

14

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14

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
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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

#2
Brostrom
Worlic

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 1½ see inside of back cover.

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The paper stock of this book is made of a high grade 50% rag paper having a water resisting surface. This book is sewed with Bing Special Enamel Waterproof Thread.

Made in U. S. A.

/40-28

There is one book missing,
for info on even numbered
lines running North.

Maybe there is another
book in storage.

5	4
34	33

T. 140

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

↑
Page 25-31

↑
Page 13-25

↑
Page 1-12

26+40
26+37

Set
Found



35+36

140-28

stake set by CCC

12+00 Enter Balsam Fir-Cedar

15+
15+00

Enter swamp Alder, pole & spruce

13+20

set approx. stake set

8+00

alder swamp

3700

Enter Swamp Alder, pole timber

Aspen pole timber

0+00

started North from center of road. 3
Found 2 BT. X.P. SW. " and W.P. SE "

35+36

21'

5E "

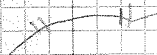
N.

D

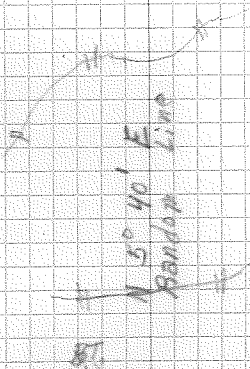
Look for:
At 2640' 1/2 sec cor.
Poplar 7" S66E 15'
Spruce 4" N25E 5'

Date: Feb. 7, 1941
Party: DeMat - Chief
and compass.
Johnson - Notes
Ward - Chain
L'Esprit - Brush
Evans - "

Found:
No. original
evidence
Found from 3"
Fir stake
Found 14" cedar
with ax marks



Look for:
At 1518' creek 7' wide



BT SW

Spot station

Chaining from



53+12

Found I.P. (2") 11 1/2 Feet East.

20/25

35/36

30+20

HIT ASPEN

44+30

HIT HIGHLAND BALSAM AND OTHER

40+90

ENTERED WILLOW SWAMP and continuing
of spring - Balsam - Train

39+60

SET APPR. 1/6 CORNER

39+36

1/6th 3' Balsam Stake

Logging Trail

35+50

ENTERED, Balsam

33+00

Entered Willow Swamp

28+20

Entered dead cedar swamp

26+40

Contd on same line

Look for:

Poplar 8" N 50 W - 28'
 " 8" S 49 W - 15'
 " 10" S 46 E - 15'
 " 8" N 80 E - 18'

Date: Feb. 7, 1941

Party:

Found:

I.P. 11 1/2' East of
 random line.
 No BT.

Look for:

At 3168' creek 16' wide
 NW

40'
 N
 Random Line

26+40

Set APPX $\frac{1}{2}$ corner stake
came to Road Birch 4"

20/25

25+32

23+00

Hill started

20+0

Entered ASPEN + Birch

13+80

PUT IN TEMP. $\frac{1}{2}$ STAKE
3" ASPEN

Aspen Pole timber

0+00

Started from NW TP
on random line

20/25

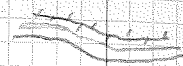
3536

Date - Feb 12, 1941

3.

Chief - Dieman
Brush - EUBANKS
Le Clair
Chain - MILLER
Notes - BROWSTROM

Look for
Dry Spruce 3" SWW
No other Trees West



Found

no Evidence
OF BIT

N 50° 40' E
Random Line

640

52+80

Set APP. acc. Section COR.
ASPEN 3"23/24
26/25

59-80

FEW PINES WHITE JACK

U.

39+60

SET APP. 100' STAKE
WEST 2" ASPEN

27+00

Entered ASPEN
Hill started

30+10

Entered MAY AND small BY 37

27+00

Swamp Few BALSAM

26+40

CONT. ON SAME LINE

Date Feb. 12, 1941

4.

LOOK FOR

W. PINE	25"	S50°E	16'
" "	20"	S58°W	24'
" "	5"	N70W	49'
Maple	7"	N58E	52'

Chief - Dr. M. W.

Brush - Evans

Le Clair

Notes - Bystrom

Chain - Miner

Found:

NO EVIDENCE OF
G.T.

N50°E
RANDOM LINE

BY

26+41 Set ecc App 1/2 cor STAKE
3" ASPEN

23/29

19+50 ENTERED MARSH AND SMALL LAKE

14+30 ENTERED POLE ASPEN

13+20 SET APP 1/2 COR

12+0 USED 3" ASPEN
ENTERED MARSH AND SW

8+80 LEFT MARSH ENTERED ASPEN SMALL
GROWTH

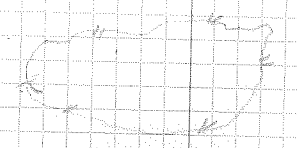
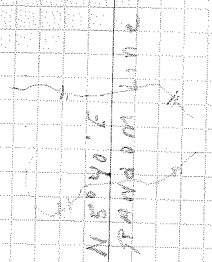
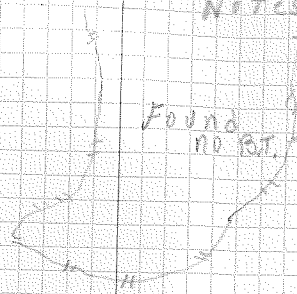
7+0 ENTERED SMALL MARSH WITH SW

0+00 ASPEN GROWING 1-5"
STARTED FROM TEM. ecc IN MAX LINE
SEC. FOR ASPEN 5'

LOOK FOR
N.P.W. 13" SLOPE 33"
20" N.P.W. 20"

Date Feb 12, 1941 5.
Chief - Deiman
Brush - Evans
LeClair
Chain - Miner
NOTES - Brostrom

FOUND -
NO B.T.



52+80

Found no Evidence of BT
Made App Sec. of Stake
4" Aspen

14113
2/12/91

42+80

Entered Alder Swamp

44+80

Entered Birch

39+60

Set App 1/2 cor. Stake

38+90

Used 3" Aspen
Left S.W. - Entered Aspen

37+80

Entered S.W.

Entered Aspen growth Small

37+15

Left Small Lake

36+40

Cont. on Random Line

Date
Feb. 12, 1991

Look For

pxy Pine 14" N29°W 17'

" 22" 5" S37°W 33'

" Fir 8" S65°E 16'

Chief - Deiman

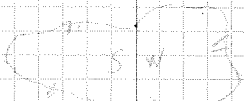
Brush - Lockhart

EVANS

Chain - M. Nier

Notes - Brad Thomas

Found -
No. BT



N 50° 10' E
Random Line

Lake

26+40 Mixed ASP. & COY
US + 0 9" Birch

31+10 Entered Birch

19+20 ENTERED ASPEN

15+0 Mixed Brush and Birch

13+20 Set up APP 1/6 COY
Used 3" Birch

18+40 Entered Birch
Crossed Creek 10' wide

10+30 Crossed small marsh

9+10 Entered SHM

3+0 Entered ASPEN

0+0 Entered Swamp and TAMARACK
Started from APP SW. CN
BY RANDOM LINE

14/3

23/24

Date Feb 14, 1941

Look For
N. PINE 16' S45°W 3'
" " 15' S30°E 17'

Chief - DELANEY
Brush - EVANS
1c. CLAY
Chain - MURPHY
Notes - BRUSH FROM

Found -
No Evidence
of PINE

Look For
AT 100' M.R.
Willow 4" S80°W 13'
" " 4" N30°E 19'

Found -
NONE

Look For
AT 396 M.R.
W. Birch 5" S35°W 16'
" " 6" S50°E 14'

Found -
NO M.R.

52+80

MADE APP Sec. Cor
Used 4' Birch1112
1413

47+00

FEW BALDORN, JACK PINE, AND
WHITE PINE

39+60

Set APP 1/2 CORN.
Used 3' Birch

37+00

ENTERED Birch

27+0

MIXTURE OF ASPEN BIRCH AND
JACK PINE

26+40

CONT ON RANDOM LINE

Date - Feb 14, 1941

LOOK FOR

W Pipe 18" S50E 22'

N " 22" S30W 8'

W Pipe 28" N52W 40'

" " 8" N50E 26'

CHECK - DEWMAN

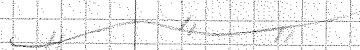
BRUSH - LEBLANC

EVANS

CHAIN - MINEY

NOTES - BROSTON

FOUND - NO B.T.

MSO 20' F
RANDOM LINE

LOOK FOR

26+40 APP 4 COV
Used 3" ASPEN

23+1 HIT TRAIL

20+15 ASPEN MIXTURE WITH OAK - pole
edge of Lake

13+20 IN LAKE - APP X COV

4+50 LAKE STARTED

IN SHM. - pole Timber
some Balsam

0+0 STARTED 3+07 WEST OF APP
Sec. Cor. ON OLD LINE

Date
Feb. 17, 1941

Look For
Rock Maple 7" N57E 11'
" 8" S60W 27'

Chief - Deiman
Brush - Evans
Leclair
Chain - M. W. C. Y.
Notes - BROSTROM

Found
No B.T.
IRON PIPE 112' N. OF
APP 4 COV

Look For
HT 1920 M.C.
W. PINE 7" N45E 18'
" 8" S57W 13'

Found
- no B.T.

Lake

N 50 40 E
RANDOM LINE

Look For
HT 325 M.C.
ELM 7" N70E 14'
P. OAK 7" S54W 10'

Found
No B.T.

52+80 App. Sec. Col
set 3" Ash stake
Fall in lake

29+60 App. Y6 cov
in lake

35+00 HIT lake

39+85 HIT trail

28+0 OFF SET 50' E AND SET back

26+40 STARTED FROM L.P. IN
RANDOM LINE

D2TC

Feb 17, 1941

Look for
PRINT IN LAKE

Chief - Deiman
Brush - Leckler
EVANS
CHAIN - Minter
NOTES - Brostrom

LAKE

Look for
AT 2778' M.P. FOR LAKE
OAK 5" 55°W 13'
Willow 5" 51°E 39'

Look for
AT 2705' Creek 132°W
FUNS N.E.

86+40 Set APP. $\frac{1}{4}$ cor
Used 3" Ash

19+00 Hit road

14+00 Hit Willow AND BRUSH
LEFT LAKE
13+20 Set APP $\frac{1}{6}$ cor IN LAKE
SMALL STAKE

0+00 con. from point IN LAKE ON
RANDOM LIND

Date
Feb. 24, 1941

Look For
Spruce 9" N75°E 4'
W. Pine 6" N45°W 5'

Chick - Drimad
Brush - Evans
L. K. K. K.
Notes - Brostrom
Child - mader

Found -
NO BT.

Look For
1384' M.B.
Pine 7" N88°W 3'

Lake

Look For
Tree corner IN LAKE

52+80 Set App Sec. Coy
Used 4" Birch

TAMARACK AND BALSAM
ENTERED SWAMP ON BREAK (over)

39+60 Set App 1/2 Coy
Used 3" Ash

35+0 ENTERED WOOD PINE AND

34+80 HIT YARD ^{75 PCM}

26+40 ON ROAD THROUGH F. PINE
AND WOOD & PINE ROAD

Date - Feb 24, 1941

Chief - Deimov

Brush - Evans

Chain - Miner

Notes - Brostrom

Found
No. BT

Look East
Euler 5" 820° W 8'
Spruce 6" 850° E 9'

BRN WOOD

==

26440 Set APPROX. $\frac{1}{4}$ cor n. 337 14028.

24475 HIT High line

21400 left spruce + Tam. Enter n. pine + pine.

13720

HIT fence.
Set APPROX. $\frac{1}{6}$ cor-left alder Enter
spruce + Tam.

1400 Enter alder brush

0401 Started n. from center of road

$\frac{33}{34}$
 $\frac{1}{5}$

Date Feb. 10, 1991. 13.

Map for
M. B. ...
M. B. ...
M. B. ...

part Fisher: Chief
Kortekaas: Brush
Schultz: chain
Worlie: holes.

High line

Y-pine + pine

Found
no Evidence.

Fence
Tam
Spruce
Alder

Random line
Map by M. B. 485

Alder

Road

52780 Set Stake in lake ³⁹²¹ 33/34 No. 47

39460 Set Stake in lake

34450 Enter lake.

33400 left Spruce-cedar Enter Aspen

27400 Enter ^{cedar} Spruce leave Y pine ^{35/34} 10028

26400 continued n on same line 10028

Date: Feb. 10, 1941

Section
Field in lake
Dist. 50 ft

party

Fisher, Chief
Kortelias, Field
Schultz, chain
Worley, notes

Found
no Evidence

4000 ft W. 14.45

W. 1100 ft S. 50 W. 18.1 kg.
E. 100 ft W. 20 E. 30 kg.

in
Address
line
Map
Geo. M. 50 92 E

Lake

Aspen

Cedar
Spruce

Y pine

26+40 Set approx $\frac{1}{4}$ corner
26+00 left Alder Enter Birch & Aspen

22+45 left Pond Enter Alder

18+11 Enter pond leave Alder

16+00 left Aspen enter Alder

13+20 Set approx $\frac{1}{4}$ cor 3' Aspen.

8+00 leave Swamp Enter Aspen

6+00 Enter Swamp Leave Aspen

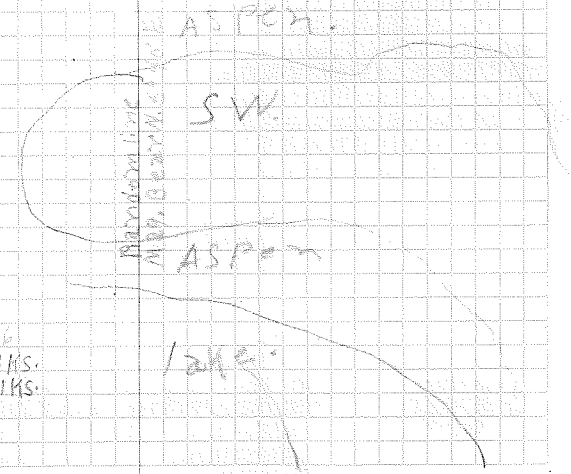
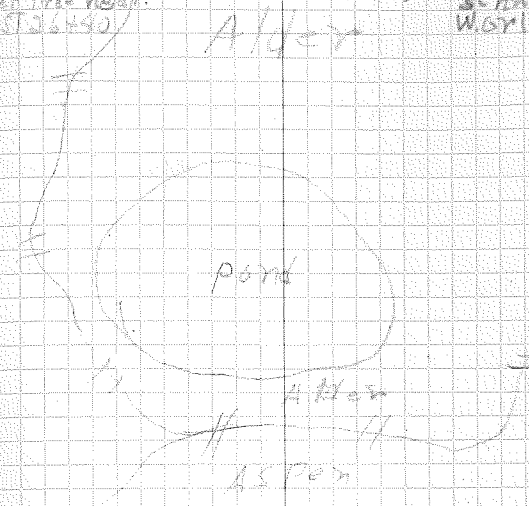
4+00 left Lake Enter ASPEN

0+00 continued nonsampling $\frac{26+40}{33-14}$

DATE Feb. 10, 1941.

Look for:
Dist from 18° S. 89° E. 120 YRS. //
No other trees near.
Dist 26+40

party
Fisher: Chief
Walter: 255
Schattschneider
Worlie: notes



Look for MS. 31 3.6
Erm. 1' N. 50° E. 43 YRS.
Oak 7' N. 30° W. 40 YRS.

52780 Set Approx Sec. corner. $\frac{3}{377}$

47400 left lake Enter Balsam + Aspen

39460 AT Edge of lake. Set $\frac{1}{16}$ cor

37443 Enter Road

35460 left lake Enter Aspen Birch

28460 Enter lake left Birch + Aspen

22440 continued North on same line $\frac{1}{16}$ cor

Date Feb. 10, 1941. 16

part of
T.M. 1. N. 60° E. 481 MS.
T.M. 2. S. 55° E. 431 MS.
T.M. 3. S. 80° W. 221 MS.
W.P. 1. 20° N. 32° W. 43 MS.
W.P. 2. 20° N. 32° W. 43 MS.

part of
Fischer's Chief
Kortchaas: Prush.
Schultz: Chalm.
Wierlei: notes.

Balsam + Aspen

lake

Aspen

Look for M.C. 3569
Cedar 1. S. 43° W. 551 MS.
Cedar 2. N. 70° E. 331 MS.

Aspen

lake

Look for M.C. 3578
Cedar 1. N. 56° E. 241 MS.
Cedar 2. S. 48° W. 321 MS.

Aspen

□

26+40 Set Approx $\frac{1}{4}$ cor. 5122-140-28

Set 4" Aspen Stake.

13+20 Set Approx $\frac{1}{2}$ cor. 3" Aspen Stake.

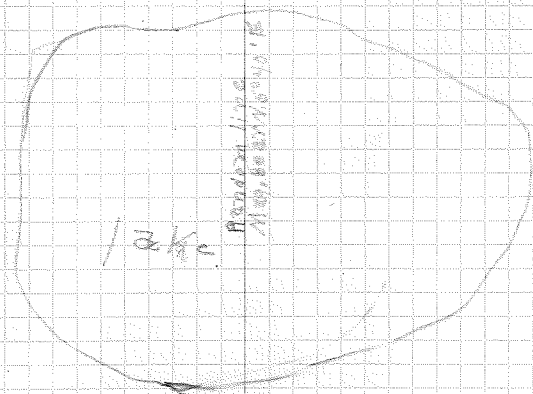
9+00 left lake Enter Aspen Birch

1+27 Enter lake. left Aspen 220m
0+00 continued N. on same line 21 27
28 27

Date Feb. 13/1947.

party Fisher: Chief
Kortekas: Brush
Evans:
Schultz: Chairman
Worlic: Note B.

look for
W. Pine S. 70° W. 3.1 MS.
Dry Birch S. 40° E. 8.1 MS.
Dist 26.1 MS.



140-29

52480 SET APPROX. Sec. 667. ^{10/15} 3/12
3" Aspen Stake.

49400 left T&M + Spruce. Enter Aspen

46737 left Aspen, Pines Enter T&M + Spruce

39460 SET APPROX. corner ^{10/15} 3/12
3" Aspen Stake.

38420 HIT Telephone line

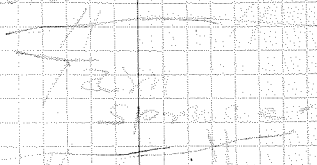
2749 Enter Road

36440 continued N. of S. line ^{10/15} 3/12

Date Feb. 13/1919.

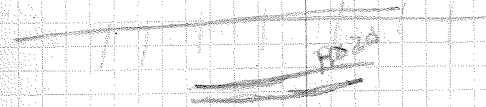
Party Fisher Chief
K. F. Fisher, Bush
E. Fisher, " "
Schultz, Chas.
W. L. Motes.

W. B. Fisher S. 57° W. 50 Yds.
W. B. Fisher N. 55° E. 40 Yds.
W. B. Fisher N. 42° W. 50 Yds.
Maple N. 5. 42° E. 50 Yds.
DIST 52480



Telephone line

Telephone line



2640 Set Approx. $\frac{1}{4}$ cor. 1516 -140-28
3' Aspen Stake

3720 Set Approx $\frac{1}{6}$ cor. top
3' Aspen Stake

6750 Leave spruce Enter Aspen

3700 Enter spruce SWAMP LEAVE Aspen.

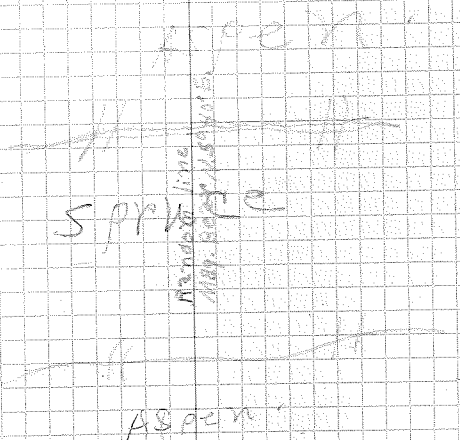
0+00 CONTINUED n. on same line $\frac{1615}{21122}$

Date Feb 26, 1941

19

Tree for
W. pine 39' S 24° W 50' NE
Spruce 7.5' S 64° E 88' NE
Dist. 2640

party: FISHER
Moffet Maas
D. Schults
L. Worlic
Evans
Moore
Wilson



52780 Set Approx Sec 20th 1/4
4' Ash Stake

HA

39460 Set Approx 1/4 Corner
3' Aspen Stake

HA

26440 continued N. on same line. 15/16 1401-28

Date, Feb 26, 1941 20

Party: Fisher

Hartford
D. Schalte
K. Hill
E. V. ...
M. ...
H. ...

Found
NO EVIDENCE

1401-28
1401-28

36+45 left lake
36+40 Set Approx $\frac{1}{4}$ cor
3' Aspen Stake.

18+45 Enter lake Leave Aspen. Bitten.

13+20 Set Approx $\frac{1}{4}$ corner
2' Birch Stake

H A

8700 continued n. in same line. $\frac{940}{1370}$

Date Feb. 27/1941. 21

137500
W. S. Fisher
W. S. Fisher
W. S. Fisher
W. S. Fisher

W. S. Fisher
W. S. Fisher
W. S. Fisher
W. S. Fisher
W. S. Fisher

lake

Found
W. S. Fisher BT.
ITALY EAST OF
RANDOM LINE

H A

RANDOM LINE
W. S. FISHER

52+25 line EAST To Sec. corner 495 EAST
52+80 Set APPROX Sec. corner ³⁴ 910 140-28

HA

39+60 Set APPROX $\frac{1}{4}$ corner
to 2' Maple Stake

HA

26+65 Left Lake

26+40 CONTINUED MONITORING 910 140-28

DATE: Feb 27, 1941, 22

Survey
W. Pine 20' S 65° W 511.15
S. Pine 7' S 68° E 189.15
B. Maple 6' N 80° E 45.15
Redwood 4' S 20° W 39.15
27 25280

Party: Fisher
Hartkeads
Schultz
Evans
Moore
Nelson
Worlie.

Found
iron pipe 495 FT East
of Random.

Random Line
May 20, 1941

26+40 Set Approx $\frac{1}{2}$ way
8' Aspen Stake

314

17+75 Enter Logging Road.

14+10 Enter Foot Trail

13+25 Set App. $\frac{1}{2}$ way
9' Aspen Stake

10+65 Hit Highway

0+00 continued N. on same line $\frac{3-4}{9/10}$

Date: Feb 28/1943.

Party: Fisher

Kortka
D. Schuitz
Wardle
Moore

Loop 9.7
Map 1 S 80° E 12/115.
Map 2 N. 85° W 12/115.
Dist 36+90

~~Logging Road~~

Foot Trail

Highway

Random line
Mag. Rem. N 5° 45' E

140+28

54+10

Set corner on ~~range~~ line

T1WN

33/34
4/3



SW.

42+1

Enter road

40+45

Enter SWamp

39+60

Set approx 1/2 cor.

HA

26+40

Continued No. on same line

3/4 40-08

Date Feb 28/91

Party: Fisher

Schmitts.

Partekas.

Wright.

Nelson.

Dist 30

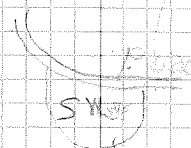
Dist 15

Dist 15

SW.

Found

1 Iron pipe. East of
Random point East
on ~~range~~ line,
YDOWN



Random 1/2 cor.
May 18 21/50 40 E

26+40 set in approx $\frac{1}{4}$ cor.
2" Birch

13+20 set in approx $\frac{1}{16}$ cor
2" basswood

H+80 End of Aspen, Elm
started in Birch, Aspen Red Pine

4+10 Hit Road End of swamp in narrow
and started in Aspen and Elm

1+00 started N. in swamp hardwood
0+00 started N. from $\frac{31}{65}$

Look for AT 2640
True Sec. Cor. in Marsh
Witness to Sec. Cor. 1+32
N. W. PINE 36" W 37"
Oak 6" N 35° E 34"
Look for - 2409
Marsh N.E + N.W

Date - 3-3-41 '25
Party He Blane
Zimbrick

Found no Evidence

Look for $\frac{1}{16}$ Sec
Creek 3 wide runs NE FOUND

52+80 set in approx sec. cor.
3" Bitch

40+60 End of pond
39+60 set in approx $\frac{1}{16}$ cor.
2" ASPEN

39+82 Hit pond

26+40 cont'd N. from 31/02

DATE - 3-3-41 26

Party: He Blenc
Zimbrick

Look For - AT 5281
Cor. to sec 29 30 31 32
DIPPING 26" S 85° E 17'
" " 34" N 55° E 8'
" " 24" S 68° W 11'

Found No Evidence

Look For - AT 4856
Leave Pond

Look For - AT 2732
INTERSECT POND
N.W. & S.W.

Found (to find) AT 2773
Leave Marsh

26+40 SET 17 APPROX $\frac{1}{4}$ COR
2" Birch

13+20 SET 17 APPROX $\frac{1}{4}$ COR
2" Birch

0+00 started N. 8 PM $\frac{30}{31}$
 $\frac{29}{32}$

Date - 3-3-41 97.

Party - LeBlanc
Zimbrick

Look FOR AT 26 $\frac{1}{2}$ '
24 Sec. COR
W. PINE 32' N 61° E 24'
" " 30' N 35° W 19'

FOUND NO EVIDENCE

32+60 set in approx. sec. oak
2" ASPEN

39+60 set in approx $\frac{1}{2}$ cork
2" oak

34+20 HIT lake shore

26+40 contd N. from 30/29

Date - 3-3-41 28

Party - BeBlans
Zimbrick

Look For mt 4521
Sec. Cork to Secs 19
20, 29 add. to NW
Lake

Found no Evidence

Look For mt 4521
N.C. on Lake shore
W. Birch 4" N 70° E 65'
N Pine 4" S 73° W 52'

Found no Evidence

FOUND IP
27+63 Hit IP

29+11 Hit Highway

19+20 Hit Trail

13+20 set in approx $\frac{1}{4}$ cor.

3+20 End of bake

1+32

offset 55 ft
started N. 5 from

19/30
30/29

Date - 3-11-41 29

partly - hCB latc
Z / 172 block

FOUND

Look For AT 2640
Sec Coy
W. PINE 28" S 40 E 3'
N. PINE 12" N 55 W 37'

Look For AT 182
2000 1000 SET M.C
T.M. 7" N 89 E 15'
T.M. 9" N 57 W 11'

52+50 SET in APPROX. SEC COR.
2" ASPEN
offset 1118 ft. W

39+10 SET in APPROX. $\frac{1}{2}$ COR.
2" ASPEN

32+50
32+13 HIT hakeshoro

26+40 cont'd N. 19/30

Look for 4T 50 ft
SEC COR. in 2nd
T. SEC. 17, 18, 19-20

Date - 3-10-41
Party - G. B. Lane
E. M. B. K. K.
FOUR 70 EVIDENCE

Look for 3250'
INTERSECT W. B. L. H. FOUND NO EVIDENCE
M. B. -
W. Birch 7" N65° W 26'
" " 8" N30° E 2'

26+40 set in App Proj $\frac{1}{2}$ cor.
3" Aspen

13+20 set in App Proj $\frac{1}{2}$ cor.
2" Aspen

0+00 started N. from $\frac{18}{19}$
 $\frac{19}{20}$

Date - 3-10-41 31
Party - 60 Blazie
2 timber

Lake

Lake

51 + 90 set in approx sec. cor.
2" ASPEN

39 + 60 set in approx. $\frac{1}{16}$ cor.
2" ASPEN

26 + 40 contd. N. from 18/19

Date - 3-10-41 32
Party - heBlago
Zimbrick

2
2
2

26+40 set in approx $\frac{1}{4}$ cor,
2" Asper

18+20 set in approx $\frac{1}{16}$ cor,
2" Asper

0+00 started N. from $\frac{7}{18} \frac{8}{17}$

Date - 3-10-41 33.
party he blade
Zimbrick

2000

51+65 Hit IP

50+60 Started in Birch
49+10 Ehd baka

39+60 Set in 1 pp rix $\frac{1}{16}$ col.
3" 1/5 pen

26+40 cont'd N. 3 rotn 7/8

Date -3-10-41/34

Party - to Blazo
Zimbrick

Zimbrick

PT 49+6

Field of 22 x 22

bake

26th set in Appox. $\frac{1}{4}$ cor.
2" Birds

13+90 set in Appox. $\frac{1}{16}$ cor.
2" ash

0 + 00 started N. 3pm $\frac{6}{7} \bigcirc \frac{5}{8}$

Date - 3-11-41 35

party - 2000
2176

Look for
RT 12+20 2" section
BIR 13K 14" N30E 90"
Fly 2" N60W 100"

Look for
RT 12+20
2"

Town
55+31 Hit Range line and set
17 sec. cor.
53+10 E of of lake

37+66 set in approx $\frac{1}{16}$ cor.
2" ash

36+16 Hit lake shore

26+10 cont'd N. 8 from 6/5

AT 53+59
E. of standard cor. 17 sec
31+33. set Post Ev. C.C.
DIP 1/2 W 24' S 40 E 12'

Look for
AT 51+21

M.C. LEAVE LAKE
ASH 5" N 15 W 62'
" 6" N 32 E 32'

Date - 3-11-41 36

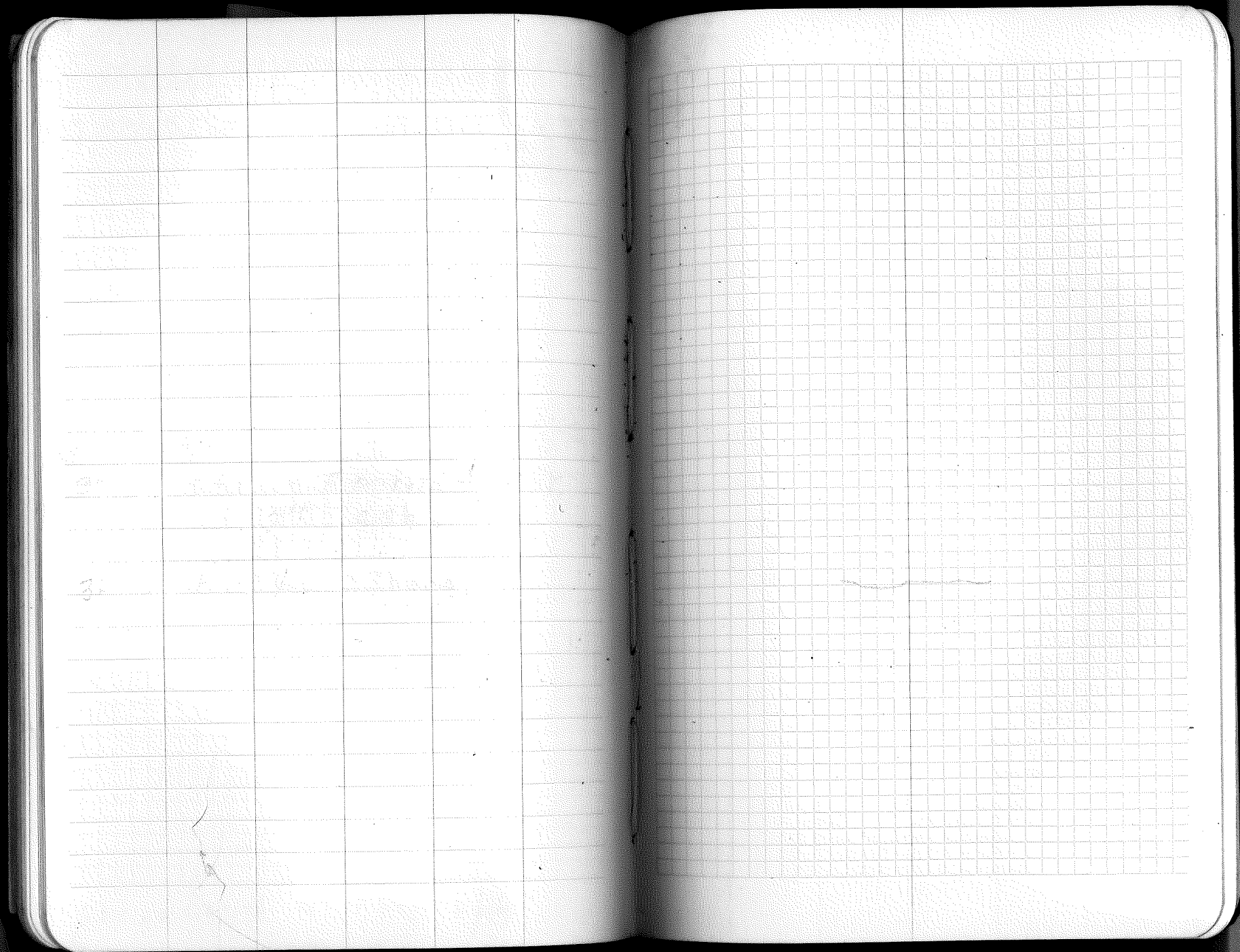
Party He Blads
Zimbrick

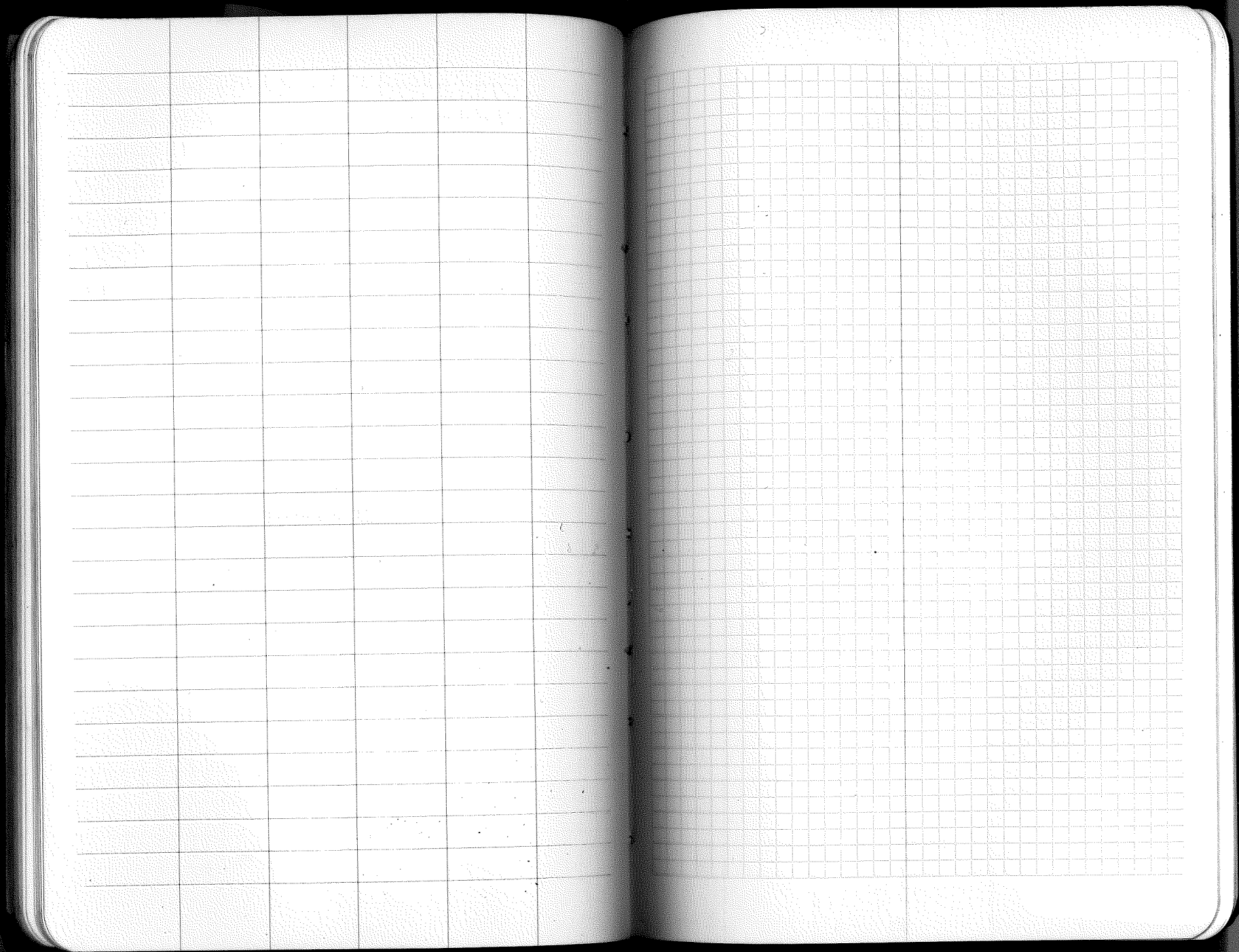
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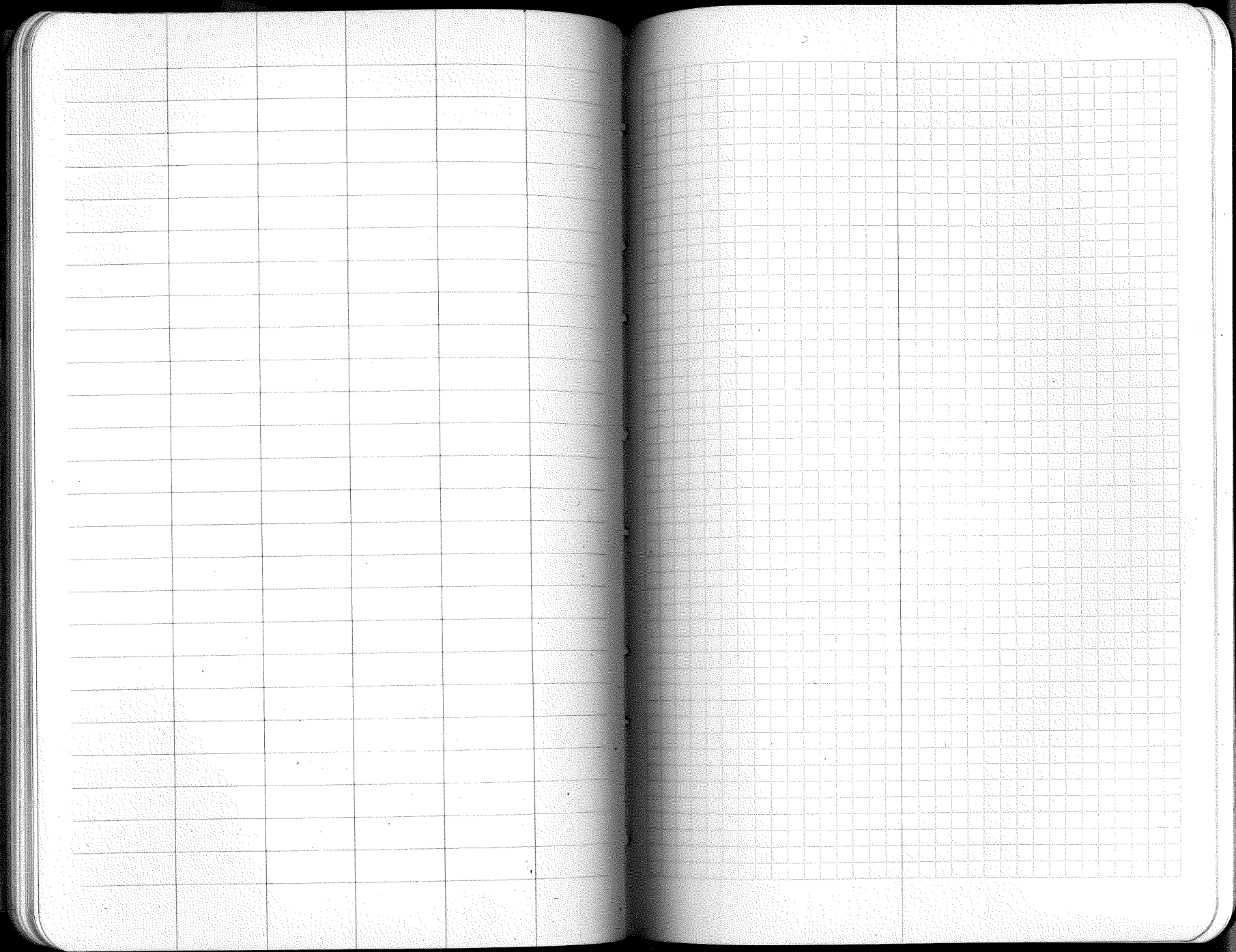
Look for
AT 40+33

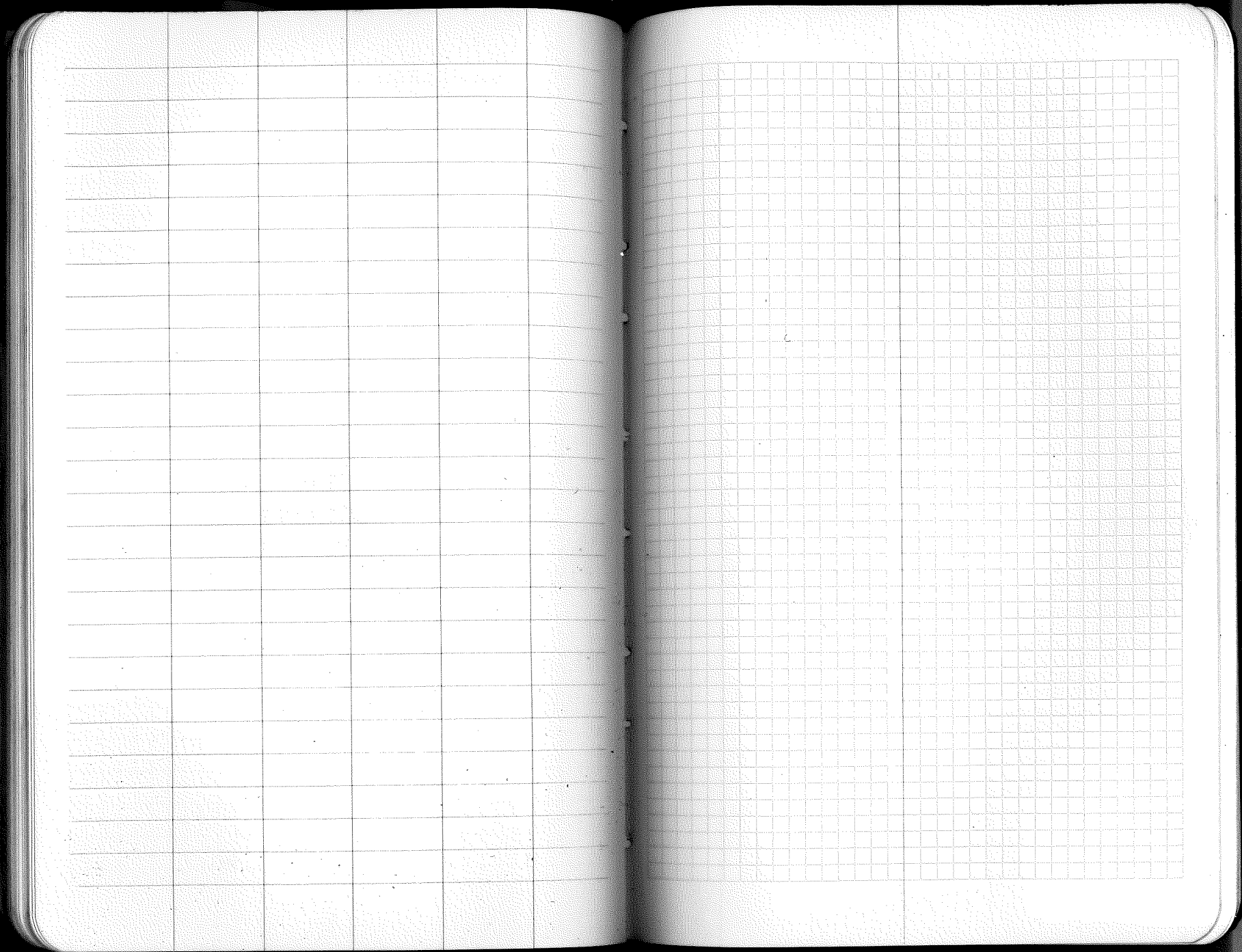
M.C. FOR WOMEN LAKE
DIP 1/2 W 10' S 6 W 32'
" " 6" S 52 E 42'

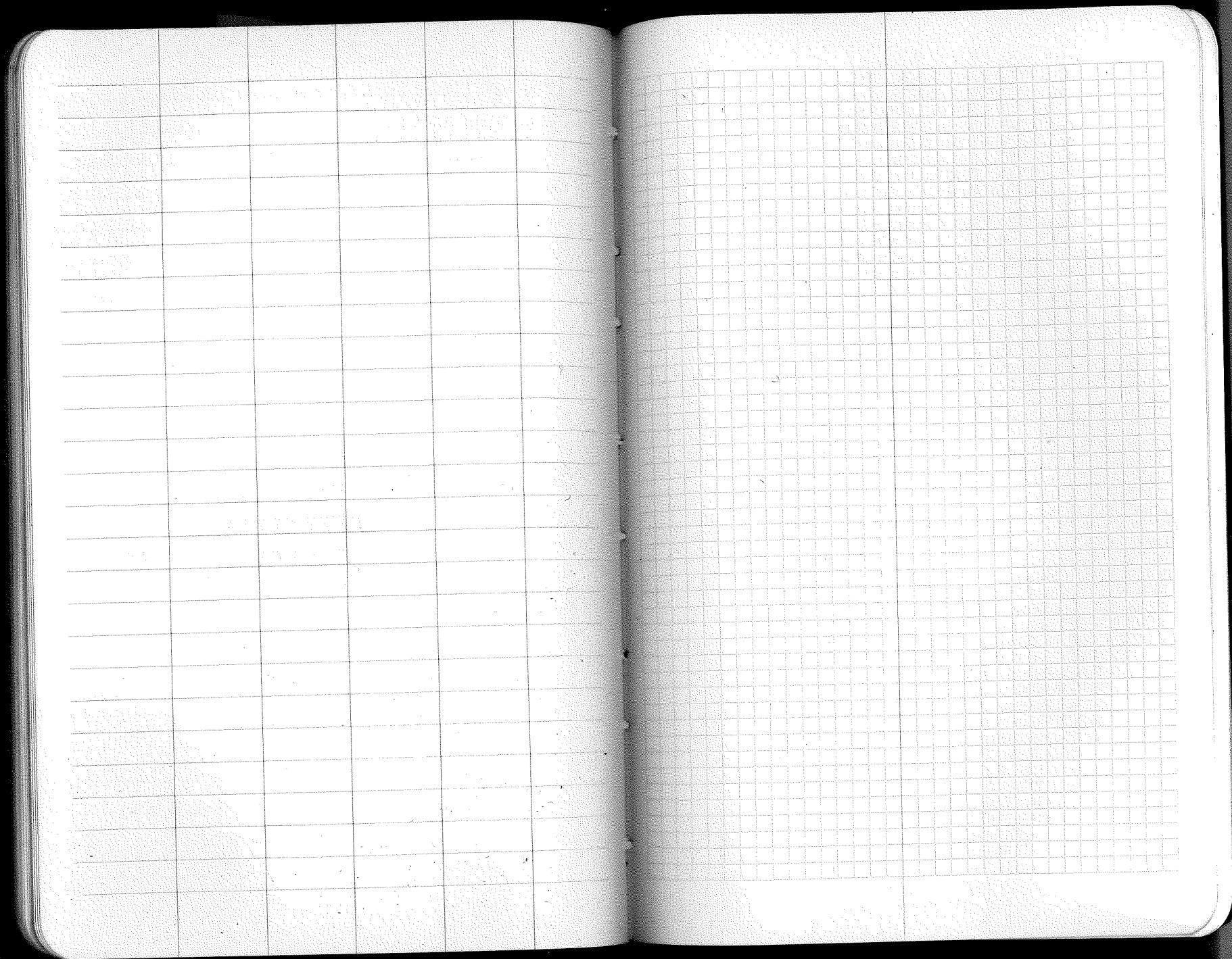
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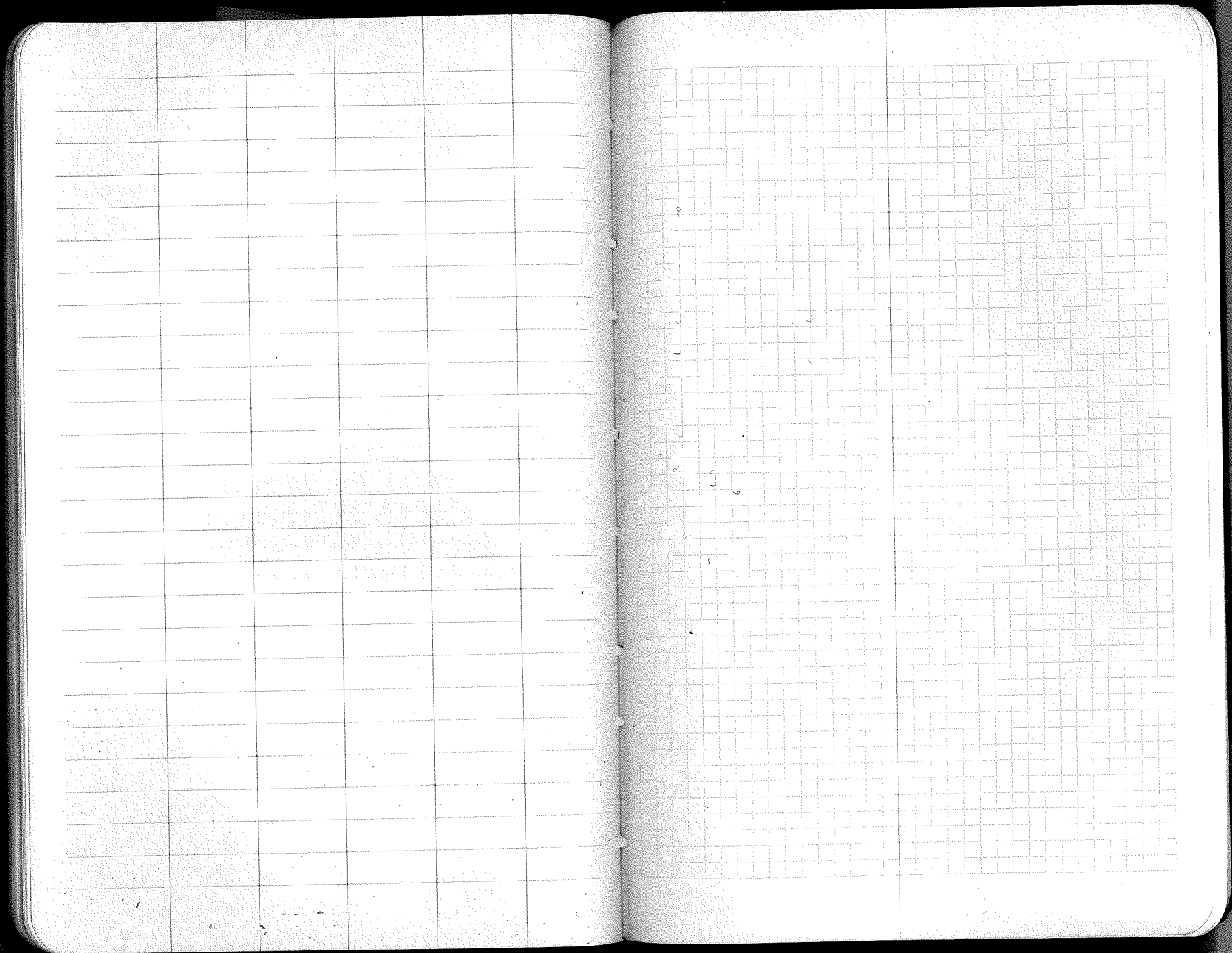


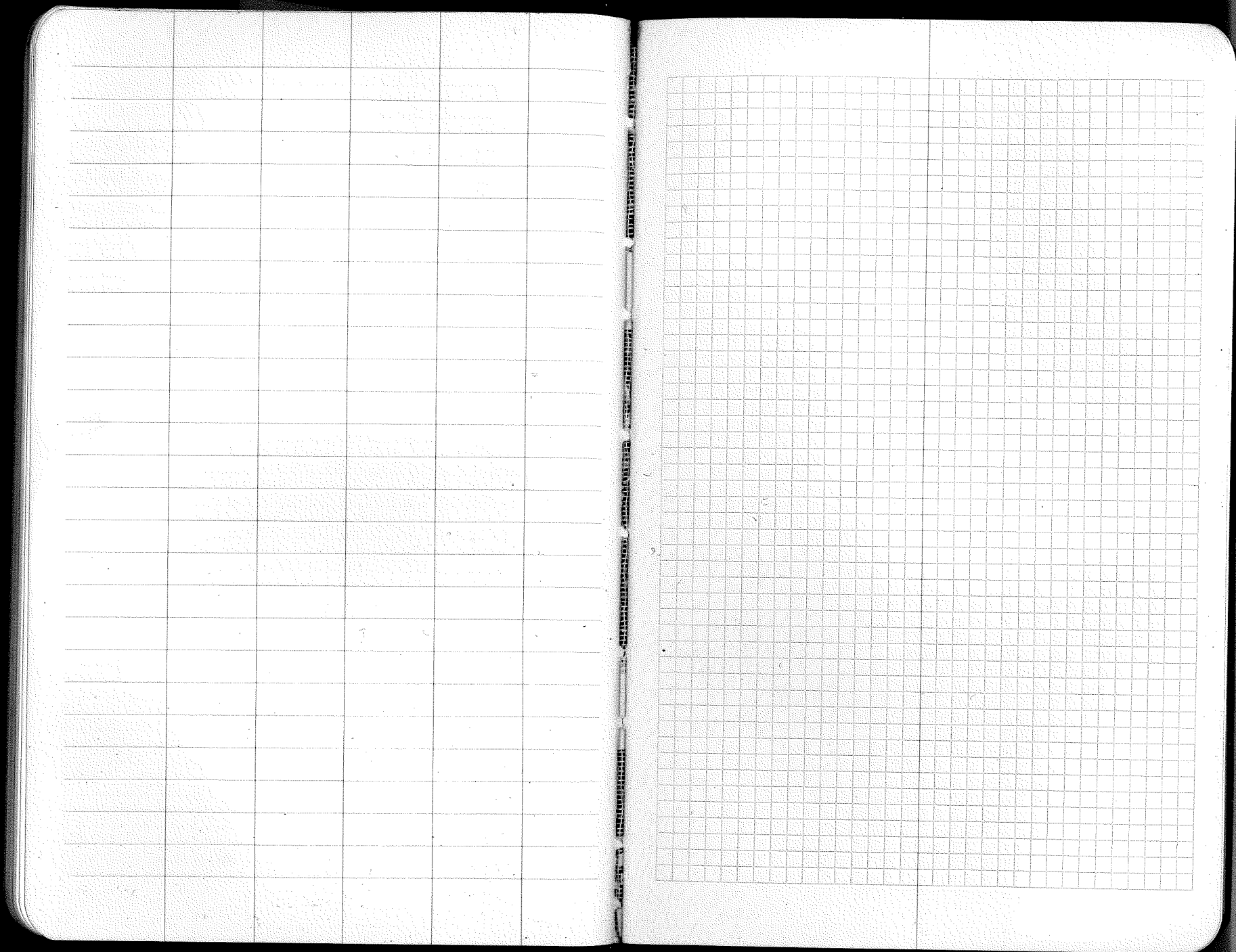


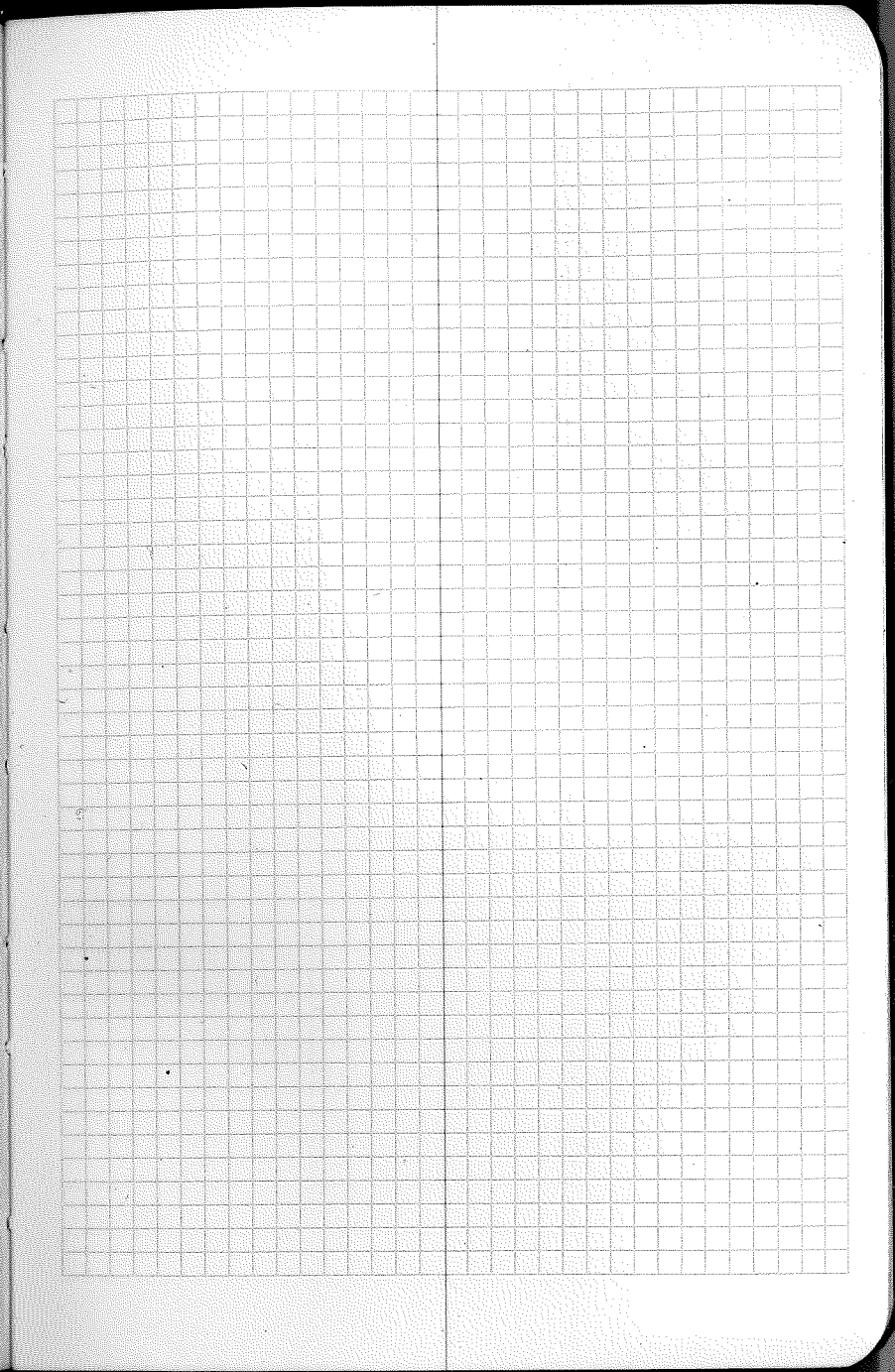
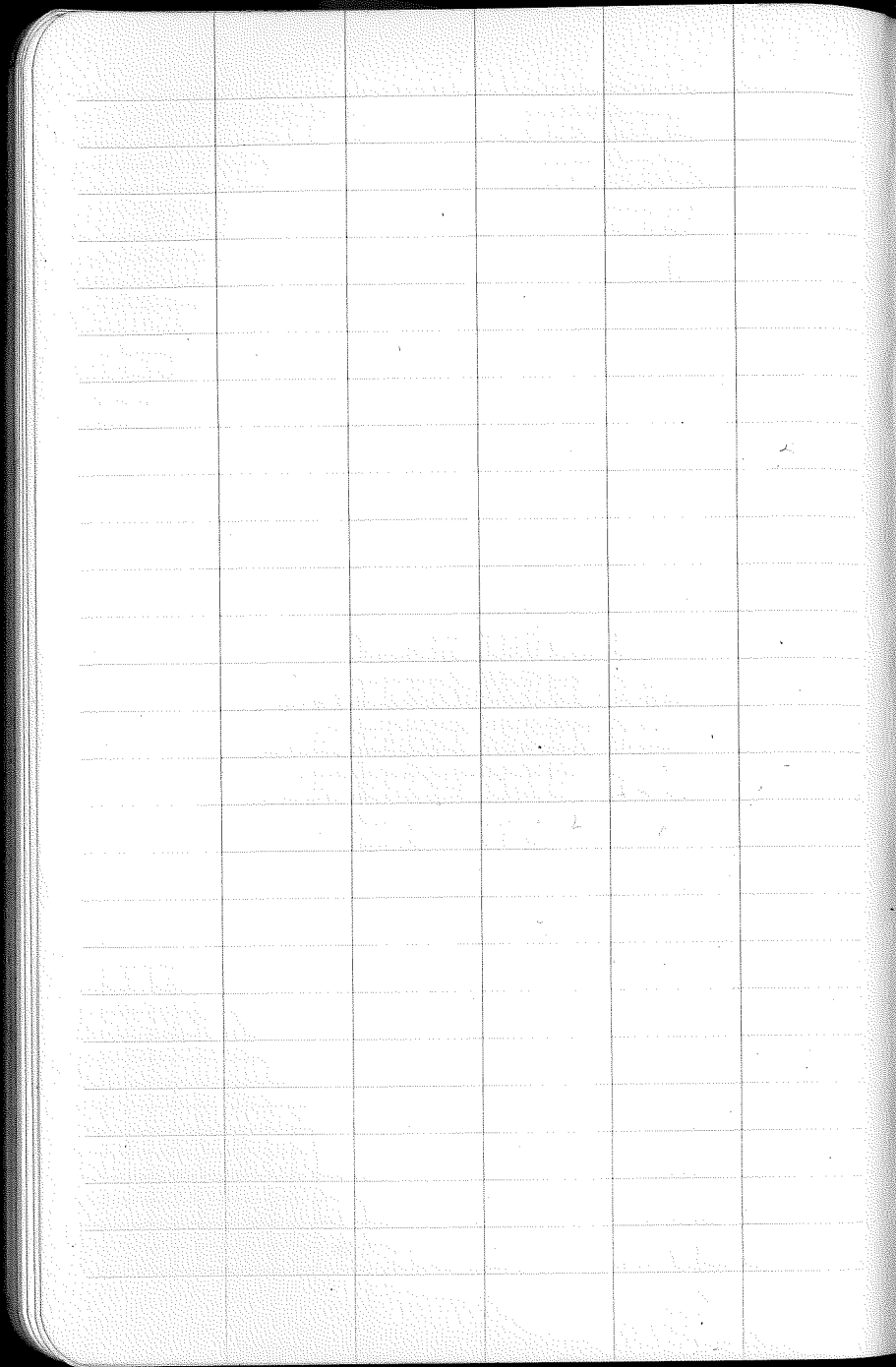


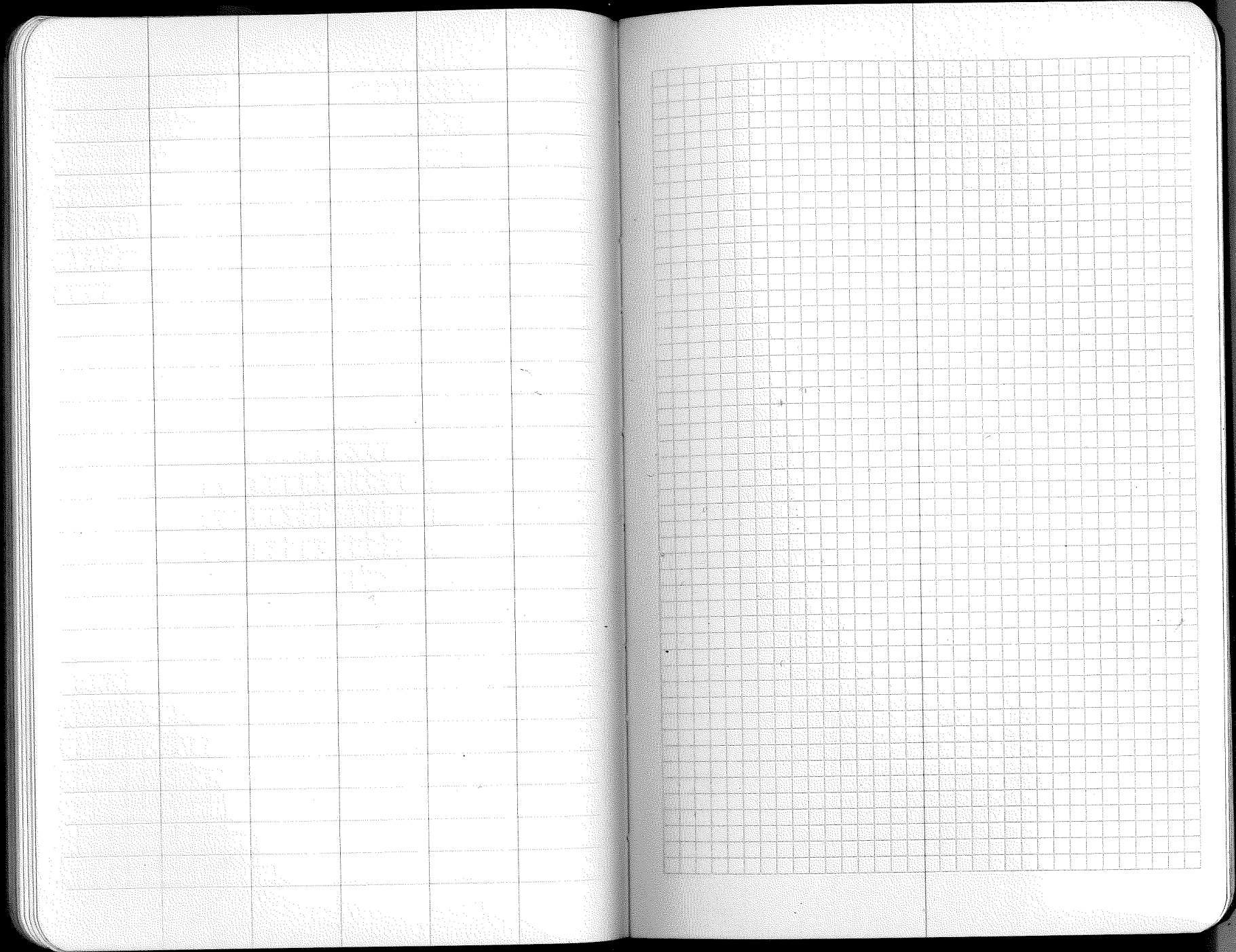


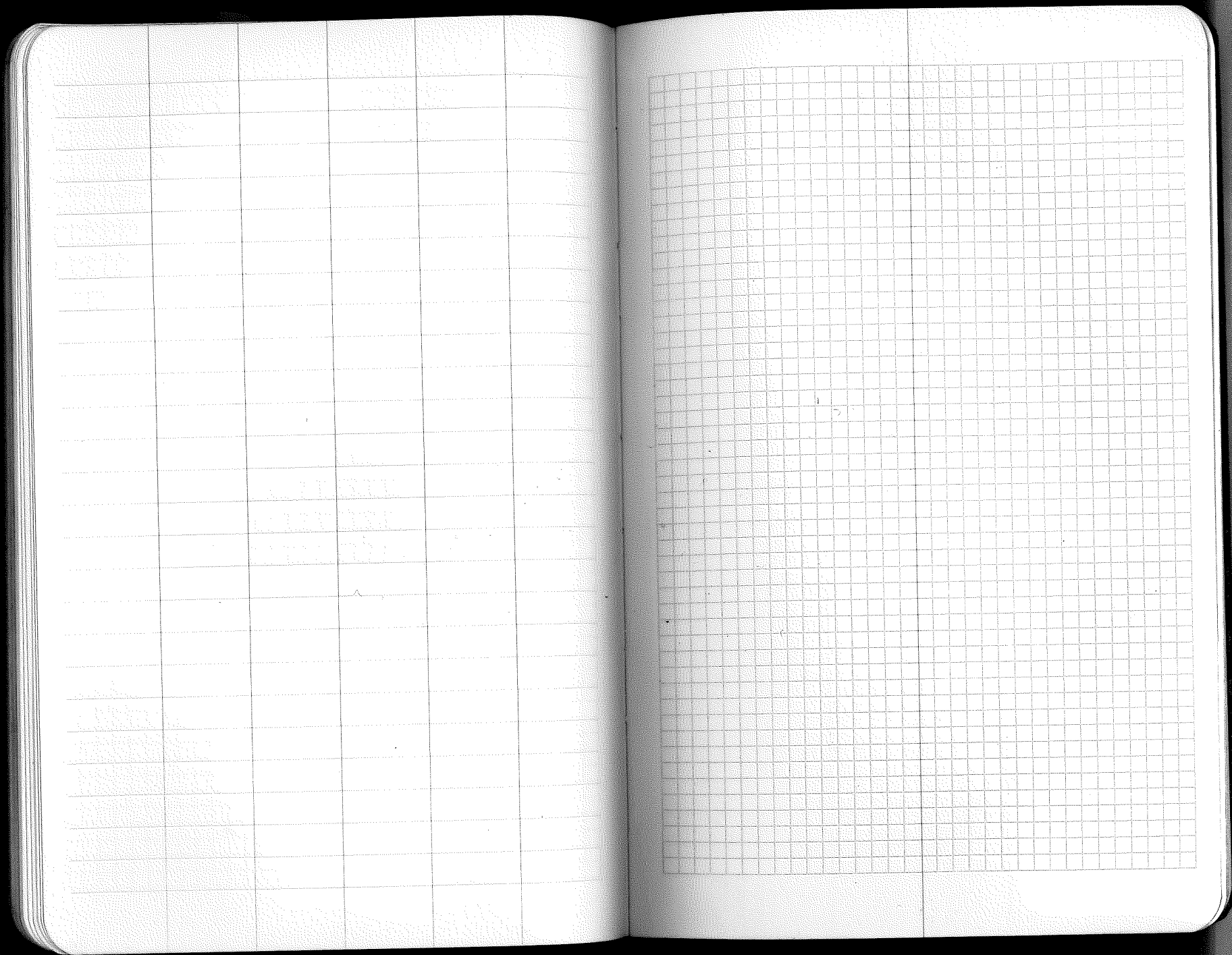


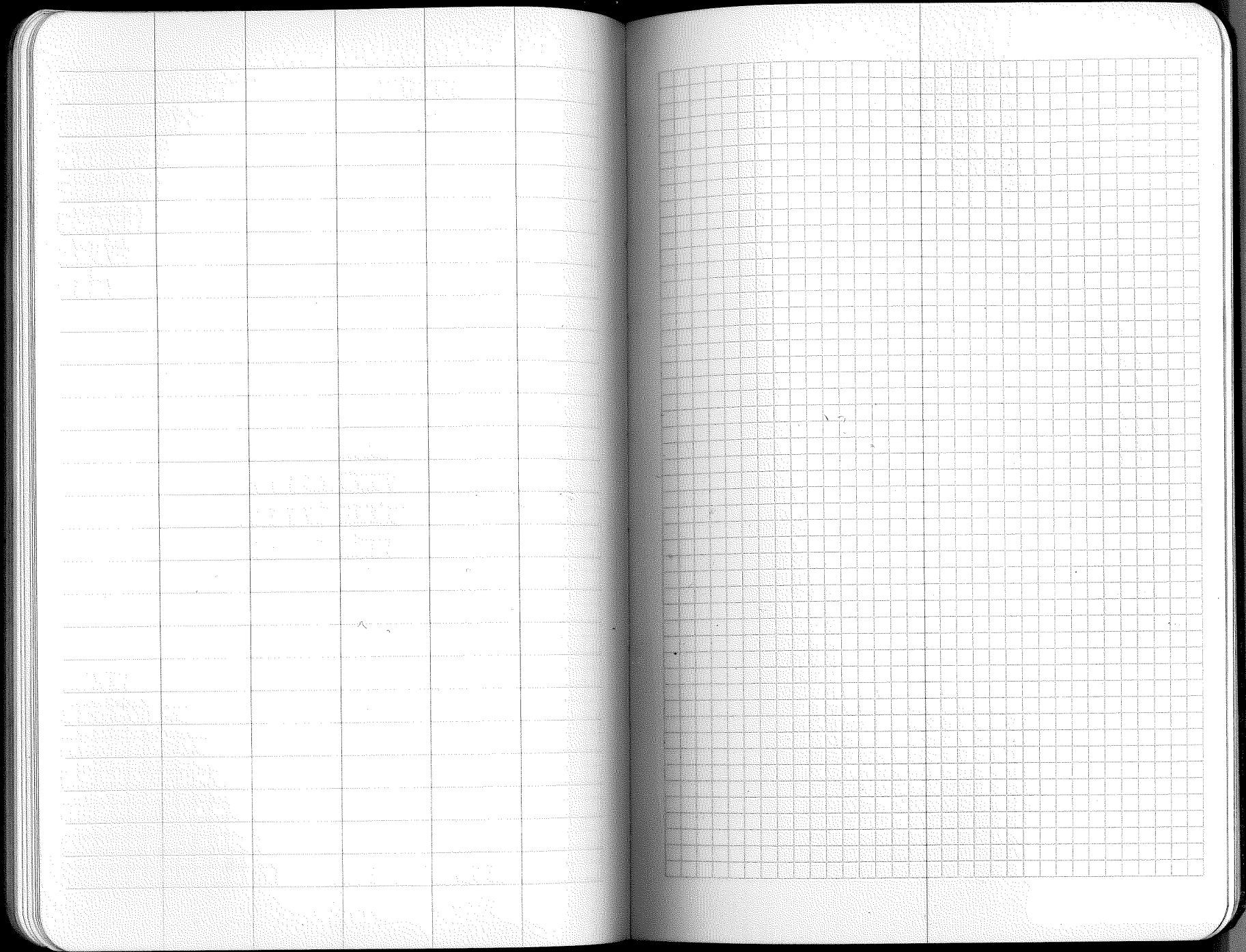


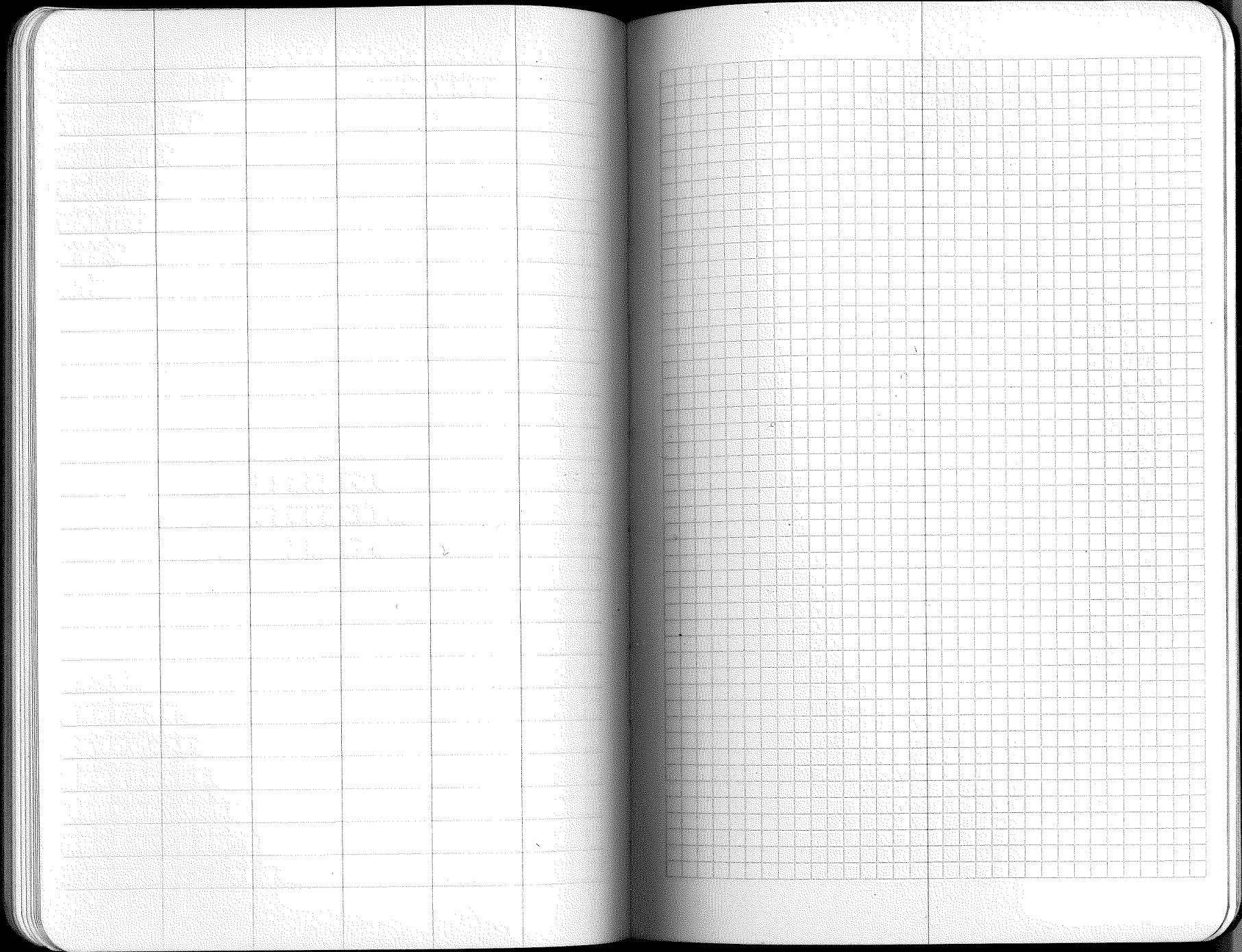


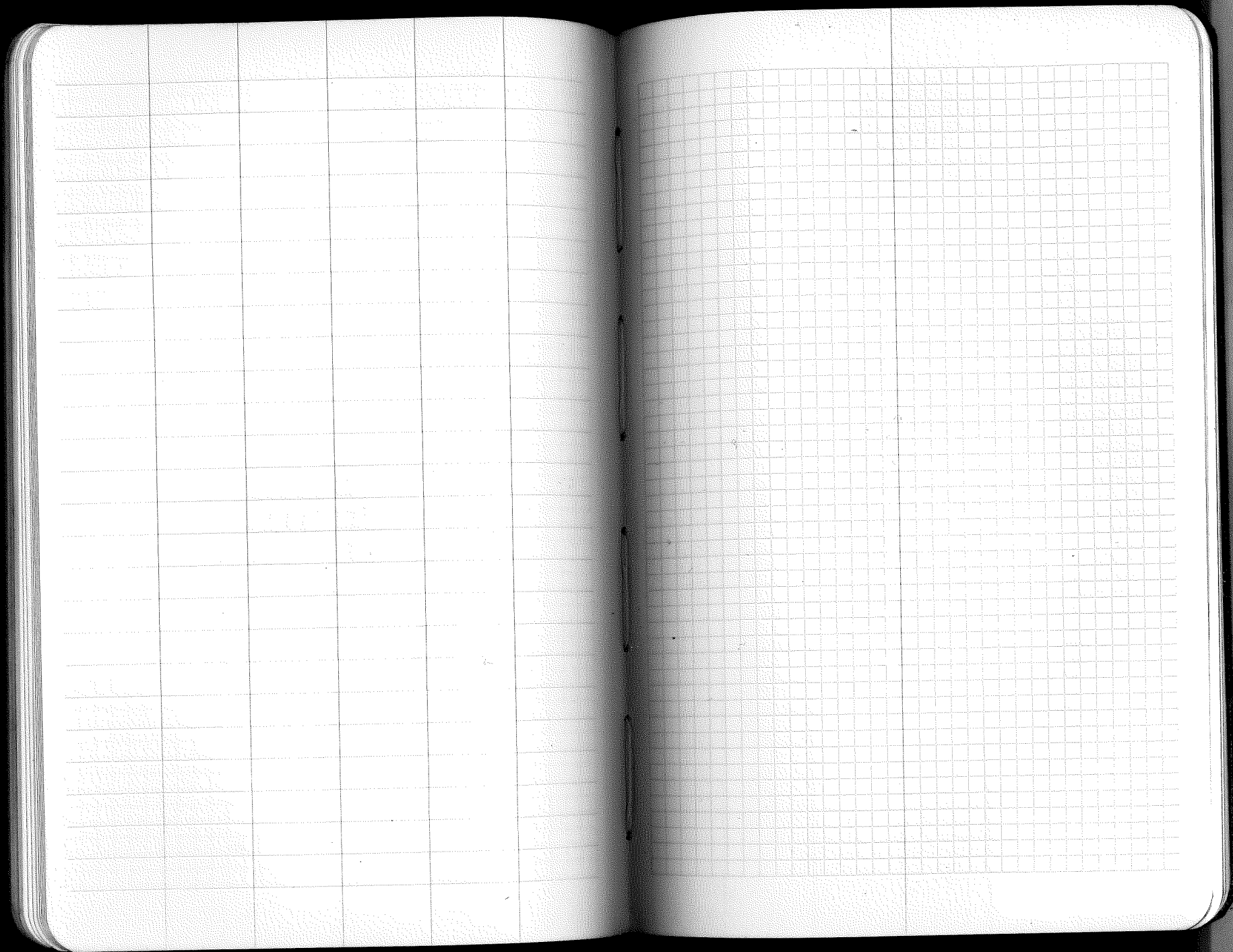


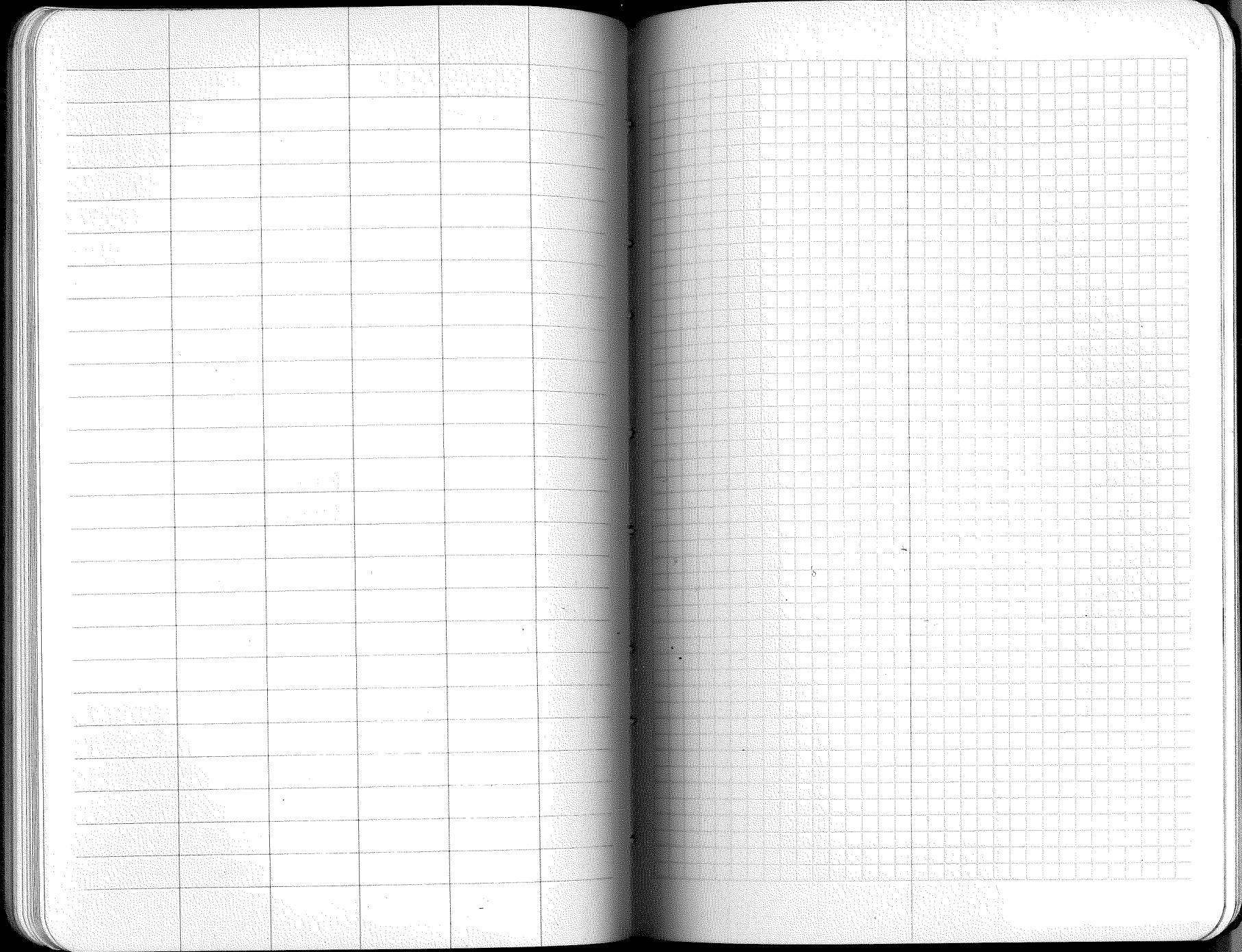


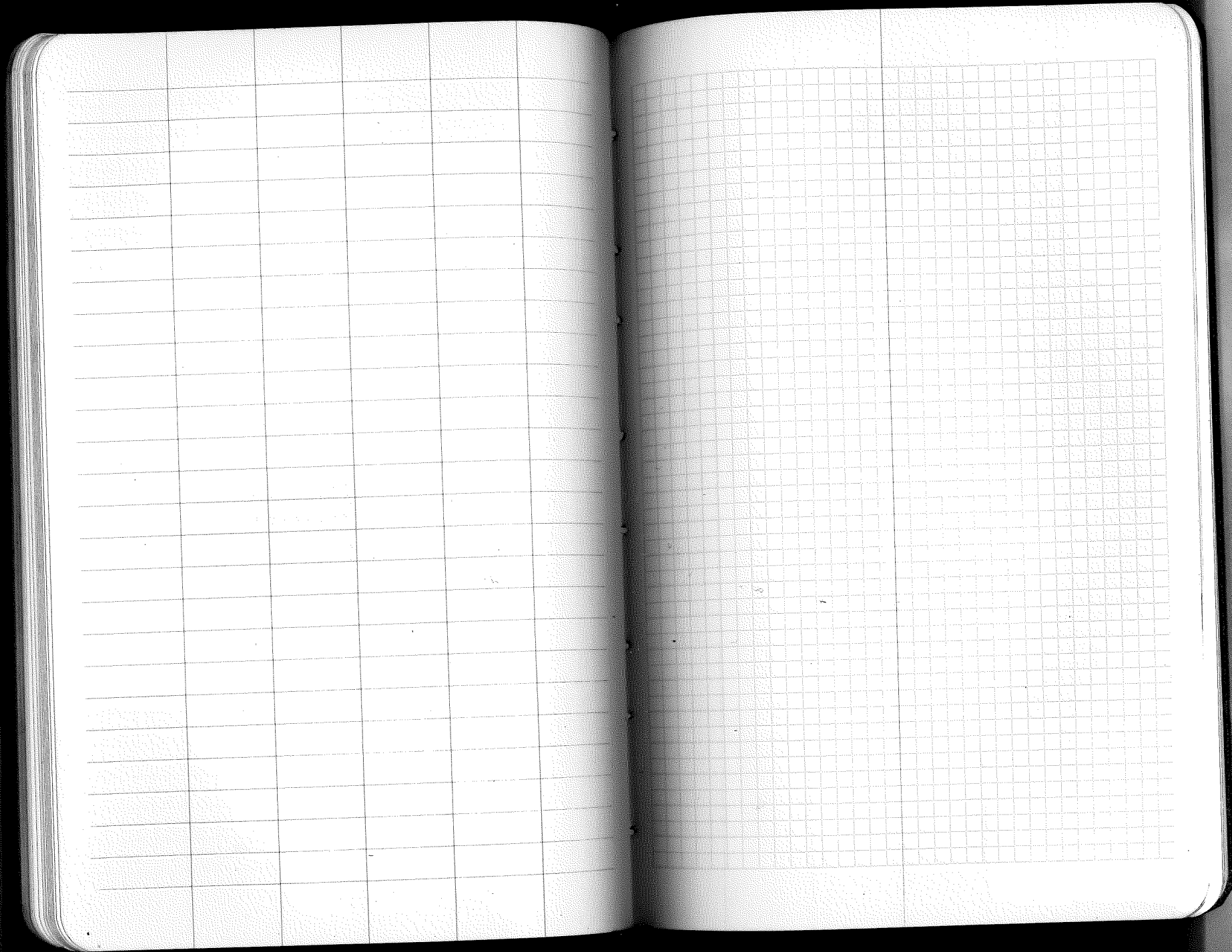


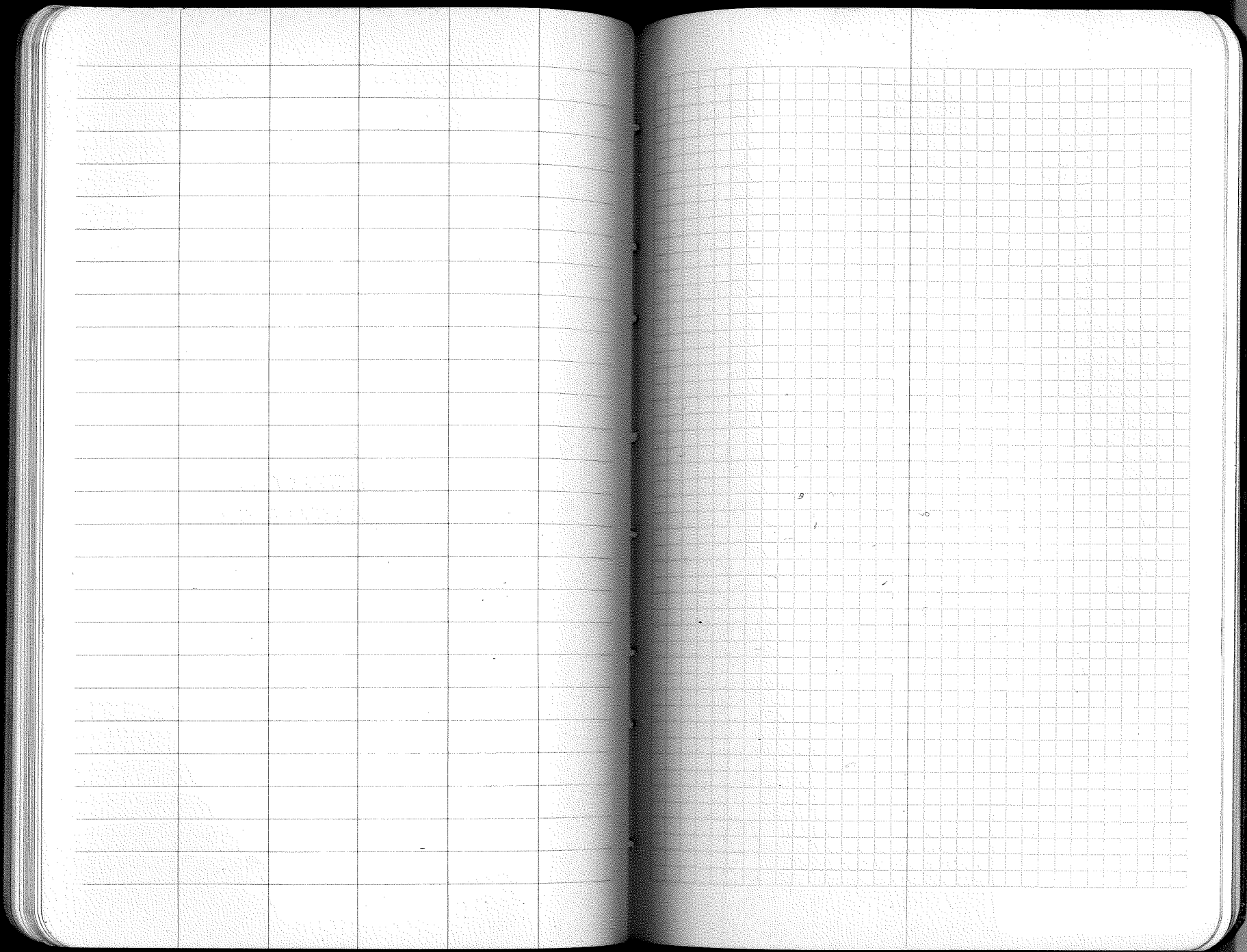


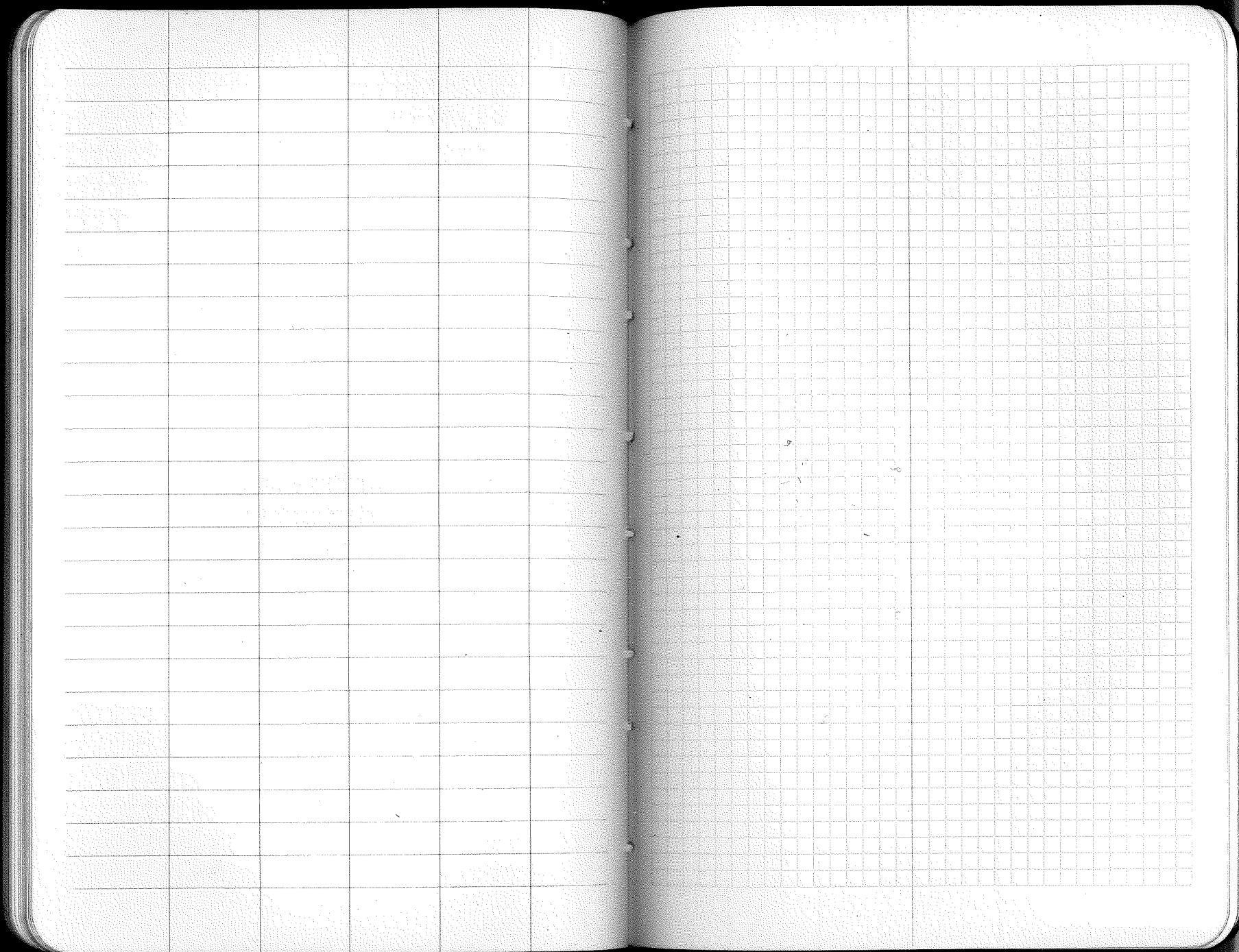


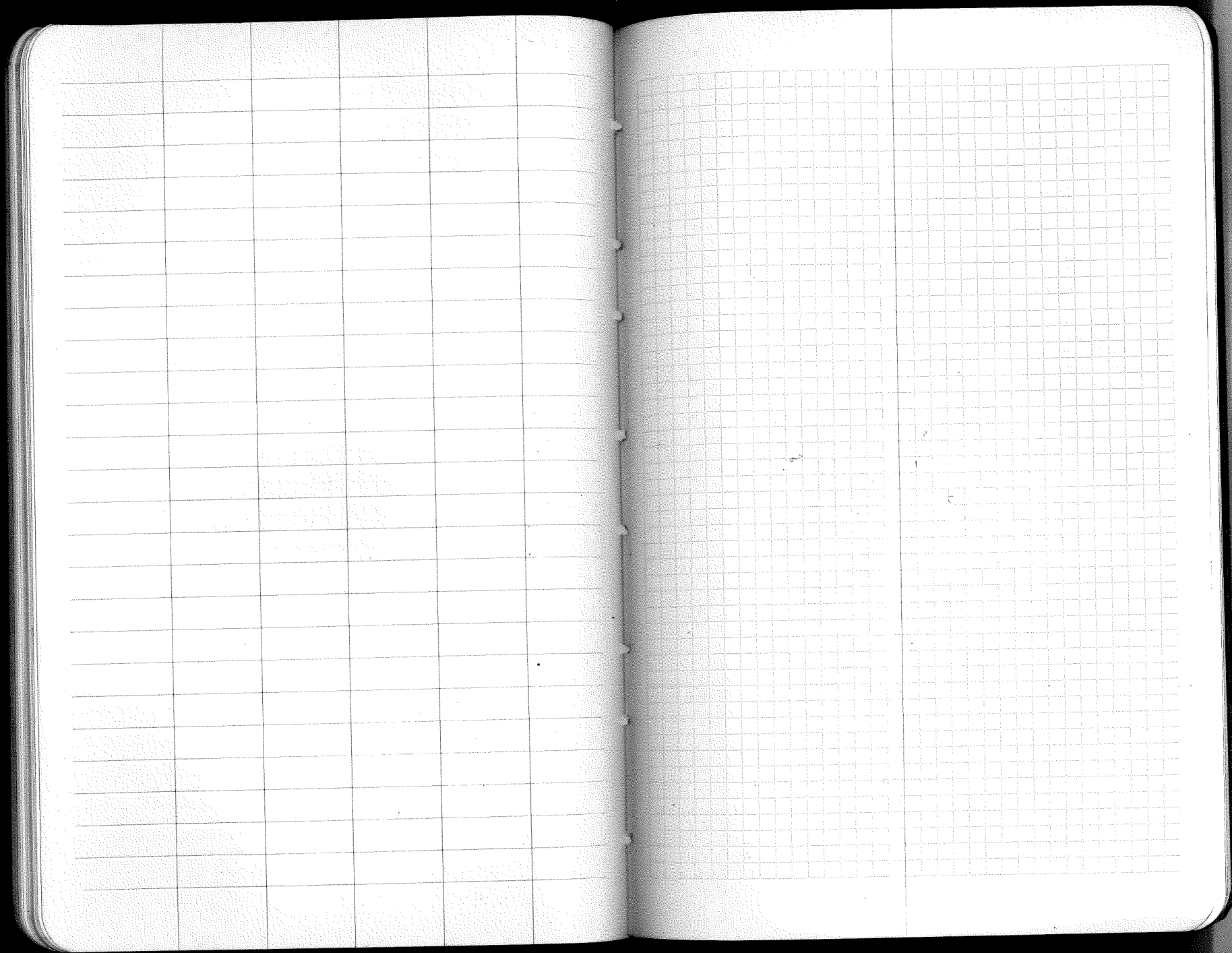


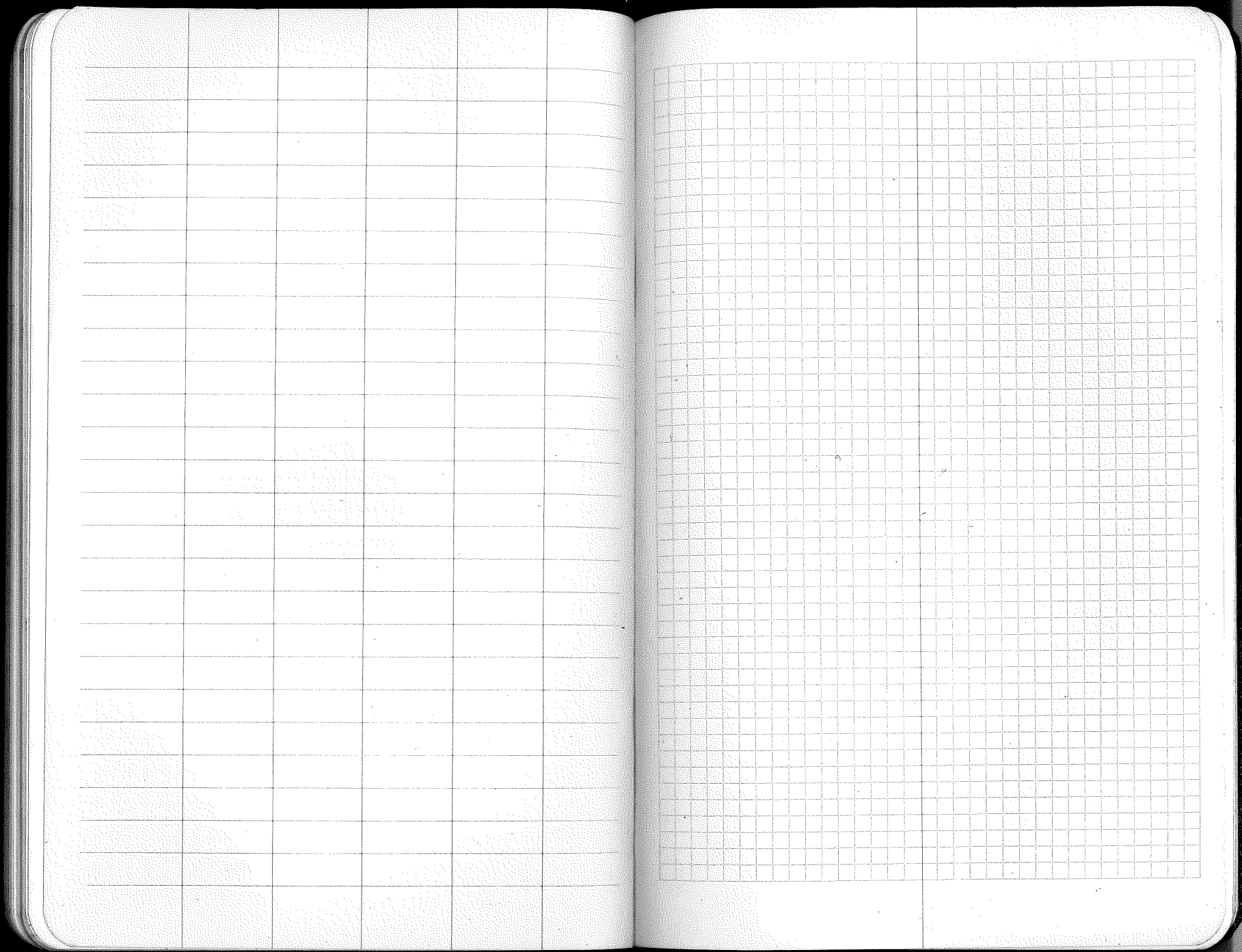


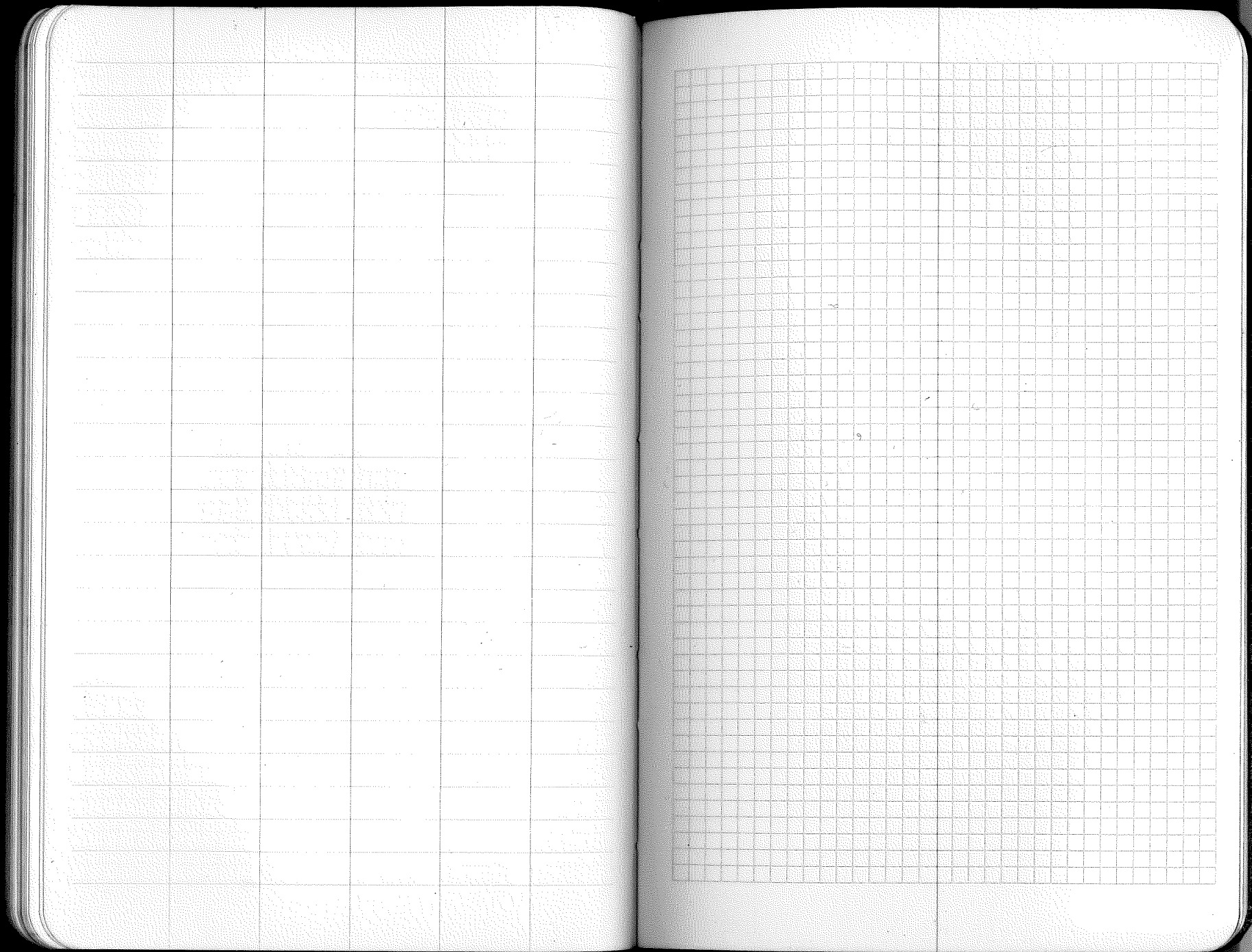


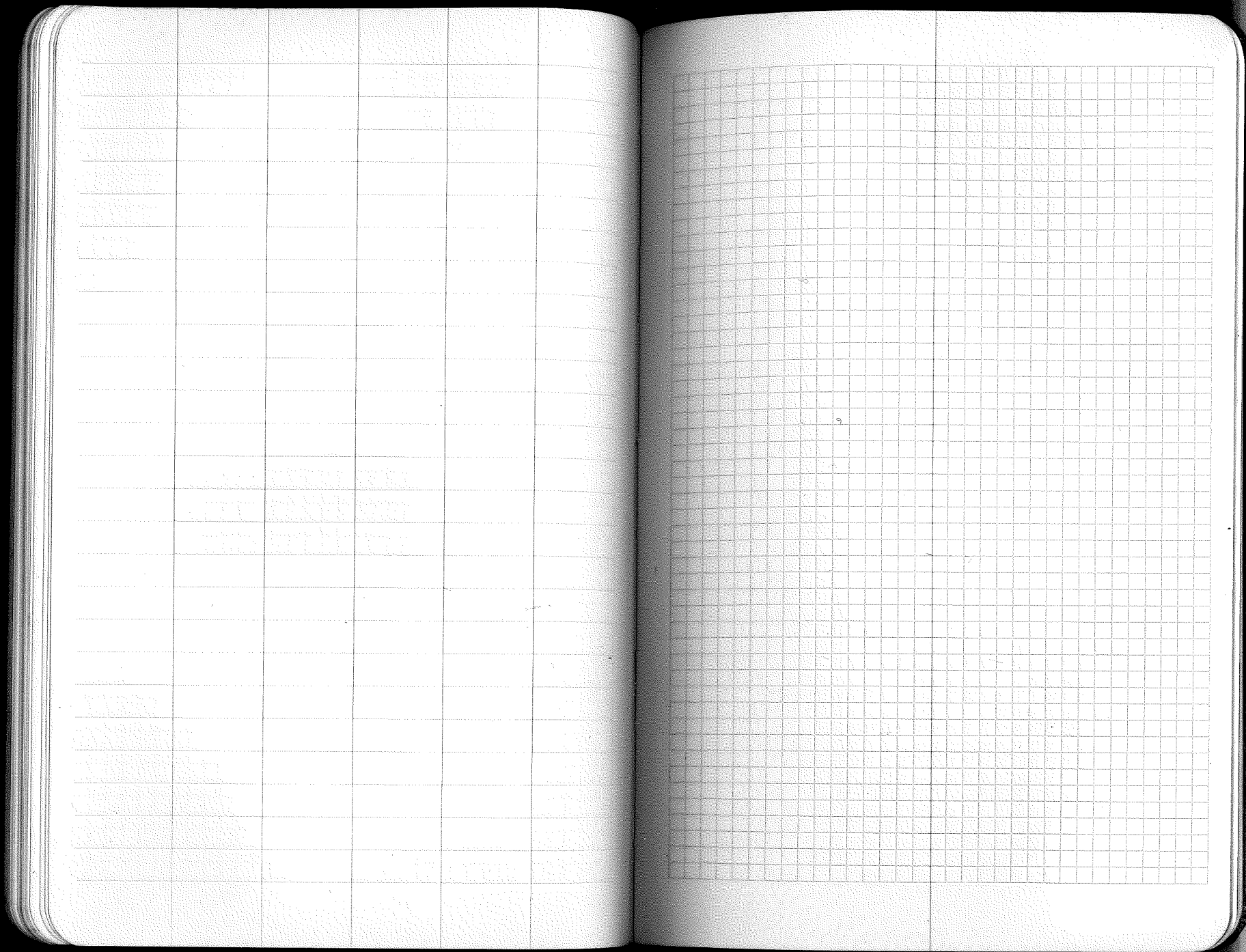


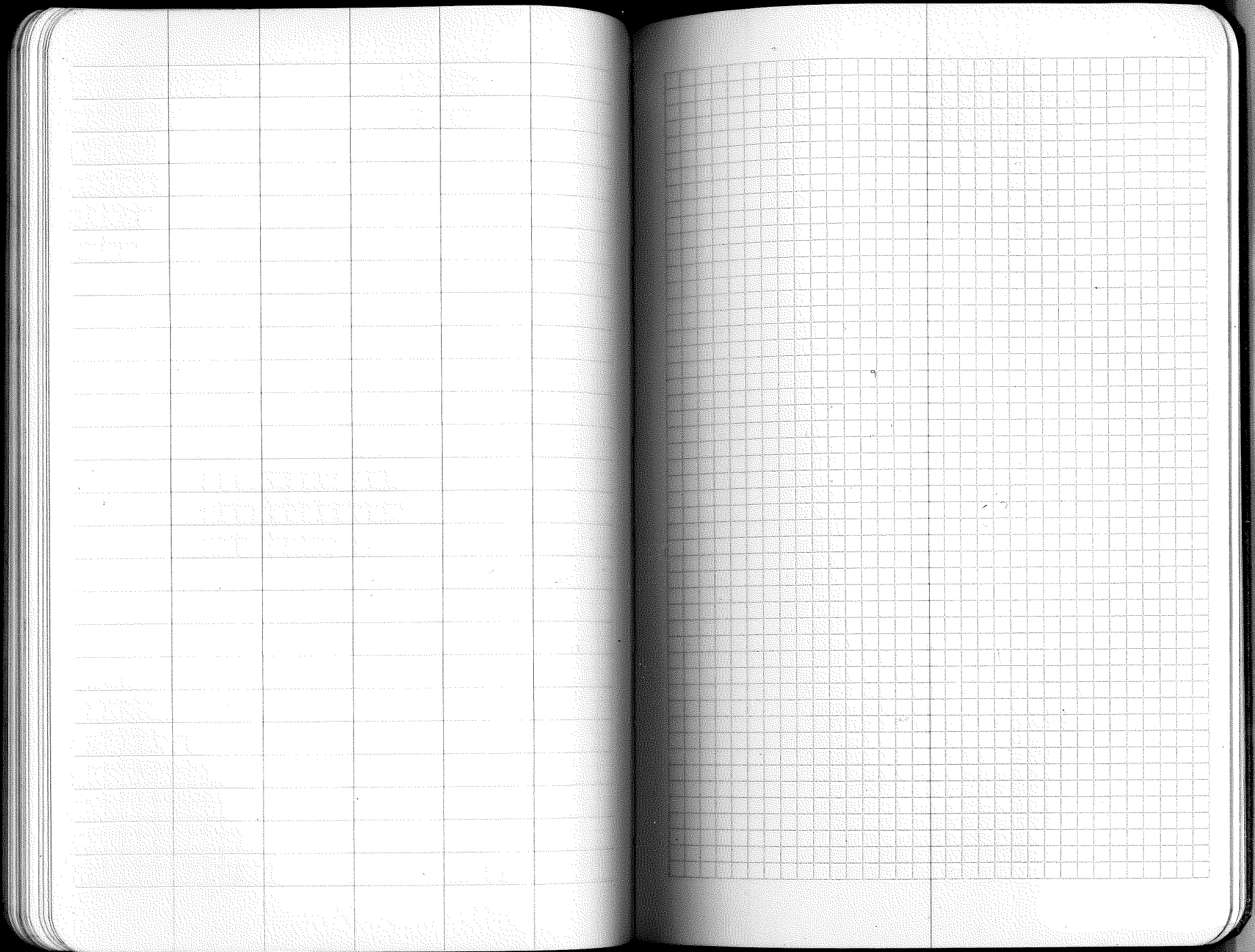


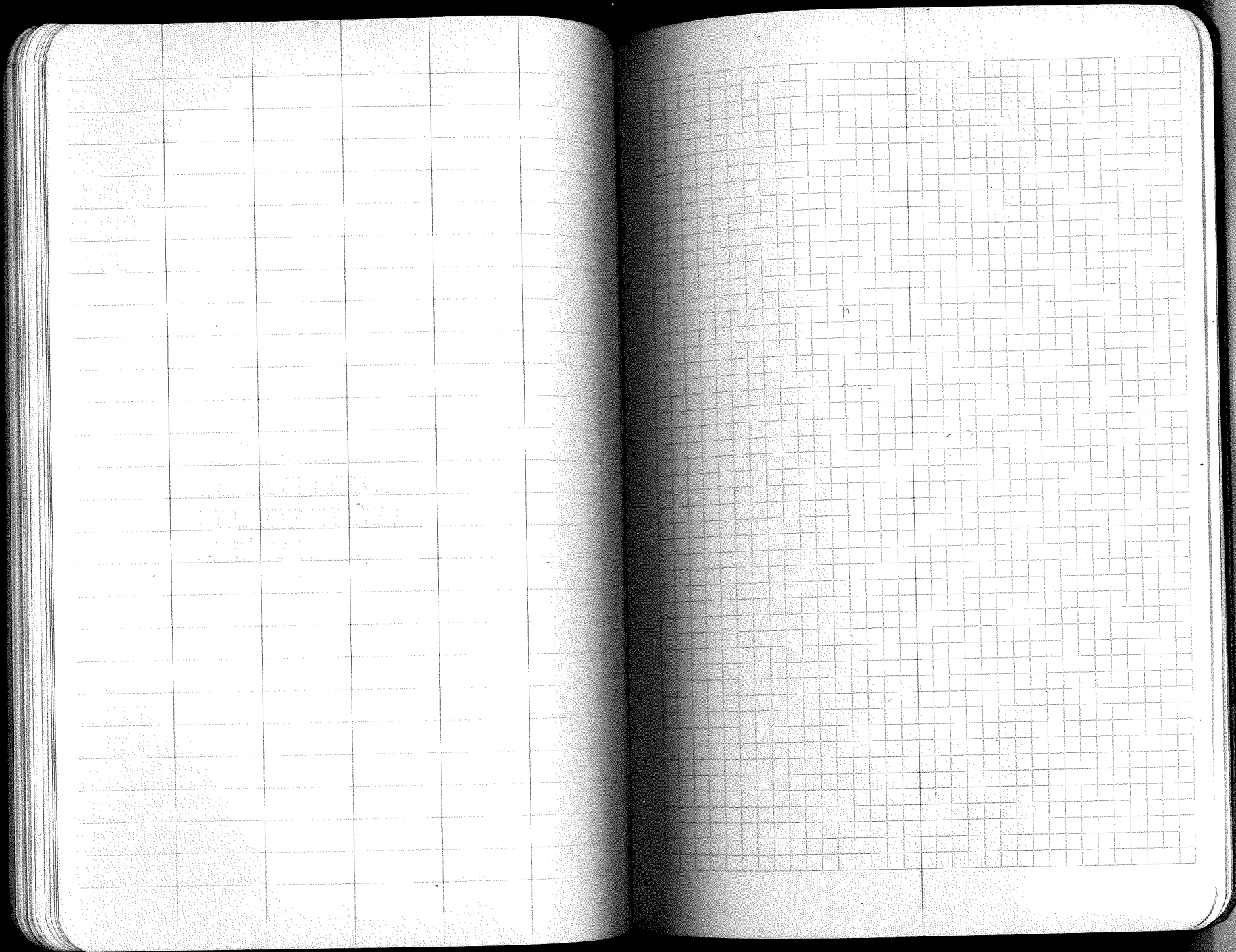


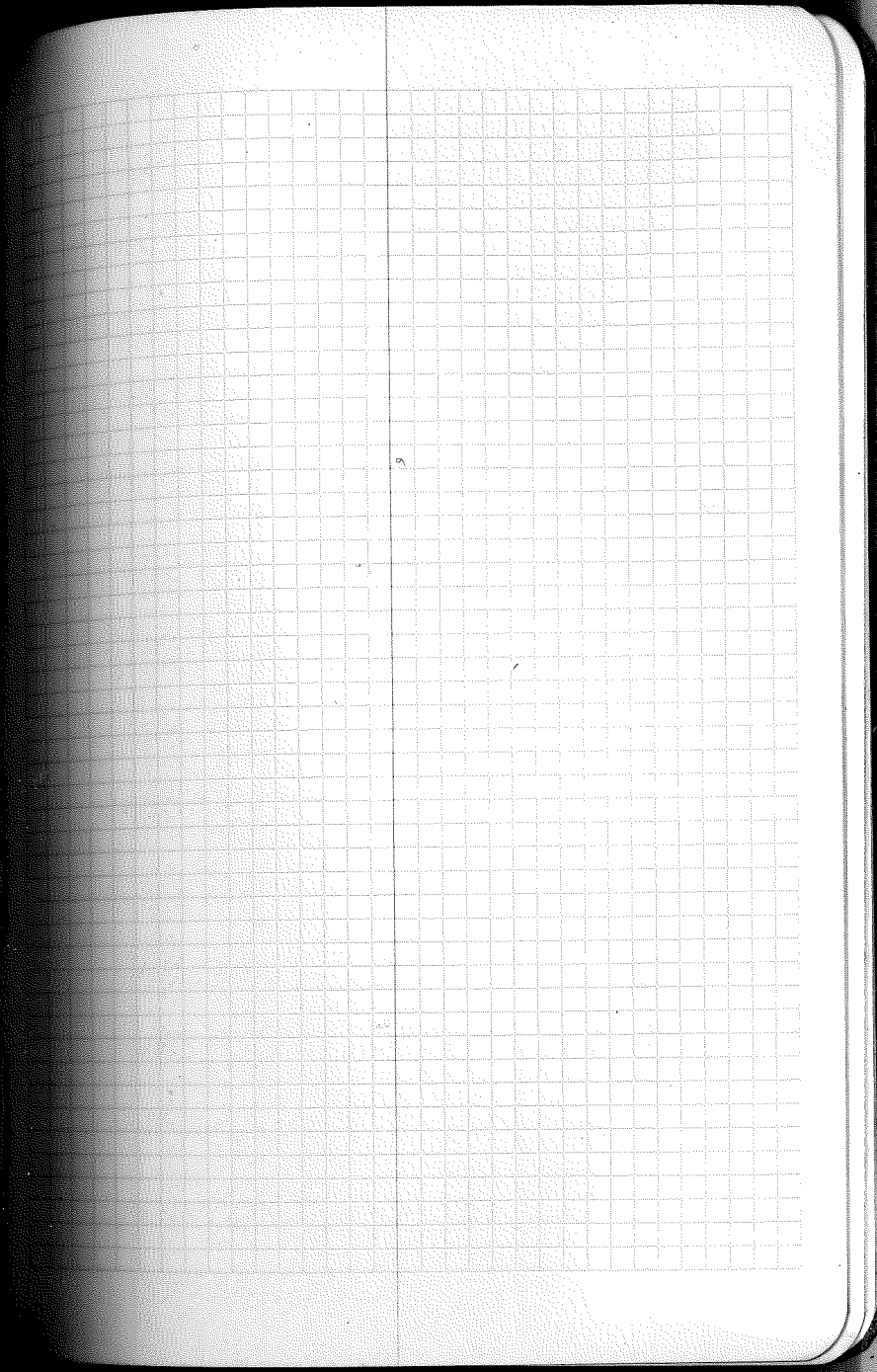
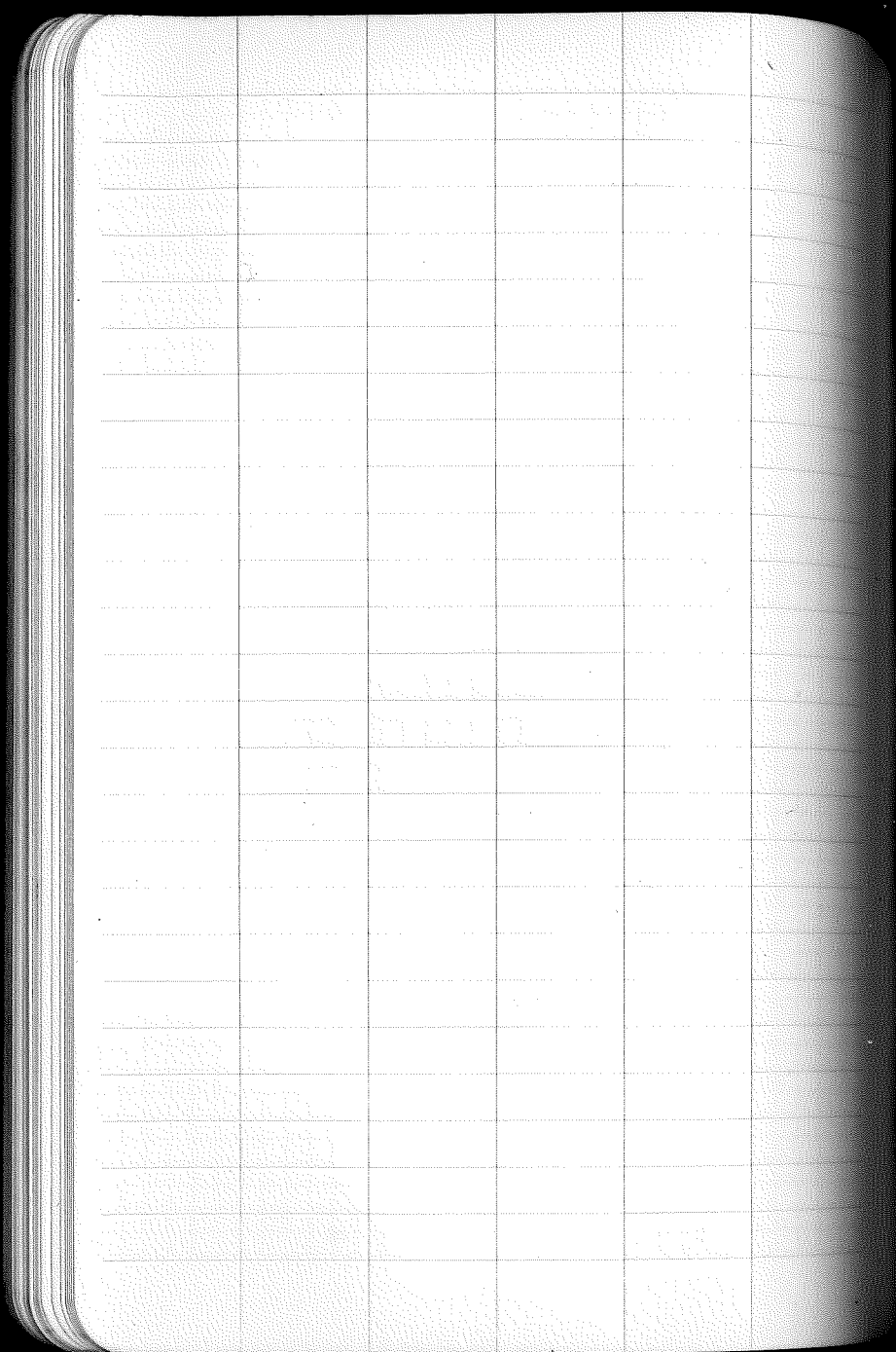


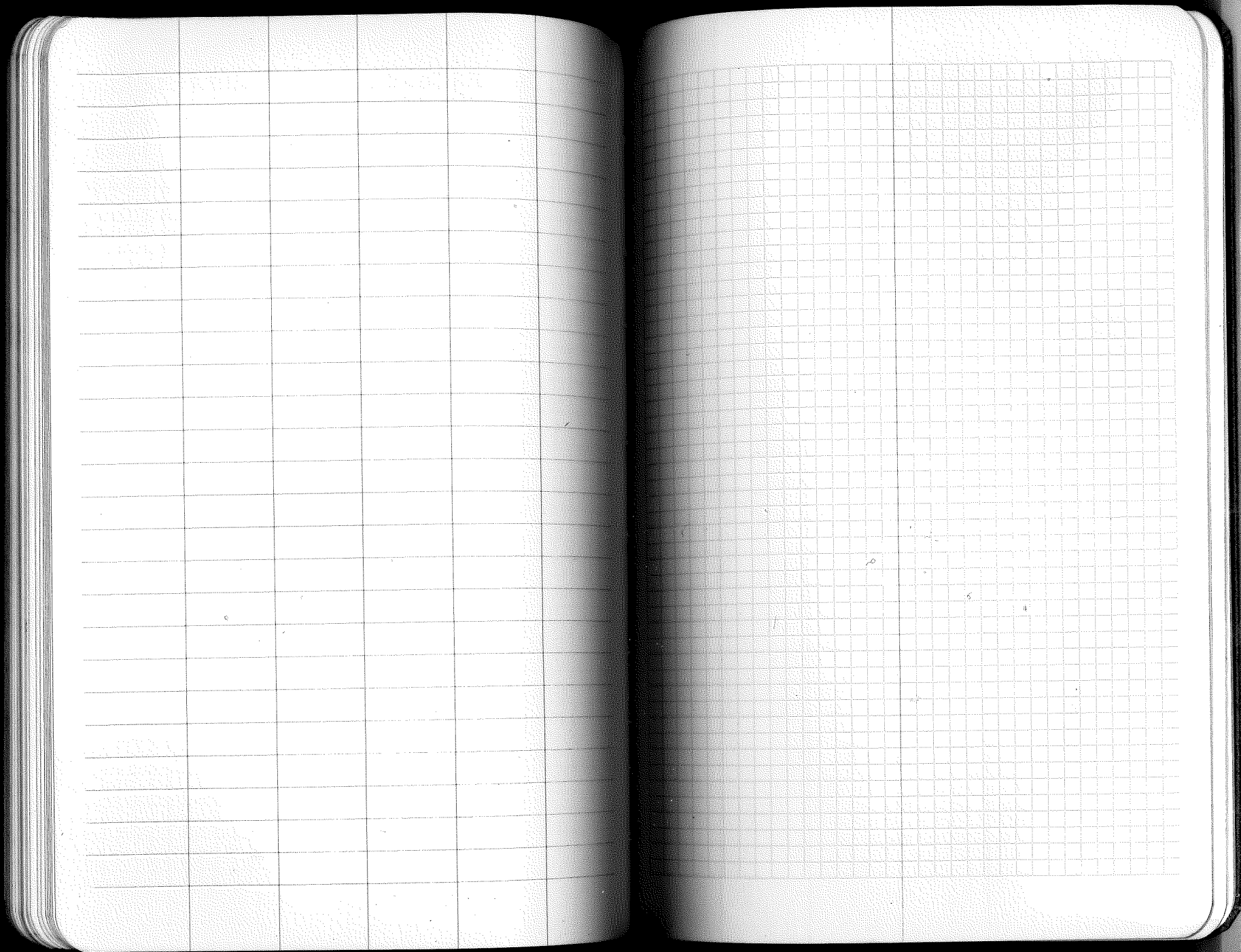


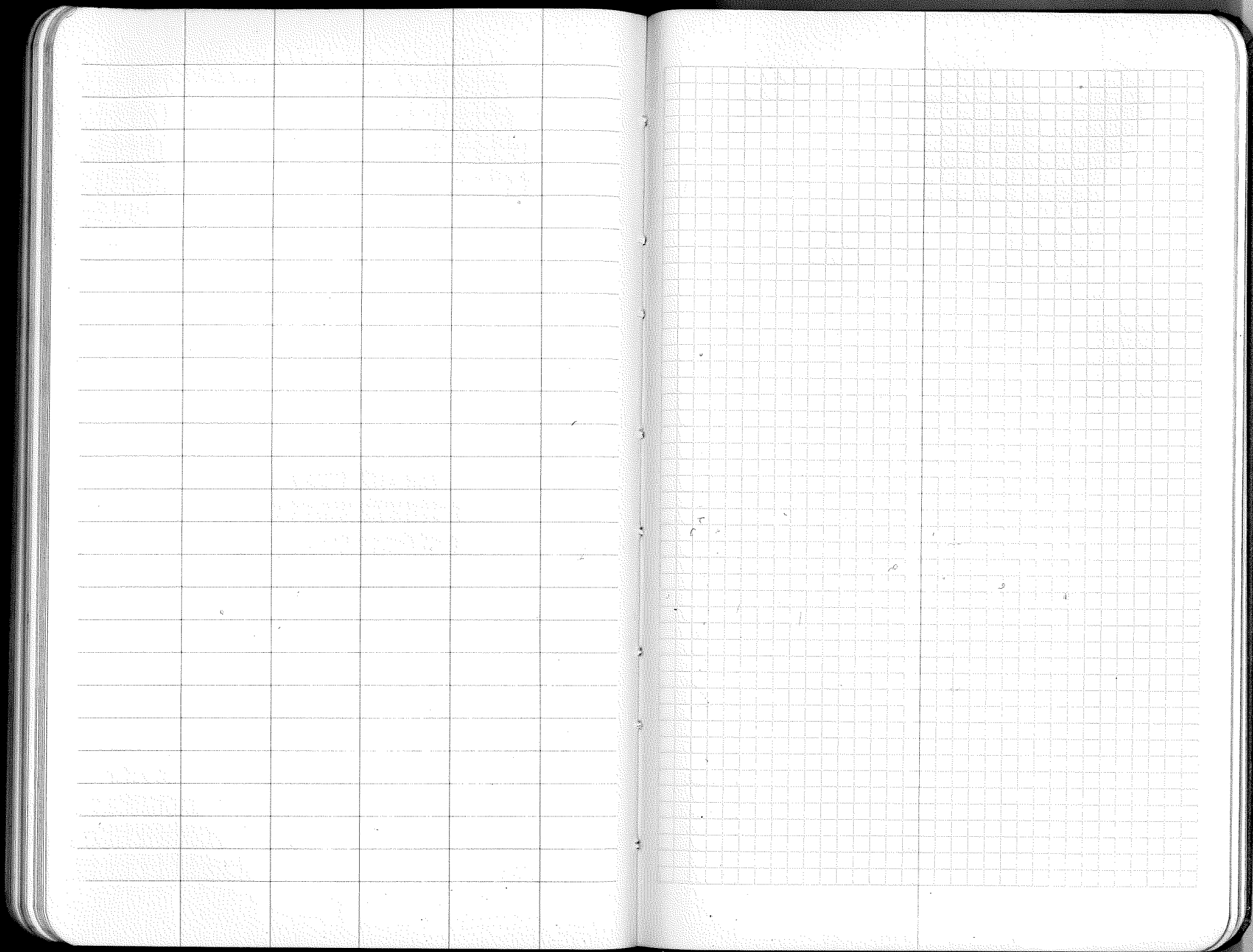


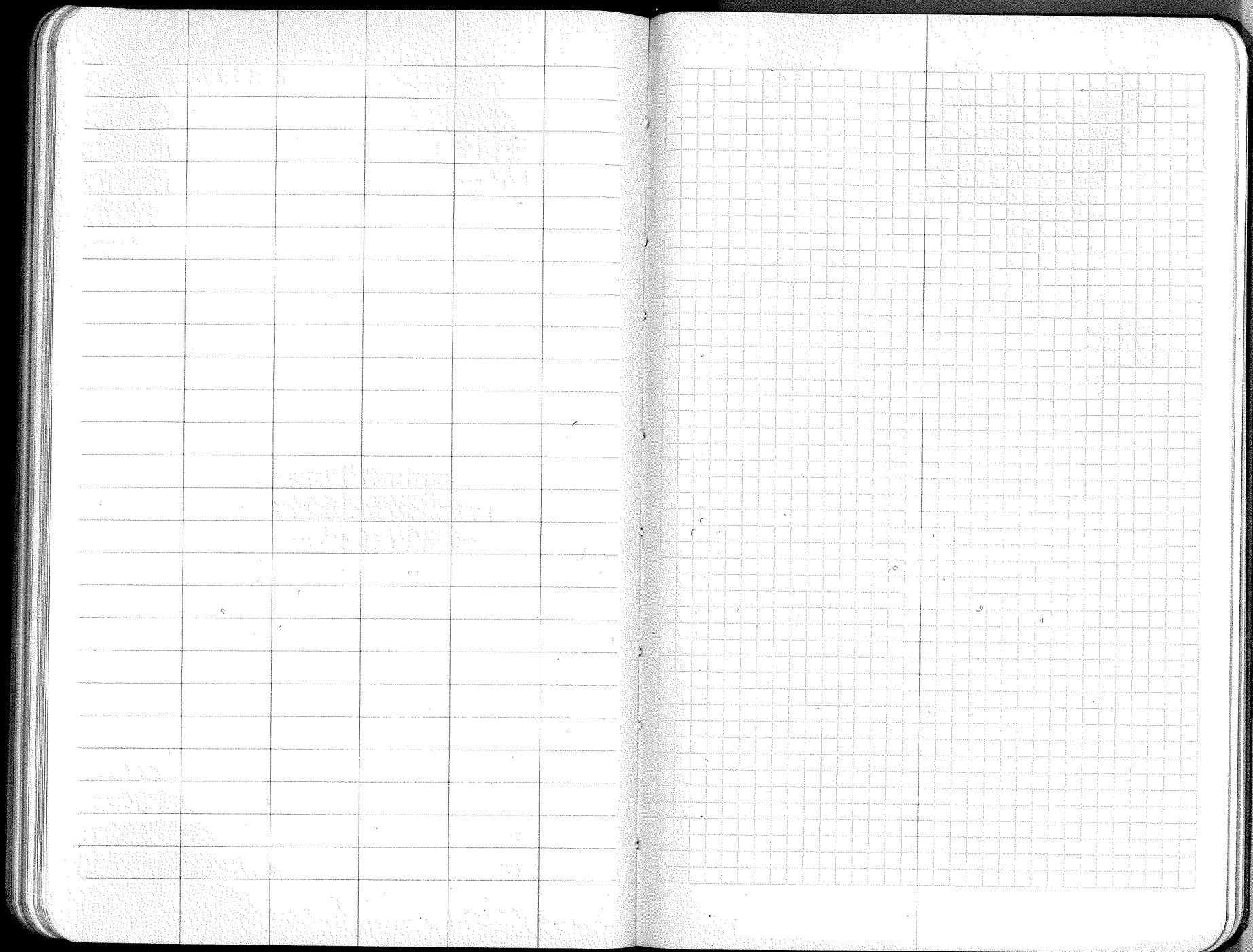


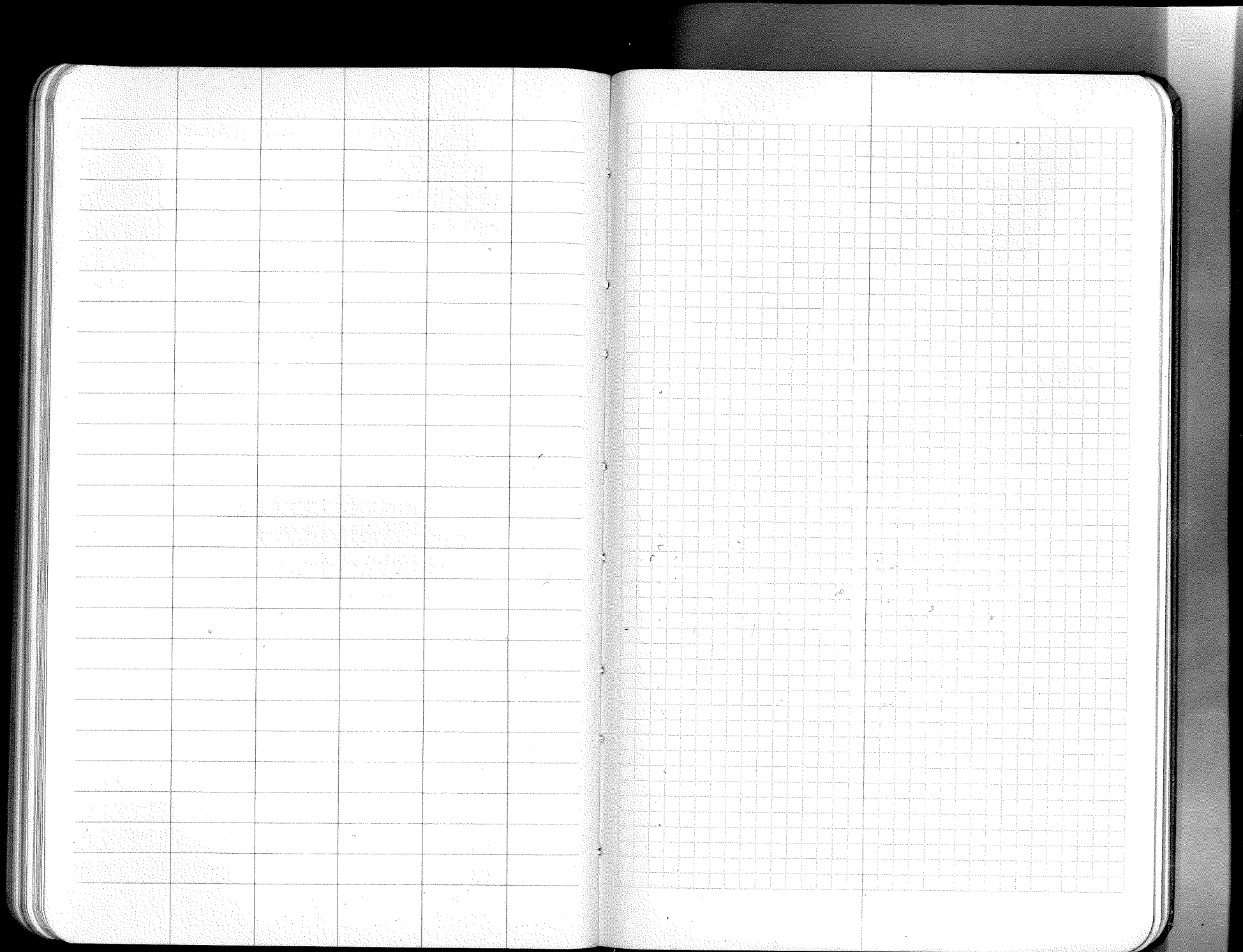


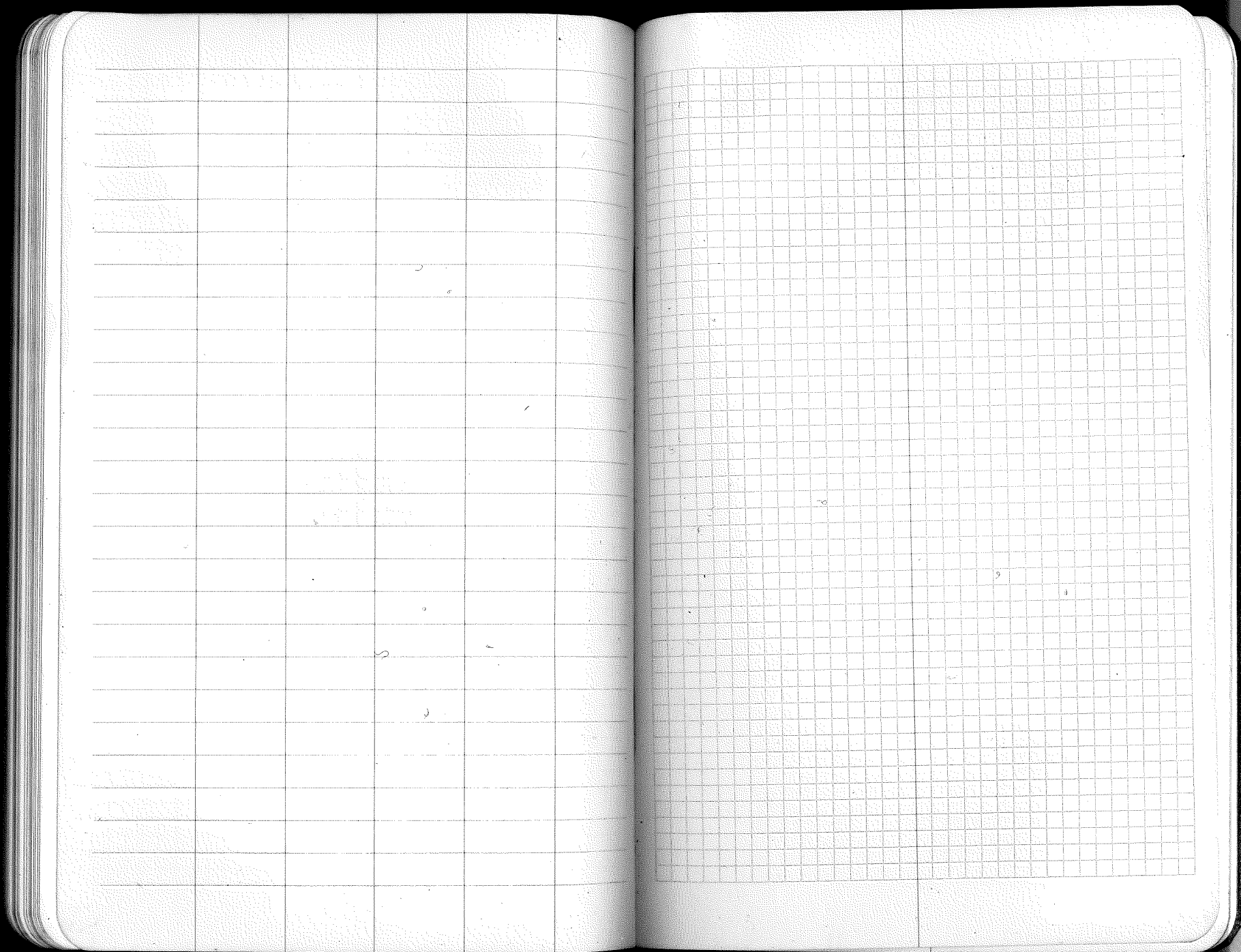


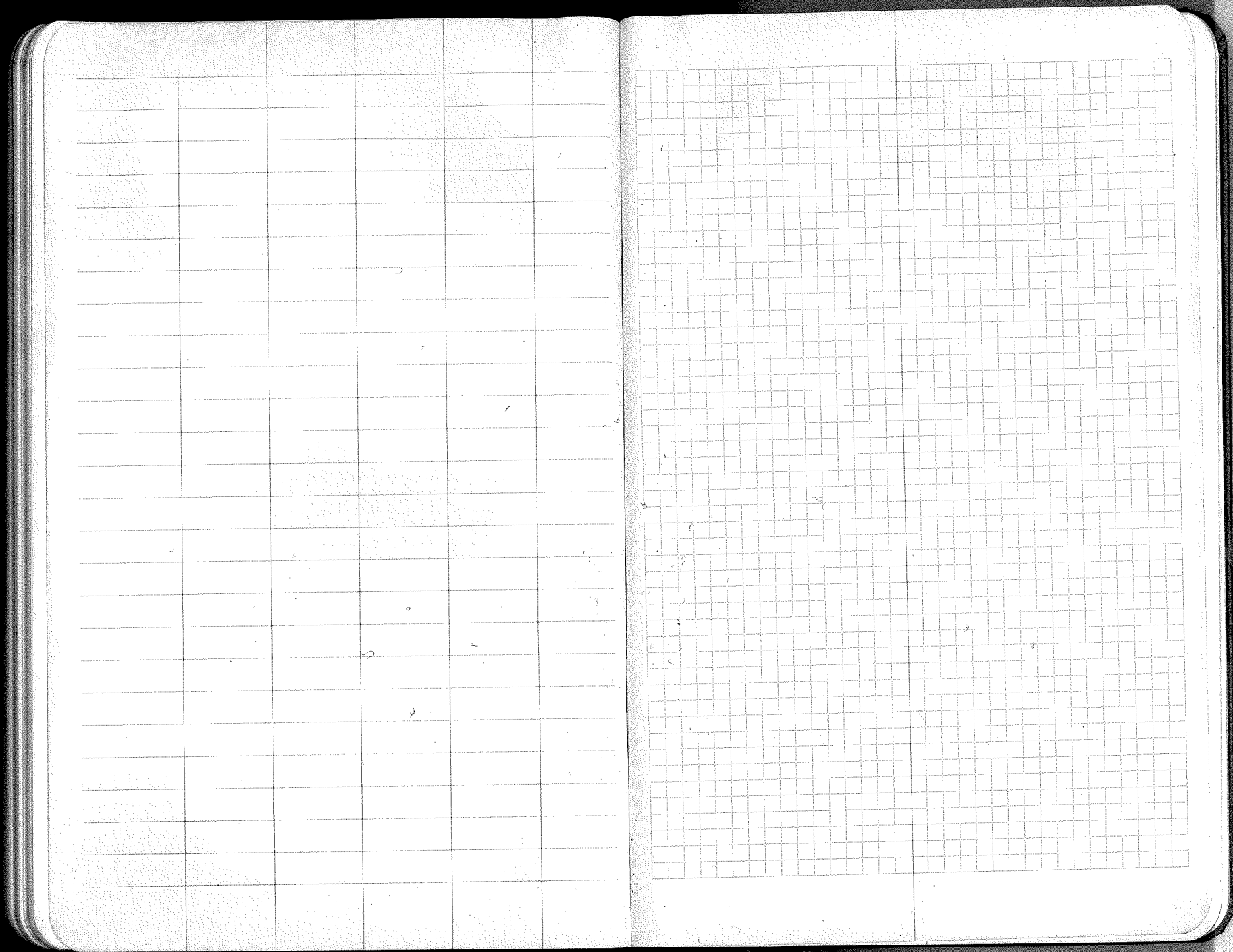


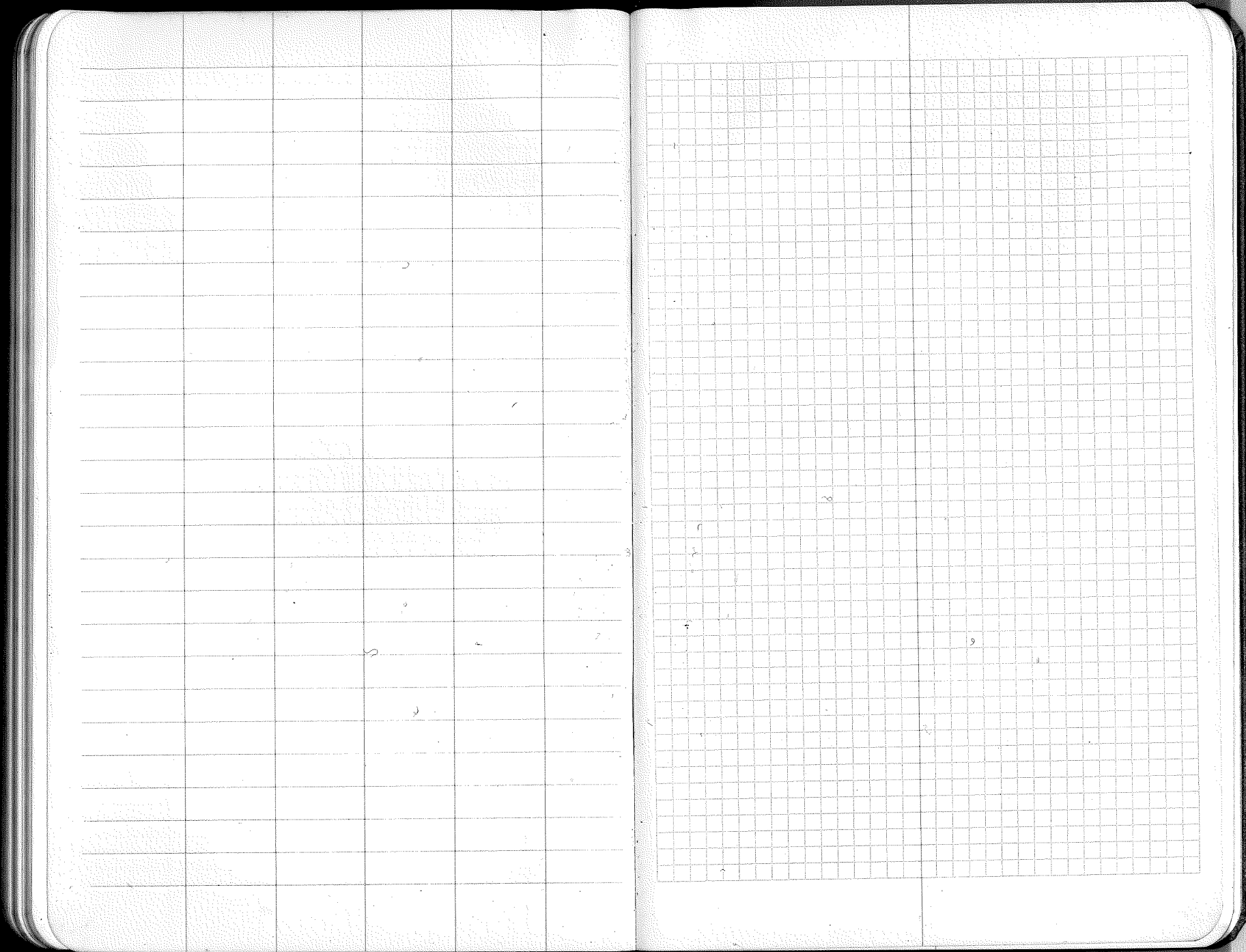


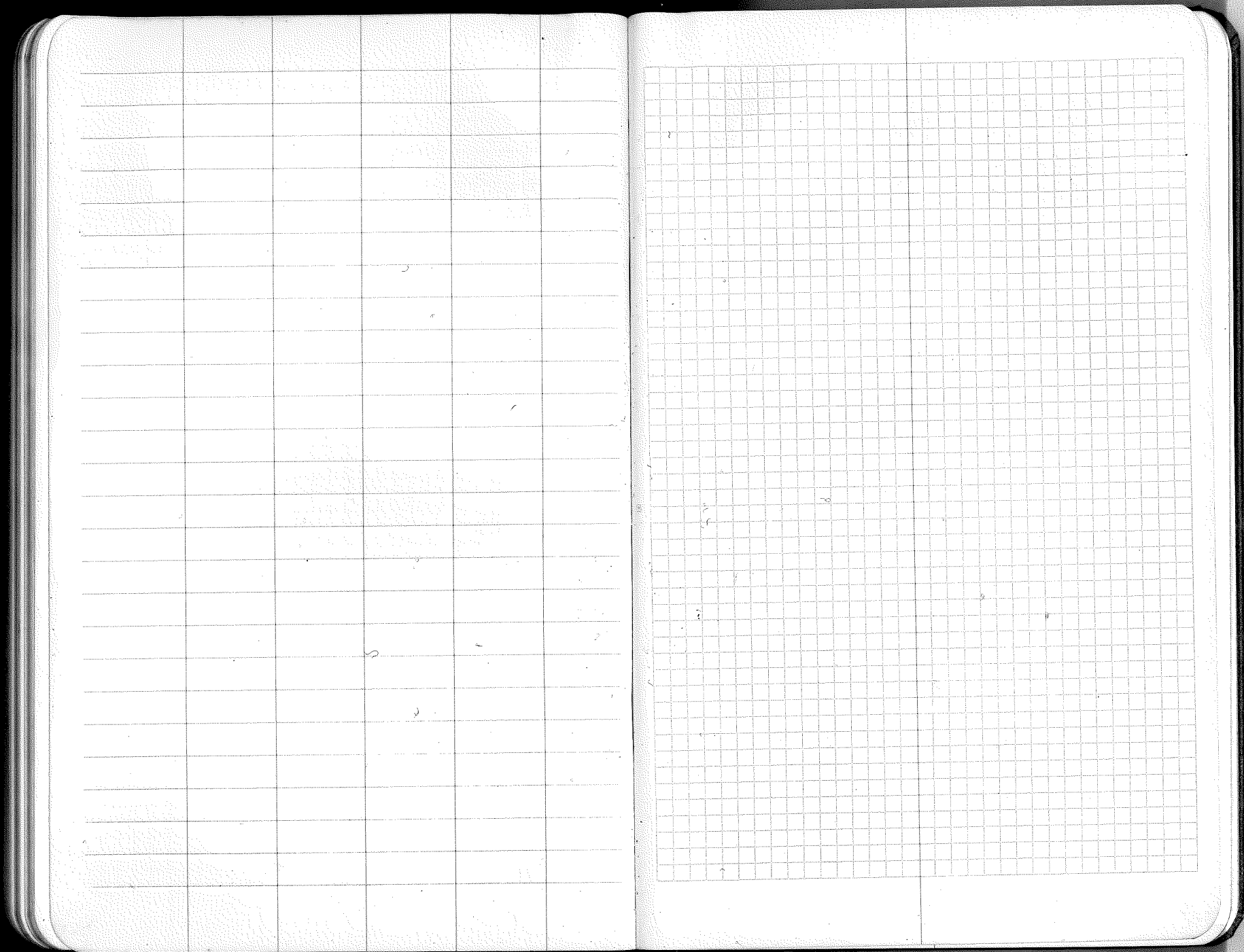


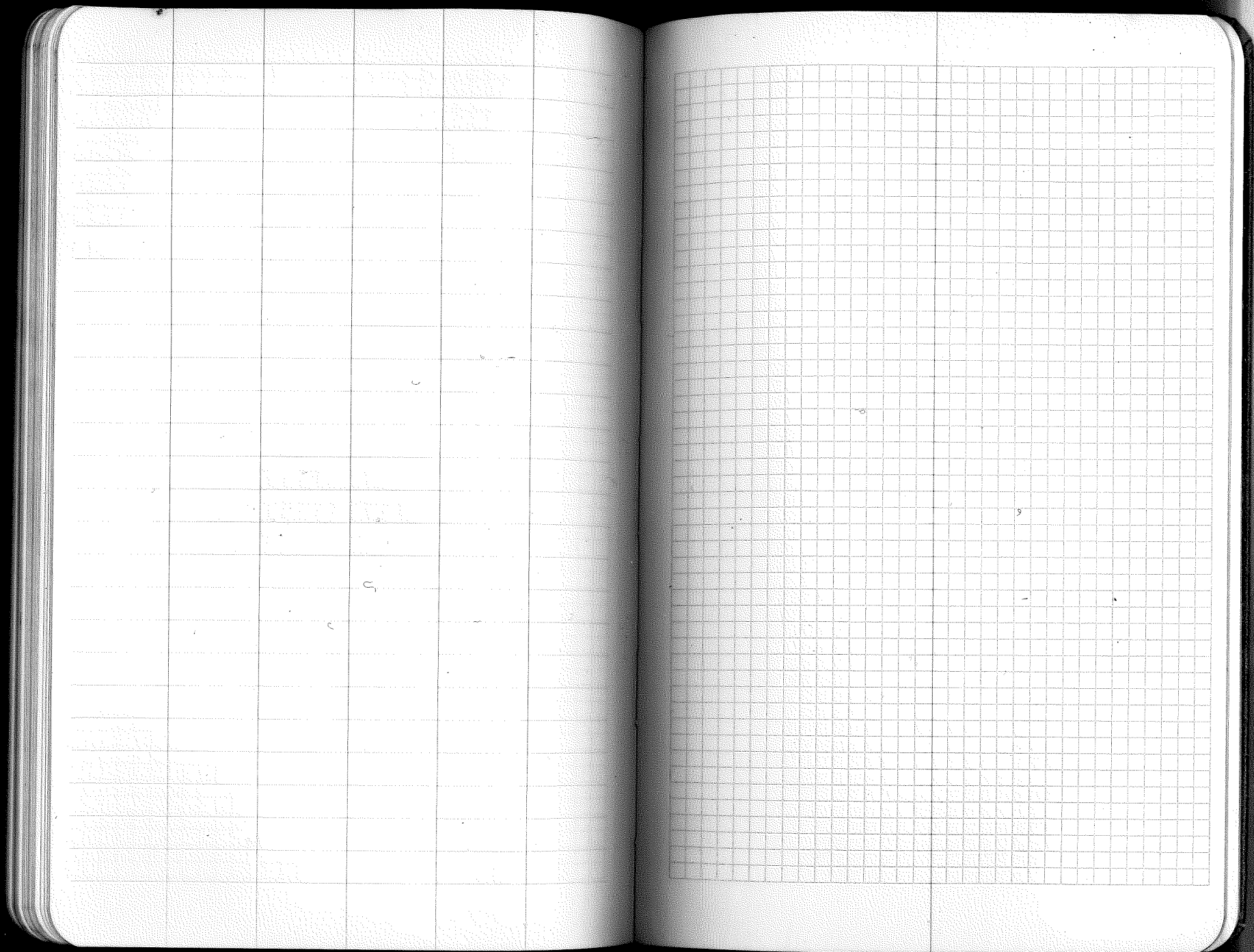


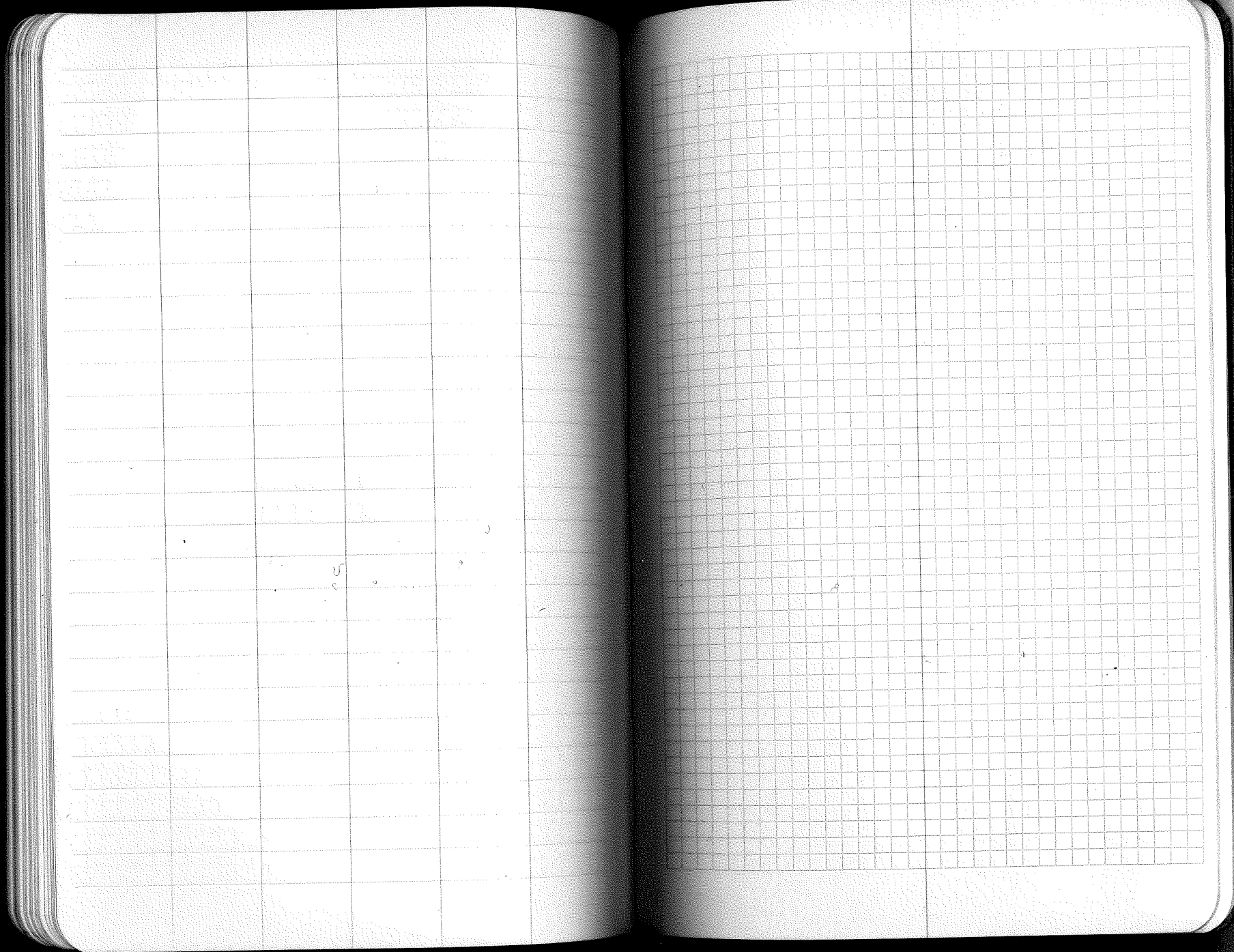


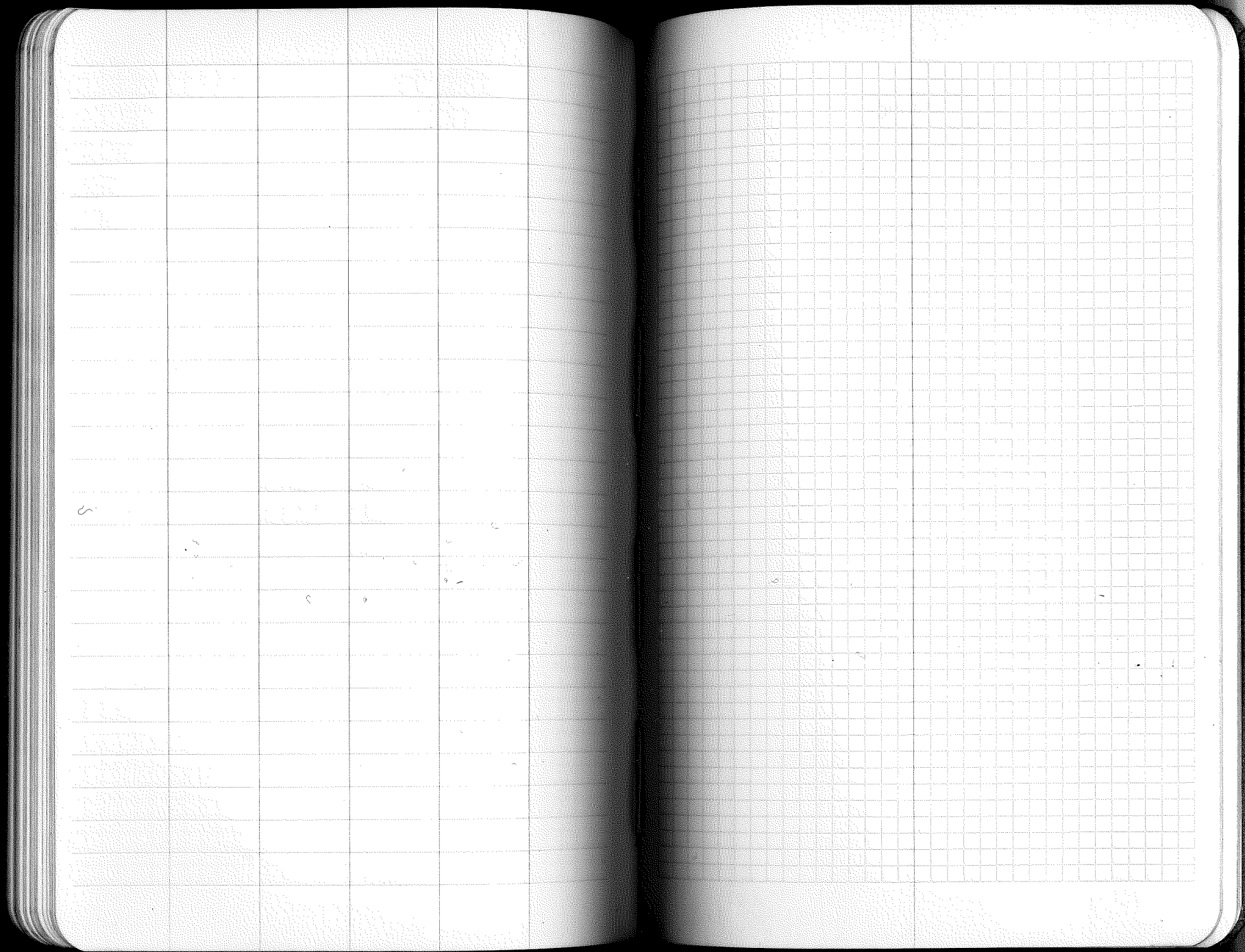


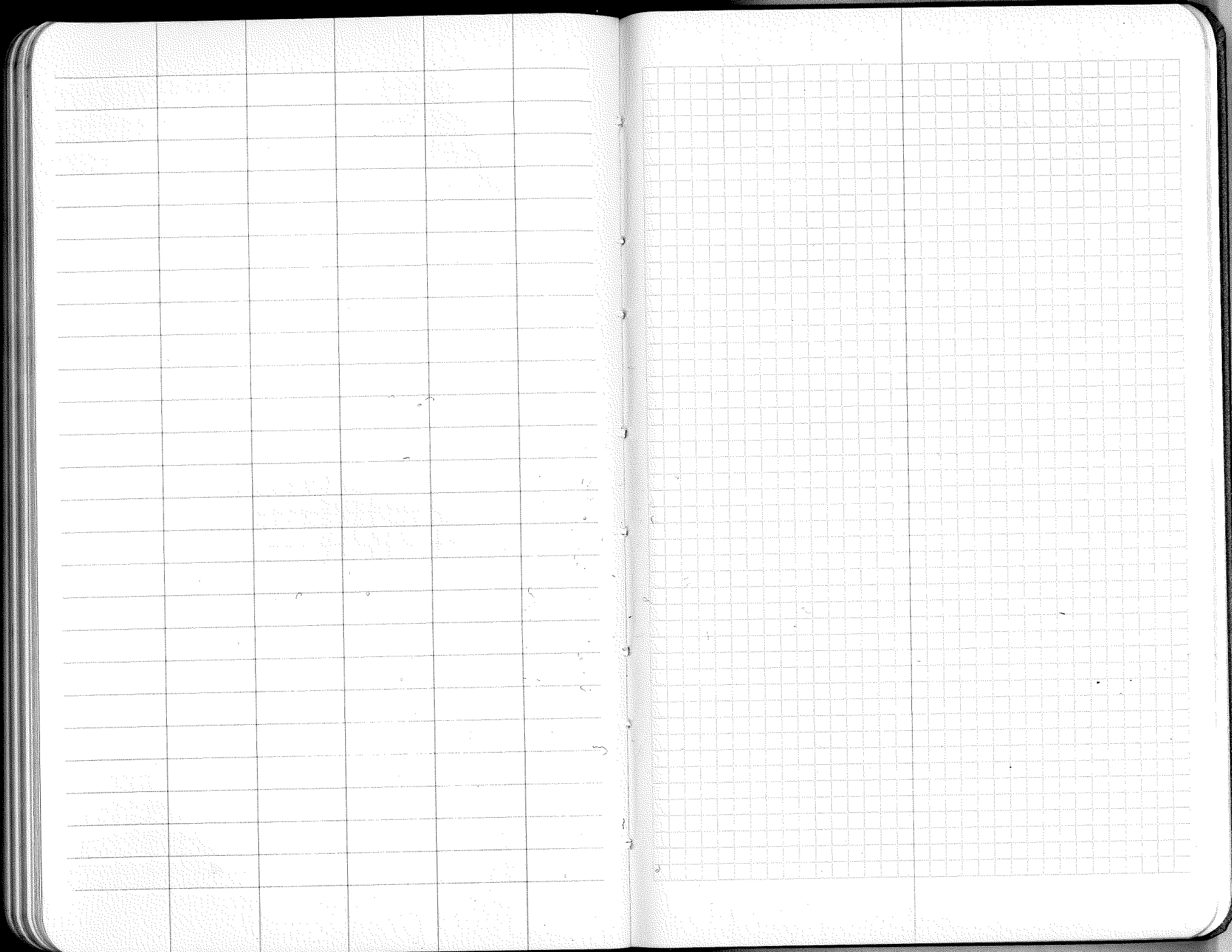


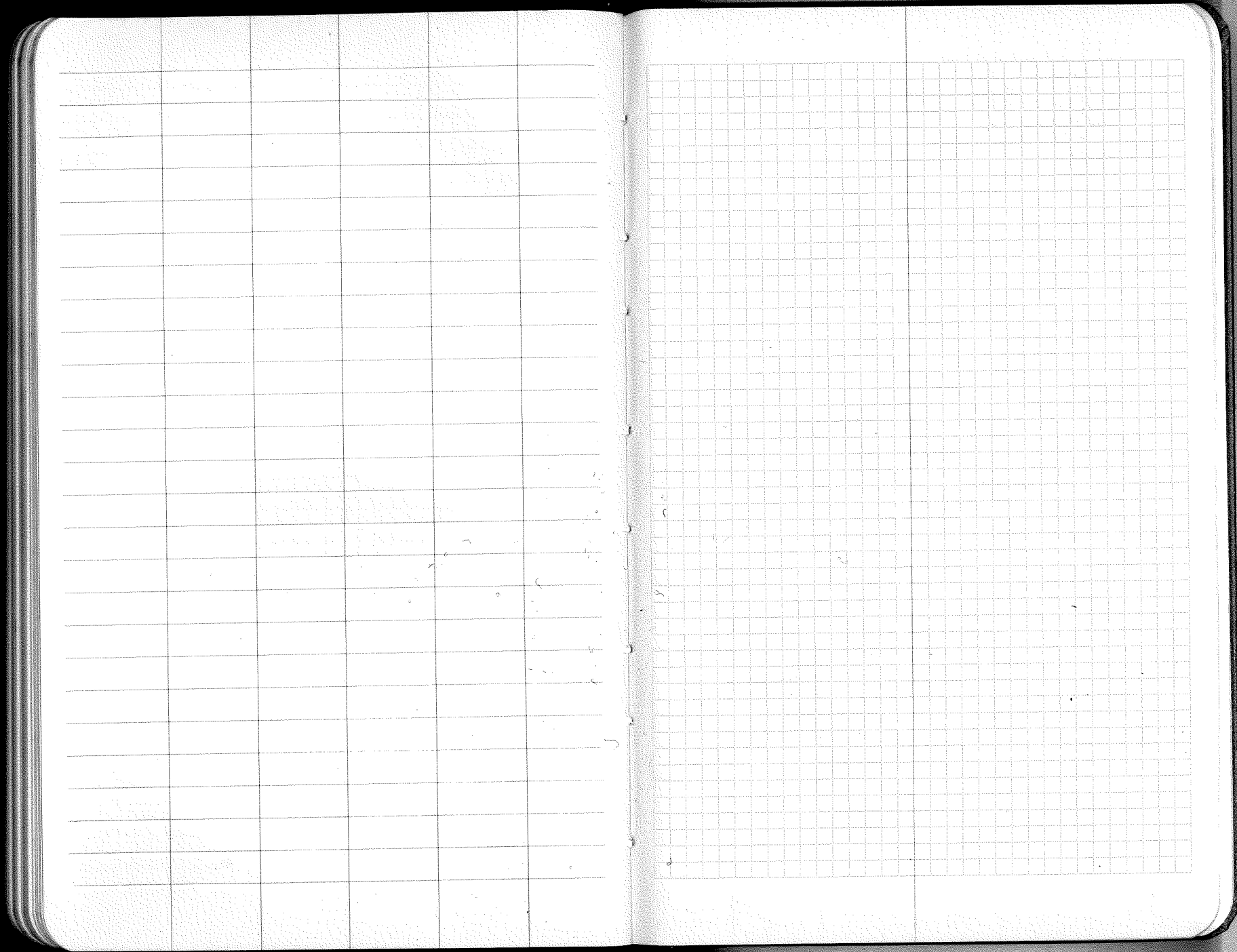


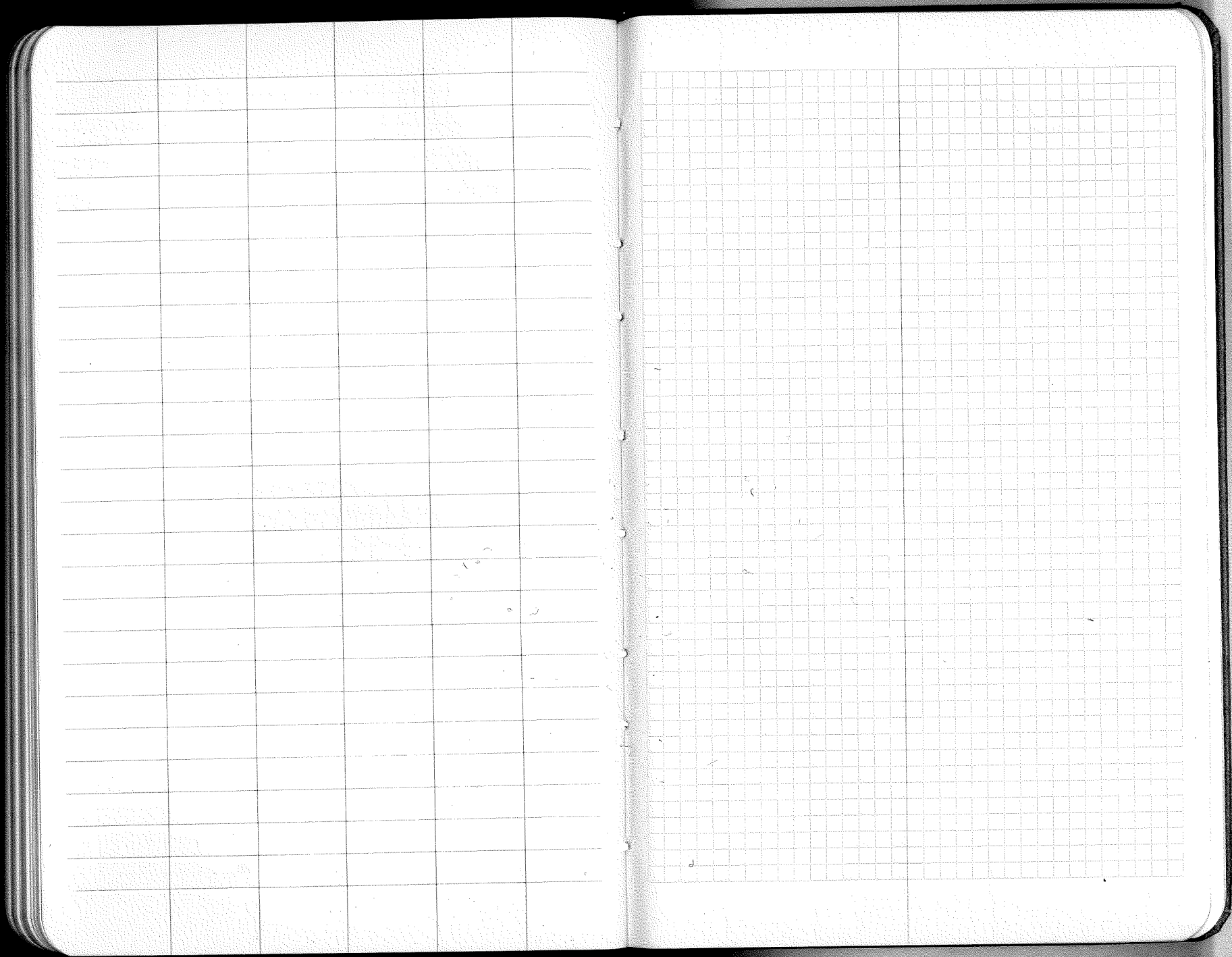


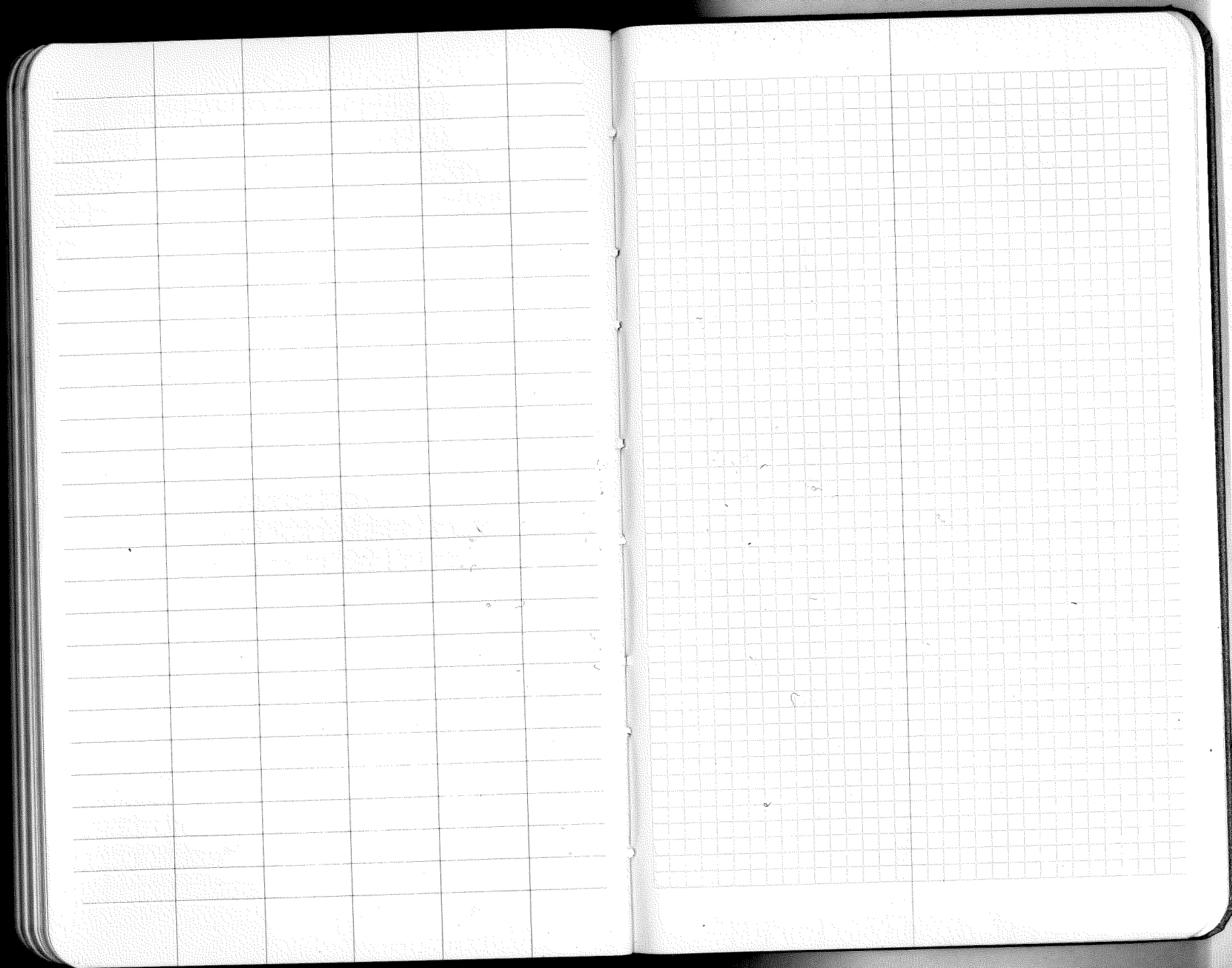


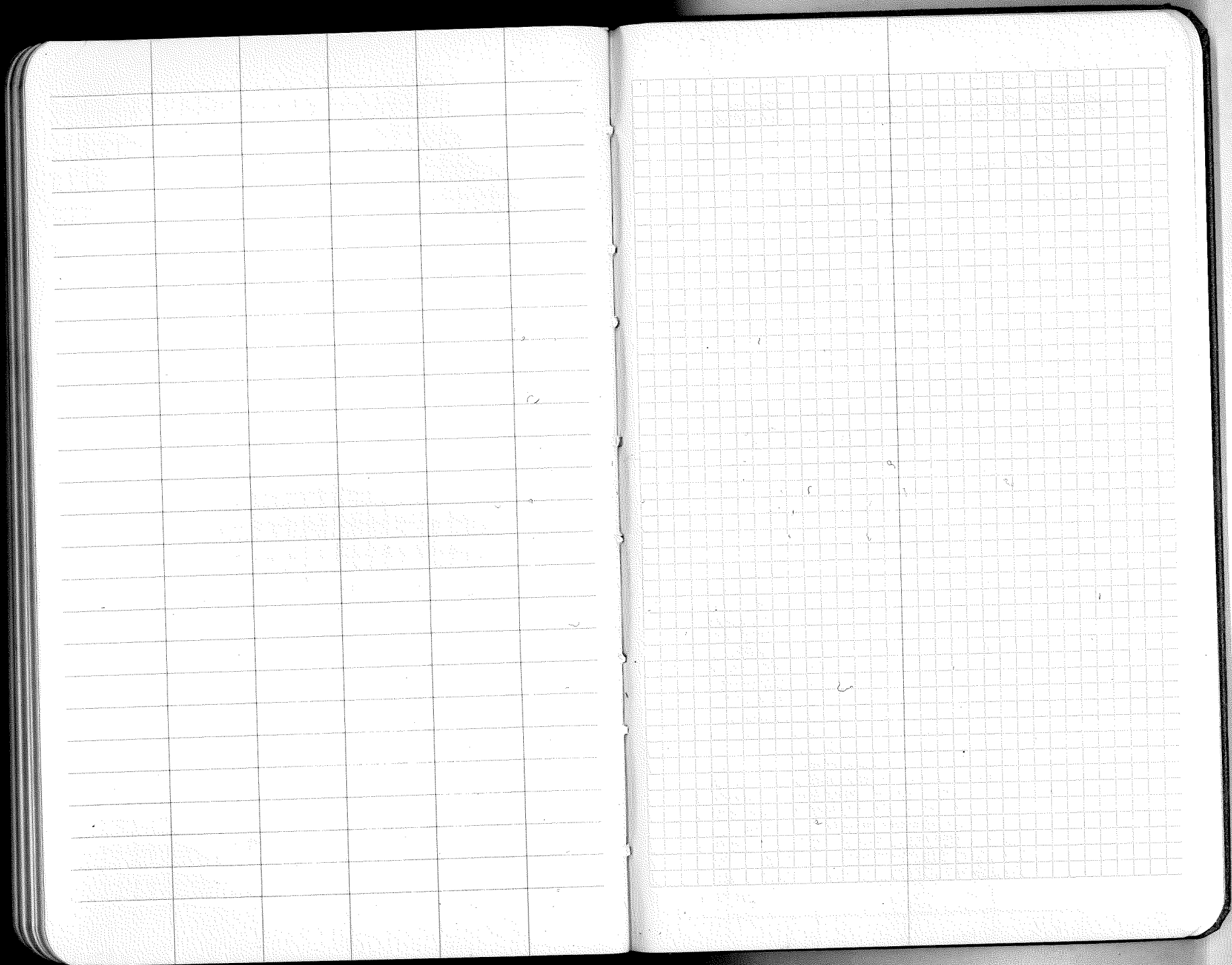






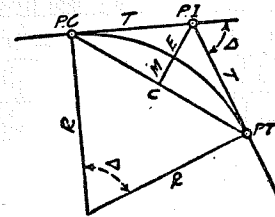






DIETZGEN'S RAILROAD CURVE AND REDUCTION TABLES

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CURVE FORMULAS

Radius= $R = \frac{50}{\sin \frac{D}{2}}$ (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) $\Delta = \text{Central Angle}$

EXPLANATION AND USE OF TABLES

Stations.—Given $P. I. = \text{Sta. } 161 + 60.35$ to find $\text{Sta. of } P. C.$ and $P. T.$ $\Delta = 62^\circ 10'$ $D = 3^\circ 20'$. From Table IV for 1° curve $T = 3454.1$ and $\div 8\frac{1}{3} = 414.49$ ft. From Table V correction $= .36$ or $T = 414.85$ ft. $P. C. = \text{Sta. } P. I. - T = 157 + 45.50$. Also from (4) $L = 746.00$ and $P. T. = \text{Sta. } P. C. + L = 164 + 91.50$.

Offsets.—Tangent offsets vary (approximately) directly with D and with square of the distance. Thus tangent offset for $\text{Sta. } 158$ on above curve is 2.16 ft. found as follows. From Table III tangent offset for 100 ft. $= 7.27$ ft. Distance $= 158 - \text{Sta. } P. C. = 54.50$, 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. $= (\text{in minutes}) .3 \times C \times D^\circ$ or $= \text{defl. for } 1 \text{ ft. from Table III} \times C$. For $\text{Sta. } 158$ of above curve $= .3 \times 54.5 \times 8\frac{1}{3} = 136.2'$ or $2^\circ 16.2'$, or $= 2.50 \times 54.5 = 136.2'$ from Table III. For $\text{Sta. } 159$ 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 $8^\circ 20' = 960.6 \div 8\frac{1}{3} = 91.27$ 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	1/8	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.—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'	781.64	1.600	6.395	2.20
30	11459.2	.109	.436	0.15	30	764.49	1.837	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 10'	5729.65	.218	.873	0.30	8 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 20'	637.28	1.965	7.846	2.70
	3125.36	.400	1.600	0.55	30	614.56	2.037	8.136	2.80
2 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		593.42	2.110	8.426	2.90
30	2455.70	.509	2.036	0.70	10 30'	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	40	521.67	2.402	9.585	3.30
	2022.41	.618	2.472	0.85	11 30'	499.06	2.511	10.02	3.45
3 10'	1910.08	.655	2.618	0.90	12 30'	478.34	2.620	10.45	3.60
20	1809.57	.691	2.763	0.95	30	459.28	2.730	10.89	3.75
30	1719.12	.727	2.908	1.00	40	441.68	2.839	11.32	3.90
40	1637.28	.764	3.054	1.05	13 30'	425.40	2.949	11.75	4.05
50	1562.88	.800	3.199	1.10	14 30'	410.28	3.058	12.18	4.20
	1494.95	.836	3.345	1.15	30	396.20	3.168	12.62	4.35
4 10'	1432.69	.873	3.490	1.20	15 30'	383.07	3.277	13.05	4.50
20	1375.40	.909	3.635	1.25	30	370.78	3.387	13.49	4.65
30	1322.53	.945	3.718	1.30	40	359.27	3.496	13.92	4.80
40	1273.57	.982	3.926	1.35	16 30'	348.45	3.606	14.35	4.95
50	1228.11	1.018	4.071	1.40	17 30'	338.27	3.716	14.78	5.10
	1185.78	1.055	4.217	1.45	18 30'	319.62	3.935	15.64	5.40
5 10'	1146.28	1.091	4.362	1.50	19 30'	302.94	4.155	16.51	5.70
20	1109.33	1.127	4.507	1.55	20 30'	287.94	4.374	17.37	6.00
30	1074.68	1.164	4.653	1.60	21 30'	274.37	4.594	18.22	6.30
40	1042.14	1.200	4.798	1.65	22 30'	262.04	4.814	19.08	6.60
50	1011.51	1.237	4.943	1.70	23 30'	250.79	5.035	19.94	6.90
	982.64	1.273	5.088	1.75	24 30'	240.49	5.255	20.79	7.20
6 10'	955.37	1.309	5.234	1.80	25 30'	231.01	5.476	21.64	7.50
20	929.57	1.346	5.379	1.85	26 30'	222.27	5.697	22.50	7.80
30	905.13	1.382	5.524	1.90	27 30'	214.18	5.918	23.35	8.10
40	881.95	1.418	5.669	1.95	28 30'	206.68	6.139	24.19	8.40
50	859.92	1.455	5.814	2.00	29 30'	199.70	6.360	25.04	8.70
					30 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 10	100.01	.87	12 10	602.21	31.56	22 10	1113.7	107.24
20	116.68	1.19	20	610.64	32.45	20	1122.4	108.90
30	125.02	1.36	30	619.07	33.35	30	1131.0	110.57
40	133.36	1.55	40	627.50	34.26	40	1139.7	112.25
50	141.70	1.75	50	635.93	35.18	50	1148.4	113.95
				644.37	36.12		1157.0	115.66
3 10	150.04	1.96	13 10	652.81	37.07	23 10	1165.7	117.38
20	166.72	2.43	20	661.25	38.03	20	1174.4	119.12
30	175.06	2.67	30	669.70	39.01	30	1183.1	120.87
40	183.40	2.93	40	678.15	39.99	40	1191.8	122.63
50	191.74	3.21	50	686.60	40.99	50	1200.5	124.41
				695.06	42.00		1209.2	126.20
4 10	200.08	3.49	14 10	703.51	43.03	24 10	1217.9	128.00
20	208.43	3.79	20	711.97	44.07	20	1226.6	129.82
30	216.77	4.10	30	720.44	45.12	30	1235.3	131.65
40	225.12	4.42	40	728.90	46.18	40	1244.0	133.50
50	233.47	4.76	50	737.37	47.25	50	1252.8	135.35
	241.81	5.10		745.85	48.34		1261.5	137.23
5 10	250.16	5.46	15 10	754.32	49.44	25 10	1270.2	139.11
20	258.51	5.83	20	762.80	50.55	20	1279.0	141.01
30	266.86	6.21	30	771.29	51.68	30	1287.7	142.93
40	275.21	6.61	40	779.77	52.89	40	1296.5	144.85
50	283.57	7.01	50	788.26	53.97	50	1305.3	146.79
	291.92	7.43		796.75	55.13		1314.0	148.75
6 10	300.28	7.86	16 10	805.25	56.31	26 10	1322.8	150.71
20	308.64	8.31	20	813.75	57.50	20	1331.6	152.69
30	316.99	8.76	30	822.25	58.70	30	1340.4	154.69
40	325.35	9.23	40	830.76	59.91	40	1349.2	156.70
50	333.71	9.71	50	839.27	61.14	50	1358.0	158.72
	342.08	10.20		847.78	62.38		1366.8	160.76
7 10	350.44	10.71	17 10	856.30	63.63	27 10	1375.6	162.81
20	358.81	11.22	20	864.82	64.90	20	1384.4	164.86
30	367.17	11.75	30	873.35	66.18	30	1393.2	166.95
40	375.54	12.29	40	881.88	67.47	40	1402.0	169.04
50	383.91	12.85	50	890.41	68.77	50	1410.9	171.15
	392.28	13.41		898.95	70.09		1419.7	173.27
8 10	400.66	13.99	18 10	907.49	71.42	28 10	1428.6	175.41
20	409.03	14.58	20	916.03	72.76	20	1437.4	177.55
30	417.41	15.18	30	924.58	74.12	30	1446.3	179.72
40	425.79	15.80	40	933.13	75.49	40	1455.1	181.89
50	434.17	16.43	50	941.69	76.86	50	1464.0	184.08
	442.55	17.07		950.25	78.26		1472.9	186.29
9 10	450.93	17.72	19 10	958.81	79.67	29 10	1481.8	188.51
20	459.32	18.38	20	967.38	81.09	20	1490.7	190.74
30	467.71	19.06	30	975.96	82.53	30	1499.6	192.99
40	476.10	19.75	40	984.53	83.97	40	1508.5	195.25
50	484.49	20.45	50	993.12	85.43	50	1517.4	197.53
	492.88	21.16		1001.7	86.90		1526.3	199.82
10 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	23.38	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	94.45	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	300.6	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	1808.2	81°	4893.6	1805.3
10'	3386.3	925.9	10'	4099.5	1815.0	10'	4908.0	1814.7
20	3397.5	931.6	20	4112.1	1822.9	20	4922.5	1824.1
30	3408.8	937.3	30	4124.8	1830.3	30	4937.0	1833.6
40	3420.1	943.1	40	4137.4	1837.7	40	4951.5	1843.1
50	3431.4	948.9	50	4150.1	1845.1	50	4966.1	1852.6
62	3442.7	954.8	72	4162.8	1852.6	82	4980.7	1862.2
10	3454.1	960.6	10	4175.6	1860.1	10	4995.4	1871.5
20	3465.4	966.5	20	4188.5	1867.6	20	5010.0	1881.5
30	3476.8	972.4	30	4201.2	1875.2	30	5024.8	1891.2
40	3488.3	978.3	40	4214.0	1882.8	40	5039.5	1900.9
50	3499.7	984.3	50	4226.8	1890.4	50	5054.3	1910.7
63	3511.1	990.2	73	4239.7	1898.0	83	5069.2	1920.5
10	3522.6	996.2	10	4252.6	1905.7	10	5084.0	1930.4
20	3534.1	1002.3	20	4265.6	1913.5	20	5099.0	1940.3
30	3545.6	1008.3	30	4278.5	1921.2	30	5113.9	1950.3
40	3557.2	1014.4	40	4291.5	1929.0	40	5128.9	1960.2
50	3568.7	1020.5	50	4304.6	1936.8	50	5143.9	1970.3
64	3580.3	1026.6	74	4317.6	1944.6	84	5159.0	1980.4
10	3591.9	1032.8	10	4330.7	1952.5	10	5174.1	1990.5
20	3603.5	1039.0	20	4343.8	1960.4	20	5189.3	2000.6
30	3615.1	1045.2	30	4356.9	1968.4	30	5204.4	2010.8
40	3626.8	1051.4	40	4370.1	1976.4	40	5219.7	2021.1
50	3638.5	1057.7	50	4383.3	1984.4	50	5234.9	2031.4
65	3650.2	1063.9	75	4396.5	1992.4	85	5250.3	2041.7
10	3661.9	1070.2	10	4409.8	2000.5	10	5265.6	2052.1
20	3673.7	1076.6	20	4423.1	2008.6	20	5281.0	2062.5
30	3685.4	1082.9	30	4436.4	2016.7	30	5296.4	2073.0
40	3697.2	1089.3	40	4449.7	2024.9	40	5311.9	2083.5
50	3709.0	1095.7	50	4463.1	2033.1	50	5327.4	2094.1
66	3720.9	1102.2	76	4476.5	2041.4	86	5343.0	2104.7
10	3732.7	1108.6	10	4489.9	2049.7	10	5358.6	2115.3
20	3744.6	1115.1	20	4503.4	2058.0	20	5374.2	2126.0
30	3756.5	1121.7	30	4516.9	2066.3	30	5389.9	2136.7
40	3768.5	1128.2	40	4530.4	2074.7	40	5405.6	2147.5
50	3780.4	1134.8	50	4544.0	2083.1	50	5421.4	2158.4
67	3792.4	1141.4	77	4557.6	2091.6	87	5437.2	2169.2
10	3804.4	1148.0	10	4571.2	2100.1	10	5453.1	2180.2
20	3816.4	1154.7	20	4584.8	2108.6	20	5469.0	2191.1
30	3828.4	1161.3	30	4598.5	2117.1	30	5484.9	2202.2
40	3840.5	1168.1	40	4612.2	2125.7	40	5500.9	2213.2
50	3852.6	1174.8	50	4626.0	2134.4	50	5517.0	2224.3
68	3864.7	1181.6	78	4639.8	2143.0	88	5533.1	2235.5
10	3876.8	1188.4	10	4653.6	2151.7	10	5549.2	2246.7
20	3889.0	1195.2	20	4667.4	2160.5	20	5565.4	2258.0
30	3901.2	1202.0	30	4681.3	2169.2	30	5581.6	2269.3
40	3913.4	1208.9	40	4695.2	2178.1	40	5597.8	2280.6
50	3925.6	1215.8	50	4709.2	2186.9	50	5614.2	2292.0
69	3937.9	1222.7	79	4723.2	2195.8	89	5630.5	2303.5
10	3950.2	1229.7	10	4737.2	2204.7	10	5646.9	2315.0
20	3962.5	1236.7	20	4751.2	2213.7	20	5663.4	2326.6
30	3974.8	1243.7	30	4765.3	2222.7	30	5679.9	2338.2
40	3987.2	1250.8	40	4779.4	2231.7	40	5696.4	2349.8
50	3999.5	1257.9	50	4793.6	2240.3	50	5713.0	2361.5
70	4011.9	1265.0	80	4807.7	2249.9	90	5729.7	2373.3
10	4024.4	1272.1	10	4822.0	2259.0	10	5746.3	2385.1
20	4036.8	1279.3	20	4836.2	2268.2	20	5763.1	2397.0
30	4049.3	1286.5	30	4850.5	2277.4	30	5779.9	2

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	3138.3	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	.53	.58	.63	.68
20°	.06	.13	.19	.26	.32	.39	.45	.51	.58	.65	.72	.79	.84	.90
25°	.08	.16	.24	.33	.40	.49	.58	.67	.75	.83	.90	.99	1.06	1.14
30°	.10	.19	.29	.39	.49	.59	.69	.79	.89	.99	1.09	1.20	1.29	1.39
35°	.11	.22	.34	.47	.58	.69	.79	.81	.92	1.04	1.29	1.42	1.54	1.66
40°	.13	.26	.40	.53	.67	.80	.93	1.06	1.20	1.34	1.49	1.64	1.79	1.94
45°	.15	.30	.44	.60	.76	.91	1.06	1.21	1.37	1.52	1.70	1.87	2.04	2.21
50°	.17	.34	.51	.68	.85	1.02	1.19	1.36	1.54	1.72	1.91	2.10	2.29	2.48
55°	.19	.38	.57	.76	.95	1.14	1.32	1.52	1.72	1.92	2.14	2.35	2.56	2.77
60°	.21	.42	.63	.84	1.05	1.27	1.49	1.71	1.94	2.17	2.38	2.60	2.83	3.07
65°	.23	.46	.69	.93	1.16	1.40	1.64	1.88	2.13	2.38	2.63	2.88	3.13	3.39
70°	.25	.51	.76	1.02	1.28	1.54	1.80	2.06	2.33	2.60	2.88	3.16	3.44	3.72
75°	.27	.56	.83	1.12	1.40	1.69	1.98	2.27	2.57	2.87	3.16	3.47	3.78	4.09
80°	.30	.61	.91	1.22	1.53	1.84	2.15	2.46	2.78	3.10	3.44	3.78	4.12	4.46
85°	.33	.66	1.00	1.33	1.68	2.02	2.36	2.70	3.05	3.40	3.77	4.14	4.55	4.89
90°	.36	.72	1.09	1.45	1.83	2.20	2.57	2.94	3.32	3.70	4.10	4.50	4.91	5.32
95°	.39	.79	1.19	1.55	2.00	2.40	2.80	3.20	3.61	4.02	4.40	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	.037	.043	.049	.056	.063	.071
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	.127	.135
30°	.013	.025	.038	.051	.065	.078	.090	.103	.116	.129	.149	.170	.179	.188
35°	.018	.035	.054	.072	.089	.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°	.055	.112	.169	.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	.183	.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	2.53
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	5.33

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	.09	.09	.07	.04	.25	6	199.73	298.90	397.26	494.53
15	.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	.15	.15	.12	.07	.41	8	199.51	298.05	395.14	490.31
20	.05	.10	.14	.17	.19	.20	.20	.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
25	.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	196.99	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
35	.17	.32	.45	.56	.62	.64	.59	.48	.28	1.66	24	195.53	282.71	357.43	416.53
38	.18	.36	.51	.62	.70	.71	.66	.53	.31	1.88	26	194.57	279.76	350.30	402.89
40	.21	.40	.56	.69	.77	.79	.73	.59	.35	2.06	28	194.00	276.59	342.69	388.42
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	1.20	.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

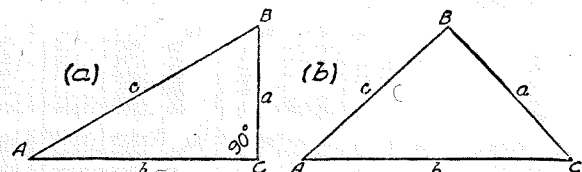
SLOPE REDUCTIONS.

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.

Angle	Sine.	Tan.	Cotg.	Cosin.	Angle	Sine.	Tan.	Cotg.	Cosin.
0°	0	0	∞	1	90°	1	∞	0	0
10	.0029	.0029	343.3	.99998	50	.7660	.7660	.7660	.6428
20	.0058	.0058	171.9	.99996	40	.6428	.6428	.6428	.3572
30	.0087	.0087	114.6	.99993	30	.5000	.5000	.5000	.8660
40	.0116	.0116	85.94	.99989	20	.3420	.3420	.3420	.9333
50	.0145	.0145	68.75	.99985	10	.1736	.1736	.1736	.9848
1	.0175	.0175	57.29	.99980	89	.9848	.9848	.9848	.1736
10	.0204	.0204	49.10	.99974	50	.7660	.7660	.7660	.6428
20	.0233	.0233	42.96	.99967	40	.6428	.6428	.6428	.3572
30	.0262	.0262	38.19	.99959	30	.5000	.5000	.5000	.8660
40	.0291	.0291	34.37	.99950	20	.3420	.3420	.3420	.9333
50	.0320	.0320	31.24	.99940	10	.1736	.1736	.1736	.9848
2	.0349	.0349	28.64	.99930	88	.9848	.9848	.9848	.1736
10	.0378	.0378	26.43	.99919	50	.7660	.7660	.7660	.6428
20	.0407	.0407	24.54	.99907	40	.6428	.6428	.6428	.3572
30	.0436	.0437	22.90	.99895	30	.5000	.5000	.5000	.8660
40	.0465	.0466	21.47	.99882	20	.3420	.3420	.3420	.9333
50	.0494	.0495	20.21	.99868	10	.1736	.1736	.1736	.9848
3	.0523	.0524	19.08	.99853	87	.9848	.9848	.9848	.1736
10	.0552	.0553	18.07	.99837	50	.7660	.7660	.7660	.6428
20	.0581	.0582	17.17	.99821	40	.6428	.6428	.6428	.3572
30	.0610	.0612	16.35	.99803	30	.5000	.5000	.5000	.8660
40	.0640	.0641	15.60	.99785	20	.3420	.3420	.3420	.9333
50	.0669	.0670	14.92	.99776	10	.1736	.1736	.1736	.9848
4	.0698	.0699	14.30	.99756	86	.9848	.9848	.9848	.1736
10	.0727	.0729	13.73	.99736	50	.7660	.7660	.7660	.6428
20	.0756	.0758	13.20	.99714	40	.6428	.6428	.6428	.3572
30	.0785	.0787	12.71	.99692	30	.5000	.5000	.5000	.8660
40	.0814	.0816	12.25	.99668	20	.3420	.3420	.3420	.9333
50	.0843	.0846	11.83	.99644	10	.1736	.1736	.1736	.9848
5	.0872	.0875	11.43	.99619	85	.9848	.9848	.9848	.1736
10	.0901	.0904	11.06	.99594	50	.7660	.7660	.7660	.6428
20	.0929	.0934	10.71	.99567	40	.6428	.6428	.6428	.3572
30	.0958	.0963	10.39	.99540	30	.5000	.5000	.5000	.8660
40	.0987	.0992	10.08	.99511	20	.3420	.3420	.3420	.9333
50	.1016	.1022	9.788	.99482	10	.1736	.1736	.1736	.9848
6	.1045	.1051	9.514	.99452	84	.9848	.9848	.9848	.1736
10	.1074	.1080	9.255	.99421	50	.7660	.7660	.7660	.6428
20	.1103	.1110	9.010	.99390	40	.6428	.6428	.6428	.3572
30	.1132	.1139	8.777	.99357	30	.5000	.5000	.5000	.8660
40	.1161	.1169	8.556	.99324	20	.3420	.3420	.3420	.9333
50	.1190	.1198	8.345	.99290	10	.1736	.1736	.1736	.9848
7	.1219	.1228	8.144	.99255	83	.9848	.9848	.9848	.1736
10	.1248	.1257	7.953	.99219	50	.7660	.7660	.7660	.6428
20	.1276	.1287	7.770	.99182	40	.6428	.6428	.6428	.3572
30	.1305	.1317	7.596	.99144	30	.5000	.5000	.5000	.8660
40	.1334	.1346	7.429	.99106	20	.3420	.3420	.3420	.9333
50	.1363	.1376	7.269	.99067	10	.1736	.1736	.1736	.9848
	Cosin.	Cotg.	Tan.	Sine.	Angle.				

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.	Angle	Sine.	Tan.	Cotg.	Cosin.
60°	.8660	1.732	.5774	.5000	30°	.5000	.5774	1.732	.8660
70	.9397	2.747	.3640	.3420	20	.3420	.3640	2.747	.9397
80	.9848	5.013	.1974	.1736	10	.1736	.1974	5.013	.9848
82	.9903	5.712	.1736	.1564	8	.1392	.1564	5.712	.9903
84	.9914	6.314	.1564	.1421	6	.1045	.1564	6.314	.9914
86	.9921	6.913	.1421	.1305	4	.0698	.1421	6.913	.9921
88	.9925	7.518	.1305	.1219	2	.0349	.1305	7.518	.9925
90	1	∞	0	0	0	0	∞	0	1
	Cosin.	Cotg.	Tan.	Sine.	Angle.				

TABLE VIII.—NATURAL TRIGONOMETRICAL FUNCTIONS.

Angle	Sine.	Tan.	Cotg.	Cosin.		Angle	Sine.	Tan.	Cotg.	Cosin.	
°						°					
32	.5299	.6249	1.600	.84805	58	30	.6225	.7954	1.257	.78261	30
10	.5324	.6289	1.580	.84650	50	40	.6248	.8002	1.250	.78079	20
20	.5348	.6330	1.580	.84493	40	50	.6271	.8050	1.242	.77897	10
30	.5373	.6371	1.570	.84339	30						
40	.5398	.6412	1.570	.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	.9713	1.030	.71732	50
						20	.6988	.9770	1.024	.71529	40
38	.6157	.7813	1.280	.78801	52	30	.7009	.9827	1.018	.71325	30
10	.6180	.7860	1.272	.78622	50	40	.7030	.9884	1.012	.71121	20
20	.6202	.7907	1.265	.78442	40	50	.7050	.9942	1.006	.70916	10
							.7071	1.	1.	.70711	45
											°
	Cosin.	Cotg.	Tan.	Sine.	Angle.		Cosin.	Cotg.	Tan.	Sine.	Angle.

TABLE IX.—CALCULATION OF EARTHWORK.

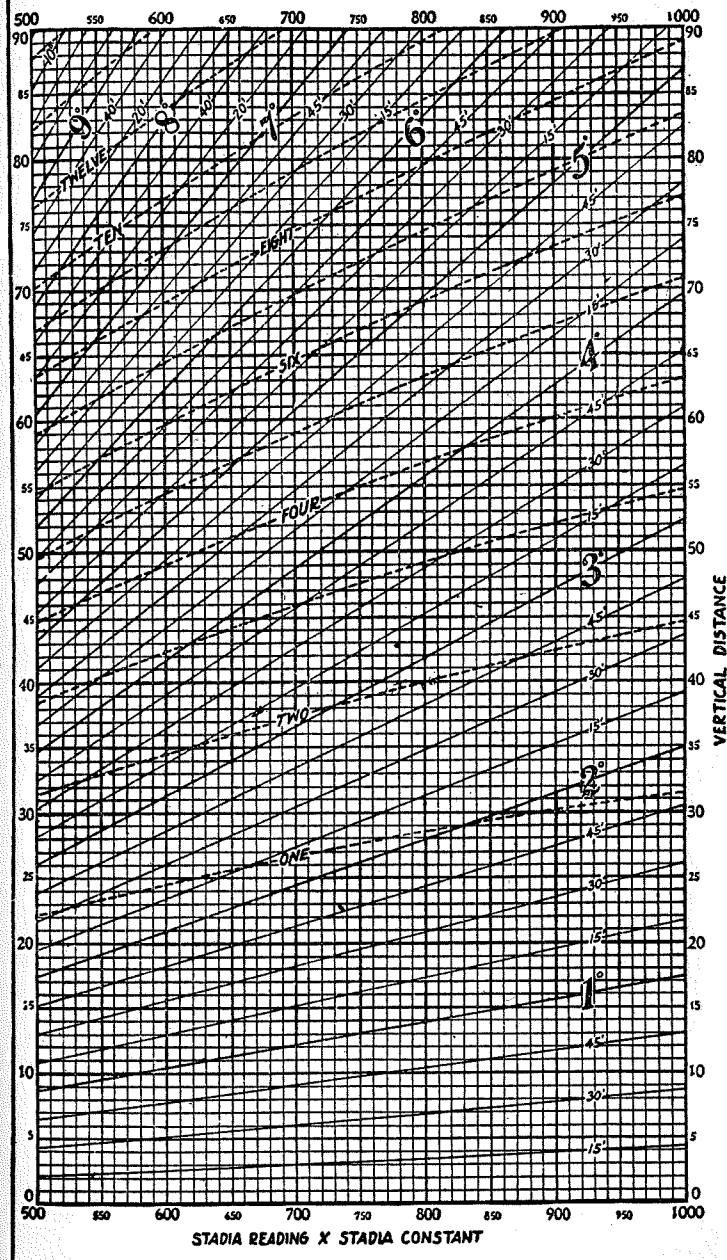
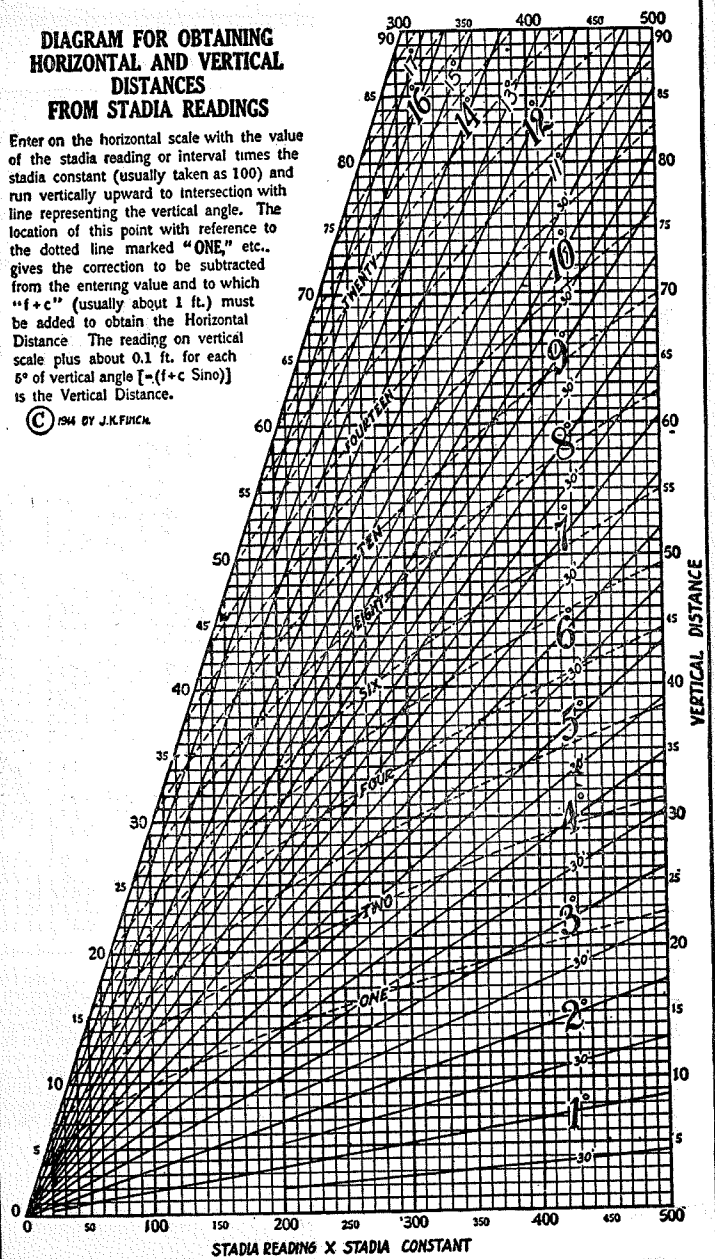
Width	HEIGHT														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	.02	.04	.06	.07	.09	.11	.13	.15	.17	.18	.20	.22	.24	.26	.28
2	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37	.41	.44	.48	.52	.56
3	.06	.11	.17	.22	.28	.33	.39	.44	.50	.56	.61	.67	.72	.78	.83
4	.07	.15	.22	.30	.37	.44	.52	.59	.67	.74	.81	.89	.96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

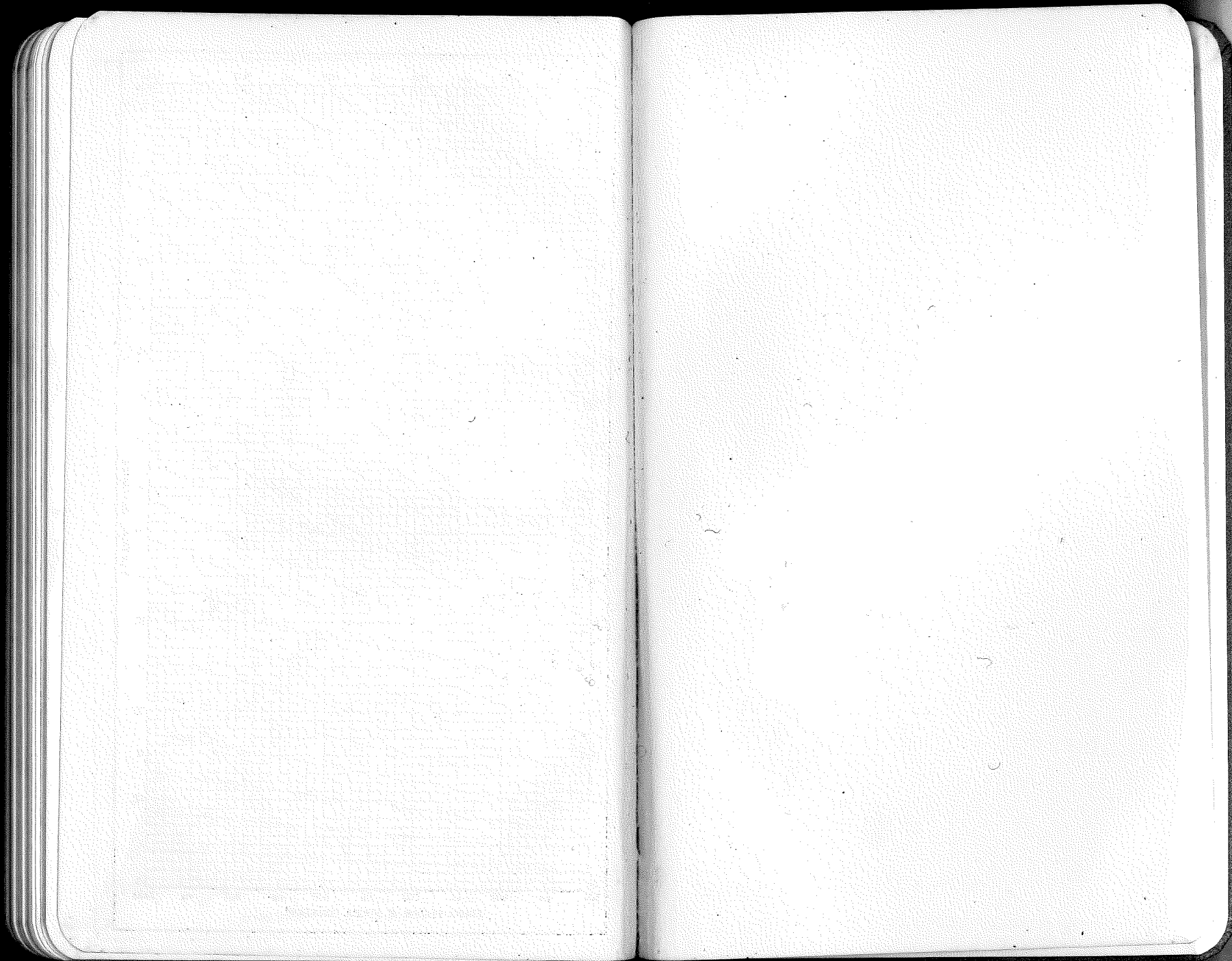
Table gives cu. yds. in 1 ft. of a triangle of given width and height. Corrections for tenths of

DIAGRAM FOR OBTAINING HORIZONTAL AND VERTICAL DISTANCES FROM STADIA READINGS

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

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39+60 - 18+00 st w of line
to South End of 8/10/47

55+31 H/T of front line

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	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.

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