

139-2

39-25

140-2

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4
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EUGENE DIETZGEN CO.

DRAWING MATERIALS, MATHEMATICAL and
SURVEYING INSTRUMENTS

Chicago New York San Francisco New Orleans Pittsburg Toronto

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

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 $30.6 + (20 - 16) \div 2$ or 2 ft. added to $30.6 = 32.6$. For slopes of 1 on $1\frac{1}{2}$ see inside of back cover.

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Made in U. S. A.

139-25

140-25

141-25

142-25

✓
US 7
PASS
W.
✓

W

W
W

S

US

W

W

at 39+60 FT. N. E. on sec. 7-18. 2 aspens
 at 36+20 FT. E. still in aspens. 38+70
 at 30+0 FT. 2 Least SWP. at 33+0 FT. E.
 at 27+0 FT. I came to wet marsh
 Birch and aspens. 26+40 N. E. of
 at 19+80 FT. E. I come to high land a few
 at 15+50 FT. I come to wet marsh E. of sec. 7-18
 Willow and a spruce grove 13+20 FT. E. of
 at 6+60 FT. East high and rolling aspens
 I set up at 1 P.M. ^{11:17} run East on N. 6. 15 min

Weather Fair-Warm

party date June 27
 Stronstead. Compass
 Cariveau. Chain.
 Ahrendt. Rod.
 Winnen.
 Foster.
 Emard.

T 139 N R 25 W

East Bt sec 7/18

at 27+0 FT. WILLOWS.
 E. of sec. 7-18. an old Road running N-S.
 of sec. 7-18. aspens and a few Willows
 29+00 old road and 29+70 still in SWP.
 sec. 7-18 low land and aspens, N. old cor. found
 and aspens, 23+10 E. of sec. 7-18 small
 7-18. VEST SWP. at 19+0 FT. E. of sec. 7-18
 sec. 7-18 in low aspen and Willow grove.
 a few scattered W.P. 9+90 FT. I came to low
 set stake at 3+30 FT. East of sec. 7-18. Low and rolling

1. P.M.
 12/7
 13/8

2140 Apr. 1/4 Cor. E. on Random line Bet. 6-7. highland aspens weather. Fiat-Warm

20500 Come to aspens on high land Random Bet. 6-7

24000 He ft. Wet marsh.

23000 Come to Low Wet marsh.

22000 a few oaks - aspens.

21000 Come to aspens - oaks, random line Bet. 6-7

20500 He ft. old lake Bottom

19500

18500

17000 Come to water in old lake

16000 Come to old lake Bottom on random Bet. 6-7

15000

14000 Ft. E. of sec. Cor. 6-7. Hazel brush - aspens

13500 1/2 Ft. E. on sec. Line Bet. 6-7. hazel brush - aspens

13000 Ft. E. on random line Bet. 6-7. cultivated land

11500 Ft. E. on sec. line Bet. 6-7. cultivated land

10000 Ft. E. on Random line Bet. 6-7. open area a few oaks

9000 Come to open meadow

8000 Ft. E. oak and Willows.

7000 Ft. E. on random line Bet. 6-7. aspens and Willows

6000 Ft. E. on sec. line Bet. 6-7. a few oak and Birch

5000 Ft. E. on Random line Bet. 6-7. a few Willows and aspens

4500 entering Low land and Willows - aspens.

3000 Ft. E. of sec. cor. 6-7. highland a few oak and Willows.

2.

Date June 29, 1937

Party

Stronstad	Compass
Canuel	- Chain
Ahrendt	- Rod
Foster	-
Emard	-

T 139 N R 25 W

184° E
Random

0100 Started Last from 1/6 139-25

40100
39160

Quit June 29, 1937
Set 100' 1/2 Cor E.L.W.
2" faced Aspen

140-25

3
T139N R 25W

8100 Ft. E. of sec. cor. 5-8. I came to 2 old tram. sup.

APPX. 80. cor. ASPEN

5200 No old cor. found I got a spec. For Cor.

5200

5100

5000

4900

4800

4700

4600

4500

4400

4300

4200

4100

4000

Started East on ~~X~~ N-84°E

5000

140-25

Weather Fair-Warm

Date June 30, 1939

4

Party

Stronsted - Compass
Ahrendt - Rod
Cariveau - Chian
Foster -
E. maid

T139N R25W

5200 6/5
5100 7/8

E
↑

6/5
7/8

140-25

40

5

T 139N R 25W

26+40 Ft. E. Set $\frac{1}{4}$ cor. Bet. 5-8. Quit June 30, 1937 set N.P.T.O. $\frac{1}{4}$ cor.

14+58

13+22 Left old Tam. SWP. $\frac{1}{16}$

39+60 I set up 1/6 post. E. on random line Bet. 5-8.

26+60 I set up 2nd 7th E. on 84th E.

Weather. Fair-Warm

Date July 1, 1937

6

Party

Stromstad - compass
Carreau - chair
Aberndt - Rod
Foster -
Kmaid -

T 139 N R 25 W

T139N R25W 7

9+16 I met Rob F 187 FT W. OF My Line

running E Rob F's W ne 44+41 Run W. met mine

4+69 I came to center of old Hay Road

West. of 4-9 s. e.

52180 I set APR. sec. cor. $\frac{713}{720}$ as per Post
APR. cor. $\frac{514}{819}$ T.139. R25 W.

3' sd.

T 140 N

B25 | K 24

52+80

Approx corner 24 | 19

22+00

I left road turning N-S.

7+75 I left turn SWP

I set up 2nd run south 1 mi along road 369.067

Weather Fair Warm.

Date July 2, 1937

Party

Stratton
Carr
Aherndt
Emery
Foster

56.30E

13-24 in SWP

19+20 Set approx $M \frac{1}{4}$ Cor ^{East} ON Edge of
17+00 Ft. Crossed Wagon Road. Running
16+50 Ft. W. of N-E sec. cor. of 25. W. Birch - aspens.

14+70 Ft. West of crossed fence run E-W.
13+20 Ft. Set approx $M \frac{1}{4}$ West of sec. cor. NE of 25.
12+53 Ft. W. I come to fence run N-S.

9+90 Ft. I come to road land sup. spruce and fish

6+60 Ft. W. of N-E sec. cor. of 25. aspens.

3+35 I come to lowland and aspens - willow's

10+00 set up at sec. cor. 24-25 $1 \frac{1}{4}$ ^{25 W.} ~~20~~ run West on

Weather Fair Warm

Date July 2, 1937

Party

Stronghold - Compress
Cariveau - ~~Chapin~~
A. H. T. H. - ~~old~~
Foster
E. M. A. T. L.

Lata

NE to SW -

S. 83° 30' W.

Run down my bearing.

total distance

5080 ft.

West of N-E sec. of 25

6+30 on bearing line

24+25

sec. cor.

at 50+10 I quit.
 at 28+40 Ft or 180ft west of lake camelia creek
 I run S-2+60 Ft. I set Apr. 1/4 on 40 ft west of my st.
 then I run west 700ft on a set line.
 I set up at 19+20 ft west of N.E. sec. 26. 226. on of set.

Weather Fair Warm

Date July 7, 1937

Party
 Stromstad - Compass
 Olson
 Abert
 Foster
 Weber

S. 830-30' W
 Random my bearing

5080 FT.
 total distance

Run N-S
 set line
 I run N. 2+60 ft to N. end of lake

50+80 Ft. Came to where old Sec. Exp. was. Set,

49+50 Ft. high and cleared land

47+00 Ft. Came to highland

46+30 Ft. SWP, alders - aspens.

42+90 Ft. aspens and SW

39+10 Ft. aspens - willows

at 37+40 I came to center of old hay field
at 26+30 aspens - alders and spruce.

at 32+00 aspens - willows and spruce

at 31+00 willows and alder, brush

I set up and ran east to my old line, and I

20+10
Weather Fair Warm

Date July 8, 1907

Park

Stronstad
deSoto
Foster
Wedch
Aberndt

S. 83° 30' W

Random May bearing

5000 FT

total distance

Came out 53 Ft south of old line coming west.

26 + 24. Ft. I met the other crew coming East.

12 + 20 Ft. W. of sec. cor. I set APR. $\frac{1}{16}$ cor. Ft. 17 on south side road.

11 + 50 Ft. W. of sec. cor. I left the road on south side of it.

8 + 50 Ft. I come out to side of road.

I set up a rd. 1477 West from sec. cor. $\frac{1}{16}$ at 17 ft. 23m to center of Road.

Weather Cloudy - Warm.

Date July 9 1927

12

Party

Stronsted - Compass
Olson - Rod
Foster - Chain
Aperndt -
Welch -

$\gamma = 6^{\circ} 30'$

5. 83° 30' W.

London 7700 bearing

to 1st of stone

26.24 Ft. to Ref. to

5-3 P.M.

26/23

25/24

Weather Fair Warm

Date July 9, 1936

Party
Stronstad
Olson
Foster
Apprent
Welch

N. 81° 15' E
to
distance
5153 E
Robert M. bearing

to
distance
19206 E
M. M. bearing

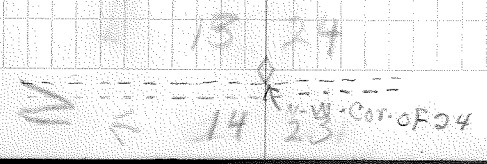
8:00 Ft. E. Came to low land and quit July 9, 1937

3:30 Ft. E. in pasture

3:50 Ft. E. I crossed fence turning N-S.

I set up at N-W cor. of sec. 24 T. 14 N. E. 17

6:15 M



Western Fair-Waym.

Date, July 12, 1937

14

party

Stinson - Compass
Kreska - Rod
Foster - Chair
Welch -
Arendt

total distance
5153 ft.

North on mag bearing
1000 9.55
W. 22° E
1000 10.00
1000 10.05
1000 10.10
1000 10.15
1000 10.20
1000 10.25
1000 10.30
1000 10.35
1000 10.40
1000 10.45
1000 10.50
1000 10.55
1000 11.00
1000 11.05
1000 11.10
1000 11.15
1000 11.20
1000 11.25
1000 11.30
1000 11.35
1000 11.40
1000 11.45
1000 11.50
1000 11.55
1000 12.00

8+00 set up and run eastern leg, 6⁰⁰ min. Run on East side, 24-13.

N.W. 1/4 of 24

33+65 ft. I came to old Tam. SWP

14+65 ft. I left SWP in May meadow.

12+27 ft. I came to open meadow.

8+65 ft. I crossed a fence Run. N-W 1/2 S-2

Weather - Cloudy - Warm

Date, July 12, 1939

Party

Stratton

Welch

Ahrens

Foster,

total distance
5153 FT.

~~Remains by
trace of May. 1939~~

N. 80° 45' E
N. 80° 0' E

N. W. 1/2 S. 2 C. 24

33+30 Ft. I came to a Lake Sagset Run

27+50 Ft. I shot to m SW of E-OF N-W BOX OF

Weather - Cloudy - Warm.

Date July 19 1937

16

total distance
5153 ft

N. 61° 45' E
N. 82° 0' E

London May bearing
true May bearing

Stromstad
Foster
Webb
Kerrick

South Ft.

W.

151 Ft. south of old original loc.
51-53 Ft. to center of road run N-S. Range 2

4446 Ft. E. of set 4175 same to E. side of lake.

2 of set ~~30048~~ 30048 Ft. on south side of Lake

33130 Ft. same to 2007 Lake. Set 30048 same of Lake

weather - cloudy - warm

Date: July 14, 1957

Party:

Stromata - Compass
Foster - Chain
Wesley - Map
Chapin
Abrams

30048 and 30049 E. 1/2 1/4 107

Coot

Lake

1200 Ft. S @ 41° E, July, 14, 1937 at low tide.

at 20 Ft. I come to Fence Run. N-S.

I set up and ran West of V. 7 deg. on N-E. Sec. cor. of sec. 10, township 10 N. R. 1

Sec. Cor.

18
Weather - Cloudy - Warm date July 14, 1937

Party

Stymmer - compass
Koster - chain
Chapman - Rod
Webb -
Arvidson

S. 83° W.

Random mag. bearing.



1211
716

T-140 R-25
3/6/40 Set 2640 post

21746 FT to Willow River 54 FT across.

15718 FT West of NE cor. of sec. 12. I come to a 3 barbed wire fence Run. North and south

12400 FT West I set up and run West on us. 70.

Weather - Fair - Warm

Date - July 19, 1937 X 19.

party

Stromstad - Compass
Foster - Chain
Chupka - Rod
Ahrendt -

July 20, 1937

Comstock - Compass
Foster - Chain
Ahrendt - Rod
Chupka -

T-140 R-25

52+80 Ft. 2nd Apr. Sec. Cot.
50+86 Ft. Seamed to old hay road.

4045 0. started July 21
39+80 SET APP TO DIST

36+30

33+60
32

31+00 crossed same creek

30

29+00 Ft. came to creek 47 FT wide

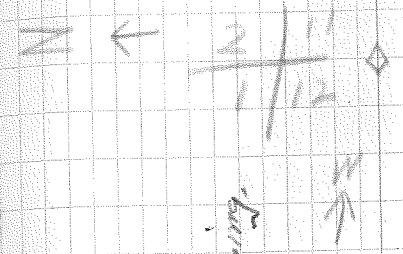
28.
27.

WEATHER CLEAR + WARM

DATE July 20, 1937
party

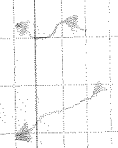
X20

COMSTOCK compass Co.
FOSTER CHAIN
KAYES Rod
CHUCKA
ABYENT



5.83 W
Barometer

July 21, 1937
STATION FOR
COMSTOCK
SAME PARTY



T. 140 R. 25

At 40 FT. I came to old original 1/4 Cor.
4" SD Post

588 FT. across lake.

at ~~1700~~ FT. I. Came to Lake shore.

at 1400 FT. I. of set to old original line, 49 FT.

1400 FT. I. quit July 21, 1937

1200 FT. approx. 1/4 Cor.

I set up at apto. N-W. Cor. of sec. 12.

Weather. Fair warm

Date July 21, 1937

21

Party

Sirnotal
Arvus
Ahrendt
Foster
Chupka.

July 22, 1937

Same Party

M. to old line

enter Willard

V = 70

W
↑

Start wet

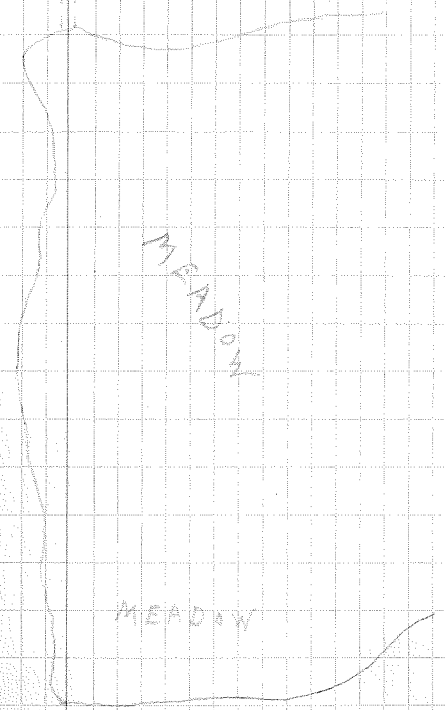
2.11
5 11.12

52+80 TO CENTER OF ROAD SET APP LOG
 52. TO SEC 3, 2
 51. 10/11
 50.
 49.
 48.
 47.
 46.
 45.
 44.
 43.
 42. MID ROAD EAST AND WEST
 41.
 40.
 39.
 38.
 37.
 36.
 35.
 34.
 33.
 32.
 31.
 30.
 29.
 28+15 MEADOW EAST AND WEST
 27.

T-140 R-26

H0-25
 26
 0-26

S. 88° W.
 Spring Ball Agency



26+40 Set APP 1/4 COR.

26

25

24

23

22

21

20. Came to hay meadow.

19

18

17

16

15

14+22

14. FENCE NO. AND SA

13

12

11

10

9+80

LEAVE MEADOWS SHORT BACK TO LINE

8+50

ENTER MEADOW

8

7

6

5

4

3

2

1

WEST BET. SEC 3-10

0+00

OFFSET 12 FT SO
AROUND LIKE

T 140 R 25

Weather - Fair - Warm

Date, July 23, 1937

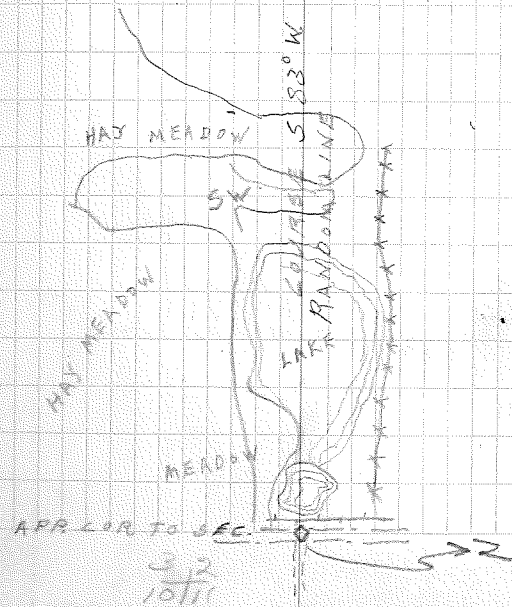
23

Party

Stronstad - Compass
Arrus - Rod
Foster - Chain
Abtendit -
Chupka -

hay
meadow

XXXXXXXXXXXX



52+00 - S

52.

51

50

49

48

47

46

45

44

43

42

41

40

39

38

37

36

35

34

33

32

31 to 0. old hay road south of line.

30

29

28

27

at 26+40 I set APP $\frac{1}{4}$ Cor. T. 140 R. 25.

140-25
26
140-25
0-25

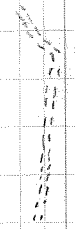
Weather Fair. Warm

Date, July 26, 1937

24

Party:
Stromsted
Arvid
Foster
Ahrens.

V-70



Ha.

0 1/4 Cor.

T. 140 B. 25.

Rolls. old cor set north 1+54 ft. from my line.
54+91 came to center of road. Bur. N.S.

52

40-25
26

40-25

0
40-25

25

=====
old cor.
N-W of S.C. 10.

26+40. Set APP. 1/4 cot 140 R 25

- 25
- 24
- 23
- 22
- 21
- 20
- 19
- 18
- 17
- 16
- 15
- 14
- 13
- 12 + 30
- 11
- 10 + 42
- 9
- 8
- 7
- 6
- 5
- 4
- 3
- 2

LEAVE MARCH

ENTER MARCH

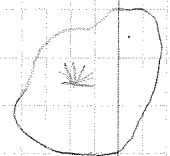
old logging Road Run NE and SW

I set up at old app. sec. Cot. Run west on Random Bet. 5-8
7. 140 N. P. 25 W.

40-25
26
40-25
26

Weather - Cloudy - warm. Date, July 27, 1937 26

Party:
Stronstad - Compass
Foster - Chain
Arvus - Rod
King - Rod
Ahrendt



COURSE 5 80 W
RANDOM LINE



53

51

50

49

48

47 + 68 FT. Come to lake shore.

46

45

44

43

42

41

40 + 76 FT. Road Run No. and South Cabin No. of line.

39

38

37

36

35

34

33

32

31 + 00 1057 Tam. and spruce swp.

30

29

28 + 00 Come to Tam. and spruce swp.

Set up at App. 1/4 cor run west on Rand on line, Bet 5-8.

140-25
26

10-25

T. 140 R. 25.

Weather Fair - Warm

Date, July 28, 1937

27

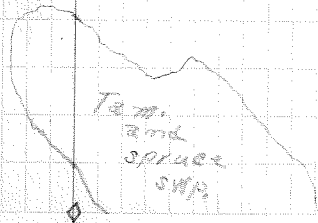
Party:

Stonstad - Compass
Foster - chain
AYYUS - Rod
King - Rod
Ahrendt -

S. 83° W.

Random Map bearing.

==== □ Corner.



26740 SET APP 1/4 POST.

26

25

24

23

22

21

20

19

18

17

16

15

14

13420 SET APP 1/6 POST.

12

11

10

9

8

7

6

5

4

3

2

1

set up at old APP. Cor Run East Va. 7d. Bet.

140-25
26

140-25

141-25

T. 140 F25

Weather Fair - Warm

YU COR. SEC 6/7

Date July 29, 1937

28

PARTY

Stromsted - Compass
Foster - Chain
King - Rod
Ahrendt
Chupita

COURSE N 83° E
RANDOM LINE

SEC. 6-7 N. 1/2 Sec. 17, old Talm. SWP

T 140 R 25

34 + 10 EDGE OF LAKE

34

33

32

31

30

29

28 + 56 FT. Cometo Road Run. No. and South.

27

40-25
26

40-25

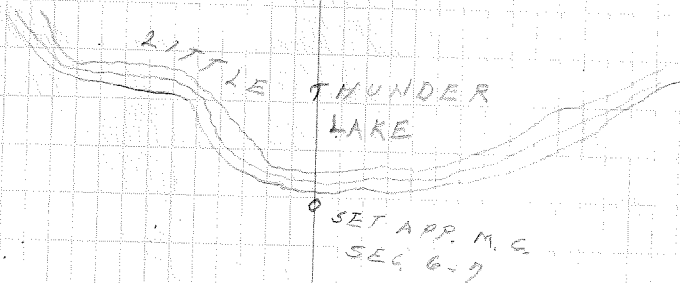
40-25

29

JULY 29 1927

Same party

McCleary N. 6880.



T140-25-26

Michaud

9+25 Set up MC at edge of lake

12/7
13/18

0+00 Started at Iron pipe sections

10+20 Ft. I came to lake.

9.

8.

7.

6.

5.

4.

3.

2.

1.

0+00 STARTED SOUTH FROM S.I.P. BET. SEC. 9, 12

40-25 141-25

38
Aug 17 1937

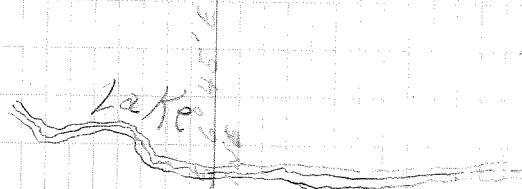
PARTS STRANDED

FOSTER

CHODAK

ARRANDT

KING



COURSE
RANDOM LINE

1/4 SEC. 7/12

2740 Ft. Come to old scribed V. cor.

Line running South Bet. 13-18.

25

24

23

22

21

20

19

18

17

16

15

14

13

12

11

10

9+50 Ft. I left swp.

9

9+20 Ft. crossed spring.

6

5+50 Ft. I crossed spring.

4

3+00 Ft. Came to Tam swp.

Corner of

$\frac{7}{12}$

started at $\frac{18}{13}$ original

40-25-25

T140N R25-26 W Aug 5 31

V=5.0

5280 Ft. 2 set. App sec. cor.

01

50

49

48

47

46

45-56 Ft. 9 Left SWP.

44 + 90 Ft. crossed road W-E

43

42

41

40

39

38

37

36

35

34-50 Ft. 9 Come to Tam and spruce SWP

23

22

21

20

29

28

27-40 Ft

32

25 END OF MEADOW

24

23410

22

21 Beginning of meadow

20

19-900

19

18

17

16450

15

14+15 Ft. I crossed Road N-S.

13

12

11

10

9

8

7

6

5

4

3

2+05 Ft. crossed Road

Set up at App. sec. cor. on Range line. Bet 18-19
line Range East bet. $\frac{18}{19}$ - 140-26-25

Weather Fair - Warm

Aug. 6, 1937

V = 6° 30'

Party

T 140 N R 25 W

Stronstad

Cornstock

Chupka

R. Peterson

ALLEY

N. 83° 30' E
Range line

meadow

Ha

Ha

18 19

Line E Ber 18-19

531 ¹² offset 50.675 ft. to corner set from BT
Change to this corner.
according to original notes
7 ft. N51 E of Old BT
Set up Approx Sec Corner
80 ft from approx corner
Located old BT S 30 E
18/17 16" Bird Snag
11/20

52+80 Set up approx Sec corner

38+80 Enter Ha

35+50 Enter ST

29+00 built Aug. 6, 1937

29

28

27

26+0

26

change +80

Aug 9, 1937

34
same party
T 140 N B 25 W
V = 6° 30'

42+90

39+60

36+30

33+0

29+70

ST

Ha

Line run E Bel 17-20
N. 83° 30' E Random mag. bearing.

27+00 Quit for day
old Hay or logging road.
26+00 Set approx $\frac{1}{4}$ corner along
21+15 Enter Ha
18+50 Enter St. + Ss
12+50 Enter Ha
11+30 Middle old Hay road
8+00 Enter meadow
5+40 Enter Ha
4+20 Enter M s e
0+00 Approx Sec 18 | 17

old BT Present 19 | 20

T 140 N R 25
V = 6° 30'
Chainage 1

141-25 35
Aug 9 1937
Same party

N 83° 30' E Random mag. bearing

19+00
16+50
13+20
9+90
6+00
338
0+00

Sec. 18 | 19
17 | 20
APP. CORNER.
Ha

Line W Bet 15-22

31+52 Fire line single furrow
26+40 Started at approx $\frac{1}{4}$
Corner $\frac{15}{22}$

T140N R25W
V=6°30'

141-25
36
Aug. 11, 1937

Stronstad

W
↑
Camstock

Edson

Adquist

R

44+00

43+00

42+00

41+00

40+00

39+00

38+00

37+00

36+00

35+00

34+00

33+00

32+00

31+00

30+00

29+00

28+00

27+00

26+00

old Bush

||

Hu

W Bat 15 - 22

16 | 15
21 | 22

32750 Set approx corners

141-25

37

T 14° N B 25° W
V = 6° 30'

Aug 10, 1937
Same party

total distance
5280 ft

5.830' W
Random mag bearing

- 52150
- 52100
- 51400
- 50200
- 49400
- 48400
- 47400
- 46400
- 45400



West →
N
St old back

- 140-25W.

26 Line Running West Bet sec. 16-21

25

24

23

22

21

20

19 + 41 Ft. I came to edge of lake.

7
18 + 16

17

16

15

14

13 + 20 ft. set App. 1/6 006

12

11

10

9

8

7

6

5

4

3

2

1

0700 start west from APPSC.

1.140 P. 25

Date Aug. 11 1927

Party

Stranstad
Comstock
Holmquist
Coulson
Buchter
Hoaglund

Loon
Lake

total distance
5.200 Ft

5.800 30' W. from top of hill

APPSC
Sec. 16

141-25

38

52+00 Ft. set app. spe. cor. west bet. $\frac{16}{21}$ -14023

51

50

49

48

47

46

45

44

43

42

41

40

39

38

37

36

34

33+00 Ft. 9 left 1a-m. SWP. surrounding lake.

32

31

30

29

28

27+00

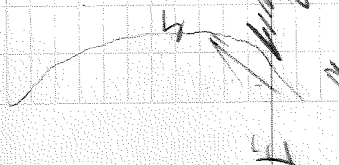
26+66 Edge of lake

141° 25'

39

Total distance
5280 FT

5
E Mine Run west S. 83° 30' W. grade 77% long
W
N



Line E Bot 17-20 of $\frac{16}{21} \frac{17}{20}$
51+65 Tied into Rppro corner 100 ft N

51+00

49+00

48+00

47+00

46+00

45+81 crossed old logging road

45+00

44+00 St again

43+00 End of St

42+00

41+00

40+00

39+00

38+00 Left Ha

37+00 Left Ss

36+00

35+00

34+00 Enter Ss

33+00

32+00

31+00

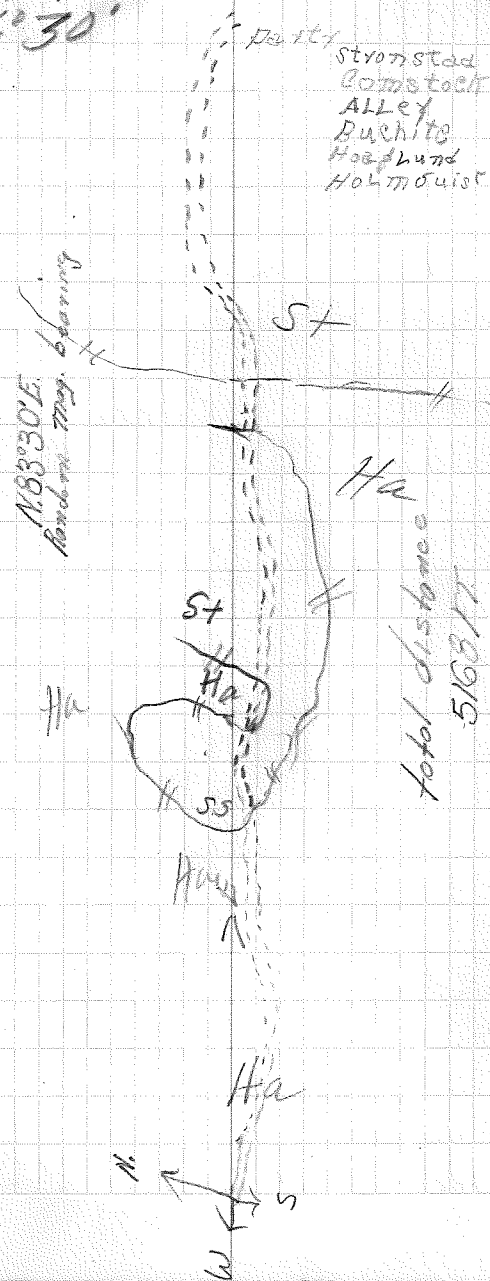
30+00

29+00

28+00

27+00 Started here.

141-25
T 140N R 25W Aug 12, 1937
V 6°30'



Line E Bet 35-2

34-111 SET APP. POST-V. ROAD

35

34

33

32

31

30

1900 Ft. S Left Tam. SWP.

18

17

16

15

1400 Ft. entered Tam. SWP.
13+68 Ft. S Left of post marked.
13+20 Ft. APP. 1/2 C. 11

12

11

10

9

8

7

6

5

4

3

2000 Ft. entered field

6000 started at approx Sec $\frac{34}{3} \frac{35}{2}$

68 Ft. High Line Tam. Mar-Sol
Road at 37 Ft. N. Sol.

141-25

T 141-141 N B 25 W

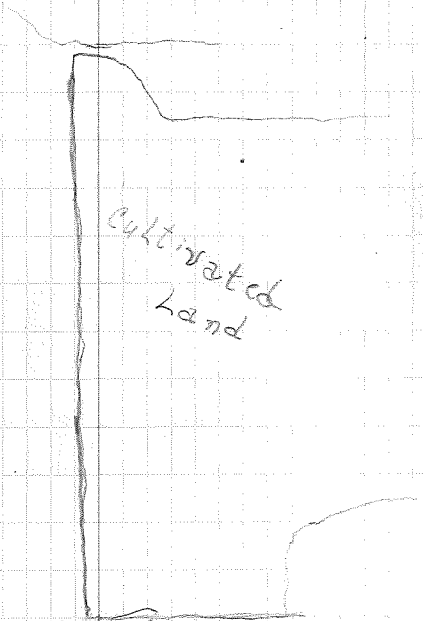
V = 6080'

3, 1937 41

Party
Stronstad
Comtoe
Atley
Buchite
Holmquist
Hoaglund

Ha

Tam
SWP.



APP. S.C.

Line E. Box 35-2

50+74 creek

50+00

48+93 Middle of R.R. track

48+10 creek

48+00

47+95 Enter Ss

46+00

45+00

44+00

43+00

42+00

41+00

40+00

39+00

38+00

37+00

36+00

35+00

34+00

33+00 Enter Ha

32+00 LEAVE baywood SWAMP

31+50 entered baywood SWAMP

30+00

29+70

28+00

27+00

Aug 13, 42

Ha
RR

Ss

Ha

Ha
Ss

E Bet 35-2

43

35 | 36
2 | 1

52+80 set approx See corner
51+00

Swamp alder.

Line W Bet 34-3 f. 140-141 R. 25 W.

25+64 FT. FENCE N.S. LEAVE PASTURE

\angle 6°30'

Distance = 5280 FT

13+20 FT SET APP. $\frac{1}{16}$ COR. BET 34-3. W
12+95 FT. Crossed Fence N. S. entered

10+00 Ft. across potatoe Field

6+60 Ft. came to potatoe patch.

6+27 Ft. across field

5+75 Ft. Came to River edge. Run N-S.

Set up and Run West from App. sec. Cor. 34-35

T. 140-141 N. R. 25 W.

Date Aug. 16, 1937

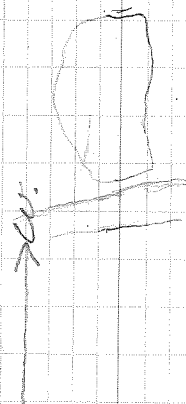
44

Party:
Stronsted - compass
ALLEY - rod
Pawson - Chain
Johnson
Baty

S. 88°30' W.

Random mag. bearing

Pasture



32 ml. 2. \angle 6°30'

34
35
2

line runs west

52+80 Ft. set App Sec. Cor.

$\frac{413}{3334}$

39+60 Ft. SET APP $\frac{1}{4}$ COR. W. BET. 34-3

30+00 Ft. set. Aug. 16, 1937

26+40 Ft. SET APP $\frac{1}{4}$ COR W. BET. 34-3

139-29

140-141 N. P. 25 W

45

Weather: Fair - Warm

Date: Aug. 17, 1937

Party
Stronstad - Compass
Alley -
Baty - Rod
Pawm - Chain
Johnson H -

137-27

T. 140-141 N. R. 25 W.

DATE. AUG. 18, 1937

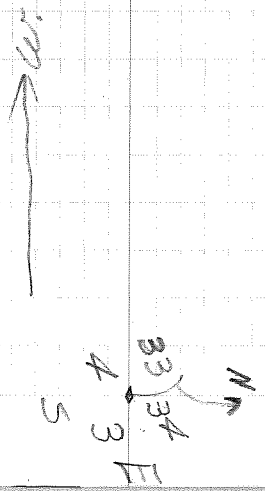
46

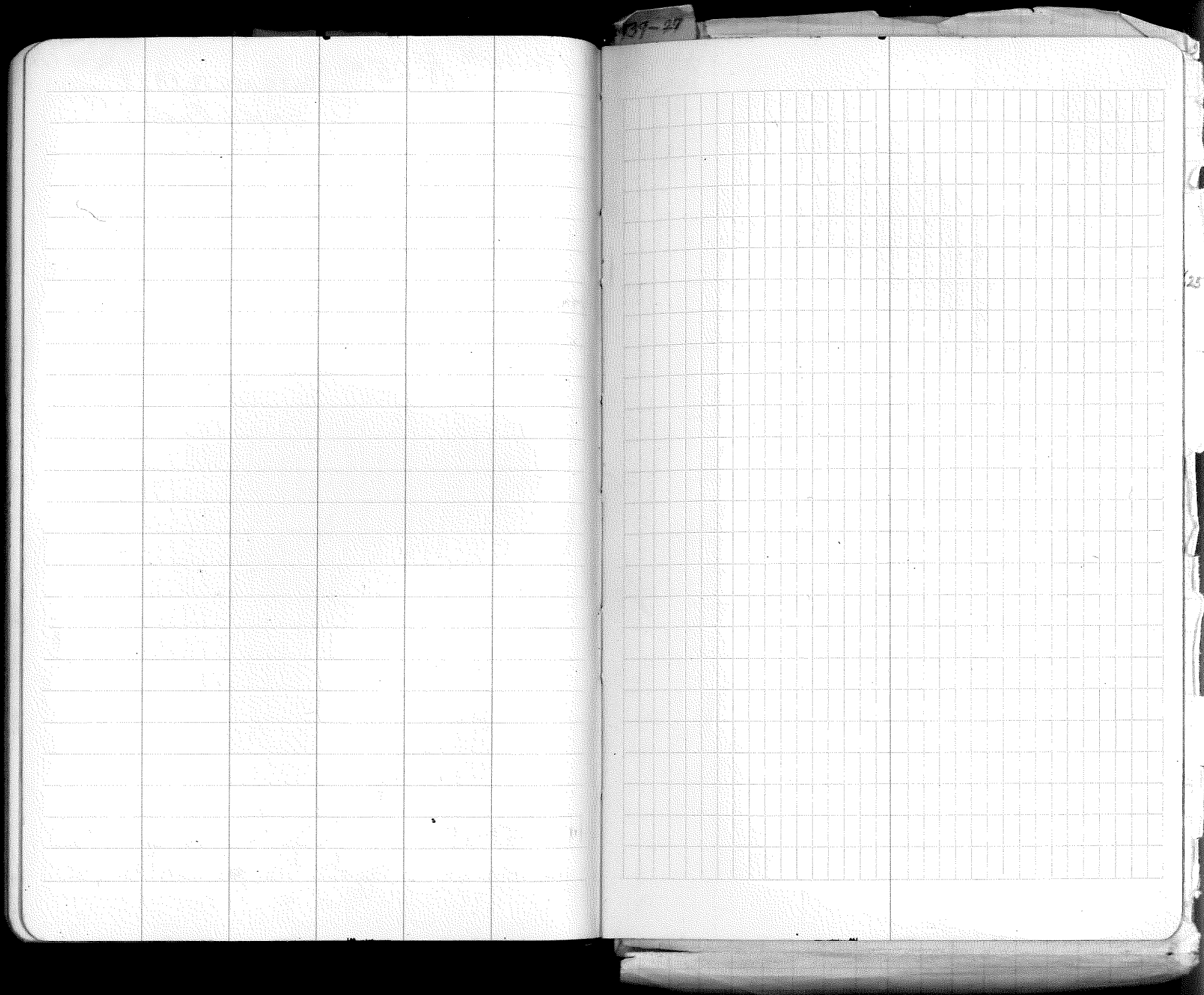
SAME PARTY

20+00 Ft. Quit,

Running west between $\frac{33 \pm 141}{-7 \pm 140}$ R. 25 W.

Set up and run West Bet. 33-4 Va 6⁰⁰ At A.P. sec. 604





137-27

T. 139 R. 27

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24 h. 2.
30	29	28	27	26	25
31	32	33	34	35	36

26+38 SET TEMP $\frac{1}{4}$ COR

$\frac{1}{4}$ COR.

29+50 LEFT ASH ENTERED TAG ALDER

18+74 LEFT ALL CONIFERS ENTER 1-5 ASH

13+70 SET TEMP CCC. $\frac{1}{16}$ COR.

9+54 ENTERED HARDWOOD AND BALSAM SWAMP
LEFT 1-5 ASPEN

00+00 started East from h.P. at $\frac{23}{26} \frac{24}{25}$ 139-27

Date: 4/8/40

Party: MINELOTH-CHIEF
PROCKAW-TRK
HESSE-TRK
WEISS-CH-TRK
ANDERSON-NOTES
TRK

Look for:

W. cedar 7-8.10 E.P.K.S.

W. cedar N. 50-E 5K3 Found:

AN OLD CUT
LINE ABOUT 14 FT.
NORTH OF OUR LINE.
WE FOUND THEIR
TEMP $\frac{1}{4}$ CORNER
ABOUT 6 FT W. AND
14 FT. N. OF OUR $\frac{1}{4}$
CORNER

Magnetic Bearing $100^{\circ} 48' E$
Random Line X
SLIM
SDB
Hd 1-5

Var. $7^{\circ} 12'$

52+76.7'

64' N. to the cor. post $\frac{24}{25}$ 139-27

51+00 cross other line -

50+30 hit creek - creek is approx 150' +
across at this point.

41+20 enter tam.

39+60 set approx. $\frac{1}{16}$ cor. E.

Alder brush + cedar

26+38 cont'd East from

to cor. $\frac{24}{25}$ 139-27

Date: 4/3/40

Party: Diamond-kr.
Hesse - Aye
Weiss-ohn
Yager-ohn-robe

Look for 1

Tam 9 N 27 W 178 L.

" 9 N 11 E 147 L. Found: old Temp. post.

" 6 S 87 W 142 L. cor. at 52+69

No tree to se. and 45' N. of our

Distance is 5276.7' line - cor. is in

middle of creek

There are 2 old

Temp. post.

Alder brush + Cedar Swamp
Mag. Bar N 80° 18' E
Random line

Var. 7° 12' E.

East on Random Bet. Sec. 25424
Va. 11° E

19.00 Enter Sec & st.
40.00 Set Temp $\frac{1}{4}$ post
79.95 Hit sec cor.
Correct back go W.
39.98 Set $\frac{1}{4}$ post
W. Cedar 7-5 10E-9 1KS
" - -N50 E-5 1KS

79.95 - Sec. cor.
Tam. 8, N 27W - 178 1KS
" 9, N 11 E - 147 "
" 6, S 88W - 142 "
No tree SE

Today - use 70 12' E

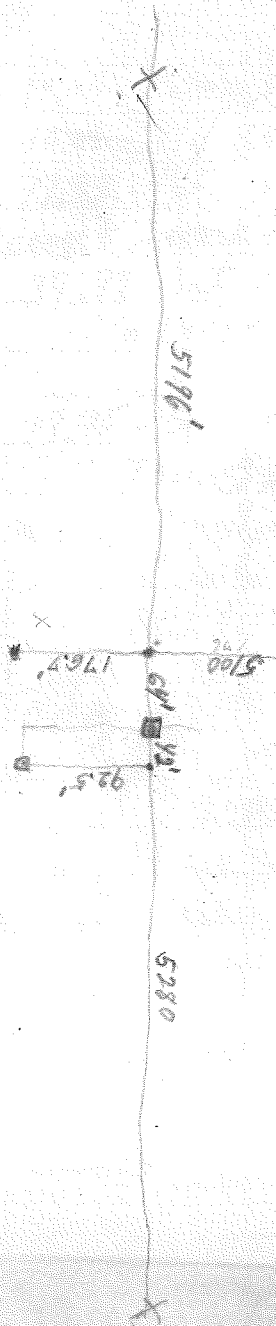
70/12'

North Bet. Secs. 25430 -

40.00 Set $\frac{1}{4}$ post -
41.00 Tam. SWP. NW & SE
59.50 Creek - 8 1KS wide runs NW
79.34 " 40 " " " SW
80.00 Set post for cor. to sec 19, 30, 24, 25

North Bet. Secs. 19424

30.00 Leave Tam Swamp NE & SW
39.70 Creek 25 1KS wide runs SE
40.00 Set $\frac{1}{4}$ post
41.50 Creek 20 1KS wide runs SW
50.00 " " " " " SE
53.00 " " " " " SW
65.00 Tam. Swp. NE & SW
75.00 Leave Swp. NE & SW
80.00 Set post for cor. 18, 19, 13, 24.

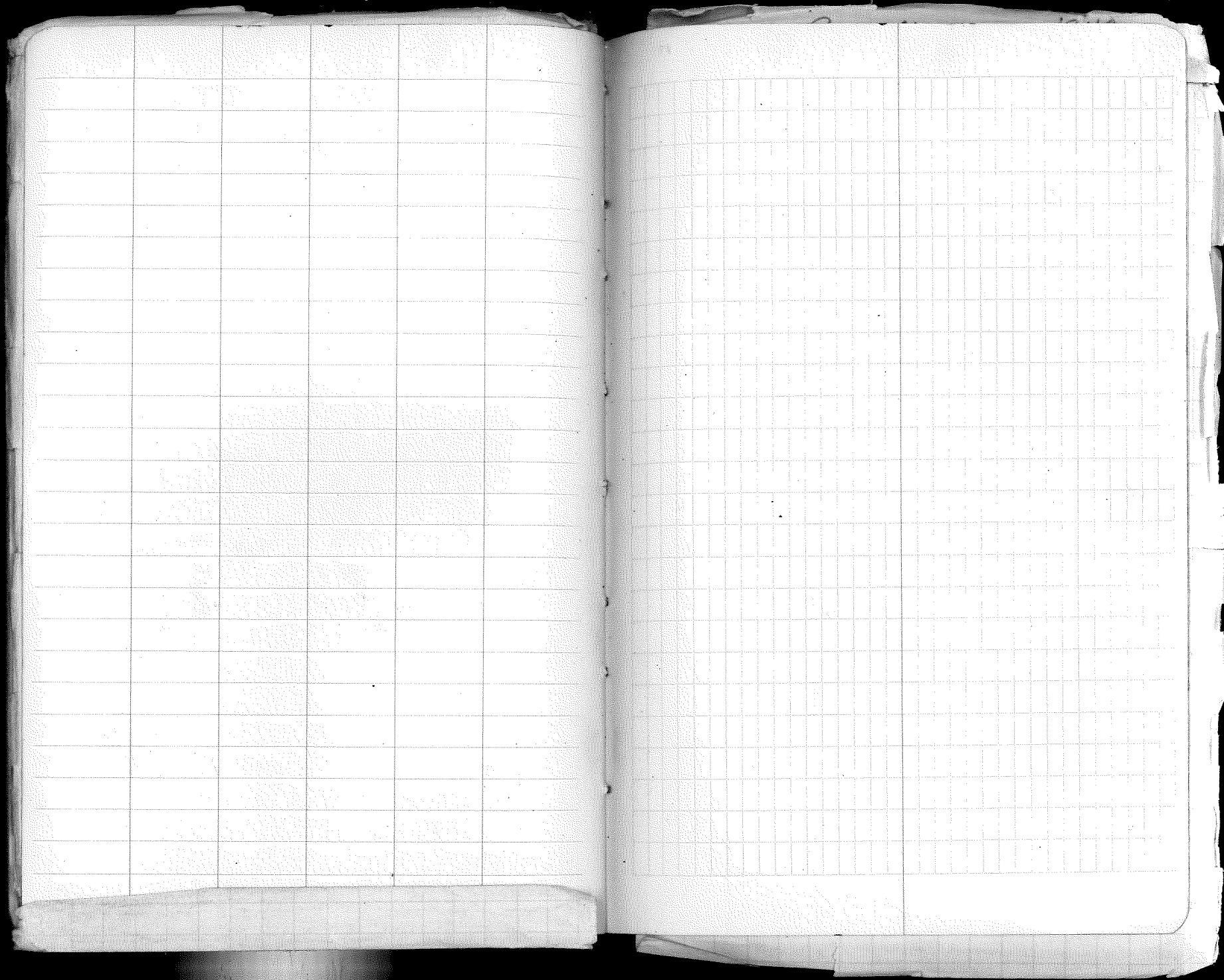


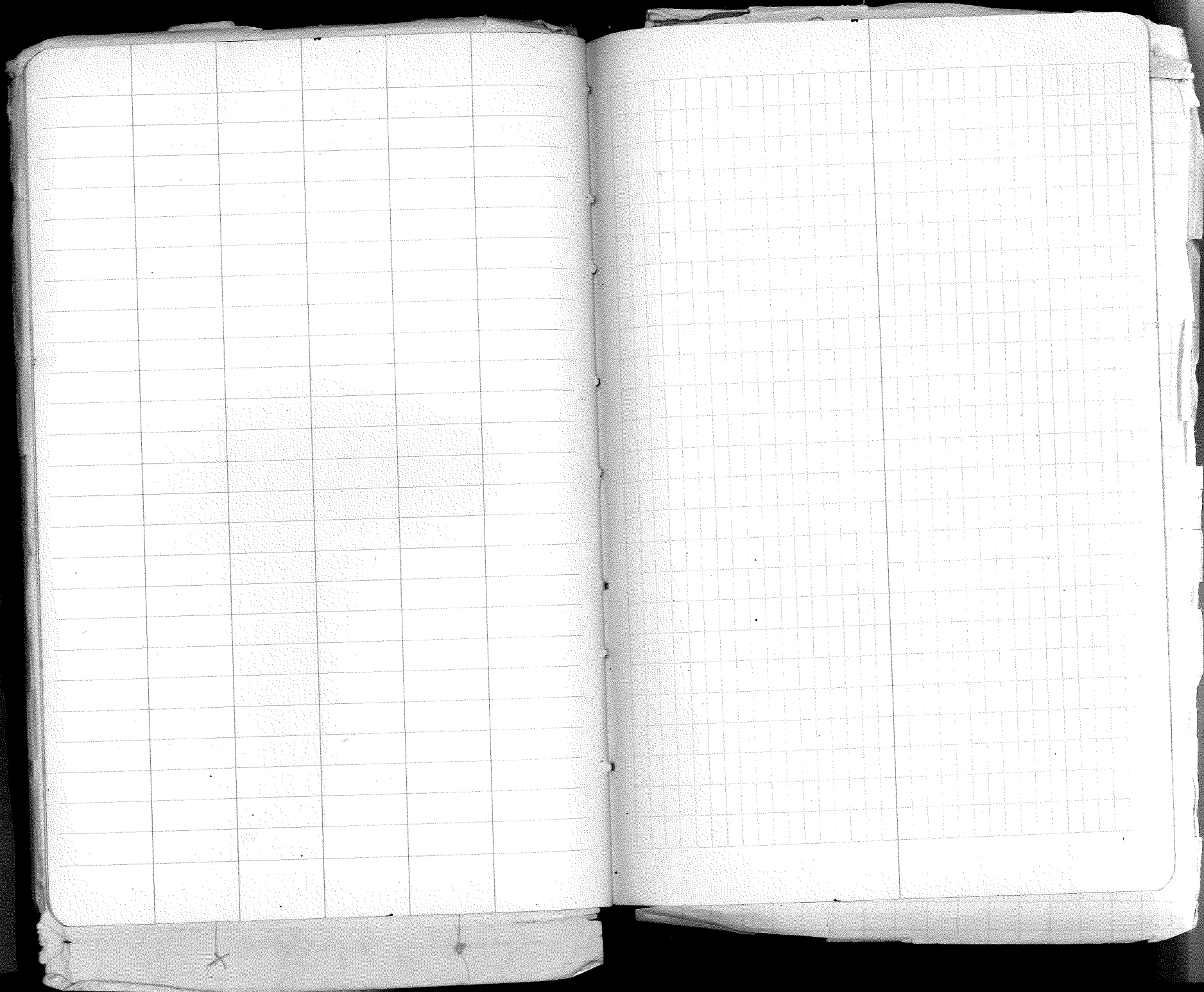
5280
5196
84

5196'

5280
5196
5233

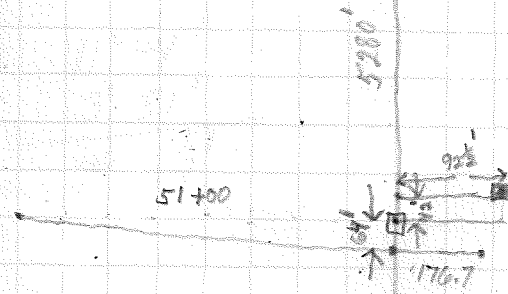
5280'





1863

1240

$$\begin{array}{r}
 5276.7 \\
 5100 \\
 \hline
 176.7
 \end{array}$$


$$\begin{array}{r}
 5280 \\
 5196 \\
 \hline
 20476 \\
 5238
 \end{array}$$

$$\begin{array}{r}
 5280 \\
 5238 \\
 \hline
 42
 \end{array}$$

1863 - Range line

$$\text{Chargo} = 3^{\circ} 51'$$

$$\begin{array}{r} 8^{\circ} 75' \\ 9^{\circ} 75' \end{array}$$

$$\begin{array}{r} 30^{\circ} 51' \\ \hline \end{array}$$

$$\begin{array}{r} 5^{\circ} 24' \end{array}$$

$$11^{\circ} 64'$$

$$3^{\circ} 51'$$

$$\begin{array}{r} 7^{\circ} 13' \end{array}$$

1240

1863

277

3

60 23 1 | 3°

180

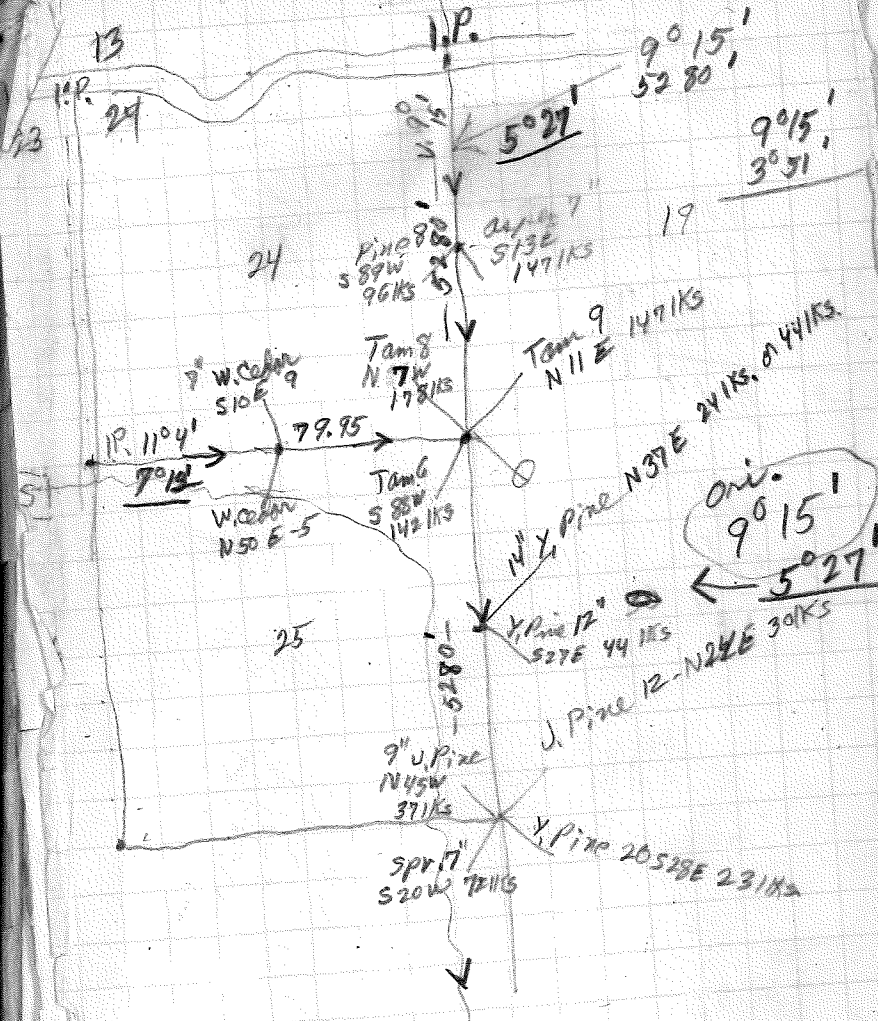
51'

2045

2242

0192

T. 139 - 26427

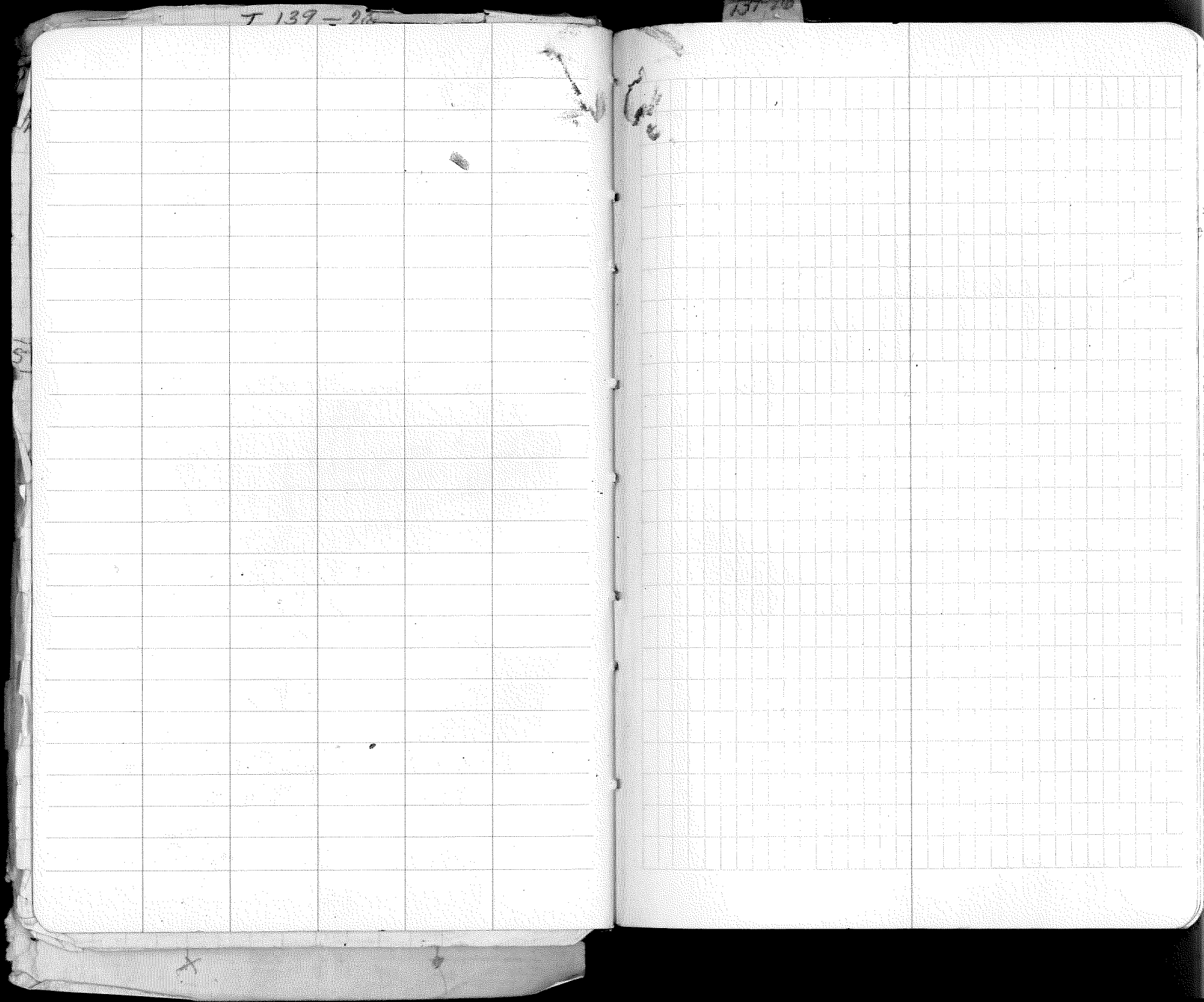


24
 3998' 39.97'
 Ver. 1104'

25

T 139 - 2.0

137.26



52+82

hit old line

I.p. 43' E.

7 | 9

18 | 17

42+00 enter Hm-5-9

39+60 set approx. to cor. S.

33+00 enter H2-5-9

22+10

Tam. Swamp

26+40

started S. from I.p.

139-26

Date: 4/11/40

Party: Minner

Diemer: Piskat

Hesse: axe

Wass: chr

Yager: notes

look for:

R. oak 7" N. 43° W 54

R. oak 7" S. 20° E 62

R. oak 10" S. 62° W 62

R. oak 8" N. 65° E 64

Found: an iron pipe

43' E. of our line

Variation - 6.9° W
Random line

26+40 set. approx. $\frac{1}{4}$ cor. in middle of field

23+10 enter Field

13+60 set. approx. $\frac{1}{6}$ S.

HM 1.5

20+00 offset 43' E to IP 4 cont'd. S-16 | 17

Date: 4-10-48

Party: Diamond-L.

Minnerath, P.

Hesse, R. G.

Wess, C. H.

Yager, notes

look for
Y. pine 20" N. 81 E ??

Found:

No evidence

Variation 6.9'
Random line

52+80 set, approx. Sec. Cor. S.
cross game line at 52+66

H 2-5-9

40+00 Main road
39+60 set approx. to cor. S.

31+00 leave swamp - enter field

29+30 enter marsh

26+40 contd. South

Date: 4/12/40

Party: Diemant.

Minnerathax

Hesse - 278

Wioss-chn

Yager-note

look for:
Paper 10" S. 45° W 40
Aspen 10" N. 75° E 1/2

Found:

No evidence

line

Variation - 6° 9' W
R. 2 P. 20 M

26+40 set approx. $\frac{1}{4}$ cor. So.

16+00 enter Ha
15+00 Tam.

13+20 approx. to cor. on edge of creek
12+56 hit creek

00+00 contd. S. on Random line

Date 14-12-40

Party: Dieman, L

Minnerath, A

Hesse, A

Wiessich, M

Yager, notes

look for:

Found:

No evidence

139-26

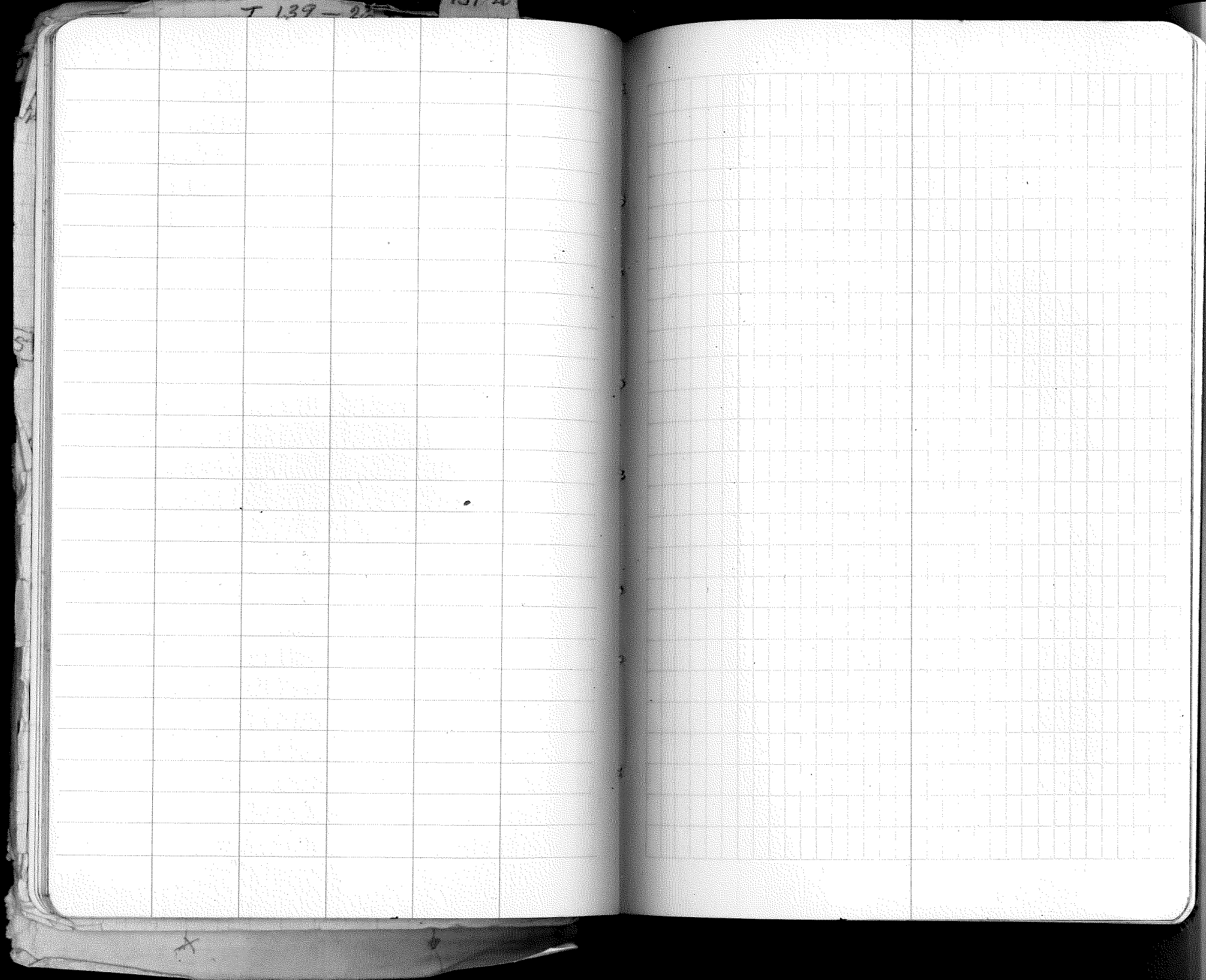
T 139-26

A grid of 20 columns and 25 rows on a notebook page. The grid is formed by light gray lines on a white background. The columns are of varying widths, with the first column being the narrowest and the last column being the widest. The rows are of uniform height.

A grid of 20 columns and 25 rows on a notebook page. The grid is formed by light gray lines on a white background. The columns are of varying widths, with the first column being the narrowest and the last column being the widest. The rows are of uniform height.

139-26

T 139-25



137-26

T 139 - 25

The image shows an open notebook with two blank, grid-lined pages. The pages are white with a light gray grid pattern. The notebook has a dark cover visible around the edges. At the top of the left page, there is a small piece of paper with the handwritten text "T 139 - 25". At the top of the right page, there is a small piece of paper with the handwritten text "137-26". The notebook is placed on a dark surface.

137-26

J 129 03

The image shows an open notebook with two blank, lined pages. The pages are white with horizontal ruling lines. The notebook has a dark cover visible around the edges. There is a small piece of paper or tape at the top center of the notebook with the handwritten number "137-26". On the left edge of the left page, there is a small handwritten mark that looks like "129". At the bottom center of the notebook, there is a small handwritten mark that looks like "x".

139-26

T 129 97

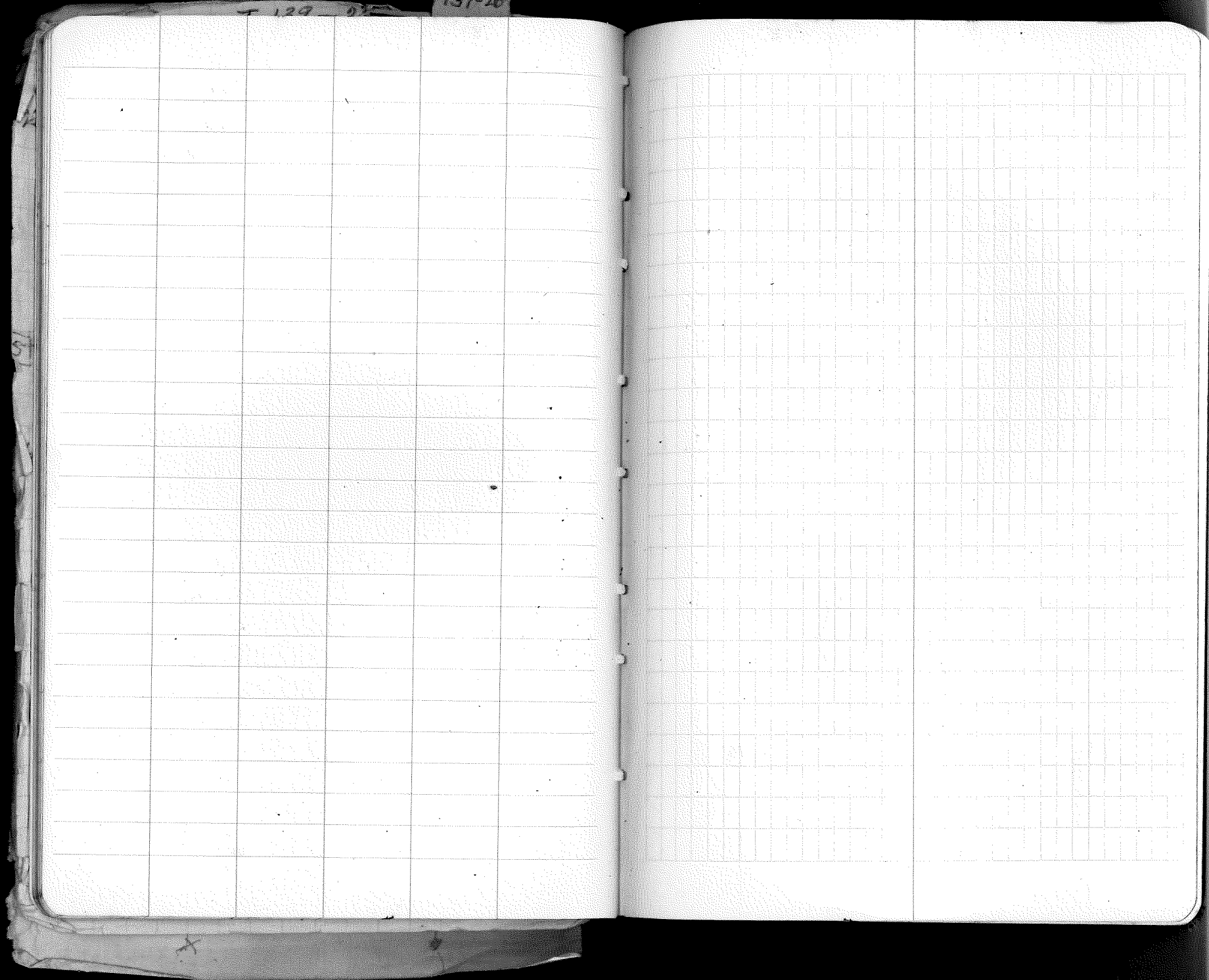
131

A grid of 20 columns and 30 rows on a notebook page. The grid is composed of thin lines forming small squares. The page is otherwise blank.

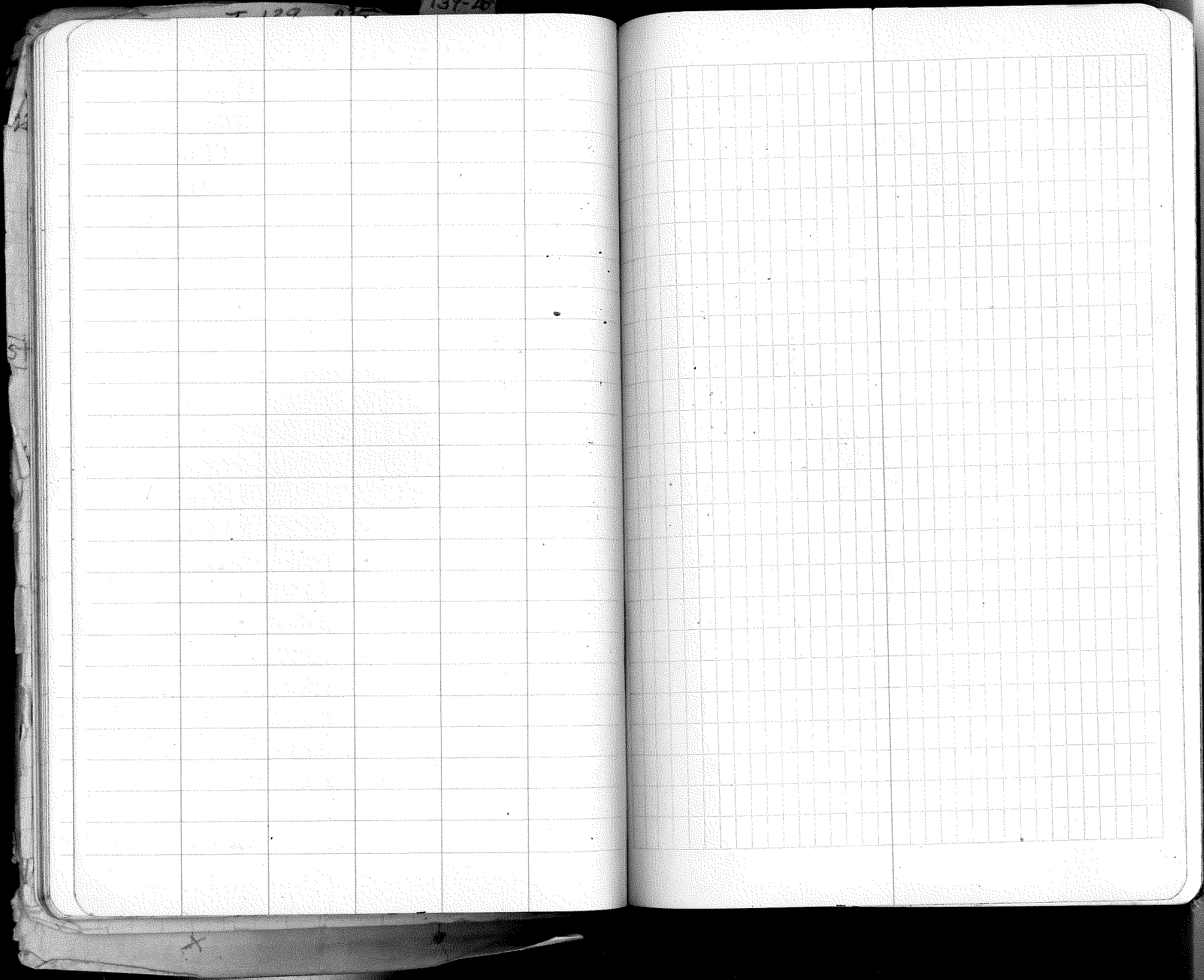
A grid of 20 columns and 30 rows on a notebook page. The grid is composed of thin lines forming small squares. The page is otherwise blank.

X

137-20



137-20



139-26

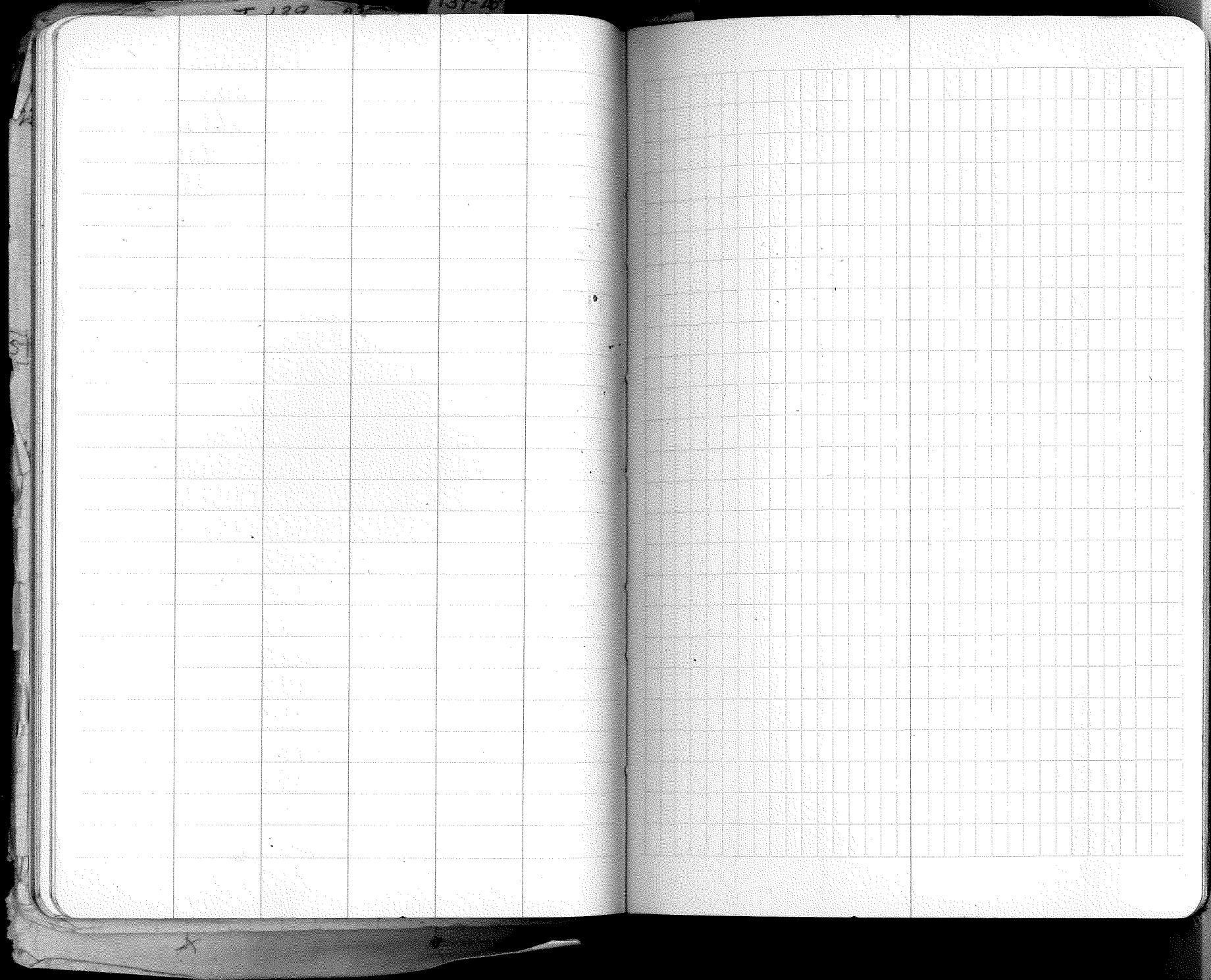
5 129 - 05

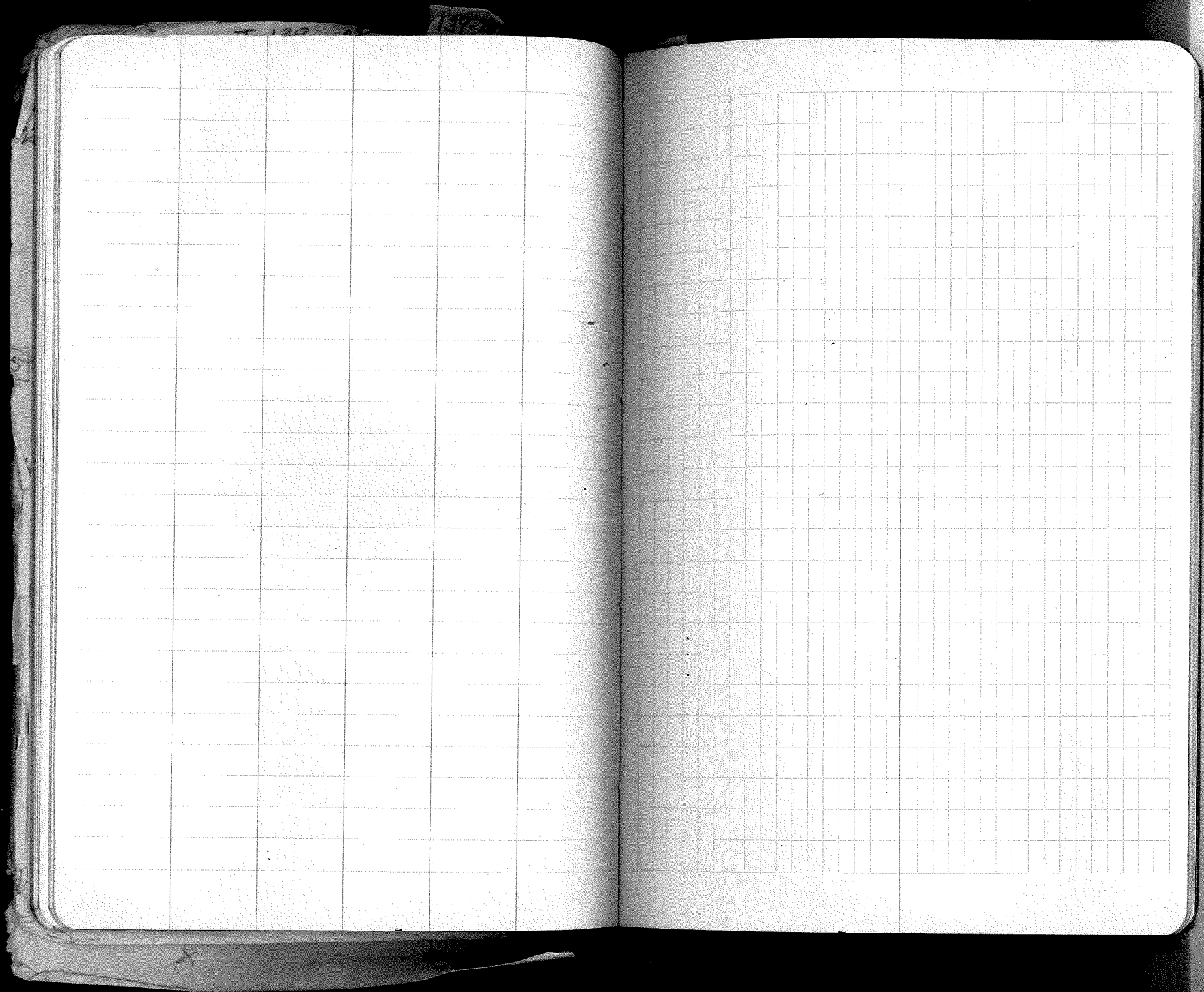
24

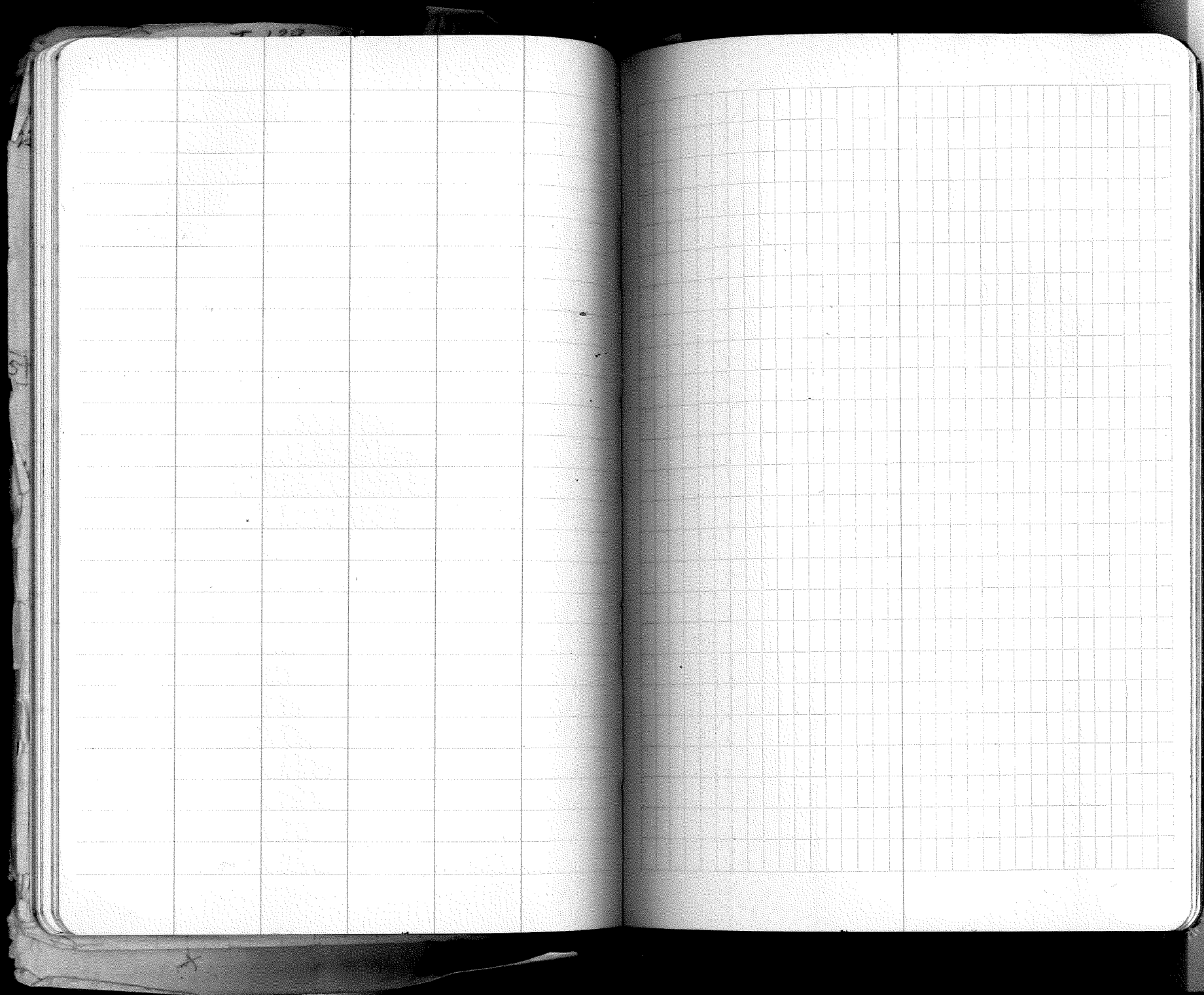
25

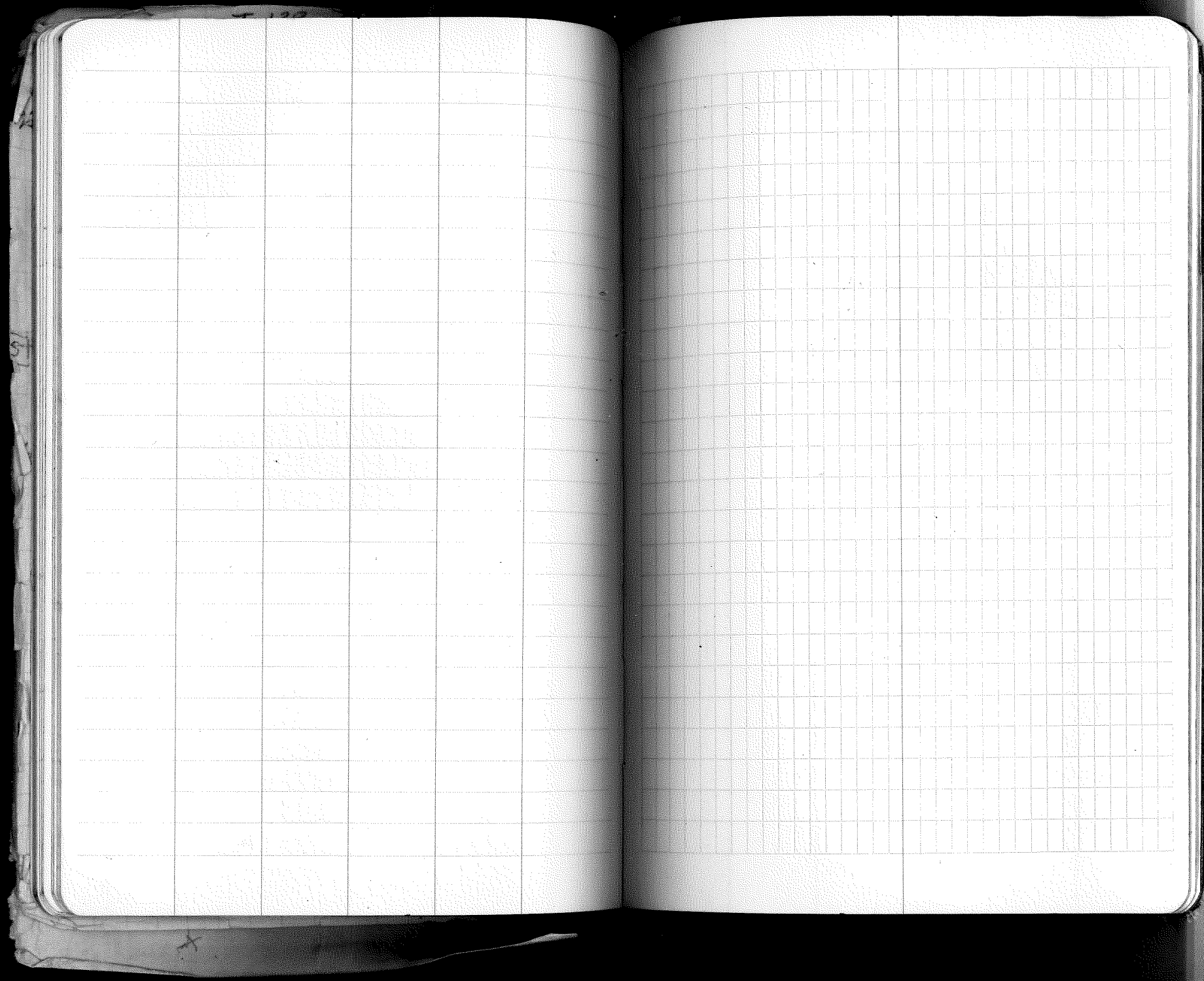
+

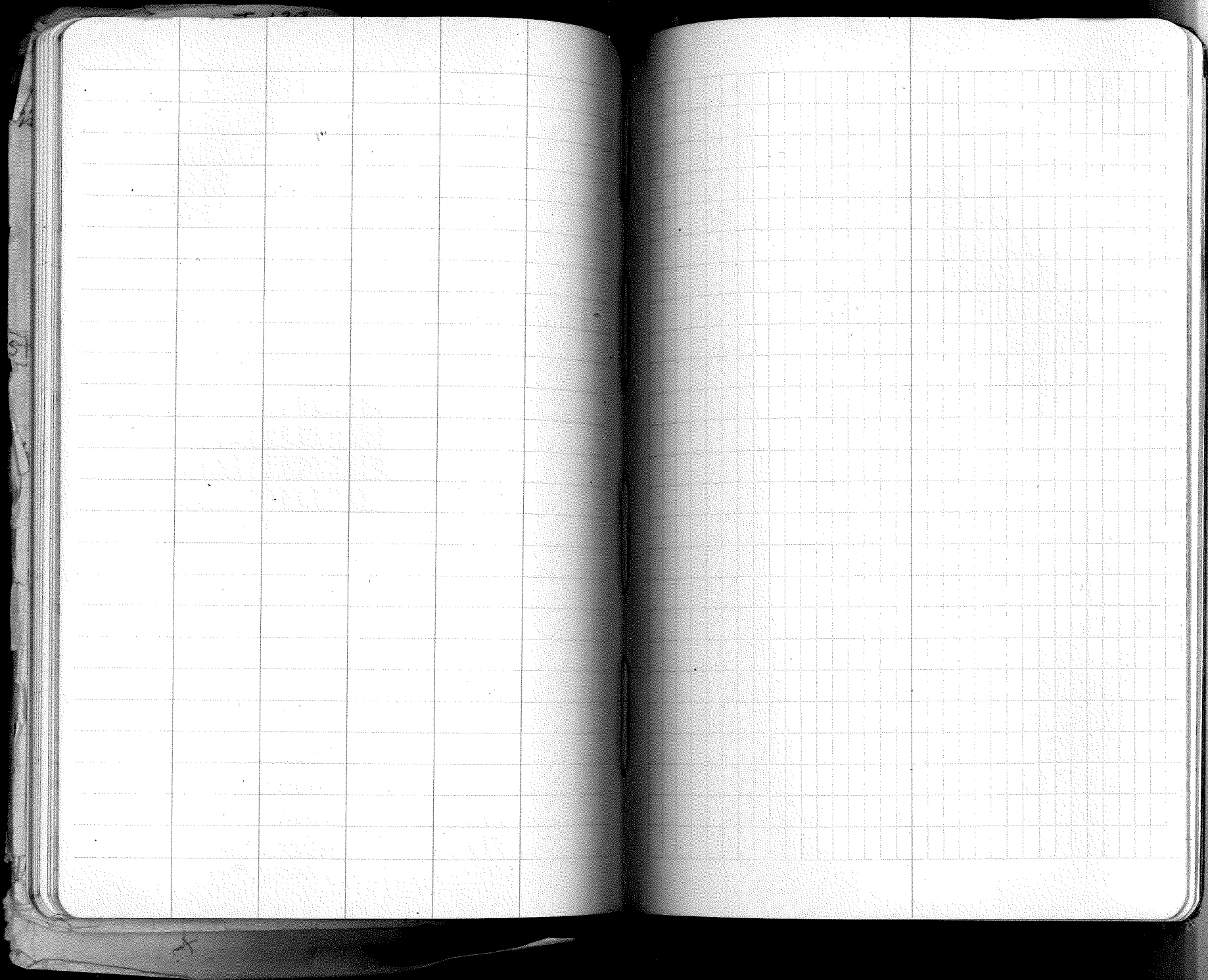
139-28

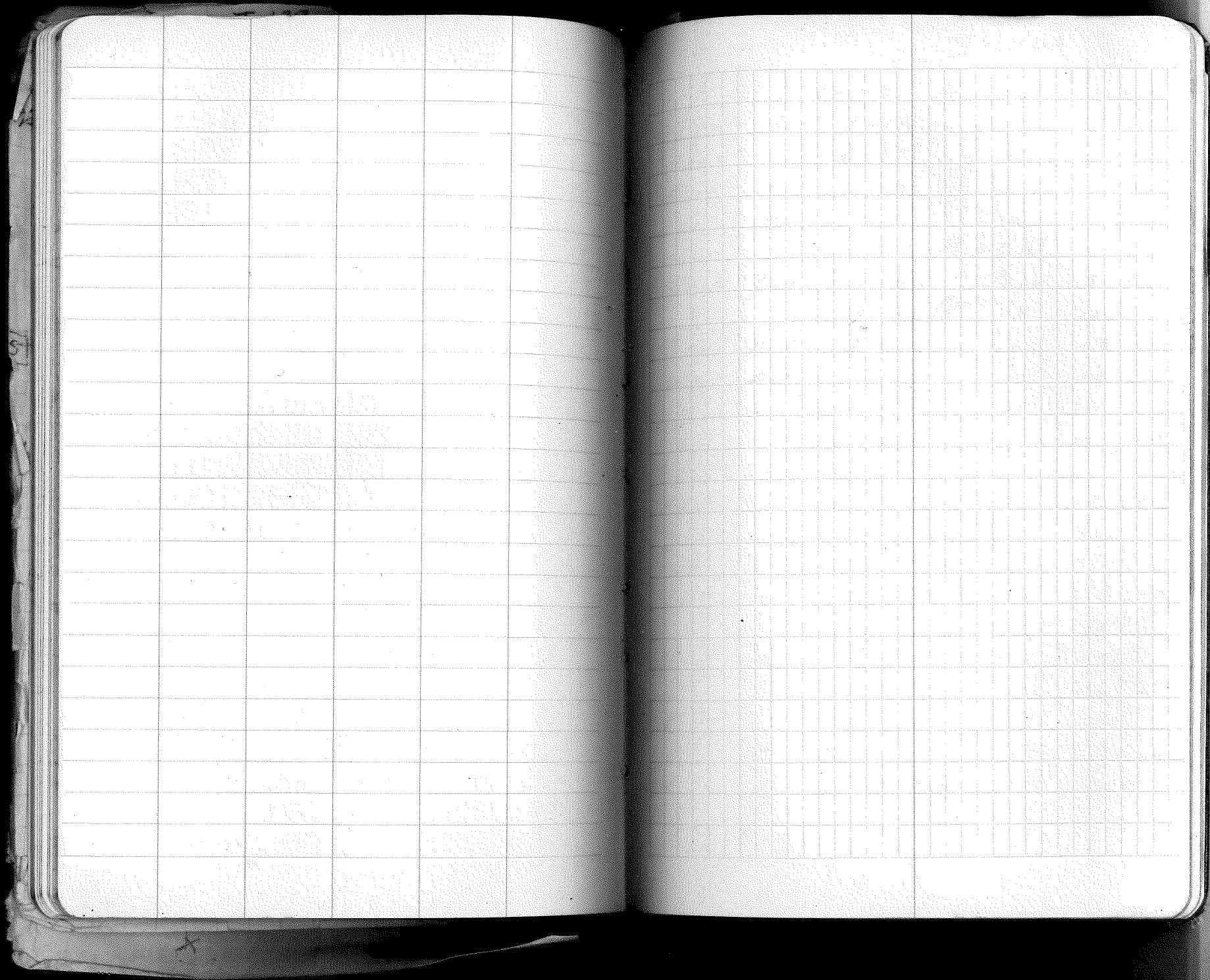








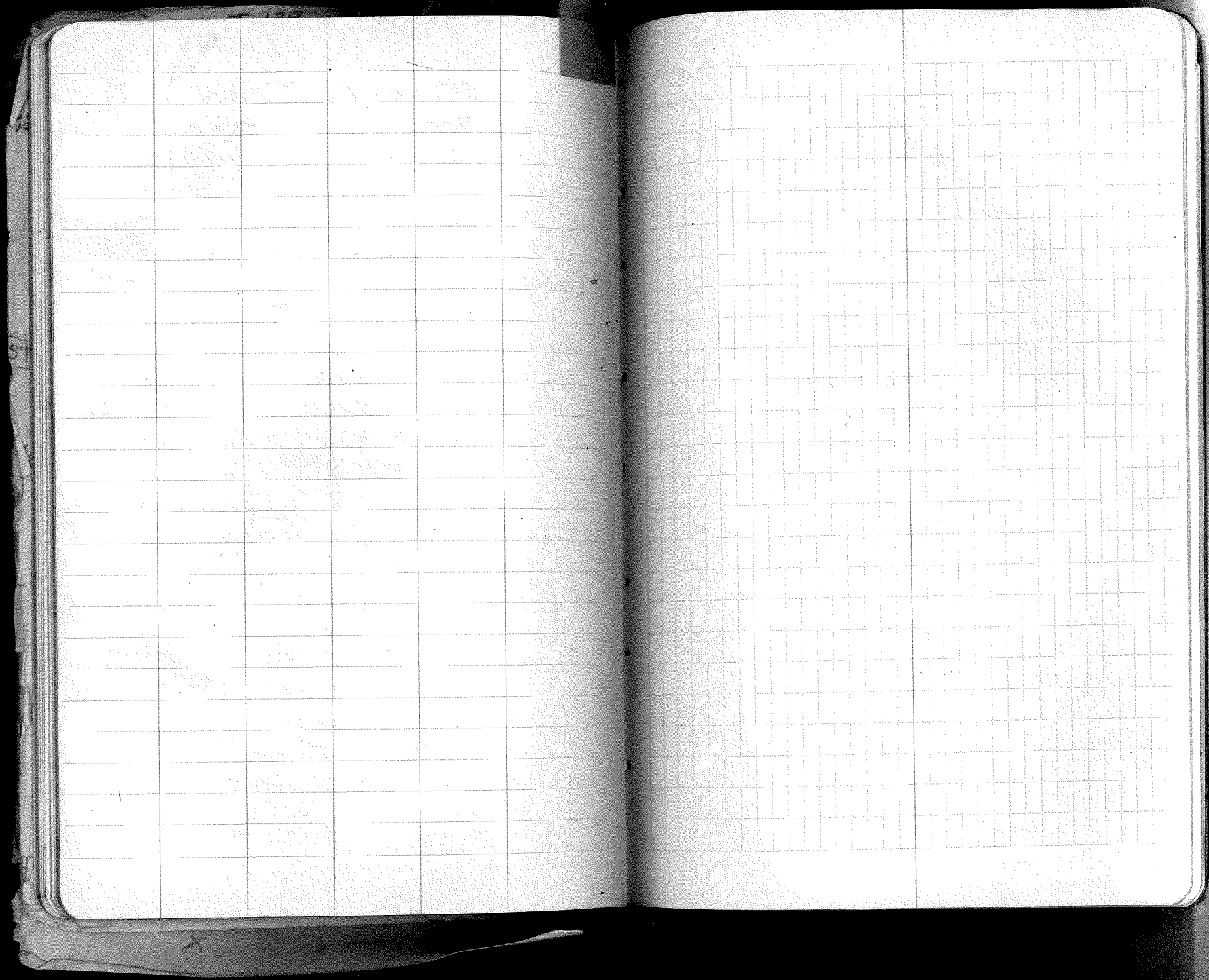


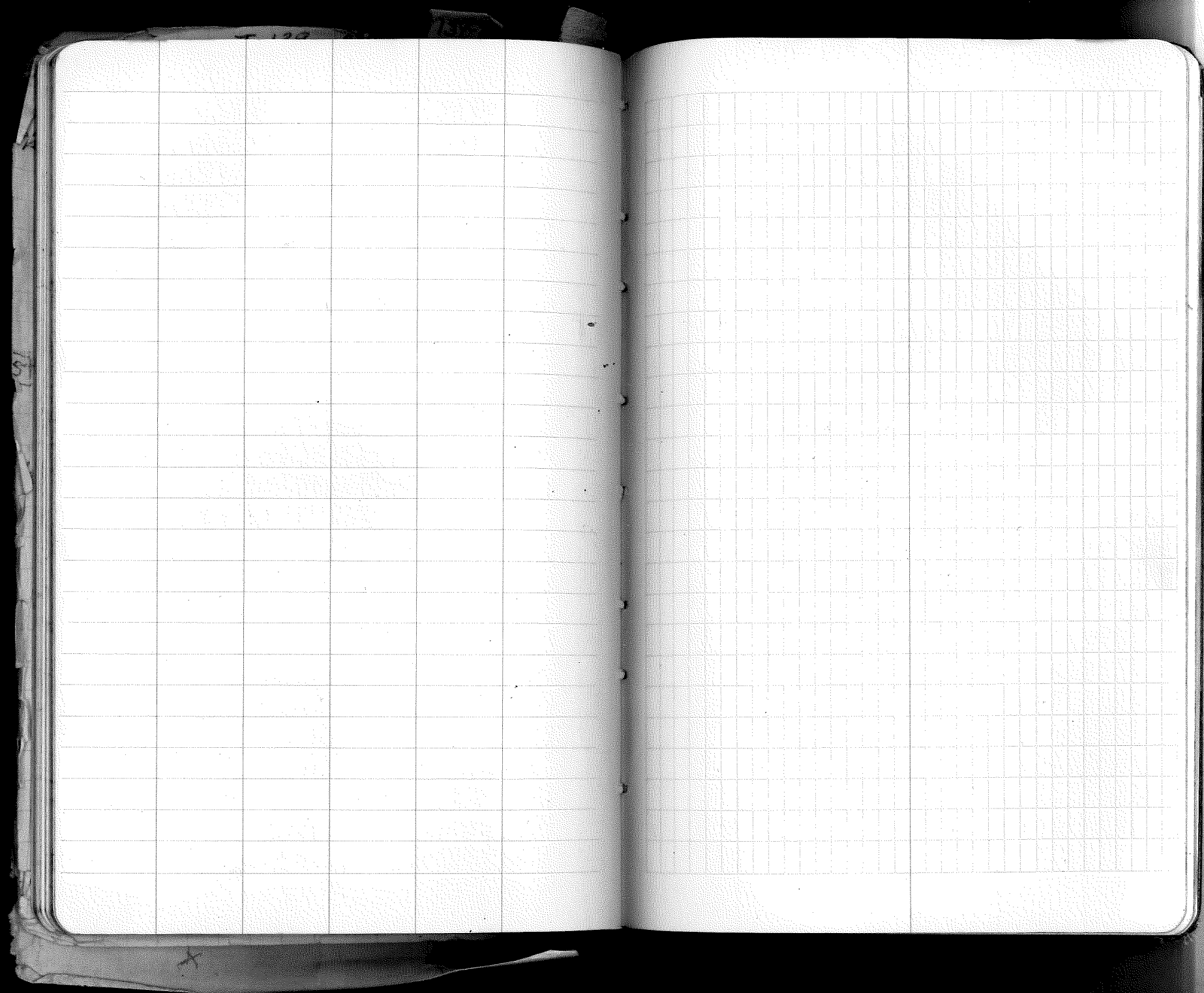


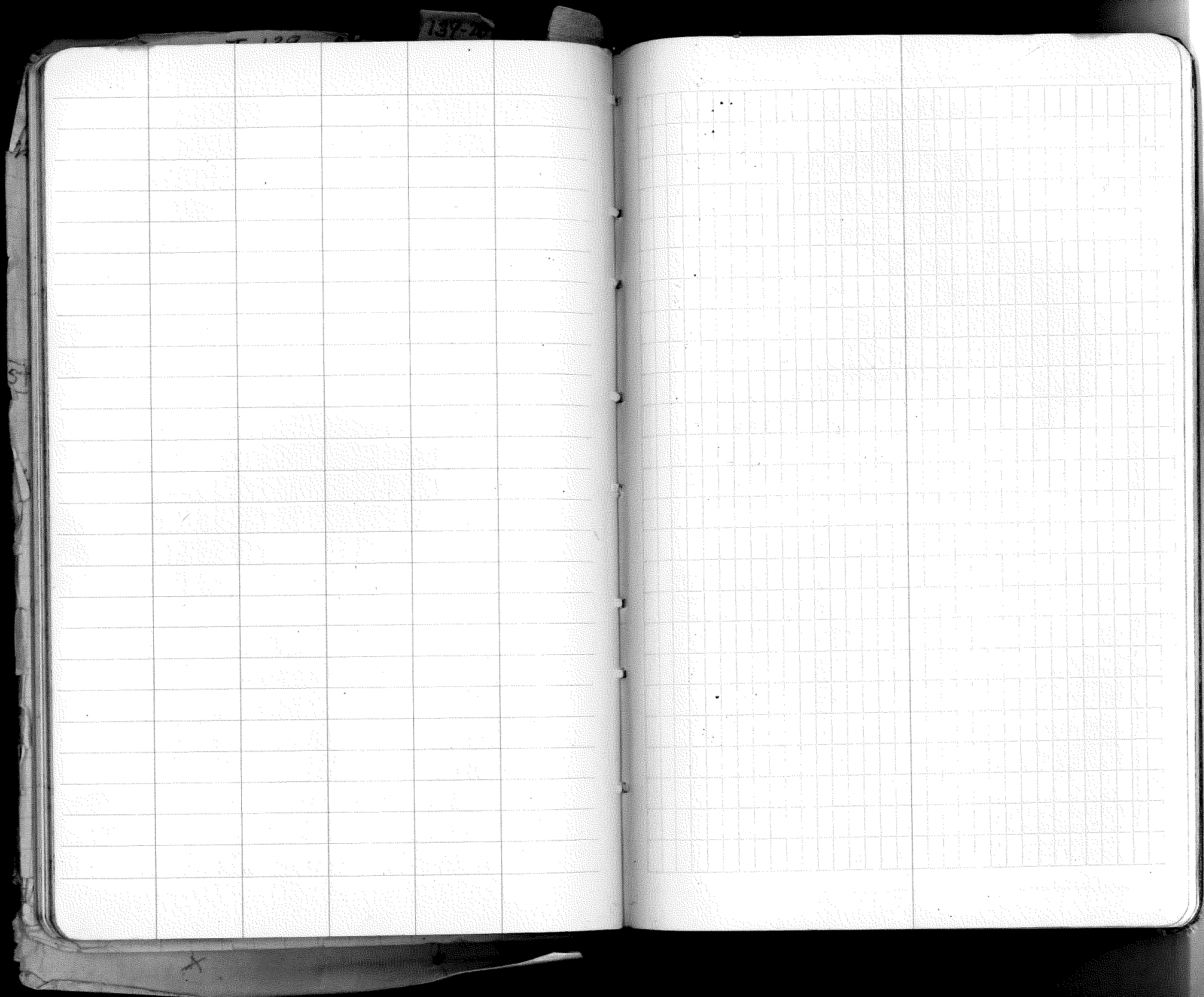
BK 4

Index.

		T 139 N	R 25 W		
East	Bet	7-18		Page	1
East	Bet	6-7		"	2-4
East	Bet	5-8		"	4-7
East	Bet	4-9		"	7
		T 140 N	R 25 W		
West	Bet.	24-25		Page	9-11
"	"	23-26	1/2 mile	"	12-
East	Bet.	13-24		"	13-17
West	Bet.	1-12		"	18-20
"	"	2-11		"	21-22
"	"	3-10		"	23-24
"	"	5-8		"	26-27
East	"	6-7		"	28-29
South	"	7-12	T 140 N R 25-26 W	"	30
"	"	13-18	" " "	"	31-32
East	"	18-19	T 140-25	"	33-34
"	"	17-20	" " "	"	35-
W	"	15-22	" " "	"	36-37
W	"	16-21	" " "	"	38-39
E	"	17-20	" " "	"	40
E	"	35-2	T 140-141 R 25	"	41-42 43
W	"	34-3	T 140-141 R 25	"	44-45



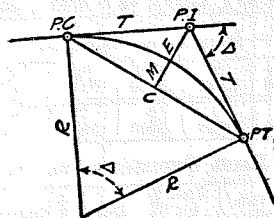




26782. Running N. from 1/4 cor. S. corner to my old line

DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

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CURVE FORMULAS

- Radius= $R = \frac{50}{\sin. D/2}$ (1) Degree of Curve= D and $\sin. \frac{D}{2} = \frac{50}{R}$ (2)
 Tangent= $T = R \tan \frac{\Delta}{2}$ (3) Length of Curve= $L = 100 \frac{\Delta}{D}$ (4)
 Middle ordinate= $M = R(1 - \cos. \frac{\Delta}{2})$ (5) $= R \text{vers} \frac{\Delta}{2}$ (6)
 External= $E = T \tan \frac{\Delta}{4}$ (7) $= R \div \cos. \frac{\Delta}{2} - R$ (8) $= R \text{exsec} \frac{\Delta}{2}$ (9)
 Long Chord= $C = 2 R \sin. \frac{\Delta}{2}$ (10) $\Delta =$ Central Angle

EXPLANATION AND USE OF TABLES

Stations.—Given P. I.=Sta. 161+60.35 to find Sta. of P. C. and P. T. $\Delta = 62^\circ 10'$ $D = 8^\circ 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{2} = 414.49$ ft. From Table V correction=.36 or $T = 414.85$ ft. P. C.=Sta. P.I.— $T = 157 + 45.50$. Also from (4) $L = 746.00$ and P. T.=Sta. P. C. + $L = 164 + 91.50$.

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

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

Externals.—May be found in similar manner to tangents. Thus E for curve above is 91.37. For from Table IV for 1° curve $E = 960.6$ for $8^\circ 20' = 960.6 \div 8\frac{1}{2} = 91.27$ and from Table V correction=.10 or $E = 91.37$ ft. Or suppose $\Delta = 32^\circ$ and E is measured and found to be 42 ft. What is D ? From Table IV $E = 230.9$ and $\div 42 = 5.5$ or $D = 5^\circ 30'$.

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	1/4	3-16	1/2	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.—RADI, ORDINATES AND DEFLECTIONS.

Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot	Deg.	Radius	Mid. Ord.	Tan. Offset	Def. for 1 Foot
0° 10'	34377.5	.036	.145	0.05	7°	819.02	1.528	6.105	2.10
20	17188.8	.073	.291	0.10	20'	781.84	1.600	6.395	2.20
30	11459.2	.109	.436	0.15	30	764.49	1.637	6.540	2.25
40	8594.42	.145	.582	0.20	40	747.89	1.673	6.685	2.30
50	6875.55	.182	.727	0.25					
1					8				
10	5729.65	.218	.873	0.30	20	716.78	1.746	6.976	2.40
20	4911.15	.255	1.018	0.35	30	688.16	1.819	7.266	2.50
30	4297.28	.291	1.164	0.40	40	674.69	1.855	7.411	2.55
40	3819.83	.327	1.309	0.45					
50	3437.87	.364	1.454	0.50	9				
	3125.36	.400	1.600	0.55	20	637.28	1.965	7.846	2.70
2					30	614.56	2.037	8.130	2.80
10	2864.93	.436	1.745	0.60	40	603.80	2.074	8.281	2.85
20	2644.58	.473	1.891	0.65					
30	2455.70	.509	2.036	0.70	10	573.69	2.183	8.716	3.00
40	2292.01	.545	2.181	0.75	30	546.44	2.292	9.150	3.15
50	2148.79	.582	2.327	0.80					
	2022.41	.618	2.472	0.85	11	521.67	2.402	9.585	3.30
3					30	499.06	2.511	10.02	3.45
10	1910.08	.655	2.618	0.90	40	478.34	2.620	10.45	3.60
20	1809.57	.691	2.763	0.95					
30	1719.12	.727	2.908	1.00	12	459.28	2.730	10.89	3.75
40	1637.28	.764	3.054	1.05	30	441.68	2.839	11.32	3.90
50	1562.88	.800	3.199	1.10					
	1494.95	.836	3.345	1.15	13	425.40	2.949	11.75	4.05
4					30	410.28	3.058	12.18	4.20
10	1432.69	.873	3.490	1.20					
20	1375.40	.909	3.635	1.25	15	383.07	3.277	13.05	4.50
30	1322.53	.945	3.718	1.30	30	370.78	3.387	13.49	4.65
40	1273.57	.982	3.926	1.35					
50	1228.11	1.018	4.071	1.40	16	359.27	3.496	13.92	4.80
	1185.78	1.055	4.217	1.45	30	348.45	3.606	14.35	4.95
5									
10	1146.28	1.091	4.362	1.50	17	338.27	3.716	14.78	5.10
20	1109.33	1.127	4.507	1.55	18	319.62	3.935	15.64	5.40
30	1074.68	1.164	4.653	1.60					
40	1042.14	1.200	4.798	1.65	19	302.94	4.155	16.51	5.70
50	1011.51	1.237	4.943	1.70					
	982.64	1.273	5.088	1.75	20	287.94	4.374	17.37	6.00
6					21	274.37	4.594	18.22	6.30
10	955.37	1.309	5.234	1.80					
20	929.57	1.346	5.379	1.85	22	262.04	4.814	19.08	6.60
30	905.13	1.382	5.524	1.90	23	250.79	5.035	19.94	6.90
40	881.95	1.418	5.669	1.95					
50	859.92	1.455	5.814	2.00	24	240.49	5.255	20.79	7.20
					25	231.01	5.476	21.64	7.50
					26	222.27	5.697	22.50	7.80
					27	214.18	5.918	23.35	8.10
					28	206.68	6.139	24.19	8.40
					29	199.70	6.360	25.04	8.70
					30	193.18	6.583	25.88	9.00

Note. Chord Deflection=2 times tangent deflection.

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
1°	50.00	.22	11°	551.70	26.50	21°	1061.9	97.57
10'	58.34	.30	10'	560.11	27.31	10'	1070.6	90.16
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
20	509.68	22.62	10	1018.9	89.89	10	1544.2	204.44
30	518.08	23.35	20	1027.5	91.40	20	1553.1	206.77
40	526.48	24.14	30	1036.1	92.92	30	1562.1	209.12
50	534.89	24.91	40	1044.7	94.46	40	1571.0	211.48
	543.29	25.70	50	1053.3	96.01	50	1580.0	213.86

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

Central Angle	Tangent	External	Central Angle	Tangent	External	Central Angle	Tangent	External
31°	1589.0	216.3	41°	2142.2	387.4	51°	2732.9	618.4
10'	1598.0	218.7	10'	2151.7	390.7	10'	2743.1	622.8
20	1606.9	221.1	20	2161.2	394.1	20	2753.4	627.2
30	1615.9	223.5	30	2170.8	397.4	30	2763.7	631.7
40	1624.9	226.0	40	2180.3	400.8	40	2773.9	636.2
50	1633.9	228.4	50	2189.9	404.2	50	2784.2	640.7
32°	1643.0	230.9	42°	2199.4	407.6	52°	2794.5	645.2
10	1652.0	233.4	10	2209.0	411.1	10	2804.9	649.7
20	1661.0	235.9	20	2218.6	414.5	20	2815.2	654.3
30	1670.0	238.4	30	2228.1	418.0	30	2825.6	658.8
40	1679.1	241.0	40	2237.7	421.4	40	2835.9	663.4
50	1688.1	243.5	50	2247.3	425.0	50	2846.3	668.0
33°	1697.2	246.1	43°	2257.0	428.5	53°	2856.7	672.7
10	1706.3	248.7	10	2266.6	432.0	10	2867.1	677.3
20	1715.3	251.3	20	2276.2	435.6	20	2877.5	682.0
30	1724.4	253.9	30	2285.9	439.2	30	2888.0	686.7
40	1733.5	256.5	40	2295.6	442.8	40	2898.4	691.4
50	1742.6	259.1	50	2305.2	446.4	50	2908.9	696.1
34°	1751.7	261.8	44°	2314.9	450.0	54°	2919.4	700.9
10	1760.8	264.5	10	2324.6	453.6	10	2929.9	705.7
20	1770.0	267.2	20	2334.3	457.3	20	2940.4	710.5
30	1779.1	269.9	30	2344.1	461.0	30	2951.0	715.3
40	1788.2	272.6	40	2353.8	464.6	40	2961.5	720.1
50	1797.4	275.3	50	2363.5	468.4	50	2972.1	725.0
35°	1806.6	278.1	45°	2373.3	472.1	55°	2982.7	729.9
10	1815.7	280.8	10	2383.1	475.8	10	2993.3	734.8
20	1824.9	283.6	20	2392.8	479.6	20	3003.9	739.7
30	1834.1	286.4	30	2402.6	483.3	30	3014.5	744.6
40	1843.3	289.2	40	2412.4	487.2	40	3025.2	749.6
50	1852.5	292.0	50	2422.3	491.0	50	3035.8	754.6
36°	1861.7	294.9	46°	2432.1	494.8	56°	3046.5	759.6
10	1870.9	297.7	10	2441.9	498.7	10	3057.2	764.6
20	1880.1	300.5	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	1002.8	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	2326.5
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						

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	4605.6
50	6020.2	2581.3	50	7181.7	3457.6	50	8629.3	4628.6
93	6037.8	2594.0	103	7203.2	3474.4	113	8656.6	4651.3
10	6055.4	2606.8	10	7224.7	3491.3	10	8684.0	4674.2
20	6073.1	2619.7	20	7246.3	3508.2	20	8711.5	4697.2
30	6090.8	2632.6	30	7268.0	3525.2	30	8739.2	4720.3
40	6108.6	2645.5	40	7289.8	3542.4	40	8767.0	4743.6
50	6126.4	2658.5	50	7311.7	3559.6	50	8794.9	4766.9
94	6144.3	2671.6	104	7333.6	3576.8	114	8822.9	4790.4
10	6162.6	2684.7	10	7355.6	3594.2	10	8851.0	4814.1
20	6180.2	2697.9	20	7377.8	3611.7	20	8879.3	4837.8
30	6198.3	2711.2	30	7399.9	3629.2	30	8907.7	4861.7
40	6216.4	2724.5	40	7422.2	3646.8	40	8936.3	4885.7
50	6234.6	2737.9	50	7444.6	3664.5	50	8965.0	4909.9
95	6252.8	2751.3	105	7467.0	3682.3	115	8993.8	4934.1
10	6271.1	2764.8	10	7489.6	3700.2	10	9022.7	4958.6
20	6289.4	2778.3	20	7512.2	3718.2	20	9051.7	4983.1
30	6307.9	2792.0	30	7534.9	3736.2	30	9080.9	5007.8
40	6326.3	2805.6	40	7557.7	3754.4	40	9110.3	5032.6
50	6344.8	2819.4	50	7580.5	3772.6	50	9139.8	5057.6
96	6363.4	2833.2	106	7603.5	3791.0	116	9169.4	5082.7
10	6382.1	2847.0	10	7626.6	3809.4	10	9199.1	5107.9
20	6400.8	2861.0	20	7649.7	3827.9	20	9229.0	5133.3
30	6419.5	2875.0	30	7672.9	3846.5	30	9259.0	5158.8
40	6438.4	2889.0	40	7696.3	3865.2	40	9289.2	5184.5
50	6457.3	2903.1	50	7719.7	3884.0	50	9319.5	5210.3
97	6476.2	2917.3	107	7743.2	3902.9	117	9349.9	5236.2
10	6495.2	2931.6	10	7766.8	3921.9	10	9380.5	5262.3
20	6514.3	2945.9	20	7790.5	3940.9	20	9411.3	5288.6
30	6533.4	2960.3	30	7814.3	3960.1	30	9442.2	5315.0
40	6552.6	2974.7	40	7838.1	3979.4	40	9473.2	5341.5
50	6571.9	2989.2	50	7862.1	3998.7	50	9504.4	5368.2
98	6591.2	3003.8	108	7886.2	4018.2	118	9535.7	5395.1
10	6610.6	3018.4	10	7910.4	4037.8	10	9567.2	5422.1
20	6630.1	3033.1	20	7934.6	4057.4	20	9598.9	5449.2
30	6649.6	3047.9	30	7959.0	4077.2	30	9630.7	5476.5
40	6669.2	3062.8	40	7983.5	4097.1	40	9662.6	5504.0
50	6688.8	3077.7	50	8008.0	4117.0	50	9694.7	5531.7
99	6708.6	3092.7	109	8032.7	4137.1	119	9727.0	5559.4
10	6728.4	3107.7	10	8057.4	4157.3	10	9759.4	5587.4
20	6748.2	3122.9	20	8082.3	4177.5	20	9792.0	5615.5
30	6768.1	3138.1	30	8107.3	4197.9	30	9824.8	5643.8
40	6788.1	3153.3	40	8132.3	4218.4	40	9857.7	5672.3
50	6808.2	3168.7	50	8157.5	4239.0	50	9890.8	5700.9
100	6828.3	3184.1	110	8182.8	4259.7	120	9924.0	5729.7
10	6848.5	3199.6	10	8208.2	4280.5	10	9957.5	5758.6
20	6868.8	3215.1	20	8233.7	4301.4	20	9991.0	5787.7
30	6889.2	3230.8	30	8259.3	4322.4	30	10025.0	5817.0
40	6909.6	3246.5	40	8285.0	4343.6	40	10059.0	5846.5
50	6930.1	3262.3	50	8310.8	4364.8	50	10093.0	5876.1

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

FOR EXTERNALS ADD

Central Angle	DEGREE OF CURVE													
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°
10°	.001	.003	.004	.006	.007	.008	.009	.011	.012	.014	.015	.017	.018	.020
15°	.003	.007	.010	.014	.018	.023	.027	.032	.035	.039	.043	.047	.051	.054
20°	.006	.011	.017	.022	.028	.034	.039	.045	.051	.057	.063	.070	.076	.083
25°	.009	.018	.027	.036	.046	.056	.065	.074	.083	.093	.106	.120	.137	.155
30°	.013	.025	.038	.051	.065	.079	.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°	.053	.112	.163	.225	.283	.340	.398	.457	.516	.575	.636	.697	.774	.851
65°	.067	.135	.204	.273	.343	.412	.483	.554	.625	.697	.771	.845	.922	1.01
70°	.080	.159	.240	.321	.403	.485	.568	.652	.735	.819	.906	.994	1.08	1.17
75°	.095	.182	.266	.353	.440	.528	.618	.707	.797	.877	.971	1.07	1.18	1.29
80°	.110	.220	.332	.445	.558	.671	.787	.903	1.02	1.13	1.25	1.38	1.50	1.62
85°	.128	.259	.391	.524	.657	.790	.926	1.06	1.20	1.34	1.47	1.62	1.76	1.91
90°	.149	.299	.450	.603	.756	.910	1.07	1.22	1.38	1.54	1.70	1.87	2.03	2.20
95°	.174	.350	.522	.706	.885	1.06	1.25	1.43	1.62	1.80	1.99	2.18	2.38	2.58
100°	.200	.401	.604	.809	1.01	1.22	1.43	1.64	1.85	2.06	2.28	2.50	2.73	2.96
110°	.268													

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	1.80	26	194.87	279.76	350.30	402.59
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.00	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.

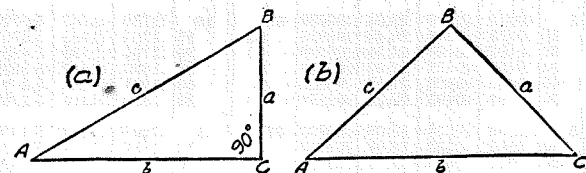
Deg. of Curve	LENGTH OF RAILS							Deg. of Curve	LENGTH OF RAILS.						
	32	30	28	26	24	22	20		32	30	28	26	24	22	20
1°	.022	.020	.016	.013	.011	.009	.008	16°	.356	.313	.273	.236	.200	.170	.139
2	.045	.038	.034	.029	.025	.021	.017	17	.378	.333	.290	.252	.213	.180	.148
3	.067	.058	.051	.044	.037	.031	.026	18	.400	.351	.306	.265	.225	.190	.156
4	.089	.079	.069	.060	.050	.042	.035	19	.423	.371	.324	.280	.238	.201	.165
5	.112	.099	.086	.074	.063	.053	.044	20	.445	.392	.341	.296	.250	.212	.174
6	.134	.117	.102	.088	.076	.064	.052	21	.466	.410	.357	.309	.262	.222	.182
7	.156	.137	.120	.104	.088	.074	.061	22	.487	.430	.375	.325	.275	.233	.191
8	.179	.158	.137	.119	.100	.085	.070	23	.509	.450	.390	.338	.287	.243	.199
9	.201	.175	.153	.133	.112	.095	.078	24	.531	.469	.408	.354	.299	.253	.208
10	.223	.196	.171	.148	.125	.106	.087	25	.552	.486	.424	.367	.311	.263	.216
11	.245	.216	.188	.163	.139	.117	.096	26	.573	.506	.441	.382	.323	.274	.225
12	.268	.236	.206	.179	.151	.128	.105	27	.594	.524	.457	.396	.335	.284	.233
13	.290	.254	.222	.192	.163	.138	.113	28	.618	.545	.475	.411	.348	.294	.242
14	.312	.275	.239	.207	.175	.148	.122	29	.638	.564	.491	.424	.361	.303	.250
15	.334	.295	.257	.223	.188	.159	.131	30	.660	.583	.508	.438	.374	.313	.259

SLOPE REDUCTIONS.

When distances are measured on a slope they may be reduced to the equivalent horizontal distance by the following approximate rule:— subtract from the slope distance the square of the rise divided by twice the slope distance. Thus for a slope distance of 250.3 ft. and a rise of 15 ft. correction=15²÷2×250.3=.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.

See fig. (a). TRIGONOMETRICAL FORMULAS.

- 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	$B = 90^\circ - A, b = a \cot. A, c = \frac{a}{\sin. A}$
A, b	B, a, c	$B = 90^\circ - A, a = b \tan. A, c = \frac{b}{\cos. A}$
A, c	B, a, b	$B = 90^\circ - A, a = c \sin. A, b = c \cos. A$
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	$\tan. \frac{1}{2}(A-B) = \frac{(a-b) \tan. \frac{1}{2}(A+B)}{a+b}$
c, b, c	A	If $s = \frac{1}{2}(a+b+c), \sin. \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{bc}}$
		$\cos. \frac{1}{2}A = \sqrt{\frac{s(s-a)}{bc}}, \tan. \frac{1}{2}A = \sqrt{\frac{(s-b)(s-c)}{s(s-a)}}$
		$\sin. A = \frac{2\sqrt{(s-a)(s-b)(s-c)s}}{bc}$
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.

Table with columns for Angle, Sine, Tan., Cotg., Cosin. and rows for angles 0 to 90 degrees.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Table with columns for Angle, Sine, Tan., Cotg., Cosin. and rows for angles 90 to 180 degrees.

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Table with columns for Angle, Sine, Tan., Cotg., Cosin. and corresponding values for angles 32 to 40.

TABLE IX.—CALCULATION OF EARTHWORK.

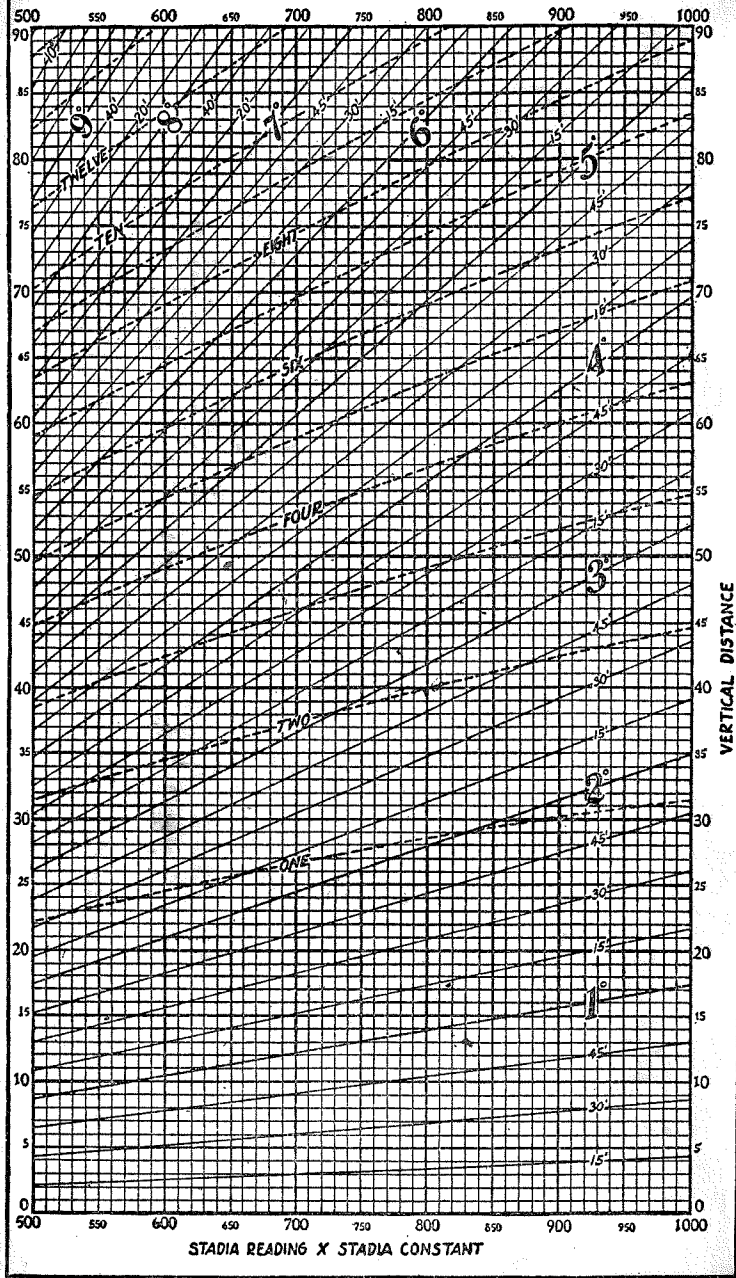
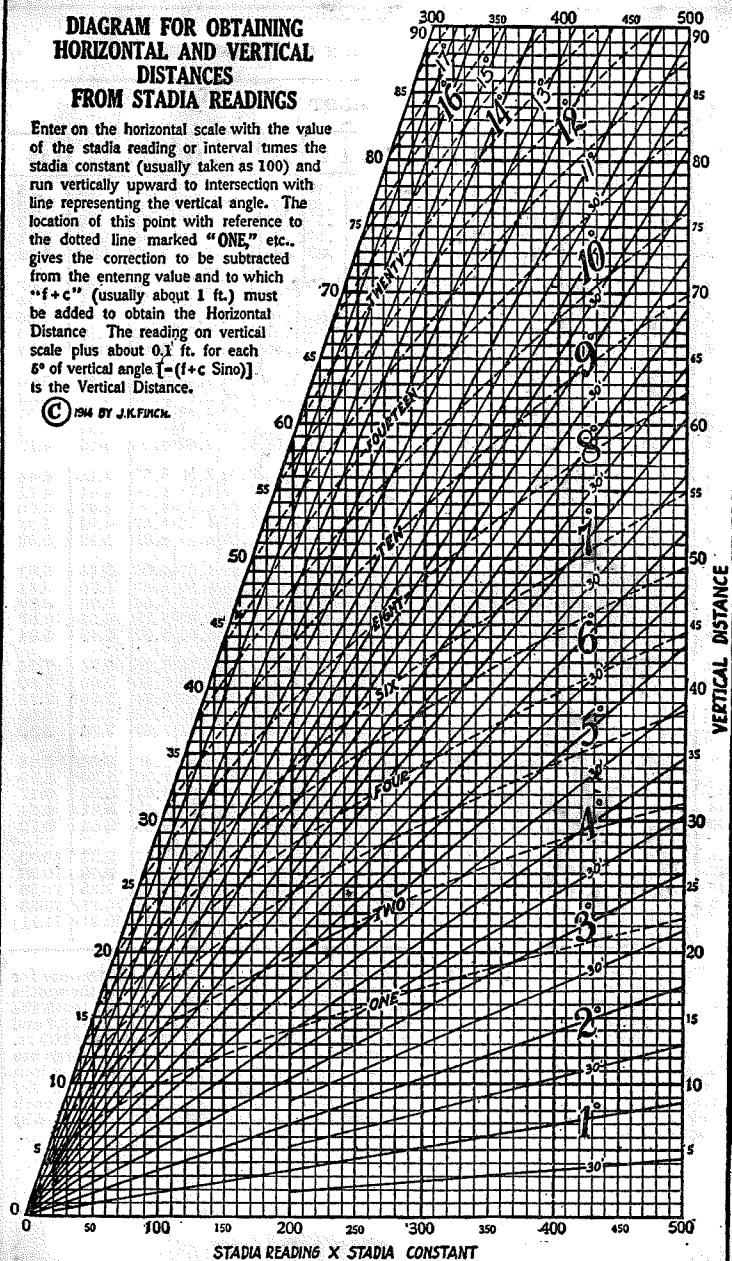
Table with columns for Width, HEIGHT (1-15), and values for calculations of earthwork.

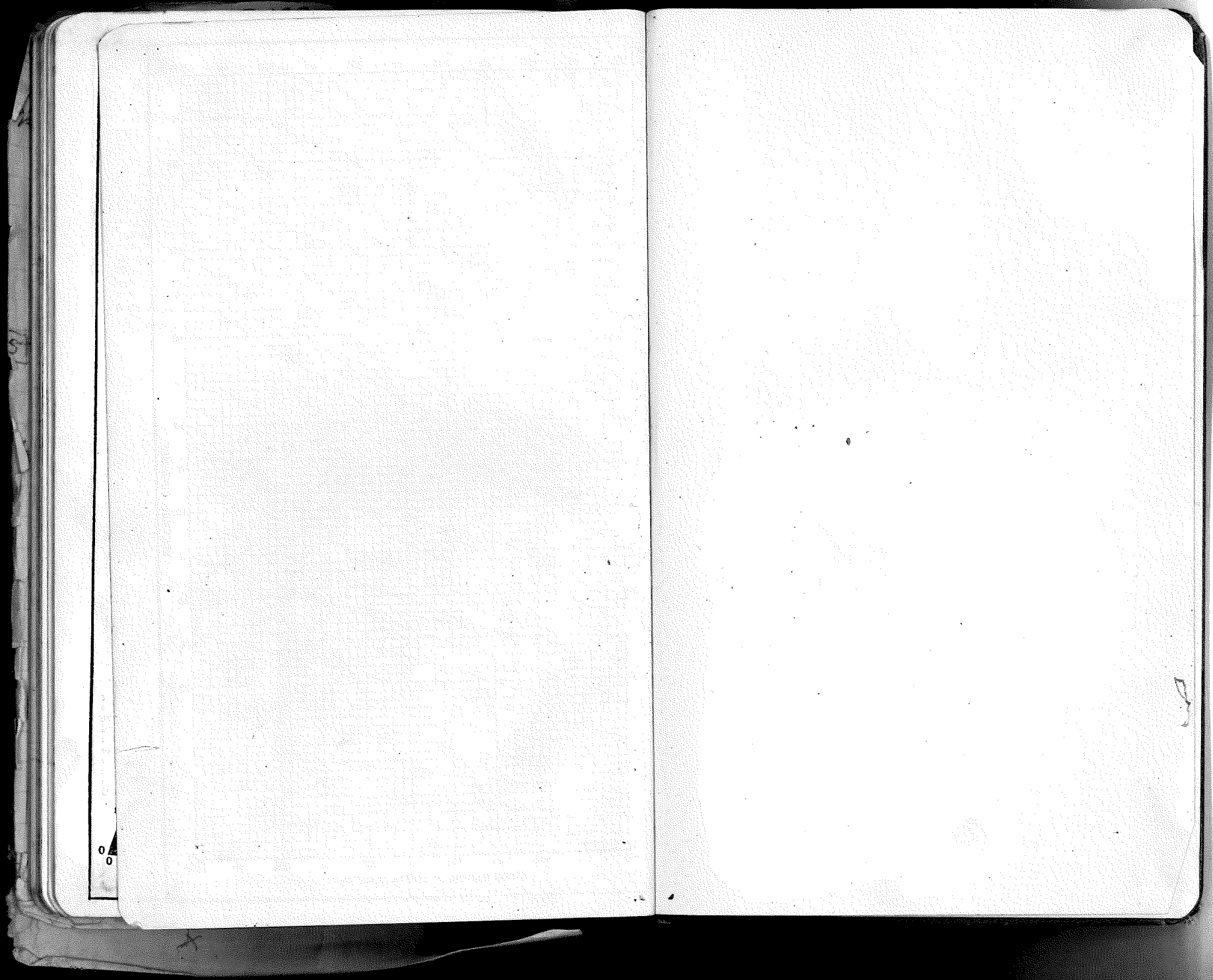
Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of width are one tenth the values found under each height considering the widths from 1 to 9 as tenths and similarly the corrections for tenths of height are one tenth the figures opposite width considering the heights from 1 to 9 as tenths.

**DIAGRAM FOR OBTAINING
HORIZONTAL AND VERTICAL
DISTANCES
FROM STADIA READINGS**

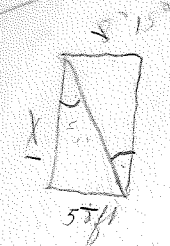
Enter on the horizontal scale with the value of the stadia reading or interval times the stadia constant (usually taken as 100) and run vertically upward to intersection with line representing the vertical angle. The location of this point with reference to the dotted line marked "ONE," etc., gives the correction to be subtracted from the entering value and to which "+f+c" (usually about 1 ft.) must be added to obtain the Horizontal Distance. The reading on vertical scale plus about 0.1 ft. for each 6° of vertical angle [$=(1+c \text{ Sino})$] is the Vertical Distance.

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367



$$\tan a = \frac{50}{x}$$

$$1450x = 50$$

$$x = \frac{50}{1450}$$

$$6.9/50$$

$$\begin{array}{r} 726 \\ 357 \\ \hline 369 \end{array}$$

$$\begin{array}{r} 357 \\ 145000 \\ \hline 129500 \end{array}$$

$$\begin{array}{r} 3960 \\ 330 \\ \hline 4290 \end{array}$$



$$\begin{array}{r} 7.24 \\ 6.9505 \\ \hline 7.483 \end{array}$$

$$\begin{array}{r} 170 \\ 137 \\ \hline 307 \end{array}$$

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING.

Roadway 16 feet wide. Side Slopes 1 on 1 1/2
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	26.2	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 $41.9 + (20 - 16) \div 2$ or 2 ft. added to 41.9 = 43.9. For slopes of 1 on 1 see inside of front cover.



4

4