(2)

13528

Love Edward

Apr 17 1919

IVY LEAF

Apr 9 1920

John W. Curo

Harold J. Curo

No. 1201

Sample Sheet 1-7

INDEX

136-28

Lake Edward Twp.

April 17-1919 Thursday
I work all day in sec.
4-135-28. But after supper
I go with King and Neb
Christensen to J. Dell Cowell
where I stay all night

147

Harold G. Cure

135-28

Lake Edward TWP.

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April 18-1919 Friday

Breakfast with Wm Connell & King and Christensen come with a horse and Buggy each and put their horses in Connell barn J. D. Connell King, Christensen and Myself leave at eight (8:) O clock and go to the west ¼ cor between sec 27 and 34-135-28 from which I start a line N and put up two pickets for J.D. Connell at about 9° Var.

We then go to the cor to sections 27, 28, 33, 34 where U S notes call for

Dead Pine 8 S 5 E 18
Norway " 12 N 65 E 2.48
" " 12 N 59 W 1.47

As the corner has been established By John W Cure years ago

Harold F. Cure

135-28
Lake Edwards twp.

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Apr. 18-1919 Contnd
and we find the I.M. we do
not look for the B.Trs But
set over his corner and
run west on old cut out
line which was cut out for
a road Between sections
28 and 33 - 135-28
Harald J. Curo ⊼ 100 Ft ch.
Everett H. King ch. man ax
Nels Christensen flag man ax
J. D. Cornell ax man
West Bet 28-33
@ 90 cross main road bears
SW and NE @ 100 sta @ 200, 300,
400 W stks. not on line @ 453.40 Hub
@ 500, 600, 700, & 800, stakes not on line
@ 862.60 W Hub @ 900 and 10 stks not on
line @ 1087 center of old road bears NW & SE
@ 1100 and 1200 W stakes not on line
@ 1272.90 W Hub. @ 1300 - 1400 - 1500
Harold J. Curo

135-28
Lake Edwards twp

147

April 18-1919 Contued

1600-1700 stakes not on line @ 17.24.60 W Hub. @ 1800-1900-2000-2100-2200-2300 W stakes not on line 2379.80 W Hub @ 2400 sta. not on line @ 2461 W into meadow bears NE + SW @ 2500-2600 sta in meadow not on line @ 2626 W meadow bears NW + SE @ 2640 W Hub. @ 2700 + 2800 W stakes not on line @ 2839.40 W Hub @ 2900 + 3000 stakes not on line @ 3034.40 W Hub. @ 3100-3200-3300-3400 W stakes not on line 3416.10 Hub @ 3500-3600 stakes not on line @ 3689.70 W Hub @ 3700-3800-3900 4000 W stakes not on line @ 4041.30 W Hub @ 4100-4200-4300 W stakes not on line @ 4378.60 W Hub @ 4400 W-4500 W + 4600 W stakes not on line @ 4612.80 Hub @ 4700-4800-4900 W stakes not on line

Harold F. Curd

135-28
Lake Edwards twp.

147

Apr. 18-1919 Cont

@ 4942 W. road bears NE & SW

@ 5000 - 5100 - 5200 stakes not on line

@ 5280 W. Hunt look for the cor and find a stake that Cornell had put in for the corner He found the cor. that which Whitty had put in all burnt and down so put a new one in the place he thought the old one had stood as it is after 5 we go home all the crew had dinner and supp with mrs. Cornell.

Harold L. Curo

135-28
Lake Edwards twps.

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Apr. 19-1919 Saturday
King and Christensen arrive here about 7-30 and we leave Cornell at 8 and go to the cor. to sections 28-29-32-33 and look for the old B.T. which are Viz

Blk Pine 6N 41E 20 = 13.20
" " 5N 37½ W 14 = 9.24
" " 4S 26E 48 = 31.68
" " 4S 18W 68 = 44.88

look around but do not find any of the trees and set my transit over Hub 5280 to centre line west when J. W. Curo and Chas E. Dandanell comes along and J. W. Curo finds the N E and S E B.T. plainly marked the S E tree blown over but N E tree standing green pon these he sets the sec cor by steel chain and marks New B.T. Viz

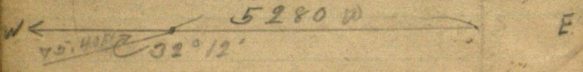
Harold J. Curo

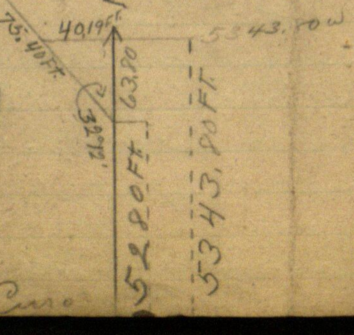
135-28
Lake Edwards Twp.

1+7

Apr. 19-1919 Continued
@ 8°30' V

J.P. 10 N 47°45' E 95.65 Ft.
" " 7 N 31°52' W 108.00 Ft.
B. Oak. 8 S 47°45' W 57.80 "
J. P. 10 S 37°18' E 57.50 "
Old B.Ts. sets Vis
J.P. N41E = J.P. N34E
J.P. S26E = J.P. S50°45' E
I then tie in my line
bet sec 28 & 33





OK check

H.S. Curo

135-28

Lake Edward Twp.

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April 19-1919 Contd

Sine .53288 x 75.40 = 40.19 Ft S

Cosine .84619 x 75.40 = 63.80 " W

5280 + 6380 = 5343.80 Ft

40.19 Ft ÷ 5343.80 Ft = .007521 Ft

S for each foot W

1 foot W goes S .007521 of a foot

453.40 Ft. W goes S		3.40 ←
862.60 " W " S	[752]	6.50 ←
1272.90 " W " S		9.60 ←
1724.60 " W " S		13.00 ←
2379.80 " W " S		17.90 ←
2640 " W " S		19.90 ←
2839.40 " W " S		19.40 = 21.40 ←
3034.40 " W " S		22.80 ←
3416.10 " W " S		25.70 ←
3689.70 " W " S		27.70 ←
4041.30 " W " S		30.40 ←
4370.60 " W " S		32.90 ←
4612.80 " W " S		34.70 ✓
5280 " W " S		39.70

Harold F. Cure

135-28
Lake Edward Township
147

April 19-1919 Continued
From the corner to sections
28-29-32-33-135-28
John W Cuno starts a line South
on 8°30' East and a line
North on 9°20' East the crew
cuts line both ways until
noon and then go to Cornelle
for dinner it rains a little
at noon but go to work and
continue line south but
not north

South between sections
32-33-135-28
@ 296.80 S Hub @ 300-600
900 stakes on line @ 935.10 S Hub
@ 1200 stake on line @ 1320 S Hub
@ 1500 sta on line @ 1557.50 Hub
@ 1800 stake on line @ 1884 center
of road bears E & W @ 1912 S
Fence bears E & W
Harold E Ott

135 - 28
Lake Edward twp.

147

April 19 - 1919 Cont.
@ 2100 sta on line @ 2390 S
road bears NE SW @ 2400 S stake
on line @ 2481.40 H whs @ 2615
enter pond @ 2640 S sta not on line @ 2655
lv. pond @ 2700 stake.
John W Curo goes to Brainerd
at 3 o'clock with a cow. I stay
with Mrs Cornell

Harold L. Curo

135-28
Lake Edwards

147

Board Sheet
Boarding with Mrs Connell

April 1919.	17	18	19	20 Sun	21	22
John W Cuno	–	–	D	O	–	SL
Harold J Cuno	L	SL	SL	SL	SL	SL
Everett H King	–	S	D	O	D	–
C H Dandarell	–		D	O	D	D
Nels Christensen	–	S	D	O	D	D
Geo Dike	–	–	–	O	–	D

Book From Page 18 and 20
Small book No 1. and
Carried To Page 24 of
This Book

13.5 - 29
Lake Edwards twp. Road Surveys

147

Time Sheet.

April 1919 no over time

	18	19	Sun 20	21	22	23	24	25
John W Cuso	-	1	0	-	-			
E & P.	-	-	0	-	-			
Harold J. Cuso	1	1	0	1	1		= 4	
Chas E. Dandanell	-	1	0	1	1			
Everett H. King	1	1	0	1	-		= 3	
Nels Christensen	1	1	0	1	1			
Christensen Team	-	1/	0	-	-			
Kings team	-	-	0	-	-			
King car	-	-	0	1/2	-			
Dandanell car.	-	-	0	-	-			
Dandanell team	-	-	0	-	-			
J. Dell Cornell	1	1	0	-	1			
Wm Dike	-	-	0	1	1			
Cornell Team	-	-	0	-	1/2			

Brot From Page 19. Small Book No 1 - Carried To Page 25. This Book.

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135-28

Lake Edward twp

April 20 1919 Sunday
Do not work as it is
Easter Sunday. Mrs &
Mr. J. D. Cornell go Yes-
day I go fishing and
get a bullhead get ready
to go fishing after supper
but as it was time before
I could get ready do not
go. John W Curo at Brainerd

Survey Record
No 147

Harold L. Curo

135-28
Lake Edward twp

147

April 21. 1919 Monday
King brings Dandanell
over with his car and
Christensen drive over
with horse & buggy
J. B. Cornell does not
work but Geo. Dike takes
his place we continue
line South between 32-33
135-28 beginning @
2700 S @ 2927.60 S Hub
@ 3000 sta on line 3110 ent
swp. @ 3250 Lw swp
@ 3300-3600 stakes on line
@ 3832.25 south Hub. @
3900-4200 south stakes on
line @ 4351.55 Hub @ 4300
stake on line @ 4503 center
of road bears NE & SW
@ 4653.70 S Hub.

Harold A. Cano

16

13 7 28

Lake Edward twp.

April 21 1919 continued
@ 4800 sta not on
line @ 4903 sta not on
line look for M.C. but do
not find them US Notes
call for.

White Pine 24 N 7 W 46 : 303
" " 25 N 28 W 67 : 4492

go to dinner and it
rains all afternoon

John W Curo went thro
on his way with EC Bain to
plat Gull Lake Townsite

147

Harold F. Curo

135-28
Lake Edward

147

April 22-1919 Tuesday
Harold J. Curo ⊼ r ch
Nels Christenson ch r a
C.E. Handanell F/g r a
Dyke - and Cornell a
King not working
Christenson sent his horse and buggy
Cornell took his big team and whole crew
Beg @ Hub 1320 So
turn 90° to random and run
West line cen of N ½ of sec 32 T135-R28
Chaining perfect 300' ch
Stakes all lined with transit
300 - Stake
572.70 Hub
600 - 900 - 1200 - Stake
Harold J Curo

135-28
Apr 22-1919 Enid
147
West
thro cen of N½ Sec 32
random line
1320 Hub 1500 stake
1550 wood SW NE
1800- stake
2050.10 Hub 2100 stake
2400 stake 2640 Hub
Turn 90° L. random and
run
North random N 0°
Cen line thro
N½ of N½ Sec 32
300-600 stake
757.70 Hub 900-1200 stake
1320 Hub both for
¼ Cor
Ret 29-32-135-28
where US mole call for
BP 10S 40W 23=
BPG N 33W 14=
Harold J Cain

135-21

Apr 22 - Contd 147

we do not find them and
come back to Cor
28-29-32-33-
Backsight South on
random line Transit
telescope turn
50 minutes Left and
run on 9°20' for
North random bet
28-29
144.60 Hub 300 - stake
450 N. enter open meadow
SW-NE 600 - 900 -
1200 stake in meadow
all on line
1291 N fence E-W
1500 stake in meadow
1700 Lv meadow E-W
1800 Ƶ wood E-W
1831.90 N. Hub
Quit for night

Harold J [illegible]

147 135-24

April 22-1919- Cont'd
All drive home to
Cornells for dinner
Landmell paid Mrs
Cornell 40¢ for dinner

John W Cuss arrives
from Brainerd in his
Ford about dark and
stays over night with
Cornell No supper

135-28
Lake Edward

147

April 23-1919 Wed

King and his team come with
Standanell and Dike
Harold Cuno ⊼ Abel Cen-Gurley.
John H Cuno Flg & Ch
King - Dike and I on
Beg @ 2640 W corner
Grant line
West. random thru
cen of N. 1/2 Sec 32-135-28
2665 Road NE-SW
2637 cross Fence N and S.
40 Ft N. of & E and W. Road
at gate where they say is
a stone mon but I refuse
to use it till I check it
2700 stake on line
2988 W Same road NW-SE
3000 stake on line 3300 stk
on line 3351.50 Hub
3381 W. Pole Fence N and S.
John W Cuno

135-28

apr. 23-1919-Cont'd

3600 Slake in plowed field
3882.90 Hub E. of pig pen
3890 Slake E of Hog pen
3900 Falls in Hog pen
3910 Slake W. of " +290 -
4250 " on line in field
7 FT N of E & W Fence
4321. Cross N and S Wire fence 3 FT N of SW Cor post
4394.80 Hub
4500-4800 Slk on line
4948.90 Hub
5100 Slk on line
5280 W. Small Hub E edge small swp

We then walk 1/4 mile N and find Sec Cor and go to dinner All except Mike take dinner with Mell Connell.

John W Cuno.

135-28

April 23-1919 Contd

147

PM

at Cor 1f 29-30-31-32

135-28

US Notes call for

Nor Pine	22	S	70°	W	85 Lks =	56.10 Ft
" "	18	N	79°	W	126 " =	83.16 "
" "	22	N	25°	E	18 " =	11.88 "
" "	20	S	17°	E	106 " =	69.96 "

We find all four stumps all marked "B.T." except the SE one which is badly burned.

We also find a big hill stake very old 6" square and 6 feet tall and a good fence running N and West.

I find that all of the measurements are away short so I set a hub & took for the true corner from the N.E. stump

for Cor

Board Sheet
Lake Edward Twp
Brot From Pg 12.

April 1919

	23	24	25	26	SUN 27							
Boarding With Mrs J O Cornell												
John W Coro	DB	DB	B									
	SL	SL										
	DB	DB	B									
Harold J Coro	SL	SL										
C.E. Vandamell	D	D										
Everett King	D	D										
Nels Christenson	-	D										
Geo Dike	-	-										

147

Time Sheet

135-28 Lake Edward Road Surveys

April 1919.

Flat Time - No Overtime

	23	24	25	26	SUN 27				
Brot From Page 13. This Book									
John W Curo @ $10.	1	1							
Expense	-	-							
Horold J Curo @ $5.	1	1							
C.E. Dandanell	1	1							
Everett H. King	1	1							
Kings Team	$2	$2							
" Auto	-	-							
Nels Christenson	-	1							
" Team	-	-							
Geo Dike	1	-							

147

apr 23-1919 contd 147

after which the NE stump and SW stump check perfect for course @ 9°30' Var but the distance to the SW stump is away short

Viz

Old NE BT. bears N 25° E 11.88 ft = 11.88 US

" SW BT. S 70° W 50.10 ft = 50.10 US

" NW BT. N 78°25' W 71.60 ft (and (should be N 79° W 83.16 US)

Old SE BT. is S 16°20' E 65.30 ft (should be S 17° E 69.96 ft US)

New BTS Viz

JP 6" N 45°20' E 26.80 ft

Oak 6 N 66°40' W 28.15 ft

Old big Stake N 49° W 3.30 ft cor

SE Cor Post of fence NW 1.18 ft is closest rock

Note on need of attraction of wire fence the var reads only 7°50' E. but I get

9°30' E

the line magnetic variation
after I set transit on the
first hub 600. ft South
where the needle reads
9°30' Run
South Bet 31-32
135-28 var 9°30'
@ 200-S stake N. edge
wet bog 475 L.V Bog
500 stake 600 Hub
617 Cross main E+W road
900 stake 1100 cut small
lain swp 1200 stake in
swp
1249.90 Cross our tran-
sit line coming from
the East at about
53 70 West
@ 1320 B. set 2x24" QP
Hub L.V bog
1468. S Hub 1500 stake
N.W. cor

stakes not on line

135-25

Op. 23-1919 Cont'd

147

1800 Stake 20.43. 90 Hub
2100-2400 Stake
24.74. 30 Hub 2600 Stake
26.40 Hub
26.56.00 S. corn good
E and W-wire fence at
about 11 ft west of a
small stake under fence
At this point the
¼ bet 31-32
calls for:
Oak 10 S 79° E 104 Lks = 68.64 ft
NP 20 S 70 W 173 = 114.18 ft
We cannot find the
old B.T.S and there is
no post but a new B.T.
stands SW being 14" up
marked 20 years ago about
As the E & W fence
runs E & W as far as we
can see and as this
agrees

Stakes not on line

135-28

Apr 22 - 1919
Cont'd

147

is a new fence a few
year old built E & W
over an old fence maby
25 years old I will
call this fence the limit
for my 1/4 Cor as to N & S
and will take just my
1/4 Cor under this fence
some place

We only need the
"length" of the line
for our purpose now
so will pass this
survey up on Q.S. till
some future time

Quit for night
Harold and I still at
Cornells

John W Cress

135-28
Lake Edward Twp
147

April 24-1919 Thursday
Christiansen comes with one horse and leaves it with Cornell.
King brings his team to haul survey crew and Dandanell comes with him Harald Jensen & Dandanell correct the line a mile E & W bet Secs 28-33
and drive hubs & set lath & stakes marked "Road Center-Sec Line"
as given on Page 9. This book
Note:-
At the 1/4 Cor on this line US Notes say
BP 8 N 43 W 22 Lks =
" " 8 S 64 W 15 " -

147

apr 24-1919. Cont'd

We do not look for these Nor put in any corner but simply correct the mile straight

J W C- with Christensen and King drive West and go 16,

1/4 Cor Bet
32-33 135-28

where US Nails call for:
BP 7S 9W 134 = 88.44 Ft
NP 12S 33 1/3° E 84 = 55.44'.

We find the stumps of the 12" norway pine badly burned but we are so sure it is the correct stump we run N 33 1/3° W 55.44 where we set a 3x3x36" J P stake @ 10°20' var. which is the true course of the line

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135-28

apr 24-1919. Cont'd

147

looking North.

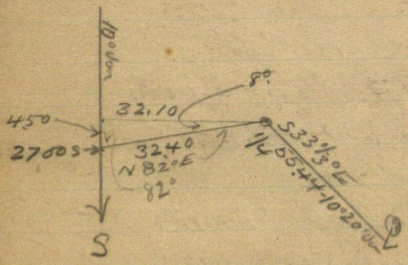
The random line here runs
10° E Var

No line to put in BTS.

Ft 2700 S th

¼ Post 32-33-135-28

sets N 82° E 32.40 Ft.



82° 00'

Sine .99027 X 32.4 = 32.08 E

Cosin .13917 X 32.40 = 4.50 N

Ft 2695.50 S th

¼ sets East 32.10

135-28

Apr 24-1919 Contd 147

Going North to 1320 S. mon
chain 30 ft to 1350 set
hub & tack run
N 82° E 16.20 ft and set
N 1/16 Cor Bet Secs
32-33 drive 2 x 2 x 36
pine stake for line 1/16
No line for B.T.S.

At 1347.75 S the
1/16 bears E 16.05

2695.50 into 32.10 .01190

1347.75 into 16.05 = .012

Corecting
South Bet 32-33-135-28
296.81 = 3.56
300 S. gave East 3.6

600 " " " 7.20

900 " " " 10.80
935.10 11.22
1200 " " " 14.40
1320 15.84
1347.75 " " 16.05

April 24-1919 Cont-d
Harold corrects this 1/4 mile alone while I go with the town Board to try to establish the corners along the two miles of line bet
26-27 and 22-23-135-28
At MC on North side of lake (Lake now drained and partly dried up) bet 26-27 we find a tall pine stump with the B.T. marks showing plain on South side
At this point US Notes call for
BP 10 N 24 W 30
" 12 N 43 E 65
This is the N? stump
and I take ties to the face of the BT marks on So side O.K.
NP 20 NW 43.20 to side not marked
Oak 15 E 54.70

135-28
Lake Edward

147

Apr 24-1919 Contd

22-23-26-27-135-28

as gone so we with West 1/4
1/4 C. on E. side of lake
Bet 22-27 US Notes call for
BP 8S 20 E 108=
NP 14N 82 E 152=
We find the stumps of the
S lies plainly mkd
BT. then go North 1/4
1/4 Cor Bet 22-23
where US Notes call for
BP 6N 32 W 168= 110.88
Oak 6N 52 E 108= 71.28
We find the stumps of the
NW BPins plainly marked
but we do not omit to set the 1/4
We also find one B.T. stump
on N side Lake Edward but
go to Henry Hoff's place and
call a meeting to pay for the cut
John W Cain

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135 28
Lake Edward

147

Apr 24-1919 Contd
Road Petition

Lake Edward - - established and laid out Beg @ SE Cor 28. West 1 mile bet 28-33: N ½ mile bet 28-29

Beg again @ SW Cor 28. South 80 rods bet 32-33 - West on ¼ line 160 Rods to connect with a road at this point

August Halskeit
J D Cornell - Geo Dike
Chris Fritz - Fred W Larson
Geo Cassette - Joseph Tutch
Ed Tutch Filed June 17-1918
H M Haff Clk

Nels Christiansen Box 33
Merrifield Minn

135-28
Lake Edward Twp

147

April 24-1919 Cont'd
Town Board met @ Hoffs
and we payed the crew & left
that they held back 3 days $30.
of my money and the Comells board
Bills Paid today are
John H Cuno @ $40. $50.00
Harold J Cuno @ $5. $55.00
Chas E Handanell
Everett H King
Nels Christiansen
J D Comell
Geo Likes
J D Comell Board
Mrs C E Handanell Board
Harry Handanell
Smalwood board bill bill breakfast between
Back to Comells for supper where
I take my Car and Harald and go
to Geo Rardins for over night

135-28 Lake Edward

147

May 27, 1919 Tuesday

Go to Dandanell from Geo. Raidon in Curo's ford. we have dinner with Dandanell and then John W Curo Chas. Dandanell and I go with Curo ford to the N E Cor of sec 22 where J. W. Curo shows me the corner he put in a year or so ago. we then drive one mile south and leave the car and go west bet. sec 22 & 27 to M C. on East side of lake. where U.S. Notes call for.

Blk Pine 8 S 20 E 108 - 71. 28 Ft.
Norway " 14 N 82 E 15-2 - 100.32 "

we find the S E stump and set the Cor. we then go to the

Harold L. Curo

135-28
Lake Edward

May 27, 1919 Comnt.
¼ cor bet. sec 23 & 26 where
U.S notes call for
Norway Pine 8 N 17 W 63-41.5 Ft
we find it plainly marked
and set ¼ cor. Dandanell
walks home & John W Cuno
and I go to Nels Christensens
he is gone so tell his wife to tell
him to get me in the morning.
on his way to work at J. D.
Cornell we then go to Cornell
but as they are looking for
company they can not
Receive so I go to Longs
for supper an J. W. Cuno.
go to Brainerd

147

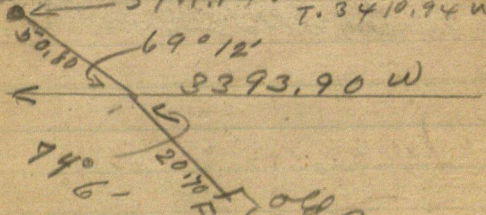
Harold S. Cuno

40 133-29
Lake Edwards
147
May 28, 1919 Wed.
do not see Christensen
when he goes by so
he goes to Connells and
comes back for me and
we go to the ¼ bet 23-
26-133-28, and run West
bet 23-26 at 4.9° East
Crew as follows
Harold J. Curo ✕ + ch. 300 ft.
Everett King ch. & ax
Chas Dandanell flag & ax
Nels Christensen ax man.
@ 300 sta, not on line
@ 404.60 W Hub.
@ 600 sta not on line
@ 843 old road, bears N & S
@ 900 sta set with transit
@ 1200 " not set with "
@ 1259.15 Hub.
@ 1272 Fence N & S
@ 1500-1800, 2100 sta on line.
Harold J. Curo

133-28
Lake Edwards
May 28, 1919

147

@ 2424.30 W Hub.
@ 2595 W Fence bears N & S
@ 2640 W center of main road
Lake on line
@ 2654 Fence bears N & S
@ 2700 sta on line
@ 3000 sta not on line
@ 3014.90 W Hub in field
@ 3300 sta not on line
@ 3393.90 west corner
as follows



Dinner at James Christensen pays for my dinner & his
King & Donaldson bring dinner
Harold F. Cuno

42 135-28
Lake Edwards
May 28, 1919 147
We go in King car to
the NE Cor of sec 22 and
run South @ 300 600
900 sta not on line
1200 1500. 1800 set with
transit 2023.705 Hub.
@ 2100 sta not on line
@ 2400 2640 3000 3300
& 3600 sta on line 3900 on line
@ 3962.50 Hub.
quit for night
supper at Longs

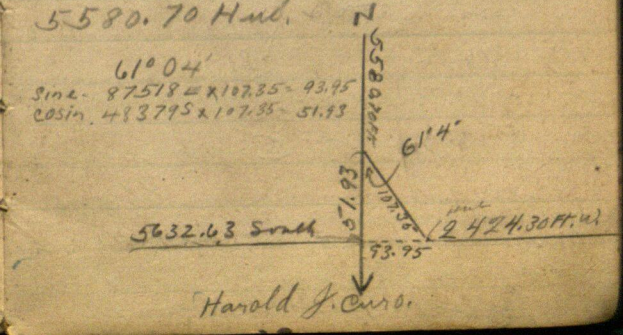
Harold L. Curd

135-28
Lake Edward Twp.

147

May 29. 1919 Thurs

King does not come but sends H. M. Hamilton in his place Christensen comes after me @ Longs and we drive to the con to secs. 22-23-26 & 27 135-28 here we meet Hamilton & Dandaneau we begen at ~~hub~~ 3962.50 and continue South @ 4200 - 4500 - 4800 - 5100 sta on line @ 5256 enter field @ 5280 sta on line 5400 sta on line 5675 in field 5580.70 Hub.



Harold J. Curo.

135-28

Lake Edward Trip

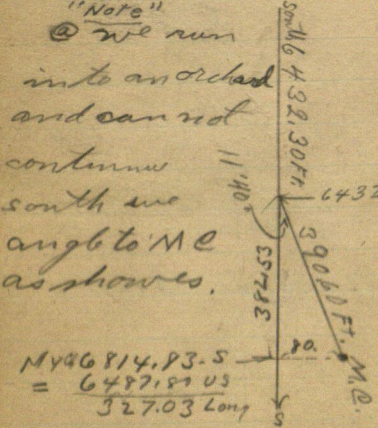
May 29th 1919

5622 fence E & W

5700-6000 sta in field on line @ 6105 fence bears NW & SE @ 6300 sta not on line @ 6347 S Road NW & SE @ 6432.30 S Hub.

"Note"

@ We run into an orchard and can not continue south we angle to M C as shown.



From M. C, we start a new line South on main road @ 300. 600. and 900 stakes on line in Harold & Cuo

135-28
Lake Edward Twp. 42

147

May 29, 1919,
center of road set a hub
on hill but do not chaine
to it as have not got time
as the town board does not
want to do any more work
so take the straight for
Brainerd have dinner
out.

Harold F. Curo

Time Sheet
Lake Edward twp
13.5 - 28

147

	May 1919				JUNE 1919		
	Tue 27	Wed 28	Thu 29	Fri 30	Sat 31	Sun 1	Mo 2	3
MAY 1919.								
John W. Curo	1	-	-	½ AM	-	0	1	
Harold J. Curo	½	1	1	-	-	0	-	
Everett H. King		1	-	-	-	0		
King Car.		1	-	-	-	0		
Nels Christenson		1	1	-	-	0	1	
Christensen team		1	1	-	-	0	1	
C E Vandanell	1	1	1	-	-	0	1	
H. M. Hamilton			1	-	-	0	-	
Curos Car.	1	-	-	5	-	0	1	
C. P.	6.32	-	-	-	-	0	-	

Board Sheet
135-28, Lake Edward
May 1919

Boarding with Mrs Dandenault
May 1919. June

	27	2	8	29	2
John W Curo	D				D
H. J. Curo	D				

147

Boarding with Mrs Long S.S.

	27	28	29
May 1919			
Harold J Curo	SL	SL	D

Boarding with Christensen

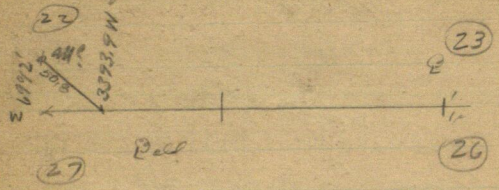
	27	28	29
May 1919			
Harold J. Curo		D	

Lake Edward
135-28

147

May 30-1919

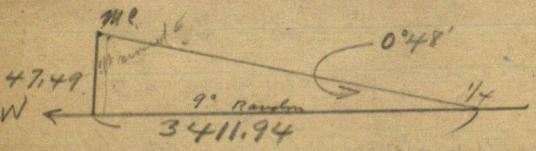
Figuring Corrections



69°12'

Lin = 93483 × 50.8 = 47.49 N

Cosin 35511 × 50.8 = 18.04 W



At 3411.94 W the MC is N 47.49 ft

To make a straight line E & W would be .01392 of a foot North for each foot West = 0°48' R.

May 30 1917
Signs corrected 1/2 day

Correction 147

Adj to E & W

948.42 + 2632.08 = 3580.40

US = 3411.94 my Chain

3580.40
3411.94
168.46 short

3580.40 into 168.46
= .04705 of a foot East for each foot West

Temporary Sec Cor @
2632.08 West gives East
123.84 To 2508.24 West
Then North 34.91 To place
where we may set Sec Cor
which would be on a Straight
line E and W.

From MC North to this
Cor would be 8000 —
6170 Lks
1830 Lks

= 120.80 Ft US
= 121.11 my Ch via Random

13528
Lake Edward

May 30-1919, Friday Cont'd
I figure Corrections assisted
by Harold

147

135-28
Lake Edward

147

June 2-1919 Monday

Lv home in Ford @ 7-30 AM
Call @ Mrs A.P. Long's
Summer house at Merrifield
and have her sign Harald's
board acct = 5 meals 2 beds
@ 50¢ = $3.50 See Pg 47

Find Christiansen
@ Cor to 22-23-26-27 - where
we lie his horse and
run my Ford a mile north
and on this mile appears
to be nearly 30 ft low
long - count the stakes
back a mile south
and find them O.K.

South

But see 22-23 135-28
following Harald's Hans's
line @ 2176.40 M.C. on
N.W. side Lake Edward
2,176

13528

June 2 Lake Edward 147

the US notes give this as
2090.88 US ch - 2176.40 my ch
being 85.52 ft too long
MC US Notes call for
BP 8N 50°W 85 Lks = 56.10 Ft
" 8N 7½ E 143 " = 94.38 "
We find the stump of
the N E line standing
5 ft tall - plainly from
which I set a circle of
pins across our random
line 94.38 Feet from face of
stump
See measurements above
Chain bal of mile S
then walk
West
Oct 22-27 - We set the
temporary MC stake
1 foot East See Page 48
so as to make the one

135-21

147

June 2-1919 Contd

remaining BT Stumps

found O.K. for course

S 20° E Turned from th

line line East

and mark new BTS viz

NP 14 N 79° 35' E 119.55 Ft

Oak 9S 25° 15' E 68.95

Old BT. Stp S 20° E

Var about 9°

Became we set th MC.

1.00 ft East it will change

our figures slightly

See Page 41-48.49

From Hub 3393.90 W

the new MC bears

N 69° 20' E (W) 50.80 ft

Correcting

Ft 2508.24 W set we run

North 90° to random 34.91 ft

Then East 0.74 ft a post

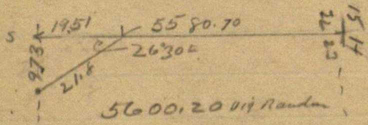
June 2 1919 Contd 147

or at 2507.50 West were run North 34.91 ft and set Hub for Temp Cor to secs 22-23-26-27-135-28 which may be the true Cor See Page 49.

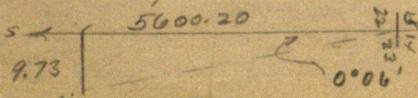
Then with transit on random Hub 5580.70 S the Temp Cor bears S 26°30'E 21.80 ft

26°30'

Sine .44620 × 21.8 = 9.73 E
Cosin .89493 × 21.8 = 19.51 S



At 5600.20 South the Temp Cor to 22-23-26-27 bears East 9.73 ft



Correction = .00174 E

135-28
Lake Ed

147

June 2-1919

Correcting back Nadl.

for trial line = .00174

Hub 2023.70 S		gain E	3.52
" 2764.10 S		" E	4.81
" 3000.00 S		" E	5.22 ✓
" 3000.00 S		" E	5.74
" 2900.		" E	5.05 ✓
2100	S	" E	3.65 ✓
2400	S	" E	4.18 ✓
5100	S	" E	8.87 ✓
4800	S	" E	8.35 ✓
4200	S	" E	7.31 ✓
2023.70	S	" E	3.51 ✓

56

13528

147

June 2nd 1919 Contd

147

Old Notes

Notes copied from a loose leaf
I found in this book Dec 7-1919
viz ewio

BP8N 7½E 143 = 94.38
Bears N 8°30' E 94.38 ft
old BT. Stump
New BT.
P. Stumps 7 N 56°08' W
68.83 turned from line
line @ 7°30' va

(Note: New BTS at MC. bet 22-23 ewio

At MC No
Oak 15 N 71 E 49.40
NP 18 N 39°10' W 62.00
(Note: MC. Bet 26-27)

ewio

147 alidade cont'd

135-28

~~5580.70S Sec Cor Sec~~ ~~S 26°30'E 2482 = 5200.23~~ -9.8

and 22.50 N of E & W fence

(Hali en 22-27-26-27)

alid.

JP 14 N 51°08'E 26.15

JP 6 N 51°08 W 17.05

JP 5 N 79°15'W 29.86

JP N 31°40'W turned from line line

~~Oak N 64°40'E 50.50~~

85.50 N of Hub 3000 S.

and 16 ft E of E road

(Hali 1/4 Bet 22-23

cms

Aliquots cont'd 147

C 1/4 22-23-135-28
Oak 10 N 62°05' E 65.85
J P 8 N 49°08' W 68.85

A 2177.60 S6 to M.C.

1.93485

150 135-28
Lake Edward Twp

March 25-1920 Thurs.

Copy notice and Ld Bal
2-30 P.M. RR. Force to Merrifield
32° Walk out to farm of
V. H (Herb) Keller owns
W½ (except Lot 3) Sec 36
T135 R28 = (233.49 Acres
P.O. Merrifield
Trustee Lake Edward Twp
3 years.

Nels Christenson Ch. 1 yr
Owns NE NW ¼ and NW NE Sec
1 T134 R28 and Govt Lot
8 Sec 36-135-28. Lives S.
side Campbell Lake P.O.
Merrifield.

Perry W. Hollingsworth
Trustee 2 years P.O. R#5
Brainerd Minn. Owns
S½ NW¼ and Lots 4 and 5.
Sec 11 T135 R28

62

= 150

Mar 26-1920 Friday

Christenson and Team. Russell T. Keller (15) all take Lunch from home Hollingsworth eats dinner with Mrs Keller and Schroeder hitches his horse and buggy.

Work transit on line stake West half mile bet 16-21 PM

all go to M.C. bet 29-30 N of 24 US Naval say:

NE 10 N 37 W 35 - 23.10 pt

NW 16 N 36° E 48 - 31.68

NE line standing green plainly marked NW. gone - stump 6 or 8 ft low far away not mkd. NC.

We find a wood stake mkd MC. which checks perfect to old N. E-13 T at 8°45' W.

We mark old stake 2 inches west to check and make new

Nov 26-1920 Friday
135.28

B.T. Obj NP5N 71°53'W 38.20
6x6 Cement block bears
2 ft N and 3/10 ft West
Mk. set 15 ft. N of walks
North bet 29-30 @ 8.45'
40.30 ft E of old US road E-W
150 Hub 108.04 old hub & Tack
300 plate 407.1 Cen of
6x8 Cem Mon set for Cor
19-20-29-30 T13S R2E.
Top of monkey wrench in Cement
US Chain calls for 407.22 ft
Cent Check - call it O.K.
Some One set ther Cem Mon
which I call O.K. for Cor
US Vales call for 11°30'
NP 25S 13W 73 = (48.18) ft.
NP 16 N 40W 190 Lks (= 125.40')
We do not stop to look much
all are burned. We accept
Cem Mon as O.K. for Cor.

135-28

Mai 26-1920 cold

From M.C. run straight line
thro Cor 19-20-29-30-135-28
Chain from Sec Cor
North bet 19 and 20 N 8°45'
Enter Cranberry bog
300 stake in bog 150 E. of
solid land Bog stretches
1000' E @ 600 stake in
bog 200 ft E. of solid land
890 Lv Bog NE-SW. 900 stake
1043.6 N. Hub 1200 stk
1448. well traveled road NE
and SW 1500 stake 1800 stake
Quit for rib- home late
work on field notes
3 Hrs over time = $2.79
Jennie Keller comes home
from Brainerd - Miss
Stanley Teacher goes home to
Bud

Johnill Oneo

Lake Edward Twp

150

Mar 27-1920 Sat

Some creek Continues

North bet 19-20 @ 2085.

& road NW-SE; 2100 stake

No stakes on line; 2237.7 Hub

2400 stake; 2472 Hub

2700 " 2717.5 "

~~2895.9 Hub; 3000 stake~~

~~3050 N. Boy E+W~~

2717.50 Cement Mon with 1" pipe

4' long sets East 1.4 ft

1/4 Bet 19-20-135.28 US Meas

NP125 10E 18 Lks (= 119.46 FT)

" 145 22 W 125 " (= 82.50 ")

All burned. Big Boy lies E = 8 A'

2895.90 N. Hub; 3000 stake

3050 point of big boy (dry)

on creek West 100 ft

3150 Lo boy; 3300 stake

3338.70 Hub; 3483.60 Hub

3600 stake; 3690 Road NE-SW

66 (66)

135-28
Lk. Edw

Mar 27-1920

150

3950 stake - enter E. end of
slim narrow bog - extends 50 ft
E. and 600 SW. : 3950 Lt
Marsh about 150 ft wide average.
4171.90 Hub Cem Mon sets E 3.10 ft
4200 stake : 4313 Road NW-SE
4370.8 Hub ; 4500 stake :
4674.7 ℄ M & I R.R. NW-SE
4800 stake in S.W. Cor of old field
4879.55 Hub W. Edge old field
5100 stake : 5400 stake : 5426.30
Hub - Cem Mon sets E. 4.90
5553.10 Hub. Var reads 8°30'
5700 stake : 6000 stake : 6000.3 Hub
6031.50 Forks of main road
bears W-E and SE (3 roads)
Set hub 600 N + Quit for nite.
Dance at Merrifield : E.J. Gasink
2514 Dupont Ave N
I work till 11-30 PM on notes

150

Mar 28-1920

Sunday

We plan on working today but it fails to rain then turns to snow Nels Christenson and Jennie pick up I and Herb Keller and get as far as Merrifield (almost) then turn back home.

Ruth Anderson stays with Jennie and Hazel Keller

Begins to snow hard about noon and turns into blizzard 6" snow then loaded

Board Sheet — Late Edward Twp

Mar 1920	25	26	27	SUN 28	29	30	31	Apr 1	2	3	SUN 4	5	6	7	8	9	10

With Mrs V. H. Keller @

John W Cure	D S	L	B D S	L	S	L	S	L	B	L	S	L	B	L	S	L	B	L	S	L	B	L	S	L	B	L	S	L	S	I

With Mrs Dave Shrader @ 50¢ Dinner

John W Cure	–	–	D	–	D	D	D	D	–	–	O	D
P W. Hollingsworth	D	D	SUN	D	D	D	D	–	–	O	D+
Nels Christenson	–	–	D	O	D	D	D	–	–	–	O	D
Bud Keller	–	–	D	O	–	–	–	–	–	–	O	D
Herb Kuler	–	–	–	O	D	D	D	D	–	–	O	–
Albert Christenson	–	O	–	–	–	D	–	–	–			

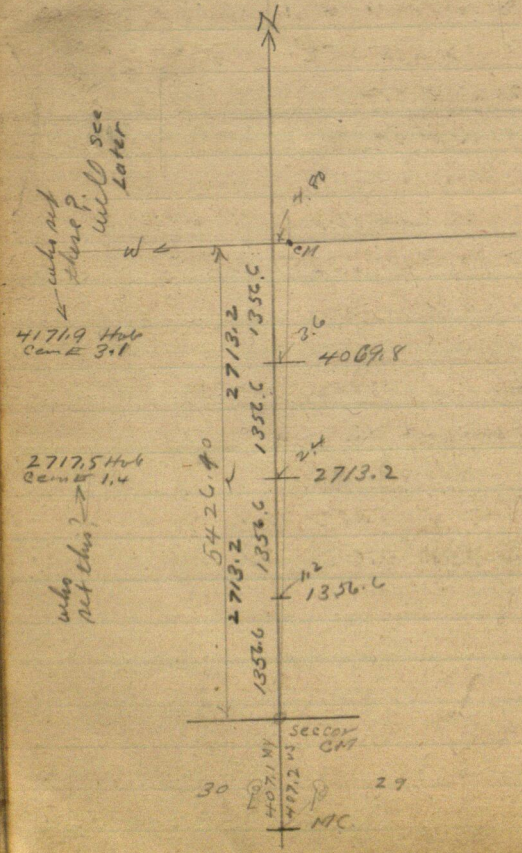
150

Time Sheet

Mar	25	26	27	SUN 28	29	30	31	1	2	3	SUN 4	5	6	7	8	9	10
John W. Coro	1	1	1	0	1	1	1	1	–	–	0	1	1	1	1		
EXP	RR 32'	–	–	0	–	–	–	–	–	–	0	–	–	–	9		
Nels Christensen	–	1	1	0	1	1	1	–	–	–	0	1	1	1	1		
Team	–	1	1	0	1/2 AM	1	1	1	–	–	0	1	1	1	1		
Perry W. Hollingsworth	–	1	1	0	1/2 AM	1	1	1	–	–	0	–	–	–	1		
horse and Buggy No Pay	–	?	?	?	?	?	?	?	–	–	0	–	–	–	?		
Russell T. (Bud) Keller 15	–	1	1	0	–	–	–	–	–	–	0	1	1	–	1		
V.H. (Herb) Keller	–	–	–	0	1	1	1	1	–	–	0	–	–	–	1?		
Albert Christenson	–	–	0	–	–	–	1	–	÷	0	–	–	1	1			
Wm and Floyd Gaidk No pay				0							0		1	–	–		
Isaac Van Doren														1	–		

160

Mar 29-1920 Monday



US Nalis

Aft Cor Ic 17-18-19-20-135-28 US Nalis
Bay. Oak 6S 28E 59 Lks (= 38.94 Mt)
BP 6N 86E 51 = (= 33.66)
" 10N 43W 8 = = 5.28
" 6S 31W 14 = 9.24
North Bet 17-18 V 10°50'
3150 M.C. NP 16S 9E 193 (=
NP 30S 19W 154 (=

Wet bet 18-19- V 11°30'
1070 marsh - 1650 Lv
3162 M.C.
NP 14N 6W 120 (= 79.2)
BP 6S 75E 76 (= 50.16)

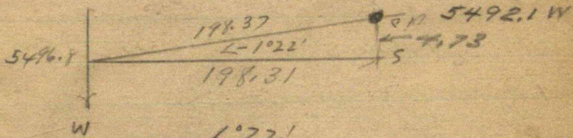
¼ A.T. 17-20-135-28
BP 10N 30W 18
" 10S 52W 33

150

May 29-1920 Monday Cont'd
Storm over- Nels C & Leam
Herb Keller and John W. Cure
Beg @ Cor. 16-17-20-21 - 135.28
C.M. Bore right about E. on line
line and run along picket line
previously cut by Town Board
West bet 17 and 20 random
All stakes set every 300 ft
on line with Transit
300-600-900-1200 stakes out boy
1450 to 1500 ath; 1658.3 Hub
about 1700 cut road SW
1800-2100 sta: 2239.9 Hub NE
2400-2700 " 2816.2 "
At 1/4 bet 17 and 20 U.S. Naile Cut for

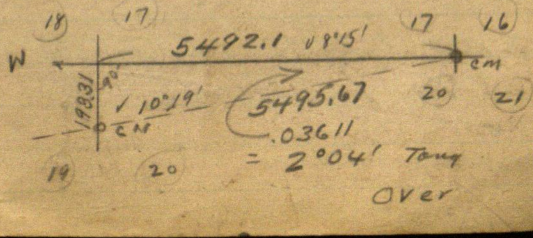
We do not look for these but
continue West
3000-3300-3600; 3708.9 Hub
3900; 4040 road N.W. S.E

4200-4500-4800: 5160
var made 8°15' E
5240 road N & S
5400 slide: 5496.8: Hub
almost on N & S corner
From which C.M. bears.
S 1°22'E 198.37 ft



1°22'
sine .02385 × 198.37 = 4.73 E
cosin .99972 × 198.37 = 198.31 S

At 5492.10 W C.M. at Cor.
17-18-19-20
bears South 198.30 ft



Over

135-25E
Lake Edward Twp

Mar 29 1920 Cont'd

150 2°04'

Sine 03606
Cosin 99935 mks 5492 = 5495.67
feet Via line line bet 17 and 20

Correcting Bet 17 & 20

.03611 S. for each foot West

300 W gave S°	10.82
600 " " "	21.64
900 " " "	32.45
1200 W gave S	43.27
1374.2 W gave S 1°22' E 49.6 To E 1/16 Bet 17-20	
1500 W gave S	54.09
1658.3 W " "	
1800 W " "	64.91
2100 W " "	75.73
2239.9 W " "	
2400 W " "	86.54
2700 " " "	97.36
2748.4 W. gave S 1°22' E	99.20

To 1/4 Cor Bet 17-20 set Temporary

Mar 29-1920

150

2816.2 W goes S

3000 W " S 108.18 ✓

3300 " " " 119. ✓

3600 " " " 129.82 ✓

3708.9 " " "

3900 W goes S 140.63

4122.6 West goes S 1°22' E 148.8 ✓

To W 1/16 Bch 17 20-135-28 ✓

4200 W goes S 151.45

4500 W goes S 162.27 ✓

4800 " " " Lined in ✓

5100 " " " 183.91 ✓ ✓

5400 " " " Lined in ✓

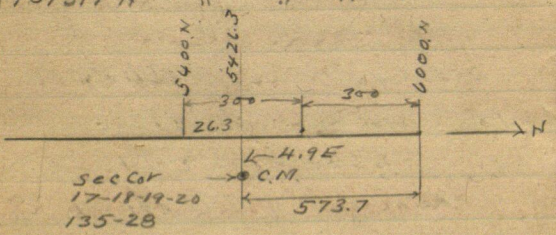
5492.1 " " " ✓ ✓

using sled

135-28
Lake Edward Twp

150

Mar 30-1920 Tues
Beg @ 6000.0 N Continue
North Rge 17-18-
See Page 66.
At 6000 S. Post this stake was
600. and set stakes every 300 ft E
6000 is 573.7 N of Cen Mon Sec Cor
@ 873.7 N Set stake mkd "900"
@ 1073.7 N " " "1100 N"
@



@ 868.9 N of Sec Cor Post Mkd "895.2"
@ 1373.7 N Stake mkd "1400"
@ 1673.7 " " " 1700"
@ 1883.7 main Road NE-SW
@ ~~1973.7~~ 1968.2 Post
1973.7 Stake Mkd "2000" N

150

in field S of Lake Bet 17-18
when US Naler Call for
2079. ft N. BTS Vig
Sec Pg 71.
NP 16 S 9° E 193 (=
NP 30° S 19° W 154 (=
All on gone Cairn flag
to be placed N. side of lake
then drive around E. end of
lake to N side where
U.S. Naler call for MC Bet 7 and 8
B.P. 8 N 21° E 15 (= 9.90 ft)
" 8 N 11° W 104 (= 68.64 ft)
Christenson finds stumps of
N.E. lines plainly marked We also
find old stake which sets
to a peggel with NE on stump
We chop out figures old NW
B.T. standing green plainly
marked but it is only 61.25 ft
away

135-28 Lake Edward Twp.

Mar 30-1920

F 150

We set a 2x2x36" oak stake for line NC. Bet 7 and 8 135-28 NEWBTS Vij
JP14N 49°55'E 69.85 Ft
JP15N 43°17'W 78.30 "
@ 8°30' on turned from line line looking South
NC. sets 1.5 ft west of our random
Stump of old NEB.T. on old NWJP bears
N10°30'W 64.25 ft being 1 Links (ft. 4 ft) short
U.S. Surveyor made 10 Lks mistake in dist to NWBT

I work half the night on vals and correction use sled.

John W Cuno

150

Mar 31-1920 Wed

Nils Cx Lean: P Hallingsworth and his horse. J & C and Herb Keller drive via Harry Hoff farm I get Twp Road Petitions roads are fallow.

Road Petition

"Lay Out" - - - Beg @ N.E. Cor Sec 21 West along Sec line of 21-20-19 until it reaches R.R. right of way" No date.

We check over West part of line bet 17-20-135-28 and cut line West

Tony Bohlke and Sec Boss

We go to N.C. West side Hubert L. bet 18-19-135-28 OS notes say

NP 8 N 8 W 16 Lks (= 10.56 ft)

BP 6 S 80 W 21 (= 13.86.)

We find the N.W. N.P. stand-

Mon 31-1920 contd

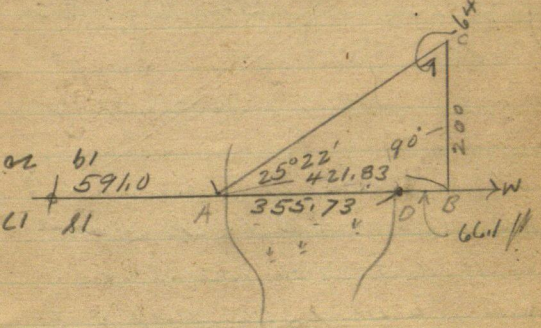
ing green plainly noted from which I chain South along east wall of Geo La Bar's Boat House and lock up News paper for line night Pt for SW-QR-13T. corner under La Bar's boat House.

We go back East and look for M.C. on E. side of lake Bet 18-19-135-28 OS Valley NP14N 6W 120 (= 79.2 ft) gone BP6S 75E 76 (= 50.16 ") "

To continue to line of 18 with S. line of 17 would hit about 2 rods So of M.C. at La Bar's Boat House. Use wagon today snow nearly gone.

135-28
Lake Edward Twp

April 1-1920 Thurs
Albert Christinson comes in place of Nels: Sam crew To get dist across bay

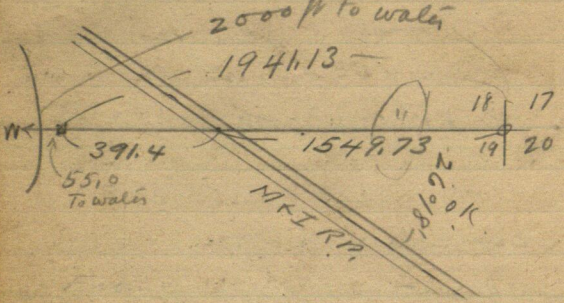


25°22'

Tang .47412
Cot 2.10916

82

150



We work transit on line bet M.C. West of Hubert Lake and Cor 1- 16-17- 20-21- 135-28 and set 4x4x32" oak post on E. bank of lake mked "Witness M.C. Recorded By Curo Sec Line" Set on top of sea wall 55. ft from water edge via sec line From this oak stake chain East along line sec line bet 18-19- @ 270.5 Hab under fence. 300 E. reach 391.4

135-28

091 150

Apl 1-1920.

Hub & N&I RR main track
456.7 Hub 3. ft from
Switch Stand in line with
H.B. 90° to Track. 600 Stake
694.2 Hub E. 900 E. West
edge of wheel track 903 &
main road N.E. and S.W.
928.3 E Hub "B"
994.4 " " "D" 10 ft
West of walnut edge of swamp

Beg @ Cor to
17-18-19-20-135-28 @ 4.
West along line line
196.30 Hub 300 Stake
516. Hub; 591. W - Stake "A"
15. ft E. of walnut
Dist bet Pt A. and B.
across bog is 421.83 ft

150

At Cor 16 17-18-19-20-135-24
find 8X36 inch "round"
set 2 years ago in plod of
iron rod and old scribed
stake:

B.T.S Cij

Old B.T. 6" J.P N 53°53' E 26.25 Ft
New B.T. 7" H 50°37' E 28.70 "
" " 5" J.P N 62°20' W 36.80 "
" " 5" Oak S 39°08' W 35.08 "
Old " 6" J.P.S 24°15 W 13.30 "
New " 4" J.P.S 45°55' E 32.80 "
Old " 6" J.P.S 80°20' E 25.70 "

Old mag-Stumps.

N 22° E 30.50 ft
N 9° E 24.10 "
N 20° W 22.40 "
N 66° W 26.70 "
N 80 W 25.20 "
and others 10 and 15 ft S W
and S.E. None noted.

Apr 1-1920

all courses turned from
Sec line looking East

The Sec line running
West turns probably 0°15' R.
of the line bet 17- and 20.

I.P. of Sec Line with ℄
of R.R. Main track called
For 0.0. Chain SE. along R.R.
@ 58.0 Head Block
16. ft Bet blocks Cen to Cen
Switch head 25.3 ft to Cen to
of stand and ℄ of main track
at 407. H.B. of first switch
483.3 R.R. X. Cen road.

Beg @ 0.0. on Sec line
Chain main line N.W.
@ 510.3 H.B.
915. East end Platform.
1000 " " Depot.
1052.4 W " "
1170 R.R. X. at Hubert St

135-28
Lk Edward

apt 1920 Contd = 150

We set the West 1/16 Cor 17 and 20-135-28 and connect the subdivision lines as given Pg 74 and 75 mked thus "V"

Very cold- Jennie Keller came from Brainard last night on train. Miss Stanley walked home to Bed after school today

Alma sends me bill of shirts by mail to Merrifield

I figure connection bill Cor at mile Road Alarm

John W Cuss

150

April 2-1920
Good Friday
Bad Storm - No work
Hazel Comer home early
morning Blaze (Ford)
I take Liam Merrifield
to Braintree 32°
Windy and snowing 2" more
Home all

Apr 3-1920 Sat Cold Home
all day in Braintree

April 4-1920 Easter Sunday
not so cold but Cold.
Bright sunshine. Wesley
Methes sewright - Mary and baby
drive down from Jackson and take
dinner - Melinda 3 P.M.

135-28
Lake Edward

April 5 - 1920 Monday
Lv Bud @ 1-A.M. 32° to Merrifield
Miss Stanley and Hazel Keller
on same train. Nels C & team
pick up I and "Bud" Keller and
go to Sec 4 - 135-28 where I
run the N Bdry Town Line
Straight from NW Cor Sec 4
East to Knutsons Cement
M.C. on West bank of Pelican
Lake and Correct the line
same as given on Page 60-61
Small Book No 1. I re-run the
mile East to the lake and using
last years Chainage
At 44.45.20 E. C.M. M.C. sets
S. .70 of a foot. at 26
4488.00 ft O.S. = 4445.20 ft My Ch
At 2614.82 E I chain S. 0.40
of a foot and set small hub for
1/4 Cor Bet 4 and 33 Between

150

T 135 and 136 N R 28 W

New B.T. S Og

NP 8" N 70° 42' W 48.15 ft (Scribed by Knutson I guess) I also blaze.
Oak 6 S 16° 40' E 29.20 ft Turned from line E & W line

~~H~~ Bud and I take our lunch for dinner and eat in John Shull's work shop. Nels gets dinner with Shull and only has 35¢ to pay him. P.M.
Shull comes out and helps us set his SE and NE Cor. Hub

See Pg 56 & 160 Book 1

At 2637.81 N. Re-Chained on my old line set line, I chain West 6.44 ft set small Hub for line Center of Sec 34.

At 1309.17 + 9.73 = 1318.90 N N I chain E 4.3

John H Curd

150

April 6-1920 Tuesday

Nels C & Team: Bud and I.
Wm Guide and Floyd Guide his son helping us No pay as they want a road to 80 on
S½ NW¼ Sec 21-135-28 Line
previously cut part way by Guide
South bet 20-21. 135-28
300-600-900 stakes on line 1036
- enter open wet bog - 1200-1500
stakes not lined 1540 Lost 1800-
2100-2400 S. Stakes lined; 2614 old
road E-W 2640 Hit Temp ¼ bet
20-21-135-28 - US wales 20;
B.P. S 54° E 8 = 5.28 Ft
BP 8" S. 84° W 97 links (= 64.02 ft) gone
@ 2700 S. stake not lined. 2740 about
M & I RR Curve NW; 2850 enter
peat Wet marsh frozen NW-SE
3000 - 3300 - stakes; 3535 Lost
3600 - 3900 - 4200 - 4500 - 4800 -
5100 - 5280 stakes not lined

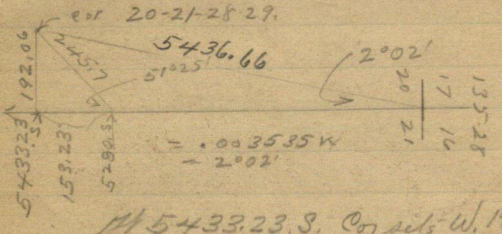
135-28
Lk Edward
150

Apr 6-1920

5280 S. Cor to 20-21-28-29
bears S 51°25' W 245.70 ft
US Notes call for:
BP 8 N 65 W 85 L (=56.10 Ft)
BP 9 N 59 1/2 E 64 L (= 42.24 ")
BP. 8 S 67 E 58 L (= 38.28 ")
BP 10 S 5 W 22 L (= 14.52 ")
We find the tall stub of broken
over S.E. J.P. Plainly marked and
stump of N.E. line not mkd
from which I chains in Cor and
set 3X3X16" Birch hub for
line Cor. SE B.T. OK @ 7'on old NE
stump N 56°15' E. Other two stps
not used. @ 2640.5 we ran
S 51°25' W 122.85 ft set small hub
ft W of RR for 1/4 bet 20-21.
3. dinners with Mrs Schrader
Dr Nelson of Bisk Melvin Gordon-Home
King want lines in Sec 101
Simmie + Mrs K to Bisk
Blanley + Kruger cook. John W. Card

150

Mp 7-19-20 Wid. Corrections



N 5433.23 S. Con sets W. 192.06

300 S. goes W 10.60

600 S. goes W 21.21

900 S " W 31.82

1320 S goes S 51° 25' W 61.40

+358.31 S. goes W 48.01 Ft N 1/16

1850 S. goes W 63.63

2100 " " W 74.24

2400 " " W 84.84

N 1/2 Mile Bet 20-21.

Nels and Albert Olson pick up Isaac VanDoren. I pay Isaac 25¢ for ferrying my life We continue last year line (See Page 19)

150

North Bet 28-29.

2150-2400 stakes 2640 found all that

2700-3000-3300-3600 set stakes found

3890 enter marsh lake NE SW

3900-4200-4500 stakes not found

4525 lv marsh lake NW-SE.

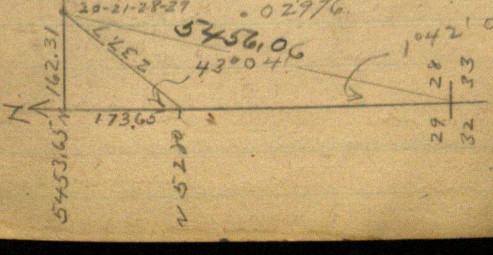
4850-5100-5280 stakes on line

4 of us take dinner with Joseph Tulch and wife. Live on Govt Lot 4 Sec 29-135-28. but also Govt Lot

PM.

At 5280 N Cor. 20-21-28-29
135-28 bears N 43°04' E 237.70 ft
Correction

See also Pg 19.



135-28
Lake Edward

150

Apr 7-1928 contd.

We correct the mile Bet 20 and 21 as given on page 92- Raised in and stakes set every 600 feet about 4 feet at places checked thus "X" All stakes marked "True Section Road Comm." but this line has really not yet been published as a road- but will be.

Jennie K. Operation on in Examined at 8 AM today At Jos Hospital then Bisie and

Miss Stanley and Miss Kroger cooking for us

Correction .02976 E

1444.60 N 600 E 4.32 ft

300 N gave E 8.92 | 600 N gave E 17.86

900 N " E | 1200 N " E

N 12½ Forest. chain N 72.41 To 1363.41

Then the S½ would be 40.60 E

2640 N gave N 43° 04' E 119.85 To ¼

Bet 28-29-135-28

150

Apr 8-1920 Thurs
3600N goes E 107.14 ft
Nels Christenson & team
Albert " "
"Bud" Keller and I
drive to the Joseph Tulich farm
Tulich goes with us
At 2640N we run
N 43°04' E 118.85 ft and
set p.p. spike for
1/4 Cor bet 28-29
over which I set transit
and after cutting out the line
Nil's & my 1/4 Cor spike appear
to be .40 of a foot too far East
At 1444.60 N I chain 4.32 E
and set tall stake mkd
Road Cor - Sec line
I work transit on line
bet this stake and the sec
Cor a mile North

150

April 8-1920

and set a line of tall
planer the entire mile
At Wire fence 12.96 N
& chain 72.41 N to then turn
90° to rt and chain
~~40.20 to 40~~
40.40 E set to intersection of
line N & S line when I
set 2x2x48" P.P. stake for
S 1/16 Cor Bet 28-29
This distance should be 40.60
ft and I cannot account
for the difference unless I
have run a 4 inch Curve
West on the center of the
mile However this is
O.K. and set I put
New B.T.S @
1/4 Cor bet 28-27
12" P.P. Stamp N 51° E 54.70 ft
10" " " N 29°51' W 94.48

135-28
Lake Edward

April 8.

150

Turned from the line line which made 7:50 a
~~Finish at 3 PM~~
Dinner with Mr Tuttle
Finish at 3 PM and drive
to Harry Hoff for
Board meets April
in my bill $110. for 11 days
Ethel Stanley and
Edna Kruger keeping house
Jennie Wellenstein - Winfield

Copy of my bill

(Engineering work in survey
March 25-26-27-29-30-31
April 1-6-7-8-1920
= 11 days @ $7.50
Use of special survey coils and
over lines on about 11 days @ $2.50
making a total of $10 each day
for 11 days = $110.

John W Cain
April 8 1920

98

135-28
Lake Edward

150

1920 Board Shut

April 7 8

With Mrs. Joseph Tutch

J. W Cura		D	D	
Nels C.		D	D	8 Meals @ 50¢
Albert C.		D	D	
Isaac Van Doren		D		$4.
Burt Keller			D	

135-28

99

150

April 9-1920 Friday

We have finished all of our surveys except the 1/4 Cor. bet 31 and 32. 135-28. We should have set new bearing trees to both of the new corners but the town board could not get time to set them

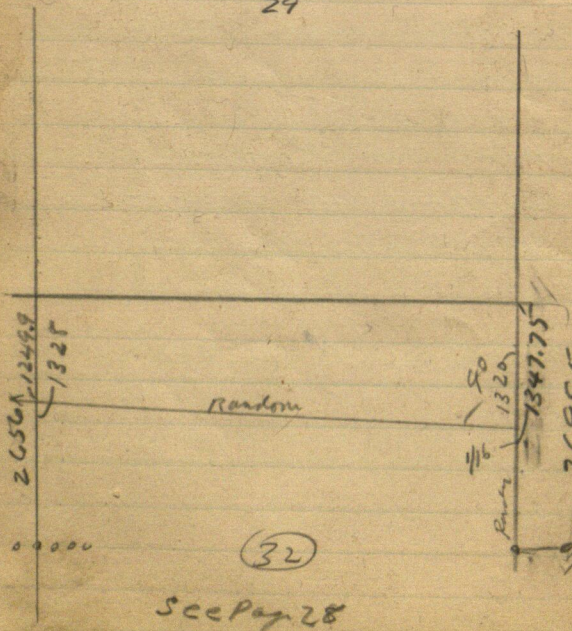
Mr. Carton

Oxatonna Mines owns E 1/2

36-135-28

.013226 L=0°45'30"

29



See Pg. 28

$$
\begin{array}{r}
67 \\
2940 \\
752 \\
\hline
5880 \\
14700 \\
19880 \\
\hline
2135680
\end{array}
$$

CASS

2

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.

Book N° 2

Note

If this book is lost finder please mail immediately by Register Mail to John W. Curo Walker Minn and receive a liberal reward.

INDEX.

138-30 Leveling

Mildred Minn June 5-1917

I am working for Pine River Township (T138-R30)

The Town Board let a contract to Asa D. Trout to make 3 small fills on the "Trout road".

The ground was not x sectioned before the work was started and as the dirt put in the swamp may have settled we try to get a close estimate of the amount by measuring the fill

If this is not satisfactory we will measure up the cut as near as we can.

Harald and I take level rod 100' "Hoe" steel tape and Gurley transit to use as a level and walk to Trouts farm

We Lv our farm in sec. 24 — 3 miles east at 9-30 Am and walk to Trouts farm W1/2 of N.W.1/4 Sec 27-138-30 (Trout has this farm listed for sale with R E Snell @ $40 an acre)

Ar Trouts at 10 A.M. and he

John W Cano

Leveling
138.30

June 5-1917 contd
gave over the work with Harold and
J. He ran 3 small fills. The
1st is near 14 cor bet secs 27 and 28
138-30 @ 25¢ a yard

2nd fill as at cor to secs 27-28-33-34
137-30 @ 20¢ a yard

3rd is just South of No 2 @ 20¢ yd.

We adjust level (Gurley Transit)
which I find 0.03 out in 200. Ft
and walk to Mildred for dinner
Get dinner with
Van Blaircom (Blacksmith)
Pd 50¢ for Harold & I.
I was to call Frank Wagon
at Hackwood @ 2. m. but he is
left town to be back @ 7. PM tomorrow
night

P.M.

Harold J. Cuno π
John W Cuno Rod & Ch & Nales
Asa Draper Trout Ch & Rod
Cuno directs Trout where to hold rod
John W Cuno

4

138-30 Fill N.Y.

Leveling

June 5 1917 Could

Sta	+S	H.I	−S	Elev	Final Elev
0				100.00	
	2.20	102.20			
0			2.20	100.00	0.0
			2.50	99.70	
			3.6	98.60	
			2.4	99.80	
			2.6	99.60	
+25			3.3	98.90	-18.25
			3.6	98.60	
			4.9	97.30	
			3.5	98.70	
			4.0	98.20	
+50			4.0	98.20	22.41
			4.3	97.90	
			5.4	96.80	
			4.2	98.00	-
			5.4	96.80	
+75			4.3	97.90	19.96
			4.7	97.50	
			5.9	96.30	
			4.4	97.80	
			5.2	97.00	

Troots 1st fill @ 25$ per rd

Grade 16' wide 1½ to 1

on ground 540 Ft S of ¼ cor bet Sec 27-28 and running thence South thro swamp.

Center of grade

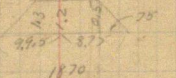
8' L

10' L

8' R

10' R

Cen of grade



6.80
19
14.00
1.26
18.25

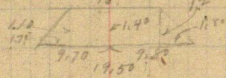
8' L

10' L

8' R

10' R

Cen of grade



1.08
10.40
10.00
93
22.41

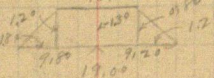
8' L

10' L

8' R

10' R

Cen of grade



.98
8.40
10.00
1.08
19.96

8' L

10' L

8' R

10' R

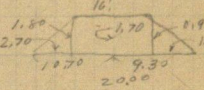
138-80 1st fill

June 5-1917 Could

Sta	+S	HI	-S	E Log	End Area
1		102.20	4.4	97.80	= 27.26
			4.7	97.50	
			6.5	95.70	
			4.8	97.40	
			5.7	96.50	= 27.17
+25			4.5	97.70	
			4.8	97.40	
			6.0	96.20	
			4.9	97.30	
			6.4	95.80	
+50			4.6	97.60	
			4.9	97.30	= 17.63
			5.9	96.30	
			4.8	97.40	
			5.6	96.60	
+75			4.4	97.80	18.43
			4.8	97.40	
			5.8	96.40	
			4.7	97.50	
			5.5	96.70	
2			4.5	97.70	= 19.50
			4.7	97.50	
			5.7	96.50	
			4.8	97.40	
			5.8	96.40	

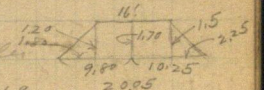
Grade 16' wid 1½ T-1

Emb fill - road embk



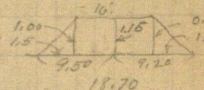
8' L .61
10' L 10.40
8' R 14.00
10' R 2.25
27.26

Emb grade - road embk



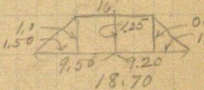
8' L 1.69
10' L 12.80
8' R 11.60
10' R 1.08
27.17

Emb fill - road embk



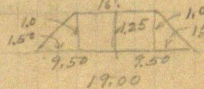
8' L 0.48
10' L 7.80
8' R 8.60
10' R .75
17.63

Emb fill - road emb



8' L .48
10' L 8.20
8' R 9.00
10' R .75
18.43

Emb fill - road emb



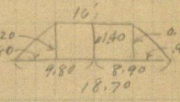
8' L .75
10' L 9.00
8' R 9.00
10' R .75
19.50

(1) June 5-1917 Cont'd 138.30 1st Fill

Sta	+S	HI	-S	Elev	End Area
2+25		102.20	4.70	97.50	= 19.75
			5.10	97.10	
			6.3	95.90	
			5.3	96.90	
			5.9	96.30	
+50			5.2	97.00	25.18
			5.6	96.60	
			7.0	95.20	
			5.5	96.7	
			6.6	95.6	
+75			5.5	96.7	= 23.98
			6.0	96.2	
			7.2	95.0	
			5.9	96.3	
			7.0	95.2	
3			5.9	96.3	
			6.0	96.2	= 23.58
			7.4	94.8	
			6.1	96.1	
			7.2	95.0	
+25			5.8	96.4	= 25.80
			6.1	96.1	
			7.6	94.6	
			6.1	96.1	
			7.2	95.0	

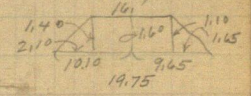
Grade 16 and 1½ to 1

Cen of fill - road cen



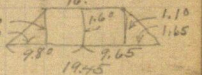
8' L .27
10' L 8.00
8' R 1.40
10 R. 1.08
19.75

Cen of fill - Road Center

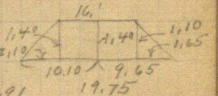


8' L .91
10' L 10.80
8' R 12.00
10' R 1.47
25.18

Cen of fill - road center



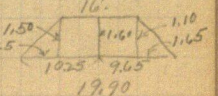
8' L .90
10' L 10.80
8' R 11.20
10' R 1.08
23.98



Cen of fill - road center

8' L .91
10' L 10.00
8' R 11.20
10' R 1.47
23.58

Cen of fill - road center

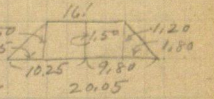


8' L .96
10' L 10.80
8' R 12.40
10' R 1.69
25.80

10 June 5. 1917 cont'd 138-30 1st Fill

Sta	+S	H I	-S	Elev	End Area
3+50		102.20	5.9	96.3 =	25.57
			6.2	96.0	
			7.7	94.5	
			5.9	96.3	
			7.1	95.1	
+75			5.8	96.4 =	24.62
			6.2	96.0	
			7.6	94.6	
			6.1	96.1	
			7.1	95.1	
4.			5.8	96.4 =	23.28
			6.2	96.0	
			7.6	94.6	
			6.1	96.1	
			7.0	95.2	
+25			5.8	96.4 =	20.63
			6.1	96.1	
			7.3	94.9	
			5.8	96.4	
			6.8	95.4	
+50.			5.3	96.9 =	23.90
			5.6	96.6	
			7.1	95.1	
			5.6	96.6	
			6.5	95.7	

Cen of pit - road Cen

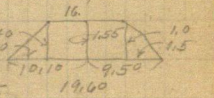


20.05

8' L 1.08
10' L 1.08
8' R 1.21
10' R 1.69
25.57

Culvert at 3+60

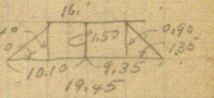
Cen of pit - road Cen



19.60

8' L .75
10' L 1.06
8' R 1.18
10' R 1.41
24.62

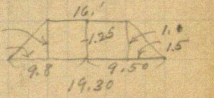
Cen of pit - road Cen



19.45

8' L .61
10' L 9.60
8' R 11.60
10' R 1.47
23.28

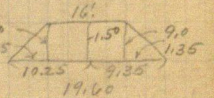
Cen of pit - road Cen



19.30

8' L .75
10' L 9.00
8' R 9.80
10' R 1.08
20.63

Cen of pit - road Cen



19.60

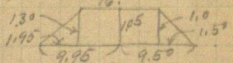
8' L .61
10' L 9.60
8' R 12.00
10' R 1.69
23.90

12 June 5 1917 corrected +38-30 Int. Fill

Sta	+S	HI	-S	Elev.	End Area
4+75		102.20	4.6	97.6 =	19.61
			5.0	97.2	
			6.3	95.9	
			5.0	97.2	
			6.0	96.2	
5			4.0	98.2 =	24.75
			4.2	98.0	
			5.4	96.8	
			4.4	97.8	
			5.7	96.5	
+10			3.6	98.6	0.00
			3.9	98.3	
			4.0	98.2	
BM 1.			4.88	97.32	

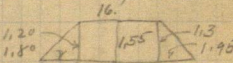
No 1

Cen of road - grade Cen



8' L .75
10' L 8.20
9.40
1.26
8' R 19.61
10' R

Cen of fill - road Cen



8' L 1.27
10' L 11.40
11.00
1.08
8' R 24.75
10' R

Cen of fill - road Cen 1050 Ft S of Y x Int 3/4 %

8' L = 0.0.  = 0.0.

8' R

10 d nail in 15' spruce stumps 50' RC 2+90

(14) June 5-1917- continued 138-30 2nd Fill @ 20°

Sta	+S	HI	-S	Elev	End Area
0.	2.65	102.65		100.00	0.0
			2.65	100.00	
			3.0	99.6	
			2.8	99.8	
+ 25			3.7	98.9	24.97
			4.1	98.5	
			6.0	96.6	
			3.8	98.8	
			4.4	98.2	
+ 50			4.0	98.6	43.51
			4.6	98.0	
			6.7	95.9	
			4.5	98.1	
			6.5	96.1	
+75			4.1	98.5	52.58
			4.5	98.1	
			7.0	95.6	
			4.5	98.1	
			7.0	95.6	
/			4.4	98.2	38.45
			4.9	97.7	
			7.0	95.6	
			4.8	97.8	
			6.4	96.2	

Nº 2

11. F.H.N. of Cn Sec 27-28-33-3 W on ground

Cen of grade - road Cen

8' L

8' R

Cen of Fill: Road Cen

8' L

10' L

8' R

10' R

Cen of fill - Road Cen

8' L

10' L on meadow = -S 6.90 rod set, solid bottom

8' R

10' R - rod reads 6.74 on solid bottom in swp

Cen of fill - road Cen

8' L

10' L - Rod reads 7.80

8' R

10' R Rod reads 7.80 on

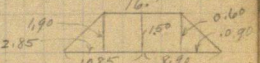
Cen of fill - road Cen

8' L

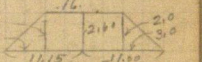
10' L Rod reads 7.5 on solid bottom in swp

8' R

10' R - Rod reads 7.4 on solid bottom in swp

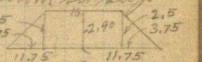


.27
8.40
13.60
2.70
24.97



3.00
18.40
18.80 = 43.57
3.31

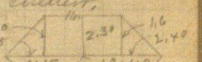
4.69
21.60
21.60
4.68
52.58



showed 15 solid bottom in the swamps.

solid bottom in swamp
Sta 0+80 culvert.

1.94
15.60
17.60
3.81
38.45



(16) June 5-1917 Continued

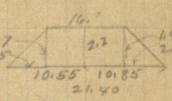
188-30
2nd Fld @ 20° m yd

Sta	+ S	H I	- S	Elev	End Mea
1 + 25		102.65	4.4	98.2	= 36.88.1
			4.8	97.8	
			6.5	96.1	
			4.8	97.8	
			6.7	95.9	
1 + 50			4.4	98.2	= 34.18
			4.7	97.9	
			6.8	95.8	
			4.7	97.9	
			6.0	96.6	
+ 75			4.5	98.1	= 37.14
			4.8	97.8	
			6.7	95.9	
			4.8	97.8	
			6.6	96.0	
2			4.5	98.1	= 42.54
			4.6	98.0	
			6.8	95.8	
			4.9	97.9	
			6.8	95.8	
+ 25			4.5	98.1	= 26.96
			4.7	97.9	
			6.0	96.6	
			4.7	97.9	
			6.2	96.4	

Fill No 2

Cen of fill - Road Cen

2.71
16.40
16.60
2.17
36.88



8' L

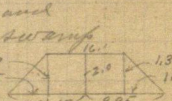
10' L Rod reader 5.9 on top in swamp and 6.8 on solid bottom in swamp

8' R

10' R Rod reader 6.10 on top of bog and 7.40 on bottom of swamp

Cen of fil - Road Cen

1.27
13.20
14.40
3.31
34.18



8' L

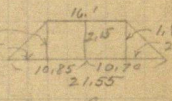
10' L Rod reader 6.40 on top of swamp and 7.30 " bottom "

8' R

10' R

Cen of fill - road Cen

2.43
15.80
16.20
2.71
37.14



8' L

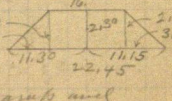
10' L Rod reader 6.0 on top of bog and 7.5 " bottom of swamp

8' R

10' R Rod reader 6.10 on top of bog and 7.10 " bottom

Cen of fill - Road Cen

3.31
17.60
16.60
3.63
42.54



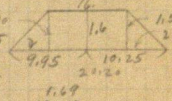
8' L

10' L Rod reader 6.10 on top of swamp and 7.50 " bottom

8' R

10' R Rod reader 6.1 on top and 7.5 on bottom of swamp

Cen of fil Road Cen



8' L

10' L Rod reader 6.0 on top and meadow and solid

1.69
12.40
11.60
1.27
26.96

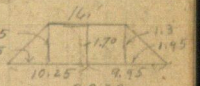
8' R

10' R on solid meadow

16 June 5-1917 Cont'd 138-30 Fill No 2 @ 20° to yd

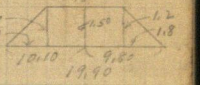
Sta	+ S	H I	- S	Elev	End Area
2 + 50		102.65	4.4	98.2	= 28.76
			4.7	97.9	
			6.2	96.4	
			4.7	97.9	
			6.0	96.6	
2 + 75			4.4	98.2	= 24.95
			4.5	98.1	
			5.9	96.7	
			4.7	97.9	
			5.9	96.7	
3			3.9	98.7	= 15.97
			4.1	98.5	
			4.3	98.3	
			4.3	98.3	
			5.6	97.0	
+ 10			3.4	99.2	= 0.0
			3.5	99.1	
			3.8	98.8	
B.M. 1			4.30	98.35	

Cen of fill-road cen



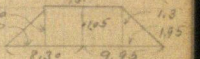
8' L 1.27
10' L 12.00
8' R 12.69
10' R 2.69
28.76

Cen of fill-road cen



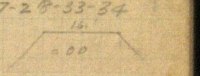
8' L 1.08
10' L 8.80
8' R 1.60
10' R 1.47
24.95

Cen of fill-road culv



8' L 1.27
10' L 9.40
8' R 5.00
10' R .30
15.97

Cen of fill road culv 299 Ft S. of Cor 16 secs 27-28-33-34



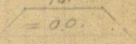
8' L
8' R

= Nail in root of 16" spruce stump 35' L at Sta 2+70

(20) June 5-1917 Cruz 138-30 Fill No 3 @ 20c

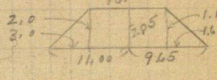
Sta	+ S	H I	- S	Elev	End Fill
0.	3.27	103.27		100.00	0.0
			3.3	100.0	
			3.6	99.7	
			5.3	98.0	
			3.4	99.9	
			3.9	99.4	
+ 25			4.4	98.9	= 32.71
			5.0	98.3	
			7.0	96.3	
			4.8	98.5	
			5.9	97.4	
+ 50			4.6	98.7	= 42.63
			4.9	98.4	
			6.9	96.4	
			4.9	98.4	
			7.1	96.2	
+ 75			3.6	99.7	= 29.59
			4.0	99.3	
			5.3	98.0	
			4.0	99.3	
			5.6	97.7	
+ 90			2.5	100.8	= 0.0
			2.6	100.70	
			3.3	100.0	

Elev assumed on ground 456. Ft S. of Cor #1
Secs 27-28-33-34



Cen of fill - road cuts
8' L
10' L Fill here
8' R
10' R In cut

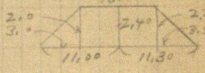
Cen of fill - Road cen



8' L .91
12.60
16.20
3.0
32.71

10' L
8' R
10' R

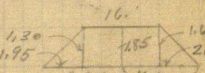
Cen of fill - road cen



8' L 3.63
18.40
17.60
3.00
42.63

10' L
8' R
10' R

Cen of fill - road cen

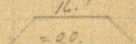


8' L 1.92
13.80
12.60
1.27
29.59

10' L
8' R
10' R

546. Ft S. of Cor 1 Sec
27-28-33-34

Cen of fill - Road cen



8' L
10' L

22 June 5 1917 Cont'd 138-30 3rd F.d @20°

Sta	+S	HI	-S	Elev
0+90		103,27	2.8	100.50
			3.6	99.7
B.M. 1.			3.73	99.54

Quit at 6-30 supper at Trout-s who asks us to stay N° pay. Trout brings us home with our horse

a Home 8-30 PM.

Harold in sick

Alma- Harold- Harold Reed and I staying on Alma's farm in Sec 24- T 38- R 30

Harald J Curo ⊼
John W Curo Rod
A.D. Trout x

8' R
10' R
Nail in side of half a WP stump 50' R at Sta 0+40

Time Sheet
Working for Pine River Twp 138-30
June 1917

	3	4	5	6	7	8	
John W. Curo			1	1			@ $5 + board
Expense			25¢				
Harald J Curo			1				@ $2 + board
Expense			25¢				
Asa D Trout			1/2 PM				@ $2. + board
Team			1 Trip $1.50				@ $1.50 Trip

138-30

June 6-1917

Figure dirt yardage in A.M.
and go to Jenkins with Frank
Wagoner & his Ford with
E. B. Cravens who buys
Wesleys 40 at Hock @ $25 an acre
and mine @ $28.75 an acre
being $1150.00 and he is to pay
Frank Wagoner $25. being the
amount I was to pay him
I wait & get Jamison to
make out the papers

If Fill No 1. is figured every 25 feet
it amounts to 410.57 yds @ 25¢ = $102.64
and if figured in full station & ½
the first plus 25 ft. it amounts to
418.33 yds @ 25¢ = $104.58

138-30

Trout Contract 25

Fill N°1. Total Feet

Sta.	Area	Sta.	Area			
0	0.0	+ 25	18.25	=	9.12 X 25 =	228.00
+ 25	18.25	+ 50	22.41		20.33 X 25 =	508.25
+ 50	22.41	+ 75 =	19.96	=	21.18 X 25 =	529.50
+ 75	19.96	1	27.26	=	23.61 X 25 =	590.25
1 =	27.26	+ 25 =	27.17	=	27.21 X 25 =	680.25
+ 25 =	27.17	50 =	17.63	=	22.40 X 25 =	560.00
+ 50 =	17.63	+ 75 =	18.43	=	18.03 X 25 =	450.75
+ 75 =	18.43	2 =	19.50	=	18.96 X 25 =	474.12
2 =	19.50	+ 25 =	19.75	=	19.62 X 25 =	490.62
+ 25 =	19.75	+ 50 =	25.18	=	22.46 X 25 =	561.63
+ 50 =	25.18	+ 75 =	23.98	=	24.58 X 25 =	614.50
+ 75 =	23.98	3 =	23.58	=	23.78 X 25 =	594.50
3 =	23.58	+ 25 =	25.80	=	24.69 X 25 =	617.25
+ 25 =	25.80	+ 50 =	25.57	=	25.68 X 25 =	642.12
+ 50 =	25.57	+ 75 =	24.62	=	25.09 X 25 =	627.37
+ 75 =	24.62	4 =	23.28	=	23.95 X 25 =	598.75
4 =	23.28	+ 25 =	20.63	=	21.95 X 25 =	548.87
+ 25 =	20.63	+ 50 =	23.90	=	22.27 X 25 =	556.63
+ 50 =	23.90	+ 75 =	19.61	=	21.75 X 25 =	548.87
+ 75 =	19.61	5 =	24.75	=	22.18 X 25 =	554.50
5 =	24.75	+ 10 =	00.00	=	12.37 X 10 =	123.75
					Total Feet	11085.48

11085.48 Ft ÷ 27 Ft = 410.57 yds

410.57 yds @ 25¢ = 8102.64

138-30

If fill N° 2. is figured every 25. ft
it amounts to 372.81 yds @ 20° - $74.46
and if figured in full stations & cost
the first plus 25. it amounts to
9744.2 ft = 360.9 yds @ 20° - $72.18

138-30

Fill No. 2

Sta	Area	Sta	Area		Total Feet
0	0.0	+ .25 =	24.97	=	12.48 x 25 = 312.12
+.25 =	24.97	+ 50 =	43.51	=	34.24 x 25 = 856.00
+.50 =	43.51	+ 75 =	52.58	=	48.05 x 25 = 1201.13
+75 =	52.58	1 =	38.45	=	45.52 x 25 = 1137.88
1 =	38.45	+ 25 =	36.88	=	37.67 x 25 = 941.63
+25 =	36.88	+ 50 =	34.18	=	35.53 x 25 = 888.25
+50 =	34.18	+ 75 =	37.14	=	35.66 x 25 = 891.50
+75 =	37.14	2. =	42.54	=	39.84 x 25 = 996.00
2 =	42.54	+ 25 =	26.96	=	34.75 x 25 = 868.75
+25 =	26.96	+ 50 =	28.76	=	27.86 x 25 = 696.50
+50 =	28.76	+ 75 =	24.95	=	26.86 x 25 = 671.38
+75 =	24.95	3 =	15.97	=	20.46 x 25 = 511.50
3 =	15.97	+ 10 =	00.00	=	7.99 x 10 79.85
					10052.49

10052.49 Ft ÷ 27 Ft = 372.31 Yds

372.31 yds @ 20¢ = 874.40

Trout Job

138-30

Fill N° 3.

Sta	Area	Sta	Area		Total Feet
0.	0.0	+ 25 =	32.71	=	16.35 X 25 = 408.8
+25 =	32.71	+ 50 =	42.63	=	37.67 X 25 = 941.75
+50 =	42.67	+ 75 =	29.59	=	36.13 X 25 = 903.25
+75 =	29.59	+ 90 =	0.0	=	14.79 X 15 = 221.77
					2475.65

2475.65 Ft ÷ 27 Ft = 91.69 yds.

91.69 yds @ 20° = $18.34

Final Estimate as follows

Fill N°1 = 410.57 yds @ 25° = $102.64

" N°2 = 372.31 " @ 20° = 74.46

" N°3 = 91.69 " @ 20° = 18.34

$195.44

138-30 Leveling

Surveyors Report

Minneapolis Minn June 7-1917

Board of Supervisors Pine River Twp
Cass Co Minn Gentlemen

Having been employed by you to measure the dirt in the 3 Fills put in by Mr H.D. Trout on the "Trout road" I wish to report that I have done so to the best of my ability with the following results:

Fill No 1. Beginning 540 Ft S. of the 1/4 Cor bet Secs 27 & 28 T138 R30 extending S. along the Sec line 510. feet has a road bed 16. ft wide on top with a 1½ to 1 slope and contains 410.$\frac{57}{}$ yards

Fill No 2. begins 11. Ft N. of Cor to Secs 27-28-33-34 T138-30 and extends S. along the Sec line 310. feet Has a road bed 16. Ft wide on top with 1½ to 1. slope & contains 372.$\frac{21}{}$ yards

Fill No 3. begins 456 ft S. of Cor to Secs 27-28-33-34-138-30 and extends S along the Sec line 90. feet Has a road bed 16. Ft

13830 — Leveling

wide on top with a 1½ to 1. slope and contains 91.69 yards
Total 874.57 yards
Signed John W Cuss. Engineer

410.57 @ 25¢ per yd = $ 102.64
372.31 yds @ 20¢ per yd – 74.46.
91.69 " @ 20¢ " " – 18.34
$195.44

Put in bill as follows:

"Mildred Minn June 9-1917
Twp of Pine River To John W Cussler
Engineer work on three fills on Trout road June 5–1917 taking levels 1 day $5.00
June 6–1917 figuring fill quantities ½ " 2.50
June 5 " Lunch at Mildred .25
$7.75

Note:

I furnished my own rodman for which I make no charge — Cuss"

Town Board met at Mildred June Saturday evening all present except Mr Bass — Bid for Bal Due Trout 195.44 / 125.00 / $70.44 allowed and my bill allowed.

Sunday June 1917 my ck drawn and signed by Frank Kaine and paid the 7 June
No discount Fst Nat. Bk P.R. John W Cuss.

138 D-30 Roads

June 12-1917 Tuesday.

I am working for Pine River Twp on survey & 4 wagon roads.

Telephone Roy E. Bryant to be at Pine River @ 11 A.M. & P.M. time when I am to meet him with auto

Alma-Herald-Herald-Record &

I Go home at noon - Go to J.J. Lobb farm - get Mrs Lobb and go to Emerson where I meet Lobb and arrange for survey then go to

farm - find him gone and leave a note asking that we would like him to help on the Survey which we will begin tomorrow

Harold & Roy get supper and stay over night with Mr. & Mrs Albert Eastwold where they will board at Wildred.

I stay home on the farm

Roy came up from Jenkins in his dads car

John W Curo

Time Sheet Pine River Twp June 1917

	11	12	13	14	15	16	SUN 17	18	19	20	21	22	23	SUN 24	25	26
John W Curo		0	1	1	1	1	0	1	1	1	1	1	1	0		
Roy E Bryant		0	1	1	1	1	0	1	1	1	1	1	PM ½	0		
Harold A Curo		0	1	1	1	1	0	1	1	1	1	1	PM ½	0		
J J Lobb Tuft Clerk		0	1	1	1	0	0	0	1	0	0	0	0	0		
Frank Kline Jr		0	1	1	1	0	0	1	0	0	0	0	0	0		
T H Adamson Trustee		0	1	0	1	0	0	0	0	0	0	0	0	0		
Wm Kline		0	0	1	1	0	0	0	0	0	0	0	0	0		
Wm E Hoffman		0	0	1	0	1	0	1	1	1	0	0	0	0		
J E Barr Trustee		0	0	0	1	0	0	0	0	0	0	0	0	0		
Albert Eastvold		0	0	0	0	0	0	0	1	1	0	0	0	0		

13-30 Twp Records

33

Board Sheet @ 4¢ per day June 1917

	12	13	14	15	16	SUN 17	18	19	20	21	22	23	SUN 24	25
Mrs Wm Kline														
John W Cure			D		D		D	D						
Frank Kline			D		D		D							
Albert Eastvold								D						

Hulo Hack

@ 8 ft per day

Board Sheet June 1917

	12	13	14	15	16	SUN 17	18	19	20	21	22	23	SUN 24	25	26
With Mrs Eastvold															
John W Cuno		S	S	D S			S		S	D				D	
Roy E. Bryant	S L	B S L	B S L	B S L	B S L	D B S L	B S L	D B S L	D B S L	D B S L	B B S L	D B S L	D B S L	D B S L	= 12.75
Harold J. Cuno	S L	B S L	B S L	B S L	B S L	D B S L	B S L	D B S L	D B S L	P B S L	B B S L	D B S L	D B S L	D B S L	
Wm E Hoffman								S							

With Mrs Lobb															
John W Cuno		D				SUN			D						
Roy E Bryant		D	D	D	D		B								
Harold J. Cuno		D	D	D	D		D								
Frank Klint		D													
T H Adamson		D													
Wm E Hoffman							D								
Albert Eastvold									R						

(A)

1-31-20

55

June 13-1917 Wed

We are to survey 4 roads

Mr Lobb has one petition which reads as fallows

"Open" "Lay out and open" a road "Beg at the public highway North of the M & I track on the sec line bet Secs 21 and 22 - T138 R30 Thence N. on sec line to Boot Lake

Thence around East side of said lake to said sec line continuing in a Northward direction to point where said sec Line intersects with the public highway North of Sec 9 & 10 T138 R30

Roy E Bryant - K. Gurley transit

Harold J Cuno - ch & flag 300 Chi steel tape - plumbob & double cu Hatch

John H Cuno - & Frank Kline ch.

T.H. Adamson & J.J Lobb ax men

Begin @ 1/4 cor 1/4 bet Secs 21 & 22 - T138 - R30 and run N. on old transit line fallowing a good fence.

@ 300. stake - 600. stake @ 775 cross R.R. fence 1/2 foot West of the corner

138-30 Road Survey

June 13-1917 Contd

part of a fence coming up from the South
@ 845. Cen of M & I R.R.
@ 900 Stake. @ 908 cross R R fence
@ 940 Cen of the New State Highway
bears SE & NW.
@ 1200 Stake. 1500 Hub on rise
where we first set up transit.
@ 1548 wagon road runs E & W
@ 1740 the East corner of a new
house sets West 37.00 feet
@ 1800 Hub. @ 2078.20 Hub on sea
wall. @ 2078.50 Stake on sea
wall 10. ft S. of waters edge of Boot
Lake.
@ 2108.04 MS chain to MC No 10
MS nails each for post and
Norway pine 12" S 47° E 27 LKS = 17.82 Ft
" " 29 S 17 W 129. " = 85.14 "
All are gone and cross with flag pole
hub on North side of Lake

As wind is high we do not
attempt to triangulate distance
but mark hub on North side of
Boot Lake O.O. which is 15. ft N. of
waters edge. near MC. No 12

June 13-1917 Contd
where U.S. notes call for post &
Norway pine 10 N 46 E 46 Lks = 30.36 Ft
" " 12 N 70 W 52 " = 34.32
We do not take time to hunt for
these stumps as it is so cold and
windy but push our line North
@ 215.40 Hub 300 Stake
Cure & Cure - Bryant & Kline - Lobb
& Adamson take dinner with Mr
Lobb P.M.
Bryant Horald & Lobb continue
North: @ 462.90 Hub: 600 stake
900 stake, 980.70 Hub 1200 stake 1295 Beg
1500 stake 1800. 2100.
@ 1295 enter marsh @ 1962 to
at 2100 stake 2140.25 set Hub 8.
ft E out of plowed ground and Quit
for night Bryant & Horald Cure
supper & over night with Ecklund
Cure - Kline & Adamson go NW.
several miles to look up US corners in
the other roads to be surveyed.
The roads to be surveyed are as fol.
1st Begin @ Cor to 3-4-9-10-138-30
runs 2 1/2 (or more) miles S. around E. side
John Olson

June 13-1917 Cont'd
of Boot Lake to the New State road just N. of 1/4
bet Secs 21-22.

2nd road begins @ Cor to Secs 3-4-9-10-138-30
and runs 2 miles West along the sec line to Cor
of 5-6-7-8-138-30 crossing the new state road and
M & I track. Gemmell has written that
he wants the crossing to go in at 90° to RR
The East mile of this road is built and
graveled except a few hundred feet in the swamp
on West end - has been built ten years or more.
and the West end has just been newly
built & also far as the State road on E side
of M & I RR track.

3rd road Begins on the Range line at
SW. Cor of Sec 7-138-30 and runs more than
two miles East to the new state highway on
E. side of M & I track just East of Cor to
8-9-16-17-138-30.

4th road is called the Kane road and
begins at 1/4 Cor bet 7 and 8 138-30 and runs
So on the line of Secs 9 and 16 nearly two miles
to the new State road. The Town Clerk does
not know where the petitions for all the above
roads are but - that is on they remember
them. Harold & Roy with Extension Co at farm.

John W Cuno

(9) 132-30
Roads - Pine R. Twp

June 14 - 1917 Thursday

Roy E. Bryant - Harald J Cuno - J.J. Lobb - Bradley transit - 300 ch. P.B + double c... In one crew continue North bet secs 15 and 16. 138-30 @ 2140.25 Hub. 2400 & 2750. stake @ 2706. Hub on West edge of field. 3000 stake. 3082 enter open marsh: 3300 stake in marsh. 3600 stake in marsh: @ 3850 Lv marsh: 3900 stake. @ 4200 stake on East edge of open marsh. 4500 - 4800 - 5100 - stakes; at 5107 road bears NW and SE 5151.5 Hub: 5400 - 5700 - 6000 - 6300 - stake 6510 old road runs E and W. 6600 - set stake and quit for night. Harald Cuno + Roy Bryant get dinner with Mrs Lobb - supper and over night with Albert Eastwold Lobb eats at home.

John W Cuno - Frank Kline - Wm E. Hoffman + Wm Kline go to the cor sections 3-4-9-10-138-30 - where US notes call for post &

N.P. 24" N 3° E 218 Lks = 140.58 Ft
N.P. 24" N 85° W 355 " = 234.30 "
N.P. 24" S 34° W 450 " = 297.00 "

We find the tall dry stub of the N E line standing plainly marked and the short solid stump of the S W line plainly marked showing just the bottom edge of the B.T. spot from which we set the cor by plat chain from face of lines and drive a 20" spike

John W Cuno

June 14-1917 Cont'd

in the South wheel track of the E & W road for the line corner. the hill slab slants about a cent for course and the SW slump is almost a cent for course but I do not take time to take the line courses or the Helio note a few feet west of the spike.

Begin @ iron spike at line cor to 3-4-9-10-138·30. Cors & Frank Klein chain due along wheel track 15 steel tape and plumb-bob. setting 8 nails for pins and pulling them up again

At 1330 W. nail & slate. 2640. nail and slate near 1/4 cor sec 4 and 9-135·30 where U.S. notes call for post and H.T.C. 4.

N.P. 18 1/4 68°45' W 83 Lks = 54.78 Ft

N.P. 15" S 62°45' W 91 " = 60.06 "

We do not stop to look for these but continue to chain west along road Hoffman and Wm Klein carry the transit and tools. @ 3960 set nail & slate @ 4900 set slate 30 ft east of west often mound E 4 cor to sec 4-5-8-9-138·30

We then walk West a mile to the cor to sec 5-6-7-8-138·30 where we find an I.M. 2 1/2 by 48" capped in mound of Wash and John D. Cain

135-30
Twp Recds. & R. Twp.

June 14-1917. Continued

of newly graded road- chain E on along road
2 85. ft cross old U.S. road N 85 and another
road beam SW: 2 1300 Nail at 13.11.60
a new fence runs S 2 1320 Nail & stake and
from about this point I took the Heller &
Brightly transit on line between 2 and play
at the cor to 5-6-7-8- and the iron ½ on
bet 5 and 8 which I can plainly see out East
in the open solid marsh From here we
set a line of hubs East to the M & I and
stake road (Heller was in perfect adjustment-)
2 1500 1800 road 1821.40 Hub in cor of
M & I RR track Quit for night and all
walk home via Mildred- I and Frank Kline
get dinner with Wm Kline and I get
supper at Mildred with Albert Eastwold
Hoffman took his own lunch.

I cant make any damn more road run
Over night at home on the farm

Justin H. Cuno

June 15-1917 Friday

Roy E Bryant County Examiner double end hub Harold J Curo 300 Ch. steel tape Plumb-bob ch. + flag JJ Lobb ax

Continue N. bet 9 & 10-138-30

@ 6600 stake - 6625.25 Hub 6900 - 7200 - 7500 - 7800 - 8100 - 8400 - 8700 stake Log barn abt 8 ft E. of Examiner line

9032.80 Hub in field - 9300 - 9600 - stake 9880.70 Hub 200.80 West of 20 ch stake at cor to 3-4-9-10

at 9880.70 N. of stake 0.0 in N. side of 18 rod Lobb the cor. to 3-4-9-10-138-30 set a hub 200.80 Ft.

Bryant then meet Curo at cor to sec 4-5-8-9-138-30 where Barr takes car and runs him to cor of 8-9-16-17. where he stake a line East

Harold Curo & Bryant get dinner with Wm Lobb but are still staying with Continued

John H Curo - Frank Kline - T. H. Adamson - Wm Kline and J E (Ed) Barr

Begin at M & St. Ry track where we go with auto and continue East on line bet sec 5 and 8. 138-30

@ 1500 stake: at 1821.40 Hub in cen of RR at 1962. cen of new State highway becom

John H Curo

13 138-30
Twp. notes

June 15-1917 Contd
NW and SE. @ 2100 stake 2250 enter edge
of open solid swamp - bear NE & SW
@ 2400. stake in marsh.
@ 2621.90 Iron Mon 1/4 bet Secs 5 & 8 - 138-30
being 2 1/2 by 4 galvanized iron capped -
I then carry transit to E ord
side of big open swamp back sight Mon
with my line of sight running thro
iron 1/4 bet 5 and 8 - to red flag at mon
en to Secs 5-6-7-8-138-30 transit tele-
cope and mon E ord.
@ 300. stake in marsh @ 567. enter new
road ditch for State HW. bears NE & SW
600 stake 852. Lv big open solid marsh
900. stake 1160.40 Hubs 1200 stake 1500
1800 - 2100 - stake @ 2204.30 Hubs 2375
enter big open wet swamp. 2400 stake
2621.90 set dry stake in big open wet
swamps and Quit for night
At noon Sam & I Kline get dinner
at Van Blaricom's Baldinsville
gets dinner with Whitcomb
Cars gets dinner with Mrs Bostwick

Jan 16 Mon

June 16 1917 Saturday

Frank Kline & John W Cline go to 1/4 cor
bet secs 5 and 8. T 13 S - R 30. H.K. & S
U.S. rules call for feet and
Bearing from 7° N 88° E 1320. Lks = 875. 16 Ft
" " 6' S 88° E 1333 Lks = 879. 78 "

Sine of 2° is .03490
Cosine of 2° " .99939

875. 16 X .0349 = 30.54 Dist to cor West N. of Line
879. 78 X .0349 = 30. 70 Dist to cor West S. of Line

I We find bolt old stamps plainly marked &
Kline sees the N. one (Bolt are 1/2 for 1/2
but Kemps iron must hold)

Ht Cor to secs 4-5-8-9 - 13E 30 US rules say feet and

WP 20	N 85° E 570 Lks =	376. 20	Ft =
WP 20	S 87½° E 576 " =	380. 16	"
15	S 82° W 725 " =	478. 50	"
BP 12	N 71° W 500 " =	330. 00	

Sine of 5° 15' .09176
Cosine of 5° 15' .99619

376.20 X .09176 = 32.79 Dist to cor stood N. of Line

Sine of 2° 30' 15" .04362
Cosine " " " .99905

380.16 X .04362 = 16.58 Dist to cor stood S. of Line

(5) 138-30
RR Twp

June 16-1917 Cont'd

We find both old SE & NE lines the S. one plainly marked The distance between them U.S. chain should be 16.58 and 32.79 = 49.37 US and is 51.87 my chain & 2.50 ft too far apart measured with level rod

Frank Kline and Cuss walk to N.J. Klines place in cen of sec 9- for dinner

P.M.

From the S E. stump I measure 17.40 ft N with level rod which should be the place where the sec line passes thru going East where I set transit - back sight E. on old road to S top of hill 50 ft E. then transit telescope and look west

My line cuts 10-or 15 feet South of an old stake which is really the old NE stake set in cen of big bog

Watcher in the E side of the stake maker me believe it is the old stake in water knee deep

I set transit over old stake facing E on old main road

The SE stump bears S 85° 45' E 381.36 ft or 1.70 ft too far away and the NE

June 16-1917 Cont'd
Stump stands N 86° 20' E 378.00 ft or 1.80 lks
for away Needle reads 8°15' Var E

We then run S 82° W 478.50 felt
but find no old B.T. one stump in 25 ft lks
close and another 8 ft lks far away and
or we have passed lots of old roots and
then are plenty more on either side of us
I believe the course should be further N or S.
and we also run N 71° W 330.00 ft and
look for old 12" B Pine but find nothing

The S W lks once stood plainly
marked from which I once set the Cor Post
or checked on the old post at which time
Chas Helm swam the lake to get
chainage to the post but then S 0 lks
is now gone and the water in the
swamp is not so deep by 4 feet.

I pass N all cpt and call the old
stake corner as it sits under an old E & W
pale fence nearly down

Chaining from the E ort @ 5262.30
30 West intersect old Cor lks runs 4-5-4-9
ft West of E ort edge of bog
ft stake 2626.90 E. cor sets 17.50 ft E
and 41.30 ft S. pc at 2639.40 East
Jabez W Cairo

June 16-1917 Continued
the corner to secs 4-5-8-9-138-30 is up. chain
sets South 41.30 feet
Correcting back bet secs 5 & 8.
East half mile
= .0156 of a foot S for Each ft East
~~39~~ 2639.4 E goes S. 41.30
2204.30 ~~chain~~ goes S. ~~18.10~~ s 34.39
1160.40 goes S 18.10
At 2204.30 chain S 34.39 and set Hub
on line road cen = sec line and
@ 1160.40 E chain S 18.10 and set hub
on line road cen = sec line
These two hubs come under an old
E & W rail fence
Heavy thunder & lightning @ 5.30 - rains
slightly Cuno and Kline quit for night
and go home via Mildred. We pick up
Harold C. Roy B & Wm H and take them in
to Mildred. Then I take Kline home in
car via our farm. Alma & kids go too

Bryant with Gurley transit double cen
hubs - Harold Cuno flag & ch - Wm E.
Hoffman ax. Begin @ iron cor to
secs 8-9-16-17-138-30 Run E @ 8°10'
John Kline

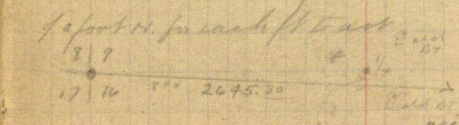
June 16-1917 cont'd

@ 12.00 ft E cor on RR fence. @ 58.00 cor of
11 & 8. RR track - blaze NW & SE:
@ 126.00 cor fence: @ 155 cor of Alaska
Rural Highway No. @ 300-600-900 plats
@ 961.20 Hub - @ 1200, 1500 - plats
@ 1665.40 spike in ground: @ 1800 - 2100 -
plats Quit for dinner Harold Cox and Roy
Bryant eat dinner with Mrs J.J. Lobb
Hoffman brot his own lunch

PM

Continue East: @ 2279.30 Hub: @ 2400 -
stake: @ 2640 temporary 1/4 corner bet secs
9 and 16 - T138-30 when U.S. mons. recd for post &
Norway Pine 18" N67°E 35 Lks - 23.10 Ft
Norway Pine 16" S21°E 129 " = 85.14 "
~~Bryant finds~~ Harold Bryant finds and
establishes Sec 1/4 cor bet 9 & 16 - 138-30
N 2645.30 E Mon 1/4 cor sets N 35.62 Ft
Correction back E on hub year .01346

1/2 post N. for each 1/4 cor



(19)

13+30

June 16-1917 Continued

2645.30 E gave N 35.60

2279.30 E " N 30.70

1665.40 E " N 22.41

961.20 E " N 12.97

Correct over line at Hub 2279.30 and with Transit on 14 back sight West on line line and run East without chaining

Supper for Harold and Roy with Mrs Eastwood then go for a walk when Bill McClane comes along and takes Harold & Roy to Jenkins with no clean clothes

John M Cuno

Sunday June 17-1917

Hma- Harold- I and Reed take Ford and go to Mildred to take Harold and Roy to Jenkins - Pd. Dan Rice 25¢ for cylinder Oil. Find them gone and we go to Jenkins - Get Oil 2 gal and 7 & 5 Gals Gas of John Allen $1.50 John must have sealed himself - will pay him bal Sat.

Go Jenkins with two cars - Wesley - Mattie - Dwight - Mary - Glovia and the baby in Buick go with us to Park Rapids - Cook dinner in the wood at Oshawa - Go Pk Rapids @ 5-30 - and make 30 miles an hour back to Hubbard & Crow Wing River.

Supper in the wood at Oshawa and then home.

Hma and I walk to Ed Harmons for milk.

John W Cuo

21. 138-30 PR. Twp

June 18-1917 Monday

Lo home in Ford @ 7-30
as Mildred immediately. Write Guy H
Todd & Short and Bradley At Cloud
that I want Hubbard & Surveying
Sign 40 day option sale on
SW¼ of SE¼ Sec 19-140-30 @ $1149 Cash
Roy Bryant and Albert Eckdahl
witness

I take Bryant - Harald & Hoffman
part way to their work then go in Ford
to cor 4-5-8-9-138-30 where Frank Klins
meets me and we drive a line of hubs
on line but this cor and ½ mile
west to cor ¼

Go with Ford to Wm Klins place where
Frank and I get dinner

P.M.

Frank Klins and Cuso - work transit
on line set red flag at 3-4-9-10 - 138-30
and an 8 ft tam pole in swamp at
cor to 4-5-8-9- and as we haul
previously chained this mile and
found it to be 5262.30 ms chain
from stake 2640 W take off 8.85 ft
and @ 2631.15 West we drive a

June 18-1917-Cont'd
dry barn plug 2x15 inch in N. edge of
South wheel track for the line 1/4 cor bet
secs 4 and 9 T 138-30
US notes call for post and
NP 18" N 68 3/4° W 93=
" 15" S 62 3/4 W 91=
I believe these stumps are here but the
NW one is burned and the SW one is
burned out by the roots and has fallen to east
on its face - perhaps if it is dug out it
might be marked
these stumps face out almost correct
from my 2640 W. stake but we pass
them up
Setting transit on 1/4 bet 4 & 9 - back sight
150 ft West on a spike - turn 90° and start
a line South
I show Frank Kline find the West B.T. stumps
bet 9 & 10 - 138-30
From the cor 1/4 4-5-8-9-138-30 it is 332
ft East to solid land, and
West to solid land

(23) Pine River Twp coord

138-30

June 18-1917 - Continued

Roy E Bryant. Harley Hamrick & Ch
Harald J Cuno Flag & Chain 300 - N.W. E
Hoffman in Camp his own lunch

Set over 1/4 bet 9 & 10 back eight West
on compiled Rule on this line and run E on 9th
@ 329. old Road N & S
@ 578.15 Hub 1569.40 Hub
@ 1722 ends open ditch swp
@ 2380 " " "
@ 2579 Hub on N & S random. 2640 E
stake near Co to 9-10-15-16-138-30

Bryant - Hoffman and Harald Cuno get dinner
with Mrs Lobb.

P M.

Bryant looks for BTs but finds none to can
be sure of @ Co to 9-10-15-16 138-30 so
leave it for Cuno to establish

Broke chain in two places by
piece broke at 111. ft leaving 189. about

Go to Co 8-9-16-17-138-30 at 3. P.M.
Forenight 1/2 mile West on main to Co
cut line West without chaining and
quit for night at 6.15 still with Harold

(54) P.R. Twp
138.30

June 19-1917 Tuesday

I take auto to Wildred pick up Roy Bryant Harold Cuno & Wm Huffman and take them to cor 89-16-17-138.30 where they will run West Cuno and Albert Canfield line cor to the old Peabody house N. of 74 on S. side of Sec 2 (SE¼) walk East to cor 9-10-15-16 138.30 where we meet J J Lobb and where U.S. notes call for post and

NP 10 N 4° E 240.2 lks = 158.40 Ft
Oak 6 N 42° W 180 " gone
NP 15 S 89° W 183 " 120.78 Ft
NP 15 S 17° E 11 " gone

We find the old E+W blazed line on a slide about 200 ft West standing on E edge of fen marsh.

We also find the stamp of the SW B.T. badly burned which checks perfect with the plainly marked stamp of the NE bet set sub+ lock for the true corner

Angle of SW angle of N+S and E+W random lines is 89°08'30"

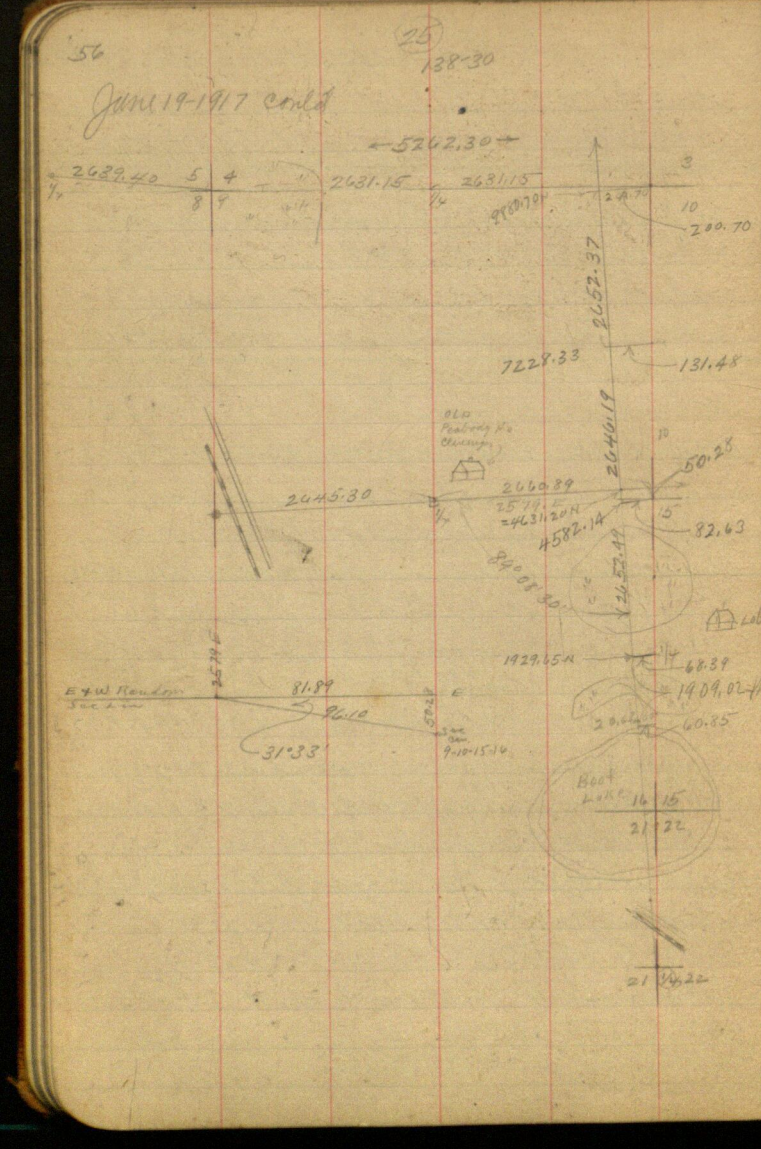
Ht 25.79. E. the cor to 9-10-15-16 = 81.89 E and
set E on 31°33' R(S) 96.10 Ft = 50.283
so that at 2660.89 E. the cor sets South
50.28 feet. 31°33' sine = .52324
cosine = .85218

John W Cuno

(15)

138-30

June 19-1917 cont'd

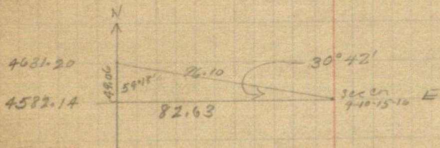


June 19-1917 Contd

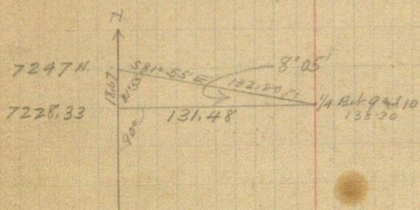
at 4631.20 N Cor to 9-10-15-16-138-30 sets S

59°18'E 96.10 or E 30°42'S - or

Sine 30°42' = .51054 × 96.10 = 49.06
Cosin 30°42' = .85985 × 96.10 = 82.63



We fund stump of NE BT. plainly mkd and stump of SW BT not mkd set by flatch from fore. Eosbold and Loff help.



at 1/4 bet 9 and 10 US notes call for post and

NP18 West 70 Lks = 46.20 ft

NP20 N55°E 46 " = 30.36 "

We fund the West stump plainly mkd "BT" from which I set compass staff for Cor @ 8°V from fore of marks. I showed Frank Kline this stump and now show it to Albert Eosbold. The NE stump can not be found the a stump 4 ft two

John W Crew

June 19-1917 Contd.
Close may have been the one tho we pass it up and only use the West stump

Easlvold with level rod for flag puts a hub on line @ 7247. N over which I set transit from which the 1/4 bet 9 and 10 sets S 81°55' E 132.80 ft

being E ont 8°05' S 132.80 ft

Sine 8°05' = .14061 × 132.80 = 18.67 S
Cosin 8°05' = .99006 × 132.80 = 131.48 E

so that at 7228.33 N. the 1/4 cor bet 9 + 10 sets E ont 131.48 ft.

Quit for dinner Lobb has went home to dinner Easlvold and I go to Wm Klines for dinner

Correcting

N. 1/2 mile bet 9 and 10
= 131.48 + 69.22 = 200.70
2652.37 ÷ 69.22 = .0260974 + 131.48
East for each foot N. of sta 7228.33
.0260974 = 1°30' −

I and Easlvold get back to line @ 4.00 P.M. being late on account of my have taken figuring and find Lobb has come and gone again.

June 19-1917 Cont'd

We set a hub and tall stake for line 1/4 Cor bet. 9 and 10 - 138-30 then with only a hatchet and make armfull of stakes and walk N. along random and as Bryant did not put hubs thick enough we put some in.

At 7800 we chain N 140 ft work transit on line at 7940 N and run East.

7940 = 711.67 N. of 1/4 and goes E 18.58 + 131.48 = 150.06 where we place a hub and tall stake on line sec line

Work transit on line at stake 8400 N which is 1171.67 N of 1/4 bet 9 & 10

chain East 30.59 + 131. = 162.07

and set hub and tall stake on line sec line over which I set Heller transit sight North on red flag at Cor to 3-4-9-10 138-30 and set a line of hubs and tall stakes North

Then transit telescope and set a hub and tall stake about 200 ft. South

Stakes all marked "Road Cen" "Sec Line".

We then walk half a mile South and correct South half mile Bet Sec 9 and 10 138-30

John W Carr

29

138-80

June 19-1917 cont'd

Corneding

S. ½ mile Bet 9 and 10

= 82.63 + 48.85 = 131.48

2646.19 in 48.85 = .01846 + 82.63

East for each foot N. of 4582.14

.01846 = 1°03'+

Earlwald and I go to Hub 6605.25 which is 2023.11 ft N of cor to 9-10-15-16 + go E

East 37.35 + 82.63 = 119.98 ft where we set hub and tall stake on line see line wood cor

Set point on line at stake 6000 + from which is 1417.86 ft N of sta 4582.14 at the cor to Secs 9-10-15-16 - 138.30

Chain East 26.18 + 82.63 = 108.81 and set hub and tall stake on line sec line wood cor

Hub 5151.50 = 569.36 N. of Sec cor @ 4582.14 and go E 10.52 + 82.63 = 93.15

Earlwald and I do not know time to set this last corner hub as it is 8.10 PM so we quit for night and take car from the old Peabody place and beat it for Milford

John W Carr

June 19-1917 Cont'd
Cain gets supper with Mrs Eastwold

Bryant and Harold & Hoffman Continue West on line line bet Secs 8 and 17-138-30 @ 268.25 Hub for wood cntr. 1064 Hub 1622.50 Hub. 1975.25 Hub - 2412.50 Hub 2650. intersection 1/4 Cor bet Secs 8 and 17-138-30

Continue West on line line Chaining perfect plumb-bob @ 319. Hub @ 692.30 Hub 1310.20 Hub spike 13.20.16 Wood 1/16 Cor set by Cannon @ 1730.70 Hub 1985.80 Hub 2240.60 Hub 2644. intersection Cor to Secs 7-8-17-18-138-30 (Hit SE side of iron)

Continue West - - just as we are - not Chaining. Iron about 1/2 mile and quit for night.

All back Lunch - Lunch for Harold & Bryant furnish by Eastwold Hoffman-Cain-Bryant & Cain get supper with Eastwold.

John W Cain

June 20-1917 Wed-

I take Roy E Bryant - Harold J Cares and Wm E. Hoffman in my car to a pt near A.S. Trout's place

Albert Eastvold and I then go to Lobbs house at 8.20 Lobb is gone and we correct hub 5151.50- East 93.15 and set hub = and tall stake in rd road cor.

Also set a line hub and stake on top of hill about 40 ft N. of sec cor to 9-10-15-16

Then walk to 1/4 Cor bet 15 and 16 - 138-30 where U.S. notes cup post and BD 4

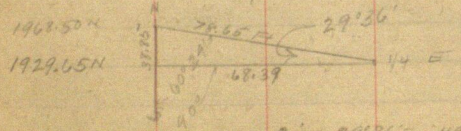
NP 20 S 45° E 4 Lks = 2.64 ft

18 S 85° W 33 = 21.78"

We find both stumps the SW one eyed down and out of the roots but well marked. Albert found these

Set 1/4 by flat chain and drive 2x2x12 oak stake for the 1/4

At 1968.50 N the 1/4 bears S 60° 24' E 78.65 ft



Sine 29°36' = .49394
Cosin 29°36' = .86949

June 20-1917 Contd

sine 29°36' = .49394 X 78.65 = 38.85 = S
cosin " " = .86949 X 78.65 = 68.39 = E

So that at 1929.65 N the 1/4 cor sets E 68.39 Ft
A. stake mkd 2640 N set by Albert Ecclestold
sets at 1893.00 N.

Correcting

N 1/2 mile bet 15-16 138-30
68.39 + 14.24 = 82.63
2652.49 into 14.24 = .00537 + 68.39
.00537 = 0°18' +

At Hub 2140.25 which is 210.60 N of
1/4 bet 15 and 16 - 138-30
We chain E out 1.14 + 68.39 = 69.53 where
we drive a hub for hus sec line - Road
Cen over which I set transit
Foresight North on stake at cor to secs
9-10-15-16-138-30 and set a line of Hubs
and tall stakes mkd road cen the
whole half mile North.
Ecclestold & Cummings to J J Lobb's place for
dinner and finding them gone we get our own
dinner - wash the dishes and ...

PM

finish staking the half mile North
John Wenzel

June 20-1917 contd

Var of the lute line reads 7°30' carefully taken - H&B needle working good.

Note: when I chained 69.53 ft East of Hub 2140.25. I was still half a foot too far West to check up with flags half a mile apart N&S. so I moved the transit ~~70 ft~~ ~~E~~ ½ a foot farther East to 70 ft E of Hub 2140.25 then ran my line of hubs North placing one on North side and one on S. side of open slough bet Cor to 9-10-15-16 and the ¼ bet 15&16. 138-30

Our N&S line cuts about 75 ft off the West side of a clover field put in by J J Lott in the SW¼ of ~~S~~ NW¼ Sec 15.

We walk to MCN° 12. on N. side of Bort Lake bet secs 15 and 16 - 138-30 where U.S. notes call for a post and

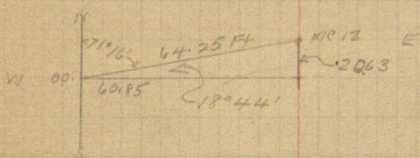
NP10W. 46°E 46 Lks - 30.36 Ft

NP12" N 70°W 52 " = 34.32 "

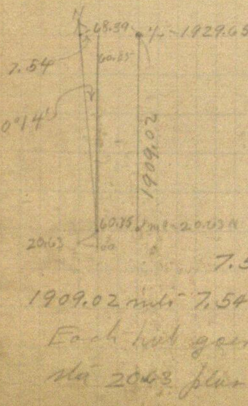
Albert Eastlo ... finds both stumps planting inkd BT from which we set the lake mc by flat chain from face of stumps

after which @ 7°30' var ... stump bears N 68°W and the other N 51°E

June 20-1917 cont'd
MC No 12 corner in the center of an old root of an 8 inch pine stump. The tree was probably used for the Meander Corner. It sets 22. ft North of waters edge
Setting transit on hub 6 0.0 on random the MC bears N 71°16' E 64.25 feet
= Correcting ⁋
S 1/2 mile bet 15-16 - 138-30
M.C. No 12 sets 20.63 N and 60.85 Ft East



Sine 18°44' = .32116 × 64.25 = 20.63 N and
Cosin 18°44' = .94702 × 64.25 = 60.85 E.



7.54 + 60.85 = 68.39
1909.02 into 7.54 = .00395 = 0°14'
Each foot goes .00395 of a foot East from cont ft No 1
sta 20.63 plus 60.85 E.
John W Curo

(35) 138-30
Turf. Roads

June 20-1917 Cont'd

Hub 215.40 is 194.77 Ft N. of MC N=12 and gas E. of 0.79 + 60.85 = 61.64

Hub 462.90 N. is 442.27 N of MC N=12 and gas E of 1.83 + 60.85 = 62.68 ft

Hub 980.70 N. is 960.07 N of MC N=12 and gas E. 3.79 + 60.85 = 64.64

June 20-1917

Roy Bryant - Harold Cuns - Wm Hoffman Begin at mon Cor to T-8-17-18-138-30 back right on line E on and run West Var reads 8°15

at 436.60 Hub 784 Hub

1052.60 Hub From here we cut line thru to twp line and quit for dinner All have cold lunch Earl Gould furnished lunch for Cuns Bryant.

PM

Chain West @ 14 51.30 Hub

1787.40 Hub 2090.80 Hub

2324 Cross old N & S. 2518.10 Hub

2646.90 the 1/4 Cor bet 7 and 18 set South 21.85 ft

MS notes cal for

NP 16 S 6° W 27 Lks = 17.82 Ft

NP 18 N 54° W 22 " 14.52 "

We find the stumps of both lines badly burned but plainly marked from which we find an old stake correctly set for the line 1/4 Cor

At 2771 W Cross old N and S

3079.45 Hub 3485.60 Hub

John W Cuns

(37)

138 30 Twp Roads

June 20-1917 Cont'd

3690 ald wood NTS 3781.60 Hub

4051.80 Hub 4455 ent mp

4770 Hub at 5018.35 The SW

Cor of Sec 7-138-30 sets South 24.70 ft

This is the Cor to sec 7-12-13-18. but T138-R30-31 W where U S Notes call for part of

NP8N20¼°E 38 LKS =

Spruce 6 N54°W 70"

NP2 OS 25E 170"

We find an iron monument set by Co Surveyor Cuno for the last Corner

Quit at 6.30 and walk back to Millard.

Harold & Roy still staying with Edwards

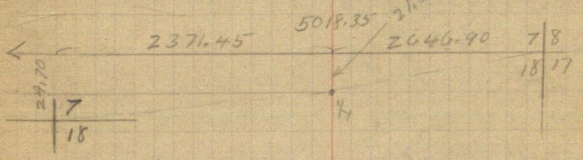
38 Road Survey 69
138-20 P.R. Twp

June 21-1917 Thursday

Correcting:

E. 1/2 mile Bet 7 & 18. =

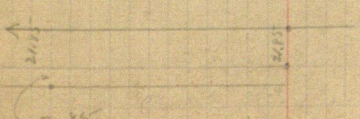
2646.90 into 21.85 = .00825 = 0°28' +



Hub 436.60 gave 3.60
" 731.00 " " 6.02
" 1052.60 " " 8.68
" 1451.30 " " 11.77
" 1787.40 " " 14.75
" 2090.80 " " 17.25
" 2518.10 " " 20.71
2646.90 " " 21.85 T. 1/4 Cor

Correcting

West 1/2 mile Bet 7-18-138-30



2371.45 into 2.85 = .001201 = 0°4' +

39) Road Survey
138-30 Pk. Tulp

June 21-1917 Thurs. continued

Correcting

West ½ mile bet 7-18 - 138-30

#5018-35 = 2871.45 W 2nd gang S 21.85 - 24.70
4770.00 = 2123.1 W " " S 2.50 + 21.85 = 24.40
4051.80 = 1404.9 W " " S 1.70 + 21.85 = 23.55
3781.60 = 1134.70 W " " S 1.36 + 21.85 = 23.21
3485.60 = 838.70 W " " S 1.00 + 21.85 = 22.85
3079.45 = 392.55 W " " S 0.47 + 21.85 = 22.32
2646.90 = 00. W " " S 21.85 to line ½ a

I help Bryant and Harold figure the above correction then run them to Barr's house from where they walk West to finish correcting the line bet 7-18 138-30

Then I run to Boot Lake and set wood stakes along N E side and come back to Eastvolden for dinner Roy + Harold late Lunch from Eastvolden.

P.M.

Roy and Harold finish correction and get back to Eastvolden about 1 PM and we all three go to Boot Lake and take out road

June 21-1917 contd

We find that at 1295 N. of hub 0.0. interest big open bog (NW & SE) and as the shore line on both the North side and where the line leaves the bog @ 1962 N. slope SE at about the same rate the distance accross bog is about the same on the corrected line as it is on the raindown being 667 feet = 40.4/10 Rods

We set a few more road stakes and also put one tall stake out 700 ft N of So side of bog all mkd "Road cen line see line"

Triangulation

Then to get the distance accross Boot Lake from stake No. 2078.50 S side to Hub 0.0. on N. side I set H & B transit on Hub 0.0. back sight South on Birch stake at 2078.50 H.

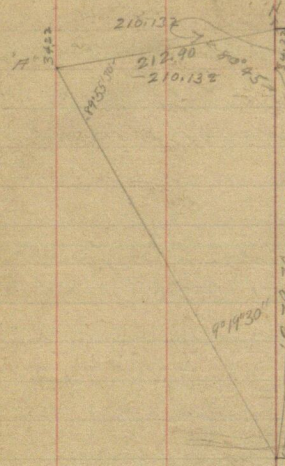
Turn telescope S 80°45' W. and chain 212.90 ft to spike "A."

Set transit on spike "A" Focus telescope So on ~~Hub~~ stake 2078.50 accross lake then turn telescope Left 89°55'30" to flag at Hub 0.0. Bryant & Harold carried flg & ch

John Weir

(41) 138-30
Price Twp. Records

June 21-1917 Continued



Sine 9°15' = .16074 x 212.90 = 34.22 S
Cosin 9°15' .98700 x 212.90 = 210.13 N.

Tangent 9°19'30" .16420 =
Cotangent 9°19'30" 6.08998 = x 210.132 = 1279.70 Ft

.1642. | 210.1323 | 1279.73

1642
4593
3284
13092
11494
16983
14778
12050
11494
6560
4926

210.1323
6.08998
1681.05784
18911.9070
18911.9070
1681.0578
1260.79380
1279.7015043540

June 21-1917 Contd

Distance accross lakes is 1279.70 plus 34.22 = 1313.92 added to 2078.50 = 3392.42 ft to Hub 0.0.

MC N°12. acts 20.63 N. of 0.0. so that the distance to MC N°12. is 3413.05 Ft

Sec Cor 3-4-9-10

¼ 9-10

Sec Cor 9-10-15-16

5322.07 — 1/4 cut 15-16
3413.05 — MC 12
3392.42 — 00
— MC 10

Sec Cor 15-16-21-22

00. — ¼ cut 21-22

June 21-1917 Contd

To run the road around East end of Boot lake we figure on keeping 33. ft from water edge

Drive PI Hub 24.30 ft N. of MC No 12 and set a hub 73. ft N and another 73 ft E of P I dist bet Hubs "73" or 79 ft and half way bet being @ 39.50 chain SW at right angles 10 ft and set hub for middle or curve

0" From P.I. 24.30 N of MC No 12
With bog compass @ 7°30' assumed at line lin N of road
W run N 65° 40' E @ 73. P.C.

@ 470 ft set Sta 1 being 33. ft from edge of sand (grass & 40 ft from water)

From 1, run N 60°30'E 137. ft to Sta 2 = {2. is 10/33 from grass + 150 from water

2. Run N 64° 40' E 138 to Sta 3.

3 " N 74° 45'E 89 Ft to Sta 4 - enter open bog near West end of Beaver Dam

4 Run S 61° 15'E - @ 66 set stake for culvert site N edge of Beaver dam @ 76 set Sta 5 on cen of Beaver dam 300 ft NE of Lake-water

From 5 run S 35° 20'E 100 Ft to Sta 6 on E side of present new wagon track just graded

From 6 run S 9°E keeping about 4 ft E of road and @ 280. intersect Sta 7. being a 2 inch birch tree lop off.

Sta. 6 is 250 ft NE of lake and at East edge of grass and Sta 7 is 200 ft E. of lake

John W. Cum

(44) 138-30

June 21-1917 contd
From Sta 7 run S 18°30'E 142 ft to Sta 8 E. side of road ∠ to road and fallow 33 ft from mark. and at 142 to sta 8
From Sta 8 run S 12°W 67 ft to Sta 9. in edge of bog ~~330~~ 300 ft from water
From 9 run S 56°30'W = @ 28 set stake for culvert @ 68 set sta 10. in edge of ___ and Quit for night

Bryant and Harald Cum stay with Earlwold I go home for supper

Get ck P.O order $15 from Hoot at Pine River payment for use of Greeley team for month of May 1917 @ $15. a month another $15. will soon be due. for June 1917

Ford is running good.

$1. to Harald

76 (45) 138-30 Temp Roads

June 22-1917 Friday

Roy and Harald cut line along E edge of Boot Lake and I figure triangulation of same and other conclusions

P.M.

Gerald-Reed and I come over in Ford and help the boys.

Beg @ Sta 10. we run N 81° W 135 T. 11

From 11 run	S 69°45' W	52.	to sta	12.	{ where grass & water meet
" 12 "	S 32°30' W	47.	To "	13	{ ~~where grass &~~ 33 in water sweet edge
" 13 "	S 12°30' W	74	T. "	14	= 33 ft fr lake
" 14 "	S 9° W	128	" "	15	soled to x then
" 15 "	S 23° W	45	" "	16	
" 16 "	S 50°30' W	70	" "	17	in monument & sup from S. 50' wide culvert site
" 17 "	S 78°30' W	~~110~~ 193	" "	18	on Island. solid shore
18 "	S 26°30' W	~~80~~	~~" "~~	~~19~~	

@ 100 enter marsh @ 173 enter water

@ 198 stakes for culvert site in 8" water

@ 229 Lv water @ 303 Lv marsh - on solid gd

@ 360. set sta 19 solid, Lv shore

19 run S 2°30' W 100 ft to sta 20

20 S 19°45' W @ 50 enter solid swp

@ 87 sta 21 in solid swp 33 fr water

21, S 38°20' W @ 25. culvert site in soft bog

@ 88. set sta 22

22 S 52°15' W @ 25 Lv soft swp

Junk ...

June 22-1917 contd

℄ 104 sta 23 is solid rocks

23 run S 56°30' W 144 F to sta 24 being

stake set about 24 ft S and 6 ft

E of stake 2078.50 N.

John W Curr Compass and chain 7°30

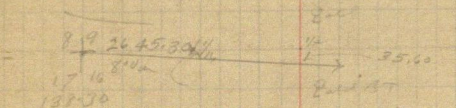
Harold Curr chain

Roy Bryant stakes &c

get thru 3.50 P.M. and go in car

to correct line bet Secs 9 and 16 N ½

Ht 2645.30 E the ¼ cor is N 35.60



.01346 N.
=0°46'

	2645.30	N	35.60 to ¼
set Hub	2279.30	N	30.80
			22.40
" "	1665.40	N	
at	1322.65	[illegible]	17.80 and set Hub W ½ bet [illegible]
at 961.20	[illegible]	N	13.00

Bill Rice helped us set the 1/16 cor

at his NE cor – From [illegible] 1322.65 E

I turn 90° from main line and set a stake

South a few hundred feet just for Bill

to cut out by. We all get in car

John W Curr

(47)

138-30
Pine River Twp - Road

June 22-1917 Continued
and go back to Mildred where I
leave Harold and Roy - then Reed
Gerald and I go home to the farm

Evening
Alma - Gerald - Reed and I go to
Pine River in Ford to see Dr
who looks Gerald over - we get
Gerald's medicine of John Allen 65¢
and as I have just got a letter from
Gladys Cree stating she has quit
work at Carlsons - Alma
suggests that we have her come down
on night train - I decide to go
for her in the car - pay 40¢ for new
light and to P. R. @ 8.40 P.M.
with Alma and the kids
Mighty dark and lights are
poor so we stop at Hackensack
and get Hallie jug and Lantern and
box of matches from Grant Cree
Ar Walker about 12 - midnight
Wake Brad up - then sleep till
6-30 and to Walker @ 6-30

John Cree

June 23-1917 Saturday

Lv Walker 6-30 with Alma - Glad - Harold & Reed.

Set Glads grip on running board and lose it off at Walker but do not miss it till I get to Hack

Telephone back to Chas Griffith who saw it in the street at daybreak and may be able to find it

Get car fixed at Hack

Take dinner with Gran - Ship 18 irons (Boiler Tubes) which I find piled at Hackensack Depot to Mildred - 25¢ ea.

then I take 8 irons and come to Mildred - Ar 2-30 PM.

Take Alma to the farm - then come back to Mildred - Find car leaks - go to Pine River - car fixed and back to Mildred @ 4 - PM.

Roy - Harold and I then set Iron monuments at the following corners.

1st ¼ bet 4 and 9 - 138 30 in E+W road

2nd Cor to 3-4-9-10 " " E+W "

3rd ¼ bet 9 & 10. Flag and big mound.

138-30 P.R. Twp
Roads.

June 23-1917 Contd
4th Cor to 9-10-15-16 - 138-30 in big mound & Flag
5th Cor to 4-5-8-9-138-30 driven in marsh
by Harold tight up against the
East side of the old U.S. Stake already
checked there by me.
Harold & Roy still with Ekslund

Sunday -

June 24. 1917

~~Roy Hme~~

We came to Mildred to get Harold &
Roy for dinner but find them gone and
go to Pine River where we pick them
up, and go to Jenkins - catch 8 trout
& back home where we cook the trout then
go fishing in Norway Brook in Ed Hermans
boat Roy catches 3 crappies
Harold Reed & I fix Ed's boat - Mel
take the boys back to Mildred - Run out of
Gas. Harold gets 2 gals
Over night on the farm

John H Carr

June 25 1917 Monday.

Town Board meets to day at Town Clerk Lobb's place and we hustle to get there our acct in and bills in

I go to Mildred -

Pick up the boys and iron monuments

Rhy runs car to Barr's place where he and Harold take one iron and walk a mile West and put it in at or 5th iron @ 1/4 bet 7 & 18 138-30 Flag & monument

I am writing these notes in the car while they are gone.

6th Iron at West 1/16 bet secs 9 and 16 - &

7th iron set at 1/4 Cor bet 9 and 16 -

138-30 we then go to dinner and all three eat with Albert Ecarbold

P.M.

I make out the following bills

John W. Cuno Pine River Minn June 25th 1917

Engineer work in survey of Townships roads and the setting of iron monuments at all U.S corners along same as required by the United States Govt in all road surveys and also required by law

June 13th To 24th 1917 inclusive except

John W Cuno

82

51
13.30
Twp work

June 25-1917 Cmd

Sunday June 17th and 24th 1917 making
10 days @ $5. p day $50.00
June 25-1917 1/2 day @ 65 .25
Total $52.50

Nat: I am making no charge for auto
used 7 days with survey crew & am making
no charge for auto to Walker & back to get
iron monument (Trip made at night) cmd
and signed John W Cmd

Next bill made out is as follows
Pine River Minn June 25-1917 John W Cmd
Town of Pine River to Roy E Bryant Dr
Engineering work in survey of Twp roads
and setting 7 I.M.S. in Cen of said roads
or required by the U.S. Government
and also required by law. Assisting Dep
& Surveyor Cmd
June 13 to 24-1917 inclusive except Sunday
June 17 and 24 = 10 days @ $5 $50.00
June 25-1917 1/2 day .25
$52.50

Nat: I am deducting for 1/2 day in 4th
June 13th 1917 when I worked on Chaining
$1.30 and also deducting 1/2 day 11th Jun
23. 1917 while sailing for survey $1.30
Total Deducted 4.00
$48.50

Signed Roy E Bryant. Bud
John W Cmd

June 25-1917

Also a bill fr Harold viz
Harold J Cuno June 25 1917 Pine River
Flog and Skimmon in county of Twp
woods in Pine River Twp. - 138-30
June 18th to 25th 1917 inclusive - except Sunday
June 17 & 24 and also ½ day in AM. June 23
1917 while waiting for mower - 9½ days @ 2. - 19.00
June 25 1917 ½ day 1.00
$20.00
Signed Harold J Cuno.

Also made out bills fr: Board & work
Albert Eastwood or fallows

Two days work @ $2.		4.00
" " Board fr cuno @ $1.		2.00
11.3/4 days " fr Bryant		11.75
11.3/4 " " Harold cuno		11.75
		$29.50

Mrs J J Lobb Board of Harvey Cuno 5c
Cuno 50c Bryant $.25 Harold Cuno
$1.35 Wm Hoffman 25c Albert Eastwood 25c
Total $3.50

Wm Kline 2 days work $4. Board of Cuno
$1. Board of Eastwood 25c
Total $5.25

Wm E Hoffman 5 days @ 2 Total $10.

John H Cuno

June 25-1917 ended

Medium auto to ½ on bet 15-16-138-30
pull up wood hat and on
No 8 put it in and mound

Then go to Board meeting at
Lobbs get our checks - go to Treasurer
in Sec 8 get checks.

Then set iron at MC No 12 on N side of
Boot Lake Then go to treasurer and
get checks recorded Then to Farmers
State Bank at Pine River and get
checks cashed.

The Boys sign checks and bank
parker is away thank me

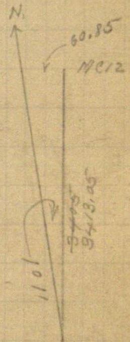
Total

June 25-1917

Correcting

Bet 20-22, At 3413.05 N.
of 1/4 bet 20 and 22, the MC No 12
sets East 60.85

3413.05 into 60.85 = .01783 –
Hub 2078.20 goes East 37.05 and
N



At Hub 2078.20 We run East
37.05 ft to line At on line where we set
transit - backsight on pencil
on hub 2078.20 Turn 90° to
R. then 1°1' further to R and
run N on trial line 21.50 ft to pt on
Sea wall 5 paces South of waters
edge where we set a 2 x 48" boiler tube
for witness Cor to MC No 10.

We pull up stake and hub at Sta 24
and set it on third N-S sec line
24.50 ft So of I.M. near MC No 10 and
107 ft from sta 23. of road around S.E
side of Boot Lake

At Hub 1800 N we chain East
32.09 ft and set Hub and tied stake on
line

① 138-30
Pine River Twp
Cass Co Minn

Aug 9th 1917

Working for Pine River Twp 138-30
Cass Co Minn

Taking measurements for dirt hauled
by Guy Stanley on Trout Road
Bet Secs 33 and 34-

I will first figure the
3. cuts and as it was not
cross sectioned before the work started
I will measure the fill as a
check

I have no rodman or chainman
and will have my wife help me

Go to the farm on Sec 24-138-30
@ 9- AM.

Go in my own Ford Car to Pine River

My two chains are at Moulster
office which I find locked

Go to Moulster residence - get
A. W. Moulster (Bill) who unlocks
his office and I take my Heller & Brightly
chains on a level- and my 300 ft
Chi steel tape. Lend Bill to Head at Noon

I have my self reading rod

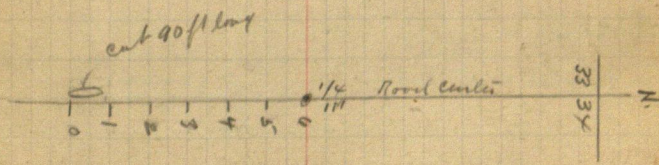
Aug 9-1917 Contd ② 13S-30 PRTrk

and drive 3. miles West of Pine River
Meet-Guy Stanley who says "turn North
at Willers Mail box"

Stop Cor near ¼ Cor bet 33 and 34
13S-30 which is a 2×4×8" gal. I.M. Coffee
Baby Reed plays near auto

Alma and I begin at I.M. ¼ Cor
and Chain South along newly built
road 600 ft to point E on S. South
end of our pist- Cat which is on
the West side of the road and is 90 ft
long

To get the depth of the cut I
cut a long pole which I lay across
cut and measure depth without
using the level

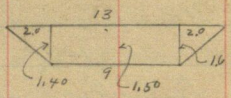


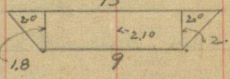
138-30
PR Twp

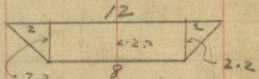
Aug 9-1917 Cmdt

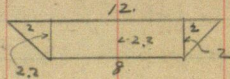
Sta 0 @ 600 Ft S. of IM 1/4 Cor

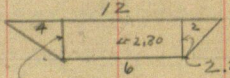
Sta	End Area
0	0.0.
+ 5	16.60
+ 5	16.60
+ 10	21.90
+ 10	21.90
+ 20	22.00
+ 20	22.00
+ 30	22.00
+ 30	22.00
+ 40	19.60
+ 40	19.60
+ 50	17.85

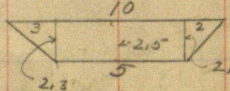












Cut N° 1.

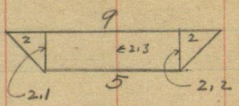
bet Secs 33 and 34 – 138-30. Going North

			Sq Ft
16.60 – 2 = 8.30 × 5 =	Rod 8 to 0 To + 5 =		41.50
16.60 21.90 38.50 – 2 = 19.25 × 5 =	" " + 5 To + 10 =		96.25
21.90 21.90 43.90 – 2 = 21.95 × 10	" " + 10 To + 20 =		219.50
22.00 22.00 44.00 – 2 = 22.00 × 10	" " + 20 To + 30 =		220.00
22.00 19.60 41.60 – 2 = 20.80 × 10	" " + 30 To + 40 =		208.00
19.60 17.85 37.45 – 2 = 18.725 × 10	" " + 40 To + 50 =		187.50
			972.75

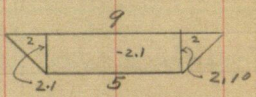
(5) 138-30
PR Twp

Aug 9-1917 Contd

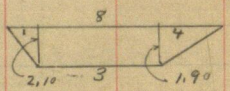
8/5	END Area
+ 50	17.85
+ 60	15.30



+ 60	= 15.30
+ 70	= 14.70



+ 70	= 14.70
+ 80	= 10.85



+ 80	= 10.85
+ 90	= 00.00

(6)

Cub No 1.

Sq Ft

Brot From Pg 91. 972.75

17.85
15.30
33.15 - 2 = 16.575 X 10 Bet Sta +50 To +60 = 165.75

15.30
14.70
30.00 - 2 = 15.00 X 10 " +60 To +70 = 150.00

14.70
10.85
25.55 - 2 = 12.775 X 10 = " +70 To +80 = 127.75

10.85
00.00
10.85 - 2 = 5.425 X 10 = " +80 To +90 = 54.25

1470.50

27. | 1470.50 | 54.46
135
120
108
125
108
170
162
8

54.46 yds @ 35¢ = $ 19.06

Aug 9-1917 cont'd

Alma Reed and I eat our lunch on a blanket

Guy Stanley comes along about 3-30 and helps me adjust the level (Transit) and rods

Testing Level

Peg @ Sta	0.0	Elev 100.00 assumed	
T @ "	"		
Rod @ "	0.0.	Reads +S	1.66
HI @ "		is 101.66	
Rod @ " Peg	2	Reads −S	8.56
Elev of Peg @ Sta 2 =		93.10	

101.66
8.56
93.10

T @ Sta 0.0. Rod @ Sta 0.0 reads 4.46
HI @ Sta 0.0. " 104.46
Rod @ peg @ Sta 2 reads 11.39
93.07

T. off 0.03 of a foot in 200. Feet which is close enough for these short fills and cuts

I take the levels of the first short fill which is about 16. feet wide on top and is 135 feet = 8.18 Rods long He is to get 35 cents a rod for brushing the bottom of each fill. John W Cuno

(8)

Fill No 1

Fill No 1

(9) 138-30 Leveling

Aug 9th 1917 Bal Sec 33-34

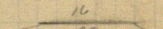
BM	Station	+S	HI	-S	Elev	End Area
1		6.90	106.90		100.00	
2				4.10	102.80	
	0.					
	1.					
	1 +65			7.00.		00
	1 +75			7.10	99.8	25.20
				7.20		
				7.30		
				8.40	98.5	
				7.10		
				7.40		
				8.50	98.4	
	2			7.60	99.3	18.00
				7.70		
				7.90		
				8.60	98.3	
				7.60		
				7.80		
				8.60	98.3	

(10) Fill No 1

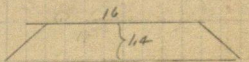
Guy Stanley Job

On 1/16 of I.M. = 1/4 Cor bet Secs 33-34. EL assumed
Peg driven in cut 200' S of BM No 1.
Is 600 Ft S. of I M 1/4 Cor bet Secs 33-34 138.30
In road - EL not taken
Cen. S. End of Fill 435 Ft S. of IM 1/4 Cor Bet 33-34 = 0.0.

Center of Fill Road Cen

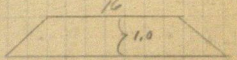


4' R on "
7' R on "
10' R in Mark
4' L on Fill
7' L " "
10' L in Mark



18 x 1.4 = 25.20

End of Fill - Road Cen.



4' R. on Fill
7' R " "
10' R in Mark
4' L on Fill
7' L " "
10' L in mark

18 x 1 = 18.00

(11)

Fill No 1.
138-30 - Sec 33-34
Leveling

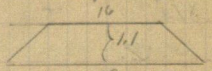
Aug 9-1917 Continued

Sta	+S	H I	-S	Elev	End Area
2+25		106.90	7.60	99.3	19.80
			7.70		
			7.80		
			8.60	98.3	
			7.60		
			7.70		
			8.70	98.2	
2-50			7.40	99.5	25.2
			7.30		
			7.70		
			9.00	97.9	
			7.40		
			7.70		
			8.60	98.3	
2+75			7.30	99.6	19.80
			7.30		
			7.70		
			8.50	98.4	
			7.20		
			7.60		
			8.20	98.7	

Pine River Twp (12) Fill No 1

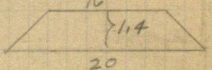
Guy Sawley work

Cen of fill. Road Cen.
4' R on fill
7' R " "
10' R in Swamp
4' L on fill
7' L " "
10' L in Marsh



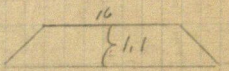
18 x 11 = 19.80

Cen of fill: Road Cen
4' R on fil
7' R " "
10' R in Marsh
4' L on Fill
7' L " "
10' L in marsh



18 x 1.4 = 25.2

Cen of fill: Road Cen
4' R on fil
7' R " "
10' R in marsh
4' L on fil
7' L " "
10' L in marsh



18 x 11 = 19.80

100 (13)

Fill No 1.
138-30 Secs 33-34
Leveling

Aug. 9-1917 Cont'd

B/S	+S	H I	−S	Elev	End Area
3.		106.90	6.90	100.0	00.
			6.90		
			6.90		
			7.20		
			7.90		

(4) Fill No 1

Pine River Twp - Guy Darley work

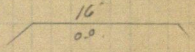
Cen of road = 0.0.

6'R on Natural ground

4'L on fil

7'L " "

10'L in mark



102 Cut No 2 (15) 138-30 Pine River Twp

Aug 9-1917 Contd

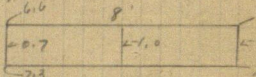
B.M. & Sta	+ S	H I	- S	Elev	End Area
1	6.90	106.90		100.00	
2+90			7.00		0.0
" "			7.60		
" "			6.70		
" "					0.0
3.			6.60		8.00
"			7.30		
"			7.30		
"			6.00		
+ 30			5.90		29.00
			6.20		
			6.50		
			6.70		
			4.20		

4 X 10 = 40 Feet

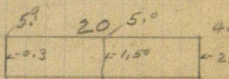
18.50 + 30 = 555.00 Feet

Cut N°2. Stanley Work

On I N ¼ Cor bet secs 33 and 34 - 138-30 Assumed
on Natural ground 16' R, 310 Ft So. of I N ¼
Cor bet secs 33-34 = S end of Cut N°2
on West edge of point of small ditch
Cen of small Cut 18' R - S. end of Cut
20' R on Natural ground E. side of Cut
Sta 2+90 End Area = 0.0.
12' R W. edge of Cut on Top of bank
13' R in Cut
20' R " "
21' R on E. Top of E. edge of Cut



Road Cen - not in cut
½ Ft R. in cut West edge
10½' R " "
20½' R " " East edge
20½' R on Top of Bank Cut is 20. ft wide
at Sta 3+30



2X10 = 2.0
.09X10 = .9
2.9

(17)

138.30
Pine River Twp

Aug 9-1917 Cont'd

B/S	+S	HI	-S	Elev	End Area
3+55		106.90	5.60		48.50
			5.80		
			5.20		
			6.00		
			6.00		also
			3.10		
			5.70		57.63
			2.70		
3+75			5.60		76.85
			5.60		
			4.50		
			5.40		
			5.50		
			1.70		
4			5.00		79.00
			5.40		
			4.20		
			5.30		
			5.40		
			1.20		

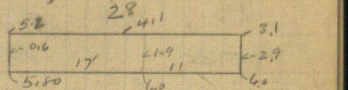
38.75 x 25 = 968.75 Feet

67.24 x 20 = 1344.80

77.92 x 25 = 1948.00 Feet

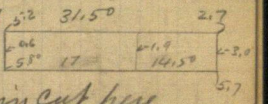
83.25 x 25 = 2081.25 Feet

Cut N° 2. Stanley Contract



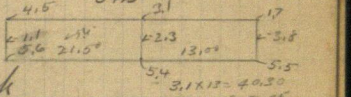
2.4 X 11 = 26.40
1.3 X 17 = 22.10
48.50

Wood Cen - In Cut
6'L on West edge of cut
7'L on Natural Bank 1 Ft W of Cut
11'R in cut
22'R " " E. side of Cut
22'R on Bank E. side of Cut
25½'R on ground in cut
25½'R on Bank Jog 3½ Ft in Cut here

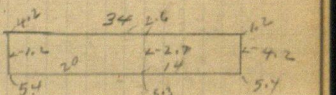


2.45 X 14.5 = 35.53
1.3 X 17 = 22.10
57.63

Cen of wood - in cut
7½'L W side cut
7½'L " " " on bank
14'R in cut
27'R " " E. edge
27'R On bank E. of Cut



3.1 X 13 = 40.30
1.7 X 2.15 = 36.55
76.85



3.5 X 14 = 49.00
1.5 X 20 = 30.00
79.00

Cen of wood - in cut
6'L in Cut - W. edge
6'L on bank
14'R in cut
28'R in cut - E. edge
28'R on bank E of cut

(19) 138.30
Prin Rivers Twp

Aug 9-1917 Contd

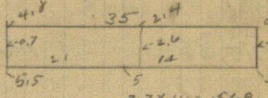
Sta	+S	HI	-S	Elev	Enclosed Area
4+25		106.90	5.10		87.50
			5.50		
			4.80		
			5.00		
			5.50		
			0.80		
+55			5.60		108.80
			5.60		
			5.00		
			5.20		
			5.20		
			1.10		
			5.20		100.40
			1.10		
5			5.30		61.00
			5.50		
			5.50		
			5.70		
			1.70		

98.15 x 30 = 2944.50 Feet

80.70 x 45 = 3631.50 FT

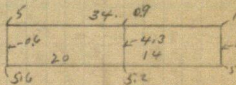
59.85 x 36 = 2154.60 Feet

Cut N° 2. Stanley Contract



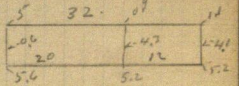
3.7 X 14 = 51.8
1.7 X 21 = 35.7
87.5

Road Cut - in cut
6' L in cut W. edge
7 L on Bank
15' R in cut
29' R in cut E. edge
29' R on Bank E of Cut



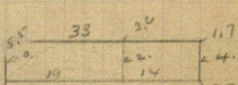
road Cut - in cut
6' L in cut W. edge
6' L on bank
14' R in cut
28' R " " E cut edge of cut
28' R on Bank E of Cut

4.2 X 14 = 58.80
2.5 X 20 = 50.00
108.80



26' R in cut
26' R on bank do. 2' W

4.2 X 12 = 50.40
2.5 X 20 = 50.00
100.40



Cen of road in Cut
5' L Edge of cut - no bank
14' R in cut
28' R in Cut. E. edge
28' R on bank

3 X 14 = 42.0
1 X 19 = 19
61.0

(21) 138-30
Pine River Twp

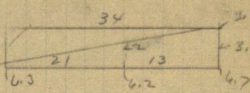
Aug 9-1917 Cont'd

Sta	+ S	HI	— S	Elev	Final Elev
5+36		106.90	6.20		58.70
			6.30		"
			6.20		27.60
			6.70		
			3.00		
			6.30		
			4.00		
5.60			5.90		6.40
			7.30		
			5.60		
5+70			7.30		
			6.70		0.0

17,00 + 2.40 = 40800 Feet

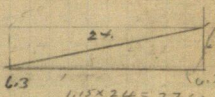
3.20 & 10 = 32,00 Feet

Cut N° 2 Guy Stanley Cut

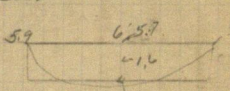


2.9 × 13 = 37.70
1 × 21 = 21.00
58.70

Cut of road-n. cut
5'L W. edge of cut-no bank
15'R in cut
29'R in cut - E. Edge
29'R on bank
18'R in cut Jog
20'R on Bank Slope 1 To 1. Jog here
10'R on bank W. Side of cut
12'R in cut
16'R on bank
14'R in cut N-End
14'R on bank narrow Cut-N. End = 0.0.



1.15 × 24 = 27.60



1.07 × 4 = 6.40

Guy Stanley Rods and we get thru about 7-00 PM

Alma and I go home via Melbourne I go home by way of

(23) 138-30
33-34

Aug 10-1917 Fill No 2.

As I can get no one to help me chain and rod & cept Guy Stanley and as I do not want him because he had the contract

My wife agrees to help me

We take baby and leave in the Ford about 9. a.m. and go by way of Mildred

Alma Cmo rod & ch

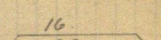
J H " ⊼

Red pitch Blue-berries

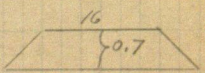
BM	Sta	+S	HI	-S	Elev	End Area
1.		4.05	104.05		100.00	
	5+80			4.20	99.8	00
	6.			4.20	99.8	11.90
				4.40		
				4.50		
				4.80	99.2	
				4.40		
				4.40		
				5.10	99.0	

Fill No 2. Stanley Contract

Berry I.M. ¼ Cor bet 33+34-138·30 = S ½° C.
Road Cen S. End of fill = 0.0.



" "
4'R on fill
7'R " "
10'R in end of marsh
4'L on Fill
7'L " "
10'L in marsh



17X7 = 11.90

25

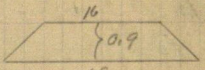
138-30
Pine River Twp
Secs 33-34

Aug 10- 1917 Cmtd

Sta	+S	H I	-S	Elev	Cmtd Area
7		104.05	4.40	99.6	16.2
			4.50		
			4.80		
			5.30	98.7	
			4.4		
			4.2		
			5.00	99.0	
8			4.5	99.5	19.80
			4.7		
			4.7		
			5.5	98.5	
			4.6		
			4.6		
			5.6	98.4	
9			4.5		16.2
			4.5	99.5	
			4.7		
			5.5	98.5	
			4.6		
			4.7		
			5.3	98.7	

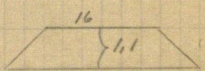
Fill No 2

Cen of road on fill
4'R on fill
7'R " "
10'R in mark
4'L on fill
7'L " "
10'L in swamp



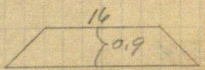
18 × 9 = 162

Cen of road
4'R on fill
7'R " "
10'R in mark
4'L on fill
7'L " "
10'L in mark



18 × 11 = 198

Cen of road
4'R on fill
7'R " "
10'R in mark
4'L on fill
7'L " "
10'L in mark



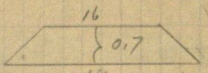
18 × 9 = 162

Aug 10-1917 contd

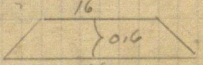
Sta	+ S	H I	− S	Elev	Enel Area
10		104.05	4.6	99.4	11.90
			4.6		
			4.7		
			5.3	98.7	
			4.6		
			4.7		
			5.3	98.7	
11			4.6	99.4	10.20
			4.7		
			4.8		
			5.3	98.7	
			4.6		
			4.9		
			5.10	98.9	
+40			4.2	99.8	23.40
			4.4		
			4.6		
			5.4	98.6	
			4.4		
			4.8		
			5.5	98.5	

Fill N°2

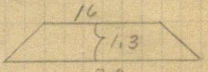
Cen in road
4'R on fill
7'R " "
10'R in swp
4'L on fill
7'L " "
10'L in swp
Cen - in road
4' R on fill
7' R " "
10'R in swp
4'L on fill
7'L " "
10'L in swp
Cen in road
4'R on fill
7'R " "
10'R in swp
4'L on fill
7'L " "
10'L in swp



17×7= 11.9



17×6=10.20



18×1.3=23.40

(29)

Aug 10- 1917 Cmld

Sta	+S	HI	-S	Elev	Cmld Dist
11+48		104.05	3.5	100.5	0.0
			3.3		
			3.9		
			6.0	98.0	
			3.5		
			3.7		
			5.8	98.2	
+60			4.5	99.5	16.12
			4.5		
			4.7		
			5.3	98.7	
			4.6		
			4.6		
			5.4	98.6	
12.			4.6	99.4	13.60
			4.8		
			4.8		
			5.3	98.7	
			4.6		
			4.7		
			5.4	98.6	
T.P	4.48	104.05	4.48		

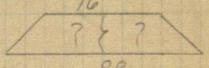
60
37
25

3,5

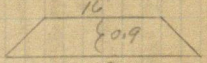
Fill N° 2

Culvert gals rim
24" X 24'2"

Road Cen-on top of Culvert -
4'R. top of sand on culvert
7'R " " " "
12'R. bottom of culvert - inside
4'L
7'L
12'L bottom of culvert - inside

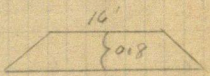


Cen of road
4'R on fill
7'R " "
10'R in swamp
4'L on fill
7'L " "
10'L in swamp



18X9 = 16.20

Cen of road
4'R on fill
7'R " "
10'R in swp
4'L on fill
7'L " "
10'L in swp



17X8 = 13,60

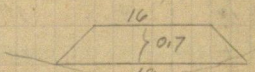
Pg 12 H.I. same as Sta 15.

Aug 10-1917 Cont'd

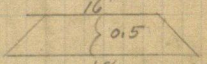
8/a	+S	HI	-S	Elev	End Area
13		104.05	4.7	99.3	11.90
			4.7		
			5.0		
			5.4	98.6	
			4.7		
			4.8		
			5.3	98.7	
14			4.6	99.4	8.50
			4.7		
			4.8		
			5.1	99.0	
			4.6		
			4.8		
			5.3	98.8	
15			4.7	99.3	11.90
			4.7		
			4.7		
			5.3	98.7	
			4.7		
			4.8		
			5.6	98.5	

Fill N=2

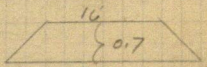
Cen of road
4' R on fill
7' R " "
10' R in swp
4' L on fill
7' L " "
10' L in swp
Cen of road
4' R on fill
7' R " "
10' R in swp
4' L on fill
7' L " "
10' L in swp
Cen of road
4' R on fill
7' R " "
10' R in swamp
4' L on fill
7' L " "
10' L in swp



17×7 = 11.90



17×5 = 8.50

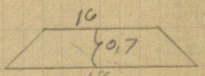


17×7 = 11.90

Aug 10-1917 Could

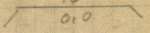
Sta	+S	HI	-S	Elev	Ent Fred
15+80		104.05	3.9	100.10	11.90
			3.9		
			3.9		
			4.6	99.4	
			3.9		
			4.0		
			4.6	99.4	
16			3.10	100.9	00
+25			2.8	100.2	00
			2.9		
			3.10		
			3.6	100.4	
			2.9		
			3.0		
			3.5	100.5	
+50			3.6	100.4	6.80
			3.5		
			3.6		
			4.0	100.0	
			3.5		
			3.4		
			4.0	100.0	

Fill N:2

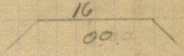


17×7 = 11.90 Ft

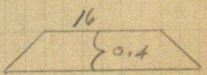
Cen of road
4'R on fill
7'R " "
10'R on solid ground
4'L on fill
7'L " "
10'L Solid ground



Cen of road on Poplar Point: Solid gd
Cen of road
4'R on fill
7'R " "
10'R on swp
4'L on fill
7'L " "
10'L Solid ground



Cen of road
4'R on fill
7'R " "
10'R on swp
4'L on fill
7'L " "
10'L on swp



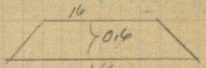
17×4 = 6.80

Aug 10 1917

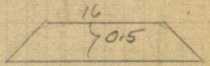
Std	+S	H I	−S	Elev	End Area
17		104.05	4.3	99.7	10.20
			4.3		
			4.5		
			5.0	99.0	
			4.4		
			4.4		
			4.8	99.2	
18			4.3	99.7	9.00
			4.4		
			4.7		
			4.7	99.3	
			4.3		
			4.4		
			4.9	99.1	
T.P.	12.65	112.62	4.08	99.97	
19			12.7	99.9	16.20
			12.8		
			12.9		
			14.0	98.6	
			12.7		
			12.7		
			13.2	99.4	

Fill No 2

Cen of road
4'R on fill
7'R " "
10'R in cut
4'L on fill
7'L " "
10'L in cut
Cen of road
4'R on fill
7'R " "
10R in cut
4'L on fill
7'L " "
10L in cut



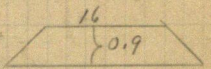
17×6 = 10.2 C.F.



18×5 = 9.0 C.F.

Proj sta 18. ℄ sta 21+80 about

Cen of road
4'R on fil
7'R " "
10'R in cut
4'L on fil
7'L " "
10'L in cut

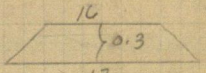


18×9 = 16.20 C.F.

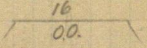
Aug 10-1917 Contd

Sta	+S	HI	-S	Elev	End Area
19+90		112.62	11.7	100.9	5.00 ft
			11.8		
			12.0		
			12.0	100.6	
			11.7		
			11.7		
			12.0	100.6	
20			11.5	101.2	00
21.			7.3	105.3	
Bm 2			2.16	110.46	
Sta 22			4.4	108.2	

Fill No 2 Guy Stanley Contract



Cen of road
4'R in fill
7'R " "
10'R in sub
4'L in fill
7'L " "
10'L in sub



Cen of road End of sub = 0.0
Cen of Road Just road No fill
On top of stumps 20'R @ sta 21.95
road Cen Not fill.

Aug 10- 1917

Sta	+S	HI	-S	Elev	Elev from Arm
22+10	10+ Feet 50 Feet	112.62	4.2		0.0
+15			4.5		20.00
	26.23 X 25= 655.75 Ft		4.7		
			3.6		
			4.8		
			3.7		
+40			4.4		32.45
	47.73 X 25= 1193.25 Feet		4.7		
			3.0		
			4.7		
			3.1		
+65			4.50		63.00
	61.20 X 25= 1530.00 Feet		5.0		
			2.2		
			4.4		
			1.7		
+90			3.9		59.40
	63.50 X 25= 1587.50 Feet		4.2		
			1.8		
			4.2		
			1.3		
Sta 23.			3.8		

Cut N° 3. Stanley Contract

Cen of road S. End of Cut N° 3 = 0.0.

Cen of " in cut

10' R in cut

10' R on bank

10' L in cut

10 L on bank

Cen of road in cut

11' R in cut

11' R on bank

11' L in cut

11' L on bank

Cen of road in cut

12' R in cut

12' R on bank

12' L in cut

12' L on bank

Cen of road in cut

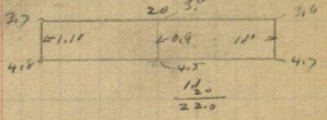
12' R in cut

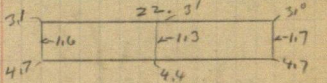
12' R on bank

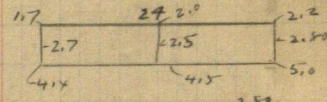
12' L in cut

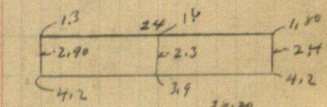
12' L on bank

Cen of road in cut









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Aug 10-1917 Cmld

Sta	+S	HI	-S	Elev	Cut Area
23+15		112.62	3.8		67.60
			3.9		
			1.7		
			3.9		
			0.7		
+40			2.7		49.40
			3.2		
			1.5		
			3.7		
			0.8		29.25
+65			2.9		
			3.2		
			2.4		
			2.6		
			1.10		
+75			2.70		
			3.10		19.00
			2.6		
			1.9		
			1.10		
+80			2.20		

58.50 x 25 = 1462.50 Feet

39.33 x 25 = 983.25 Feet

24.13 x 25 = 603.25 Feet

9.5 x 5 = 47.50 Feet

Cut N° 3. Stanley Culvert

Cen of road in cut

12 75 R in cut

12 3/4 R on bank

12 3/4 L in cut

12 3/4 L on bank

Cen of road in Cut

13' R in cut

13' R on bank

13' L in cut

13 L on bank

Cen of road in cut

13' R in cut

13' R on bank

13' L in cut

13' L on bank

Center of road in cut

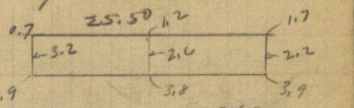
12 1/4' R in cut

12 1/4' R on bank

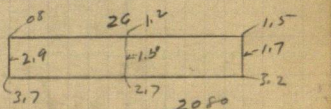
12 1/4' L in cut

12 1/4 L on bank

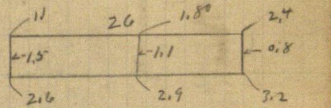
Cen of road in N end of Cut = 0.0.



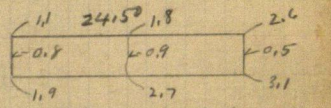
30.60
36.98
67.58



20.80
28.60
49.40



12.35
16.90
29.25



10.41
8.59
19.00

Aug 10-1917

Alma and I use a 300' steel tape chaining the total distance from Sta 0.0. to Sta 23.+80

Sta 00. is a point 600. Feet South of the I.N. 1/4 Cor bet Secs 33 and 34. T 138-30 and we chain North along the partly built new road along the Sec line to Sta 23+80 taking both cuts and fills as we go as given from Page 88 To 129. of this book

We get thro about 3-30 P.M. and beat it for home Via Pine River I send Glad another one dollar bill making only $2.

Then go home and as I have kept my field notes in a scratch lab book I re-write same in this book and keep up lab leader

Then I proceed to figure yardage

Over night at home with Alma and Reed. On the pm see 24-138-30

John A Cano

Aug 11-1917. Saturday

The boumboard of Pine River Twp meet at Mildred to-day and I am hustling to get the pgmes ready for them pgmes till 1 PM then or I cannot get thro I take car with Alma & Reed and go to Mildred S. E & W line bet W. half of sec 138-30 where I meet the board who are letting a road contract

I sit in car and pgmes till they all go home then @ 5.45 PM turn car and go to Mildred then to Pine River for mail Find none Dont see why Glad does not write! Go home to the farm

About 8-30 Alma-Reed & I go in Ford to LOE meys place where we spend a good evening Meet Petersons two girls and one son Go home @ 11-PM full of good ice cream

Quiet night on the farm

John W Carr

45

Aug 12-1917. Sunday

At home on the farm- Cloudy-Rain

I figure up Cut No 2. Stanley Contract and will add about 1/3 to the "flat" figures to make up for the "round" of the hill

Will then figure the fill on a check on the whole

Cut N° 1. Stanley Conliard.

Page 90 To 93

41.50
96.25
219.50
220.00
208.00
187.50
165.75
150.00
127.75
54.25 Sq.
1470.50 Ft = 54.46 yds @ 35° = 19.06

Cut N° 2.

Page 102 To 109.

40.00
555.00
968.75
1344.80
1948.00
2081.25
2944.50
3631.50
2154.60
408.00
32.00 Ft
16108.40 = 596.61 yds @ 35° = 208.81

Cut N° 3

Page 126 To 129.

50.00
655.75
1193.25
1530.00
1587.50
1462.50
983.25
603.25
47.50 Ft
8113.00 = 300.48 yds @ 35° = 105.17

Fill No 1

(47) 138-30
Stanley Contract

Sta	Area	Sta		Area			Feet
1+65	0.0	+75	=	25 20	=	12.60 X 10 =	126.00
+ 75	25.20	2		18 00	=	21.60 X 25 =	540.00
2	18 00	+25	=	19 80	=	18.90 X 25 =	472.50
+ 25	19 80	+50	=	25 20	=	22.50 X 25	562.50
+ 50	25 20	+75	=	19 80	=	22 50 X 25	562.50
+ 75	19 80	3		0 00	=	9.90 X 25	247.50
3	0 00					Feet	2511.00

2 5 1 1.0 0 Ft = 9 3.0 0 yds
1 7 6 6 1.6 0 Ft = 6 5 4.1 4 "
Yds 7 4 7.1 4

Fill No 1 has 135. Feet
" N2 " 1420 "
1555 Feet =
= 94.24 Rods @ 55¢ = $51.83

Sta	Area	Sta	Area	Total Feet .00
5+80	00	6	11.90 =	5.95 x 20 = 119.00
6	11.90	7	16.20 =	14.05 x 100 = 1405.00
7	16.20	8	19.80 =	18.00 x 100 = 1800.00
8	19.80	9	16.20 =	18.00 x 100 = 1800.00
9	16.20	10	11.90 =	14.05 x 100 = 1405.00
10	11.90	11	10.20 =	11.05 x 100 = 1105.00
11	10.20	+40	= 23.40 =	16.80 x 100 = 1680.00
+40	= 23.40	+48	= 0.00 =	11.70 x 40 = 468.00
+48	= 0.00	+60	= 16.20 =	8.10 x 8 = 64.80
+60	= 16.20	12	= 13.60 =	14.90 x 12 = 178.80
12	= 13.60	13	= 11.90 =	12.75 x 40 = 510.00
13	= 11.90	14	= 8.50 =	10.20 x 100 = 1020.00
14	= 8.50	15	= 11.90 =	10.20 x 100 = 1020.00
15	= 11.90	+80	= 11.90 =	11.90 x 80 = 952.00
+80	= 11.90	16	= 0.00 =	5.95 x 20 = 119.00
16	= 0.00	+25	= 0.00	
+25	0.00	+50	= 6.80 =	3.40 x 25 = 85.00
+50	= 6.80	17	= 10.20 =	8.50 x 50 = 425.00
17	= 10.20	18	= 9.00 =	9.60 x 100 = 960.00
18	= 9.00	19	= 16.20 =	12.60 x 100 = 1260.00
19	= 16.20	+90	= 5.00 =	10.60 x 100 = 1060.00
+90	= 5.00	20	= 0.00 =	2.50 x 90 = 225.00
20	= 0.00			Feet 17661.60

Aug 13-1917 Monday

Stanley Contract

Stanley was to get 55° a rod for burning and I find 94.24 Rods @ 55° = $51.83

I am not to figure the fill but do so on my own account as a check on the cuts but am so far off I pass up the figures of the fill

Fill only given 747.14 yds

Cuts give

Cut N° 1 = 54.46

Cut N° 2 = 596.61 + 89.49 = 686.10

Cut N° 3 = 300.48

Total yds 951.55

951.55 yds @ 35° = $333.04

94.24 Rds @ 55° = 51.83

$384.87

On Cut N° 2 I allow 15% extra for Bulge not hauling over-reclined the hill before cutting Cut N° 2 contains 596.61 yds

15% = 89.49 15 yds @ 35° = $31.32

1041.04 yds @ 35° = $364.36

94.24 Rds fill @ 55° = 51.83

$416.19 OK Cmo

	BS	HI	FS	ELEV
BM #1	3.32			100
		103.32		
TP	2.56		6.16	97.16
		94.72		
TP	6.04		4.59	95.13
		103.17		
BM #2	3.03		3.84	99.33
		102.36		
TP	5.89		7.77	94.59
		100.48		
TP	7.32		3.70	96.78
		104.01		
BM #1			4.11	100.00
BM #2	5.81			99.32
		105.14		
TP	12.23		5.18	99.96
		112.19		
	5.33		1.85	110.34
		115.67		
BM #3	3.43		2.96	112.71
		116.14		
TP	0.30		5.46	110.68
		110.98		

	BS	HI	FS	ELEV
TP	5.03		11.03	99.55
		104.98		
BM #2			5.64	99.34
BM #3	7.03			112.71
		119.74		
	13.26		2.04	117.70
		130.96		
	11.88		0.80	130.16
		142.04		
	7.02		3.15 (14)	138.90
		145.92		
	8.36		6.73	139.19
		147.55		
BM #4	5.62		6.25	141.30
		146.92		
	4.07		6.79 (3)	140.19
		144.26		
	0.57		4.06 (5)	140.21
		140.78		
	0.55		10.6 (59)	130.19
		130.74		
	1.91		12.95	117.79
		119.70		
DM #3			6.99	112.71

BM # 4	6.34			141.30
		147.64		
	12.98		1.62	146.02
		159.0		
	12.75		1.67	157.33
		170.08		
	12.83		1.22	168.86
		181.69		
	3.34		.34	181.35
		184.69		
BM # 5	3.12		2.16	182.53
		185.65		
	.70		5.24	180.41
		181.11		
	1.5		12.26	168.85
		170.35		
	.05		10.55	159.80
		159.85		
	.64		10.44	149.41
		150.05		
	6.10		8.0	142.05
		148.15		
BM # 4			6.85	141.30

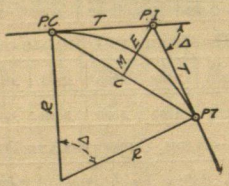
BM # 5	8.13			182.53
		190.66		
	0.55		5.85	184.82
		185.76		
	9.54		0.76	184.60
		194.74		
BM # 6	7.28		7.27	186.87
		194.75		
	4.49		12.06	181.09
		185.58		
	5.55		0.78	184.80
		190.35		
BM # 5			7.83	182.52

BM # L	10.68			186.84
		197.52		
	12.74		1.04	197.43
		210.17		
	7.74		3.05	207.12
		214.86		
	0.78		7.71	207.15
		207.93		
	2.36		11.97	195.96
		198.32		

	0.41	191.83	7.90	190.42
BM # 7	9.15	195.59	4.69	186.14
	4.53	199.31	0.81	194.78
	8.87	208.07	0.10	199.27
	9.72	216.34	0.86	207.72
	2.49	206.14	12.39	203.93
	0.20	197.70	8.64	197.5
BM # 6			10.79	186.91
BM # 7	2.35	188.46		186.11
	7.75	194.87	1.33	187.13
	0.21	194.17	10.89	184.01 183.98
	0.99	172.62	12.56	171.63
	0.57	160.39	12.90	159.72

BM #8	5.11		4.99	155.30
		160.41		
	12.97		0.69	159.72
		172.69		
	13.02		1.07	171.62
		184.64		
	10.63		0.67	183.97
		194.60		
	5.63		12.29	182.31
		187.94		
			1.99	185.95

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES



CURVE FORMULAS

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

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

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

External=E=T tan $\frac{\Delta}{4}$ (7) =R cos $\frac{\Delta}{2}$ (1-cos. $\frac{\Delta}{2}$) (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	9	637.28	1.965	7.846	2.70
40	3437.87	.364	1.454	0.50	20	614.56	2.037	8.136	2.80
50	3125.36	.400	1.600	0.55	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	10	573.69	2.183	8.716	3.00
20	2455.70	.509	2.036	0.70	30	546.44	2.292	9.150	3.15
30	2292.01	.545	2.181	0.75	11	521.67	2.402	9.585	3.30
40	2148.79	.582	2.327	0.80	30	499.06	2.511	10.02	3.45
50	2022.41	.618	2.472	0.85	12	478.34	2.620	10.45	3.60
3	1910.08	.655	2.618	0.90	30	459.28	2.730	10.89	3.75
10	1809.57	.691	2.763	0.95	13	441.68	2.839	11.32	3.90
20	1719.12	.727	2.908	1.00	30	425.40	2.949	11.75	4.05
30	1637.28	.764	3.054	1.05	14	410.28	3.058	12.18	4.20
40	1562.88	.800	3.199	1.10	30	396.20	3.168	12.62	4.35
50	1494.95	.836	3.345	1.15	15	383.07	3.277	13.05	4.50
4	1432.69	.873	3.490	1.20	30	370.78	3.387	13.49	4.65
10	1375.40	.909	3.635	1.25	16	359.27	3.496	13.92	4.80
20	1322.53	.945	3.718	1.30	30	348.45	3.606	14.35	4.95
30	1273.57	.982	3.926	1.35	17	338.27	3.716	14.78	5.10
40	1228.11	1.018	4.071	1.40	18	319.62	3.935	15.64	5.40
50	1185.78	1.055	4.217	1.45	19	302.94	4.155	16.51	5.70
5	1146.28	1.091	4.362	1.50	20	287.94	4.374	17.37	6.00
10	1109.33	1.127	4.507	1.55	21	274.37	4.594	18.22	6.30
20	1074.68	1.164	4.653	1.60	22	262.04	4.814	19.08	6.60
30	1042.14	1.200	4.798	1.65	23	250.79	5.035	19.94	6.90
40	1011.51	1.237	4.943	1.70	24	240.49	5.255	20.79	7.20
50	982.64	1.273	5.088	1 75	25	231.01	5.476	21.64	7.50
6	955.37	1.309	5.234	1.80	26	222.27	5.697	22.50	7.80
10	929.57	1.346	5.379	1.85	27	214.18	5.918	23.35	8.10
20	905.13	1.382	5.524	1.90	28	206.68	6.139	24.19	8.40
30	881.95	1.418	5.669	1.95	29	199.70	6.360	25.04	8.70
40	859.92	1.455	5.814	2.00	30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10′	58.34	.30	10′	560.11	27.31	10′	1070.6	99.16
20	66.67	.39	20	568.53	28.14	20	1079.2	100.75
30	75.01	.49	30	576.95	28.97	30	1087.8	102.35
40	83.34	.61	40	585.36	29.82	40	1096.4	103.97
50	91.68	.73	50	593.79	30.68	50	1105.1	105.60
2	100.01	.87	12	602.21	31.56	22	1113.7	107.24
10	108.35	1.02	10	610.64	32.45	10	1122.4	108.90
20	116.68	1.19	20	619.07	33.35	20	1131.0	110.57
30	125.02	1.36	30	627.50	34.26	30	1139.7	112.25
40	133.36	1.55	40	635.93	35.18	40	1148.4	113.95
50	141.70	1.75	50	644.37	36.12	50	1157.0	115.66
3	150.04	1.96	13	652.81	37.07	23	1165.7	117.38
10	158.38	2.19	10	661.25	38.03	10	1174.4	119.12
20	166.72	2.43	20	669.70	39.01	20	1183.1	120.87
30	175.06	2.67	30	678.15	39.99	30	1191.8	122.63
40	183.40	2.93	40	686.60	40.99	40	1200.5	124.41
50	191.74	3.21	50	695.06	42.00	50	1209.2	126.20
4	200.08	3.49	14	703.51	43.03	24	1217.9	128.00
10	208.43	3.79	10	711.97	44.07	10	1226.6	129.82
20	216.77	4.10	20	720.44	45.12	20	1235.3	131.65
30	225.12	4.42	30	728.90	46.18	30	1244.0	133.50
40	233.47	4.76	40	737.37	47.25	40	1252.8	135.35
50	241.81	5.10	50	745.85	48.34	50	1261.5	137.23
5	250.16	5.46	15	754.32	49.44	25	1270.2	139.11
10	258.51	5.83	10	762.80	50.55	10	1279.0	141.01
20	266.86	6.21	20	771.29	51.68	20	1287.7	142.93
30	275.21	6.61	30	779.77	52.89	30	1296.5	144.85
40	283.57	7.01	40	788.26	53.97	40	1305.3	146.79
50	291.92	7.43	50	796.75	55.13	50	1314.0	148.75
6	300.28	7.86	16	805.25	56.31	26	1322.8	150.71
10	308.64	8.31	10	813.75	57.50	10	1331.6	152.69
20	316.99	8.76	20	822.25	58.70	20	1340.4	154.69
30	325.35	9.23	30	830.76	59.91	30	1349.2	156.70
40	333.71	9.71	40	839.27	61.14	40	1358.0	158.72
50	342.08	10.20	50	847.78	62.38	50	1366.8	160.76
7	350.44	10.71	17	856.30	63.63	27	1375.6	162.81
10	358.81	11.22	10	864.82	64.90	10	1384.4	164.86
20	367.17	11.75	20	873.35	66.18	20	1393.2	166.95
30	375.54	12.29	30	881.88	67.47	30	1402.0	169.04
40	383.91	12.85	40	890.41	68.77	40	1410.9	171.15
50	392.28	13.41	50	898.95	70.09	50	1419.7	173.27
8	400.66	13.99	18	907.49	71.42	28	1428.6	175.41
10	409.03	14.58	10	916.03	72.76	10	1437.4	177.55
20	417.41	15.18	20	924.58	74.12	20	1446.3	179.72
30	425.79	15.80	30	933.13	75.49	30	1455.1	181.89
40	434.17	16.43	40	941.69	76.86	40	1464.0	184.08
50	442.55	17.07	50	950.25	78.26	50	1472.9	186.29
9	450.93	17.72	19	958.81	79.67	29	1481.8	188.51
10	459.32	18.38	10	967.38	81.09	10	1490.7	190.74
20	467.71	19.06	20	975.96	82.53	20	1499.6	192.99
30	476.10	19.75	30	984.53	83.97	30	1508.5	195.25
40	484.49	20.45	40	993.12	85.43	40	1517.4	197.53
50	492.88	21.16	50	1001.7	86.90	50	1526.3	199.82
10	501.28	21.89	20	1010.3	88.39	30	1535.3	202.12
10	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
20	518.08	23.38	20	1027.5	91.40	20	1553.1	206.77
30	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
40	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
50	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

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

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

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

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

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
91°	5830.5	2444.9	101°	6950.6	3278.1	111°	8336.7	4386.1
10′	5847.5	2457.1	10′	6971.3	3294.1	10′	8362.7	4407.6
20	5864.6	2469.3	20	6992.0	3310.1	20	8388.9	4429.2
30	5881.7	2481.5	30	7012.7	3326.1	30	8415.1	4450.9
40	5898.8	2493.8	40	7033.6	3342.3	40	8441.5	4472.7
50	5916.0	2506.1	50	7054.5	3358.5	50	8468.0	4494.6
92	5933.2	2518.5	102	7075.5	3374.9	112	8494.6	4516.6
10	5950.5	2531.0	10	7096.6	3391.2	10	8521.3	4538.8
20	5967.9	2543.5	20	7117.8	3407.7	20	8548.1	4561.1
30	5985.3	2556.0	30	7139.0	3424.3	30	8575.0	4583.4
40	6002.7	2568.6	40	7160.3	3440.9	40	8602.1	4606.0
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	5808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4354.8	50	10093.0	5876.1

Table V.—Corrections for Tangents and Externals.

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

For Tangents Add

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

For Externals Add

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

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

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

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

Table VII.—Middle Ordinates for Rails in Feet.

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

SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:—subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction=$15^2 \div 2 \times 250.3 = .45$ (by slide rule) or horizontal distance=250.3—.45=249.85. When vertical angle=V. A. is measured horizontal distance=slope distance—slope distance (1—Cos. V. A.). Thus for slope distance of 248.7 ft. and V. A. of 4° 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. $A=\frac{a}{c}$

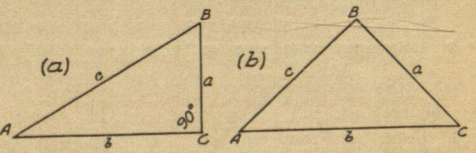
cos. $A=\frac{b}{c}$

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 $s=\frac{1}{2}(a+b+c)$, $\sin. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{bc}}$, $\cos. \frac{1}{2}A=\sqrt{\frac{s(s-a)}{bc}}$, $\tan. \frac{1}{2}A=\sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$, $\sin. A=\frac{2\sqrt{(s-a)(s-b)(s-c)}}{bc}$
A, B, C, a	area	$\text{area}=\frac{a^2 \sin. B \sin. C}{2 \sin. A}$
A, b, c	area	$\text{area}=\frac{1}{2} bc \sin. A$
a, b, c	area	$s=\frac{1}{2}(a+b+c)$, $\text{area}=\sqrt{s(s-a)(s-b)(s-c)}$

Table VIII.—Natural Trigonometrical Functions.

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

Table VIII.—Natural Trigonometrical Functions.

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

Table VIII.—Natural Trigonometrical Functions.

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

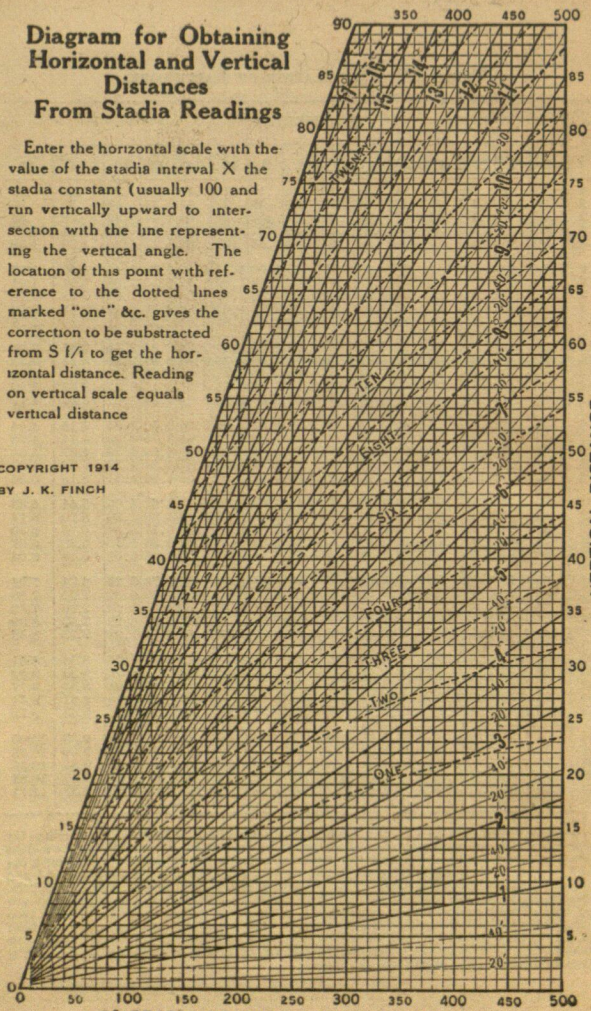
Table IX.—Calculation of Earthwork.

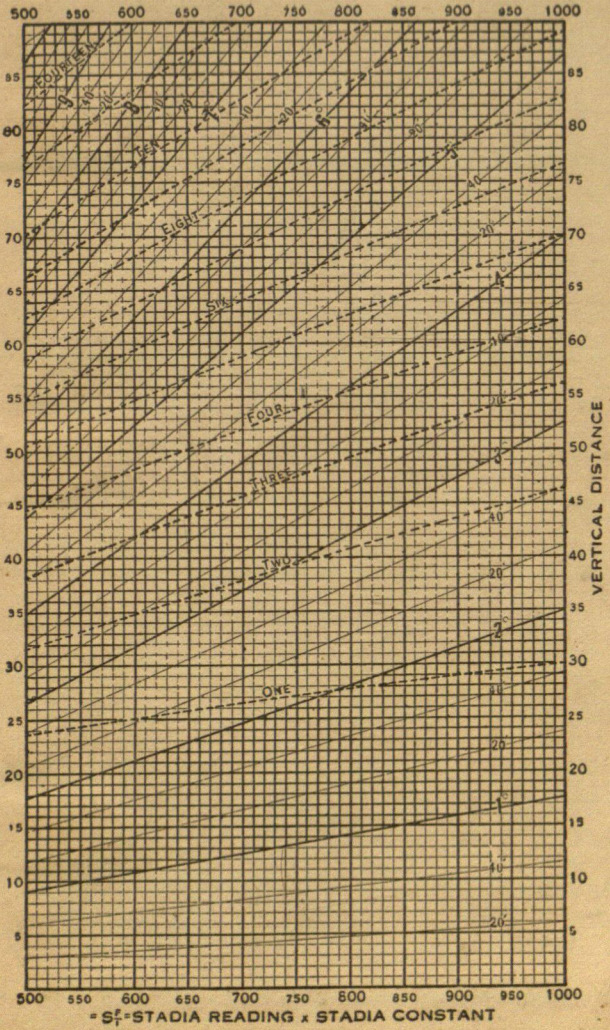
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96	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	5.33
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 the horizontal scale with the value of the stadia interval X the stadia constant (usually 100 and run vertically upward to intersection with the line representing the vertical angle. The location of this point with reference to the dotted lines marked "one" &c. gives the correction to be substracted from S f/i to get the horizontal distance. Reading on vertical scale equals vertical distance




500 550 600 650 700 750 800 850 900 950 1000
85 80 75 70 65 60 55 50 45 40 35 30 25 20 15 10 5
TEN
EIGHT
SIX
FOUR
THREE
TWO
ONE
VERTICAL DISTANCE
= S_f = STADIA READING x STADIA CONSTANT

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.