	9696	14
36	5878	5901	5925	5948	5972	5995	53	76	9703	9710	9717	9724	9730	9737	13
37	6018	6041	6065	6088	6111	6134	52	77	9744	9750	9757	9763	9769	9775	12
38	6157	6180	6202	6225	6248	6271	51	78	9781	9787	9793	9799	9805	9811	11
39	6293	6316	6338	6361	6383	6406	50	79	9816	9822	9827	9833	9838	9843	10
Deg.	60'	50'	40'	30'	20'	10'	dg.	dg.	60'	50'	40'	30'	20'	10'	Deg.

Deg.	0'	10'	20'	30'	40'	50'	Deg.
80	9848	9853	9858	9863	9868	9872	9
81	9877	9881	9886	9890	9894	9899	8
82	9903	9907	9911	9914	9918	9922	7
83	9925	9929	9932	9936	9939	9942	6
84	9945	9948	9951	9954	9957	9959	5
85	9962	9964	9967	9969	9971	9974	4
86	9976	9978	9980	9981	9983	9985	3
87	9986	9988	9989	9990	9992	9993	2
88	9994	9995	9996	9997	9997	9998	1
89	9998	9999	9999	9999	1.0000	1.0000	0
Deg.	60'	50'	40'	30'	20'	10'	Deg.

Natural Cosines

Natural Tangents.

Deg.	0'	10'	20'	30'	40'	50'	Deg.	Deg.	0'	10'	20'	30'	40'	50'	Deg.
0	0000	0020	0058	0087	0116	0145	89	40	8391	8441	8491	8541	8591	8642	49
1	0175	0204	0233	0262	0291	0320	88	41	8693	8744	8796	8847	8899	8952	48
2	0349	0378	0407	0437	0466	0495	87	42	9004	9057	9110	9163	9217	9271	47
3	0524	0553	0582	0612	0641	0670	86	43	9325	9380	9435	9490	9545	9601	46
4	0699	0729	0758	0787	0816	0846	85	44	9657	9713	9770	9827	9884	9942	45
5	0875	0904	0934	0963	0992	1022	84	45	1.0000	1.0058	1.0117	1.0176	1.0235	1.0295	44
6	1051	1080	1110	1139	1169	1198	83	46	1.0355	1.0416	1.0477	1.0533	1.0590	1.0661	43
7	1228	1257	1287	1317	1346	1376	82	47	1.0724	1.0786	1.0850	1.0913	1.0977	1.1041	42
8	1405	1435	1465	1495	1524	1554	81	48	1.1106	1.1171	1.1237	1.1303	1.1369	1.1436	41
9	1584	1614	1644	1673	1703	1733	80	49	1.1504	1.1571	1.1640	1.1708	1.1778	1.1847	40
10	1763	1793	1823	1853	1883	1914	79	50	1.1918	1.1988	1.2059	1.2131	1.2203	1.2276	39
11	1944	1974	2004	2035	2065	2095	78	51	1.2349	1.2423	1.2497	1.2572	1.2647	1.2723	38
12	2126	2156	2186	2217	2247	2278	77	52	1.2799	1.2876	1.2954	1.3032	1.3111	1.3190	37
13	2309	2339	2370	2401	2432	2462	76	53	1.3270	1.3351	1.3432	1.3514	1.3597	1.3680	36
14	2493	2524	2555	2586	2617	2648	75	54	1.3764	1.3848	1.3934	1.4019	1.4106	1.4193	35
15	2679	2711	2742	2773	2805	2836	74	55	1.4281	1.4370	1.4460	1.4550	1.4641	1.4733	34
16	2867	2899	2931	2962	2994	3026	73	56	1.4826	1.4919	1.5013	1.5108	1.5204	1.5301	33
17	3057	3089	3121	3153	3185	3217	72	57	1.5399	1.5497	1.5597	1.5697	1.5798	1.5900	32
18	3249	3281	3314	3346	3378	3411	71	58	1.6003	1.6107	1.6212	1.6319	1.6426	1.6534	31
19	3443	3476	3508	3541	3574	3607	70	59	1.6643	1.6753	1.6864	1.6977	1.7090	1.7205	30
20	3640	3673	3706	3739	3772	3805	69	60	1.7321	1.7437	1.7556	1.7675	1.7797	1.7917	29
21	3839	3872	3906	3939	3973	4006	68	61	1.8040	1.8165	1.8291	1.8418	1.8546	1.8676	28
22	4040	4074	4108	4142	4176	4210	67	62	1.8807	1.8940	1.9074	1.9210	1.9347	1.9486	27
23	4245	4279	4314	4348	4383	4417	66	63	1.9626	1.9768	1.9912	2.0057	2.0204	2.0353	26
24	4452	4487	4522	4557	4592	4628	65	64	2.0503	2.0655	2.0809	2.0965	2.1123	2.1283	25
25	4663	4699	4734	4770	4806	4841	64	65	2.1445	2.1609	2.1775	2.1943	2.2113	2.2286	24
26	4877	4913	4950	4986	5022	5059	63	66	2.2460	2.2637	2.2817	2.2998	2.3183	2.3369	23
27	5095	5132	5169	5206	5243	5280	62	67	2.3559	2.3750	2.3945	2.4142	2.4342	2.4545	22
28	5317	5354	5392	5430	5467	5505	61	68	2.4751	2.4960	2.5172	2.5386	2.5605	2.5826	21
29	5543	5581	5619	5658	5696	5735	60	69	2.6051	2.6279	2.6511	2.6746	2.6985	2.7228	20
30	5774	5812	5851	5890	5930	5969	59	70	2.7475	2.7725	2.7980	2.8239	2.8502	2.8770	19
31	6009	6048	6088	6128	6168	6208	58	71	2.9042	2.9319	2.9600	2.9887	3.0178	3.0475	18
32	6249	6289	6330	6371	6412	6453	57	72	3.0777	3.1084	3.1397	3.1716	3.2041	3.2371	17
33	6494	6536	6577	6619	6661	6703	56	73	3.2709	3.3052	3.3402	3.3759	3.4124	3.4495	16
34	6745	6787	6830	6873	6916	6959	55	74	3.4874	3.5261	3.5656	3.6059	3.6470	3.6891	15
35	7002	7046	7089	7133	7177	7221	54	75	3.7321	3.7760	3.8208	3.8657	3.9136	3.9617	14
36	7265	7310	7355	7400	7445	7490	53	76	4.0108	4.0611	4.1126	4.1653	4.2193	4.2747	13
37	7536	7581	7627	7673	7720	7766	52	77	4.3315	4.3897	4.4494	4.5107	4.5736	4.6382	12
38	7813	7860	7907	7954	8002	8050	51	78	4.7046	4.7729	4.8430	4.9152	4.9894	5.0658	11
39	8098	8146	8195	8243	8292	8342	50	79	5.1446	5.2257	5.3093	5.3955	5.4845	5.5764	10
Deg.	60'	50'	40'	30'	20'	10'	Deg.	Deg.	60'	50'	40'	30'	20'	10'	Deg.

Deg.	0'	10'	20'	30'	40'	50'	Deg.
80	5.6713	5.7694	5.8708	5.9758	6.0844	6.1970	9
81	6.3138	6.4348	6.5606	6.6912	6.8269	6.9682	8
82	7.1154	7.2687	7.4287	7.5958	7.7704	7.9530	7
83	8.1443	8.3450	8.5555	8.7769	9.0098	9.2553	6
84	9.5144	9.7882	10.078	10.385	10.711	11.059	5
85	11.430	11.826	12.250	12.706	13.197	13.727	4
86	14.300	14.924	15.605	16.350	17.169	18.075	3
87	19.081	20.206	21.470	22.903	24.542	26.432	2
88	28.636	31.242	34.368	38.189	42.964	49.104	1
89	57.290	68.750	85.940	114.588	171.885	343.77	0
Deg.	60'	50'	40'	30'	20'	10'	Deg.

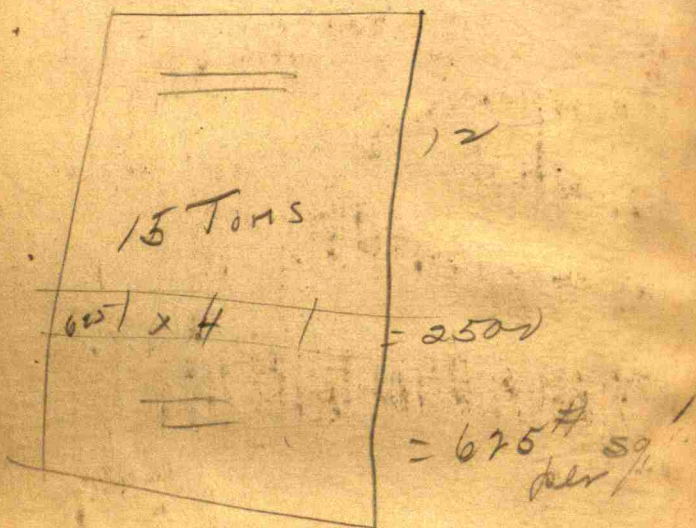
Natural Cotangents.

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J.P.J. 4



Plane surveying. Tracy.
John Wiley & Sons

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

ROADWAY 14 FEET WIDE. SIDE SLOPES $1\frac{1}{2}$ TO 1.

FOR SINGLE TRACK EMBANKMENT.

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

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