

WARREN - BURTON RE

A.C.M. 325

SEC. G-1

307

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FIELD BOOK

1897

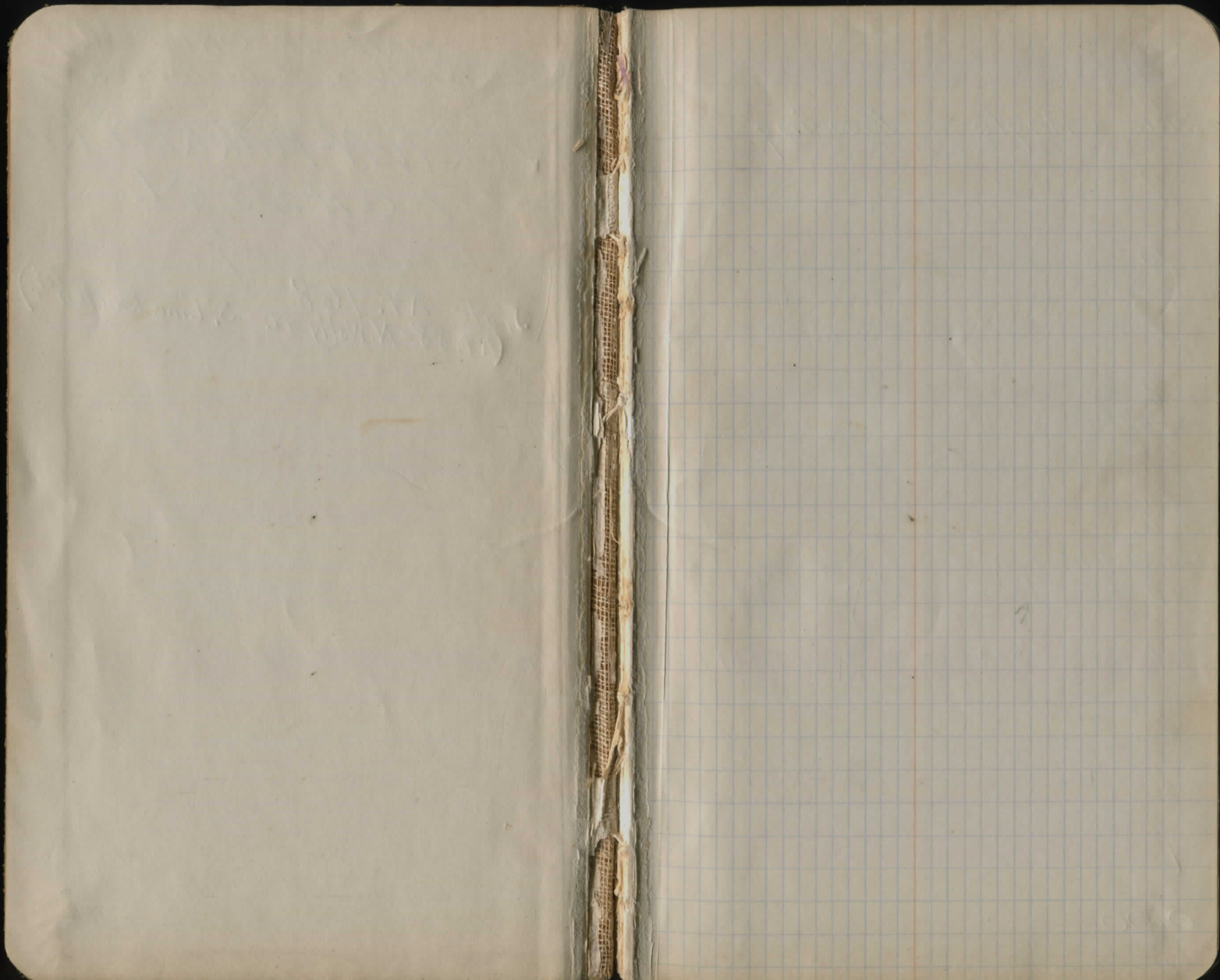
STATE OF OHIO  
DIVISION OF HIGHWAYS

BURTON-WARREN RD

1-C-H-325 G-I.

Geauga County

State Rt. 168  
(Rt. 88 - N. W. 1/4 to S. Line Burton<sup>Twp</sup>)



Sta. Angle Bearing

11

10

9

8

7

6

5

4

3

2

1

0+00

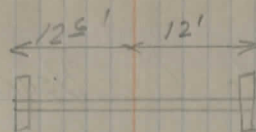
N 78 - 56 W

9-17-'27  
Hot

⊥

Hopping  
Field  
Graw

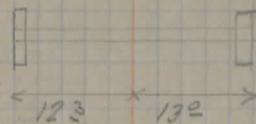
11+10 12" Corr. I.P.



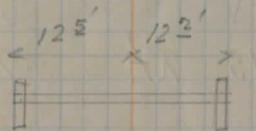
⊥ Street 10+96

⊥ Street 6+98

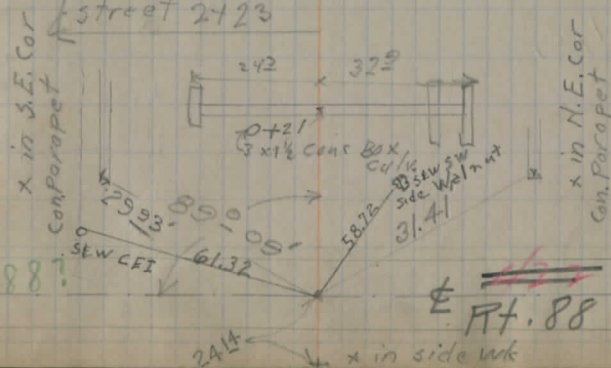
GA 12" Corr. I.P.



3+92 18" Corr. I.P.



⊥ Street 2+23



sta Angle Bearing

+4975  $\Delta$  0°-0'

20

19

18

17

(33.66)

+1134 P.T.

16

+563  $\Delta$  65°-45' Rt.

15

+7984 P.C.

14

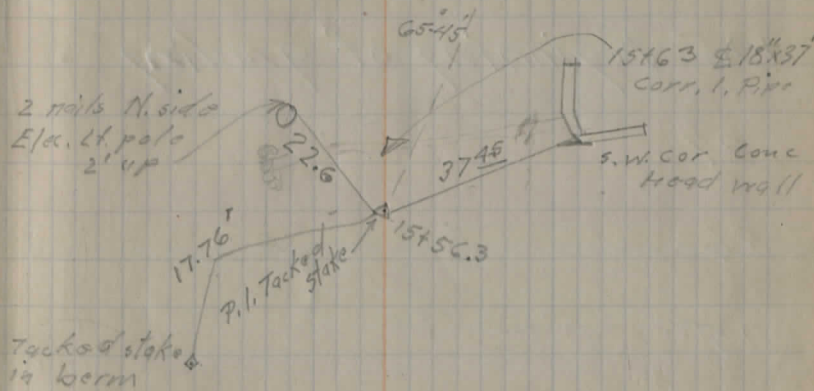
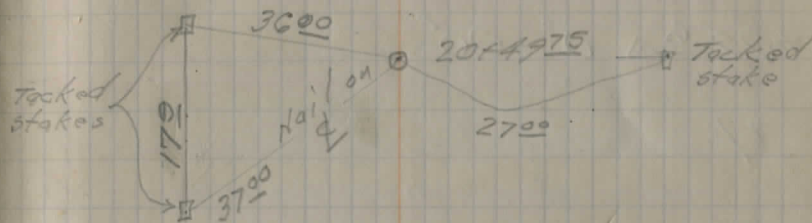
13

12

N. 13°-11' W

$\Delta = 65^{\circ}-45'$  Rt.  
 $D = 50^{\circ}00'$   
 $T = 76.46$   
 $L = 131.5$   
 $E = 217$   
 $R = 118.31$

N 78°-56' W



Sta

32

+09  $\Delta$  0°-00'

31

30

29

28

+35 Beginning of grading

27

26

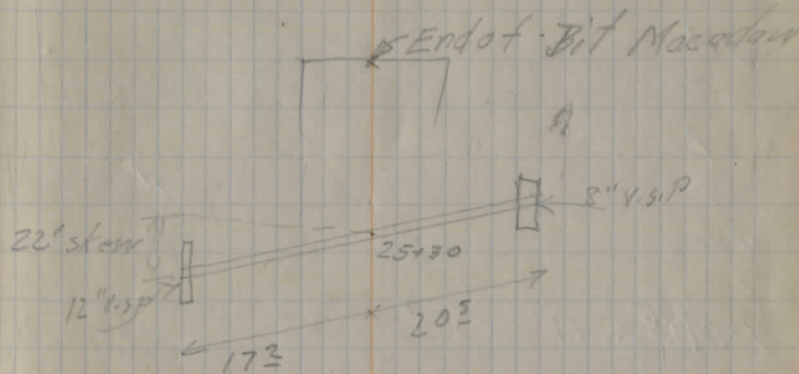
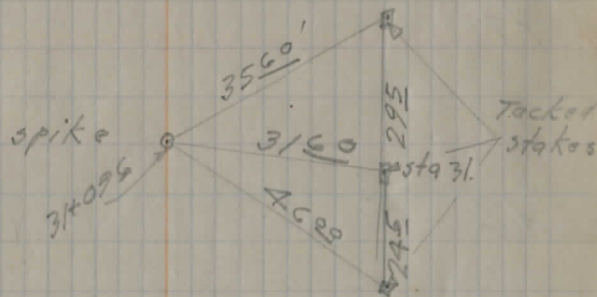
25

24

23

22

N 13° - 11' W



Sta  
44

A

B1

43

42

41

40

39

38

37

36

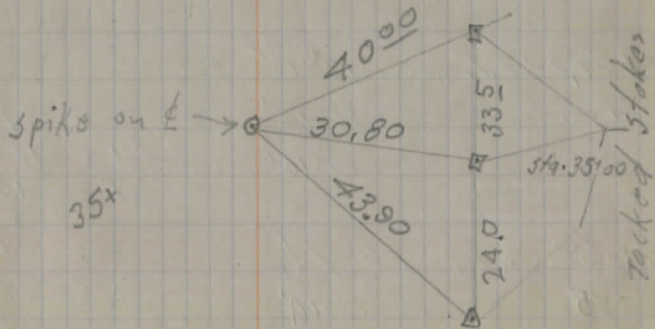
+04<sup>95</sup> Δ 0°-00'

35

34

33

N. 13° - 11' W



49, Angle Bearing  
 +2753 P.T.  $3^{\circ}-15'$  -  $N31^{\circ}-18'W$   $\Delta = 6^{\circ}-29'RT$   
 53  $2^{\circ}-58'$   $D = 30.00'$   
 +50  $2^{\circ}-05'$   $T = 108.42$   
 +1984  $\Delta$   $6^{\circ}-29'RT$   $L = 214.11$   
 $E = 3.1'$

52 +50 (38.5%)  $12^{\circ}-20'$   
 $0^{\circ}-35'$   
 +1142 P.C.  
 51

50

49

48

47

+6730 P.T. (177)  $12^{\circ}-18'$   
 +50  $11^{\circ}-16'$   
 46  $8^{\circ}-16'$

$\Delta = 24^{\circ}-36'LT$   
 $D = 122.00'$   
 $T = 104.30$   
 $L = 205.00$   
 $E = 11'$   
 $R = 478.339$

+666  $\Delta$   $24^{\circ}-36'LT$   
 +55  $5^{\circ}-34'$   
 45 (37.7)  $2^{\circ}-16'$   
 +623 P.C.

$N13^{\circ}-11'W$

2 Nails N side  
 14" Maple.

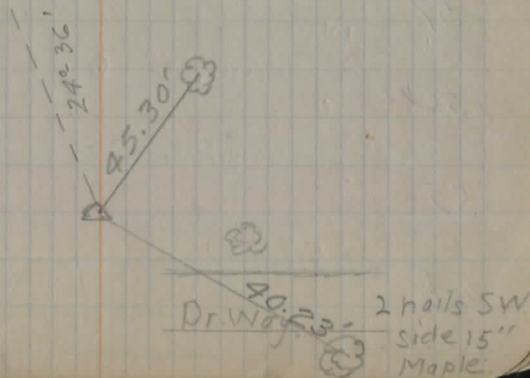
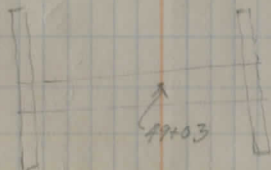
10-19-27  
 47.3 +  
 23.0' P.T.  $52+2753$   
 2 Nails in  
 S. 28" Maple

Harry  
 Field  
 Grov  
 Snyder

2 Nails in  
 NW side of  
 12" Apple

2 Nails  
 in NW side  
 of 18" Apple

36.94  
 58.80'





Sta A Br.

64

63

+454'  $\Delta$  0°-00'

62

61

60

59

58

57

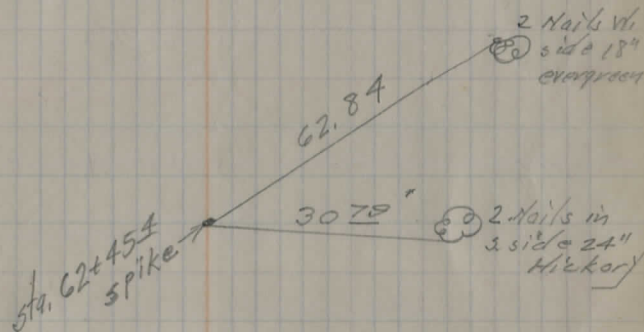
56

55

54

(42.47)

N. 31°-18' W.



Sta Angle Bearing

75

74

73

72

71

70

+72° Δ 0°00'

69

68

+88°

67

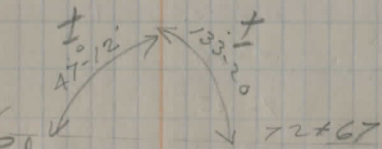
66

65

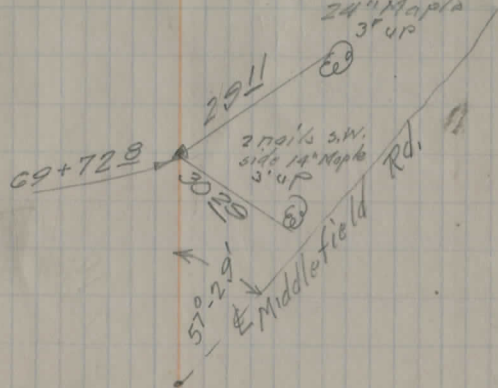
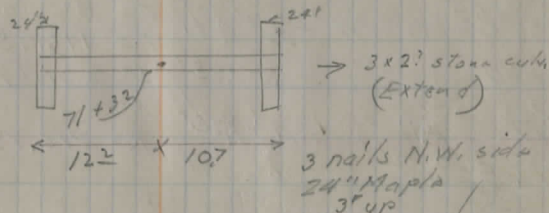
N 31° 18' W

←

Fry Road  
Nash Rd



74 207?  
ctr Rd?



Sta Angle Bearing

87

86

85 (273)

+97.27 RT

+50

84

+82.55  $\Delta$  18°-32' RT

+50

83 (344)

+65.60 RL

82

+52.25  $\Delta$  0°-00'

81

80

79

78

+53.77  $\Delta$  0°-00'

77

Def. L3.

9°-16'

7-22.5'

5°-22.5'

3°-22.5'

1°-22.5'

0°-00'

$\Delta = 18^\circ - 32' RT$

$D = 8^\circ - 00'$

$T = 116.95$

$L = 231.67$

$E = 9$

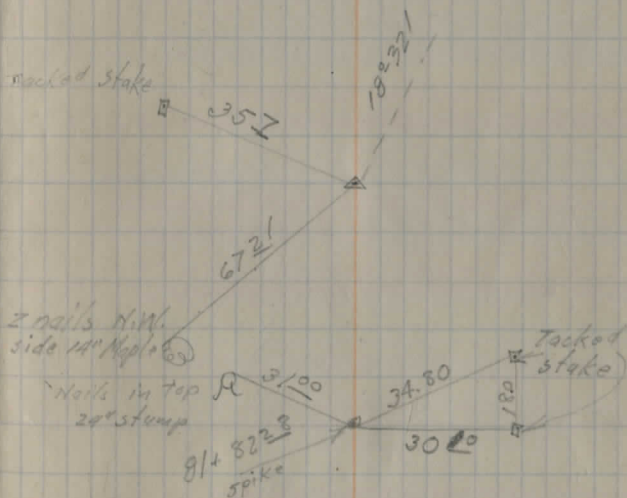
$R = 716.779$

N 97°-46' W

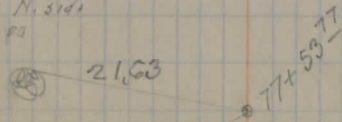
N 31°-15' W

9-20-27  
Windy

Hanna  
Field  
Gard  
Snyder



2 nails N. side  
12" outcrop



Sta      Angle      Bearing

99

N 12° 14' W

(525)

+475 Δ 0°-32' Rt,

98

97

96

95

94

93

92

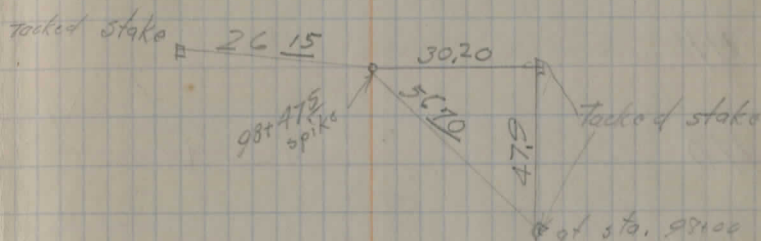
91

90

89

88

N 12° - 46' W



L

Sta. Angle Bearing

111

110

109

108

107

106

105

104

103

102

101

100

N 12° - 14' W

Sta. Angle Bearing

124

123

122

121

+835  $\Delta$  0°-14' Rt.

120

119

118

117

116

115

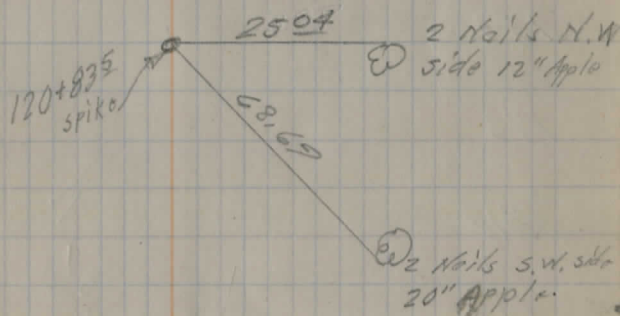
114

113

N 12° W

N 12°-14' W

E



Sta.	Angle	Bearing
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137

136

135

134

133

132

131

130

129

128

127

126

125

N 12° - W

Sta Angle Bearing

149

148

147

+77<sup>z</sup> Δ 0°-00'

146

W

145

12°

144

N

143

142

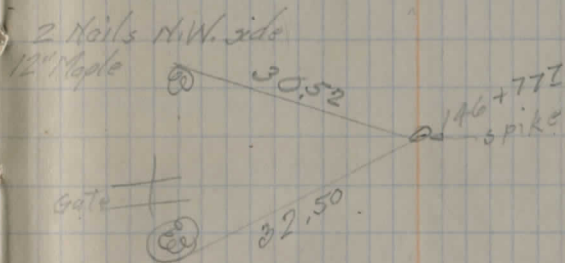
141

140

139

138

E





9-22-27

Herring  
Field  
Graw  
Snyder

Sta Angle Bearing

161

160

159

158

157

156

155

154

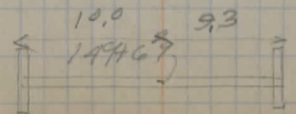
153

152

151

150

N 12° W



2.5' x 3 stone box  
concr. corr.

Sta Angle Bearing

173

172

171

170

+80<sup>33</sup>  $\Delta$  0°-08" Lt.

169

168

167

166

165

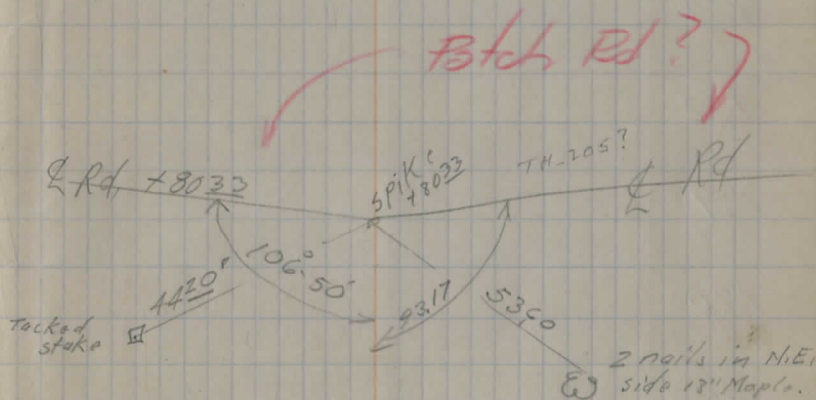
164

163

162

N 12°-21' W

N 12° W



Sta. Angle Br.

184

183

182

181

180

179

+108  $\triangle$  0°-00'

178

177

176

175

174

N 12°-08' W

2 Nails N. side  
12" Maple

35.75

2 Nails S. side  
12" Maple

21.42

6 piX E  
17871080

sta      Angle      Bearing

197

196

195

194

193

192

191

190

+31<sup>95</sup> Δ 0°-00'

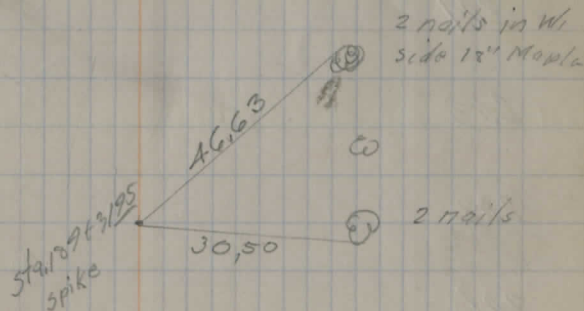
N 12°-08' W

189

188

187

186



Sta L

Br

210

209

208

207

206

205

204

203

202

201

200

199

198

N 120-08. W

Sta Angle Bearing

222

221

220

219

218

217

216

+20<sup>36</sup> Δ 0°-00'

215

214

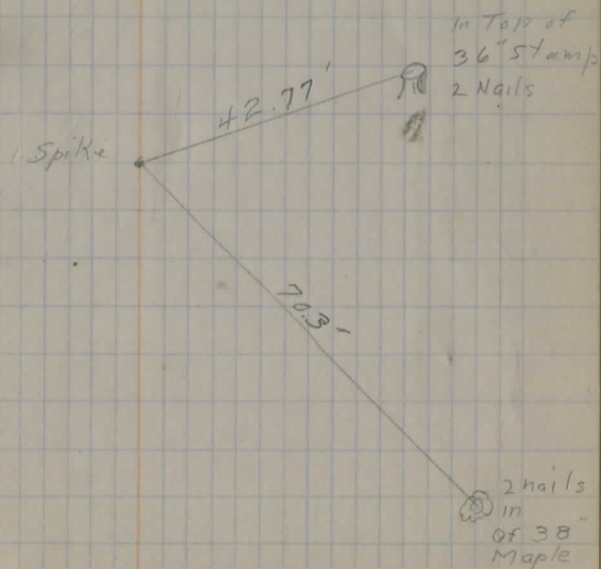
213

212

211

N 12° - 05' W

E



Sta Angle Bearing

+51.75 0°-16' Lt. (Med'm)

232

231

230

229

228

227

226

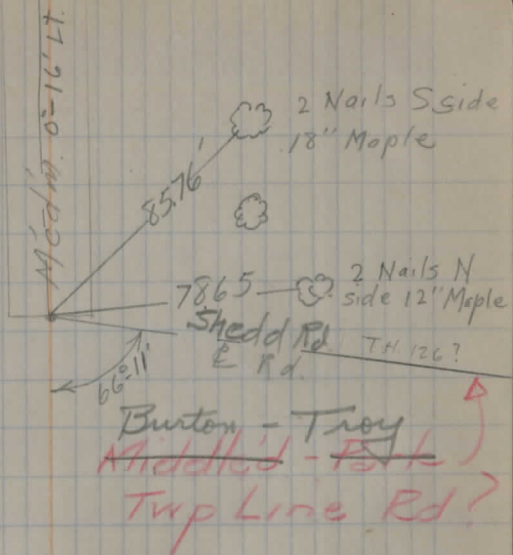
225

224

223

N 12° - 24' W

N 12° - 08' W



Sperry  
Grau  
Rossbach  
Bostwick

9/7/35 clear cool.

quit Sat Noon

240

239

238

237

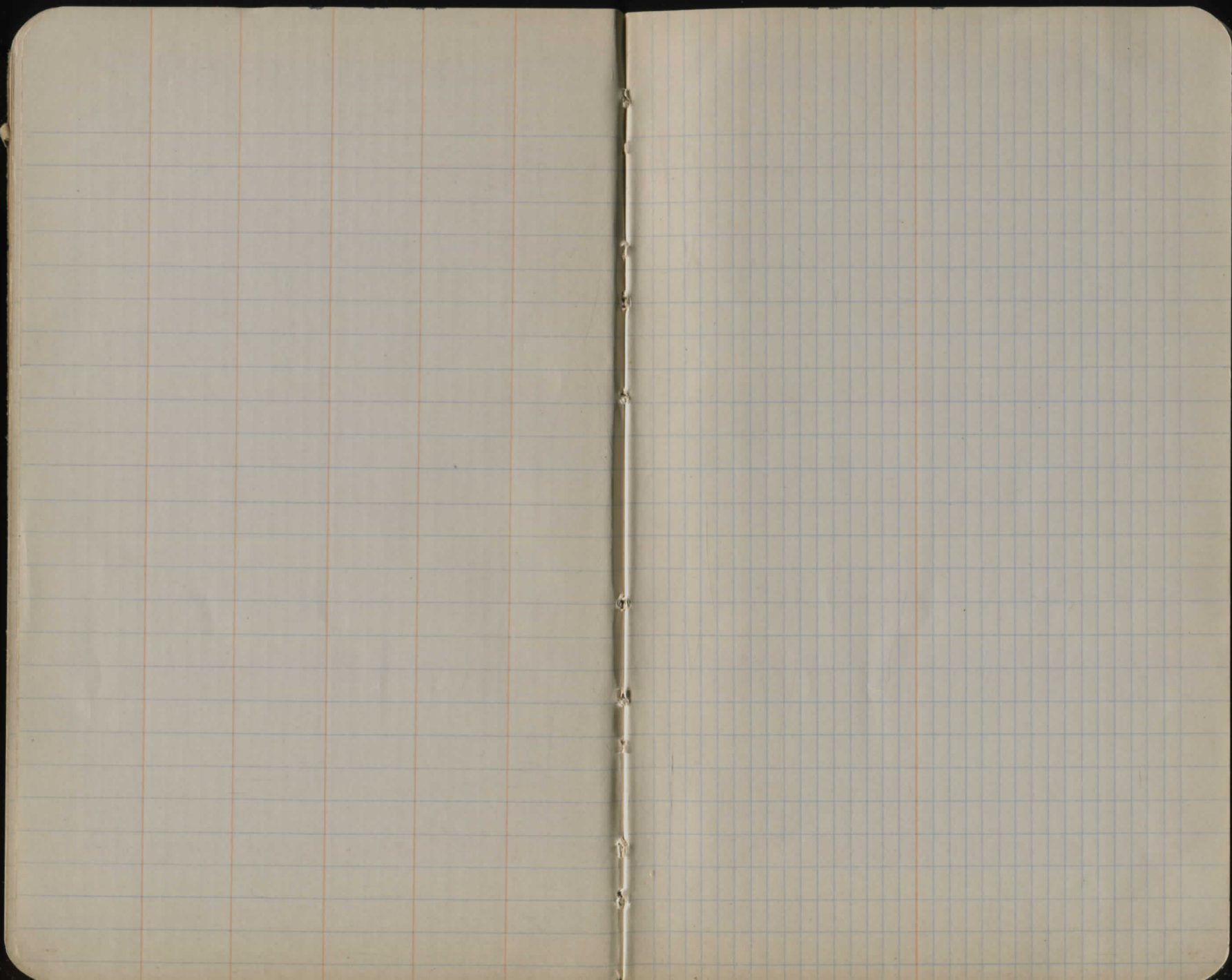
236

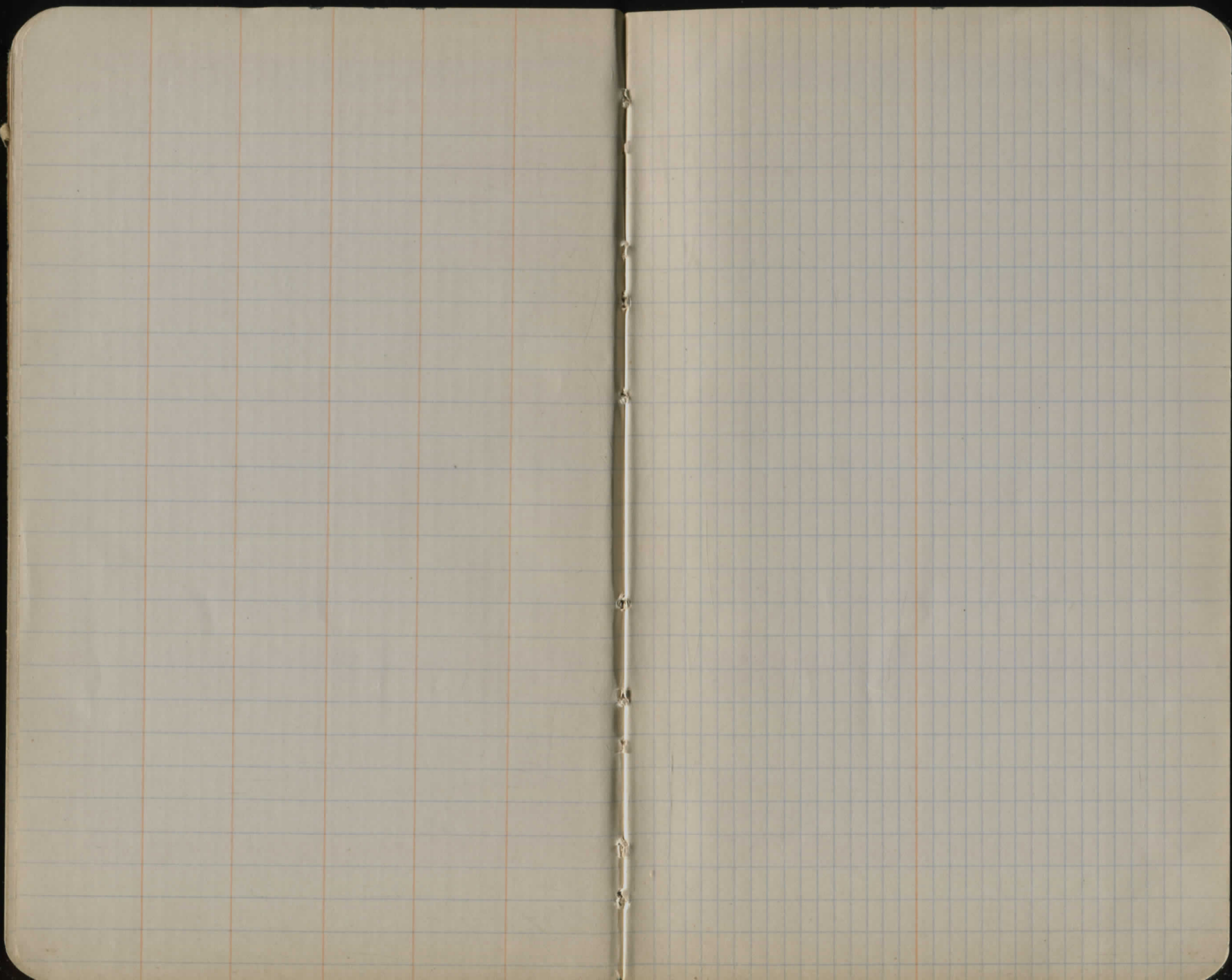
235

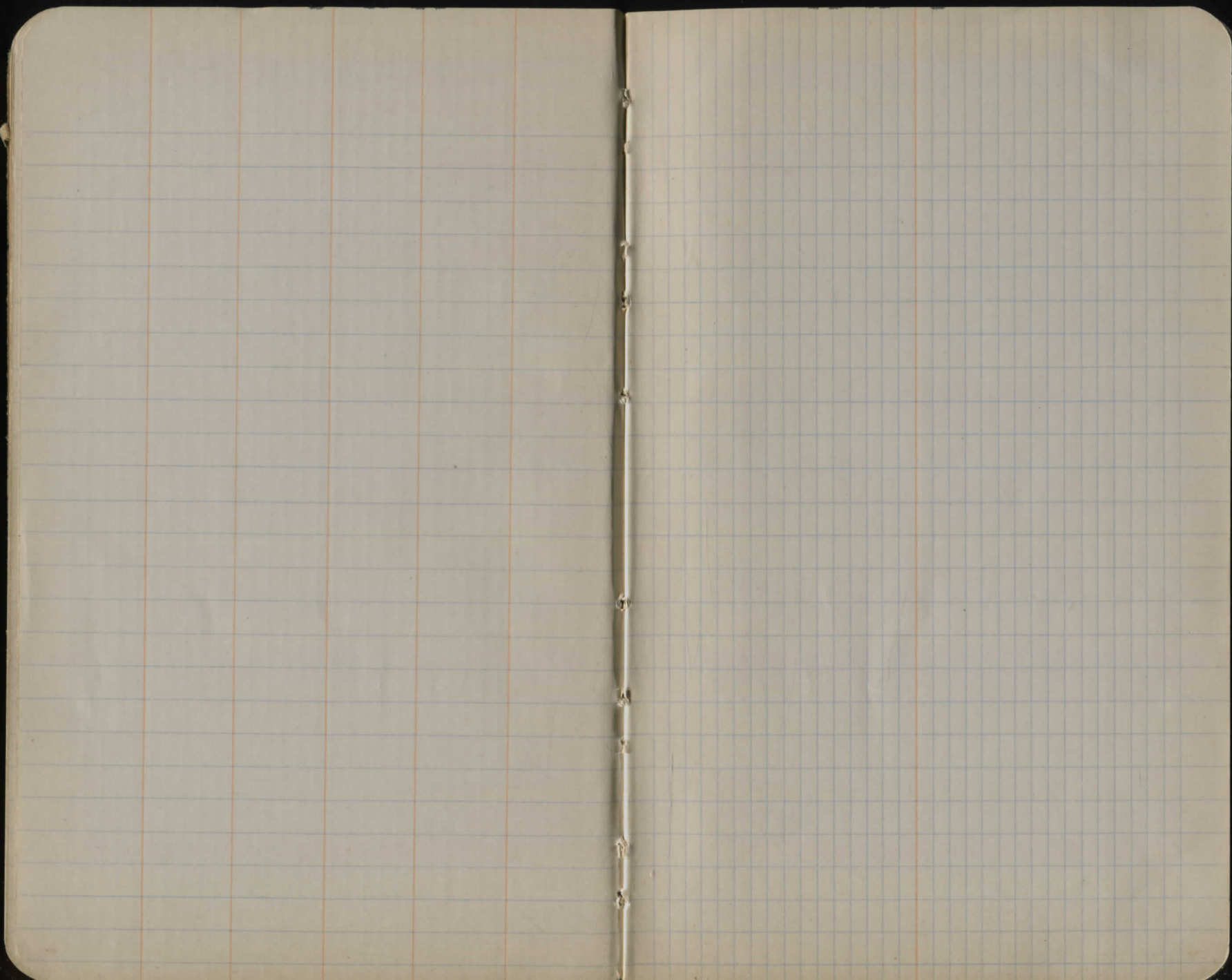
234

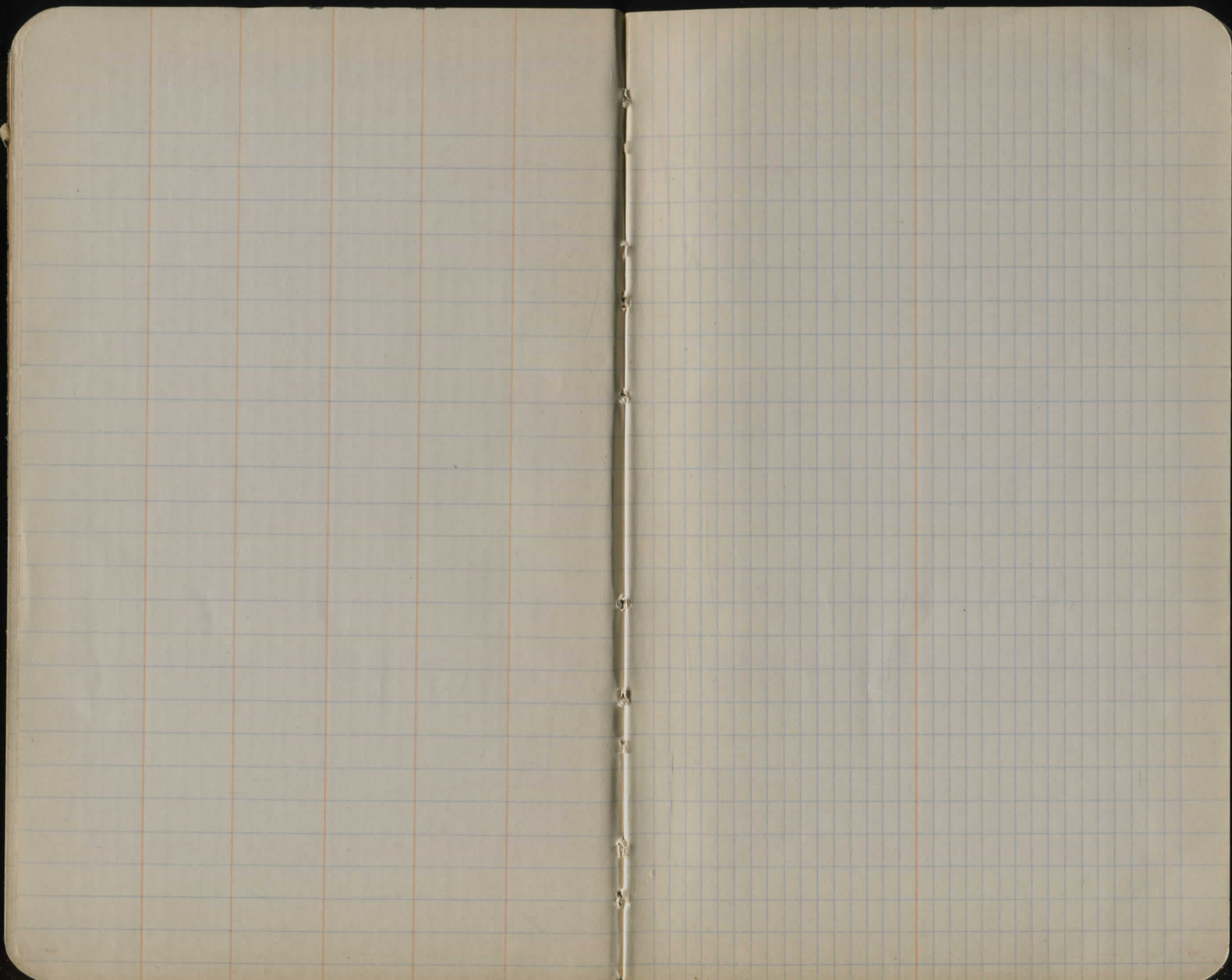
233

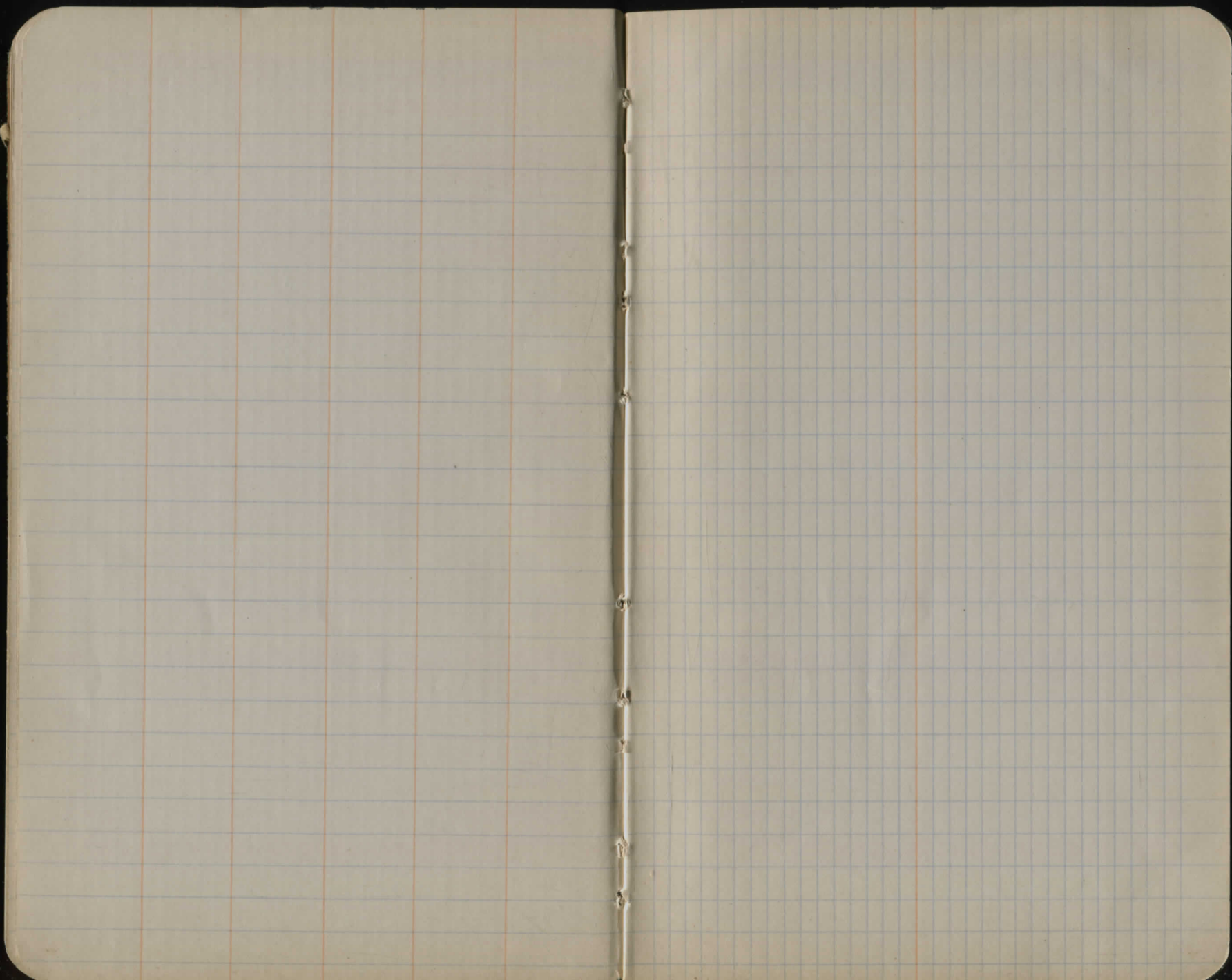


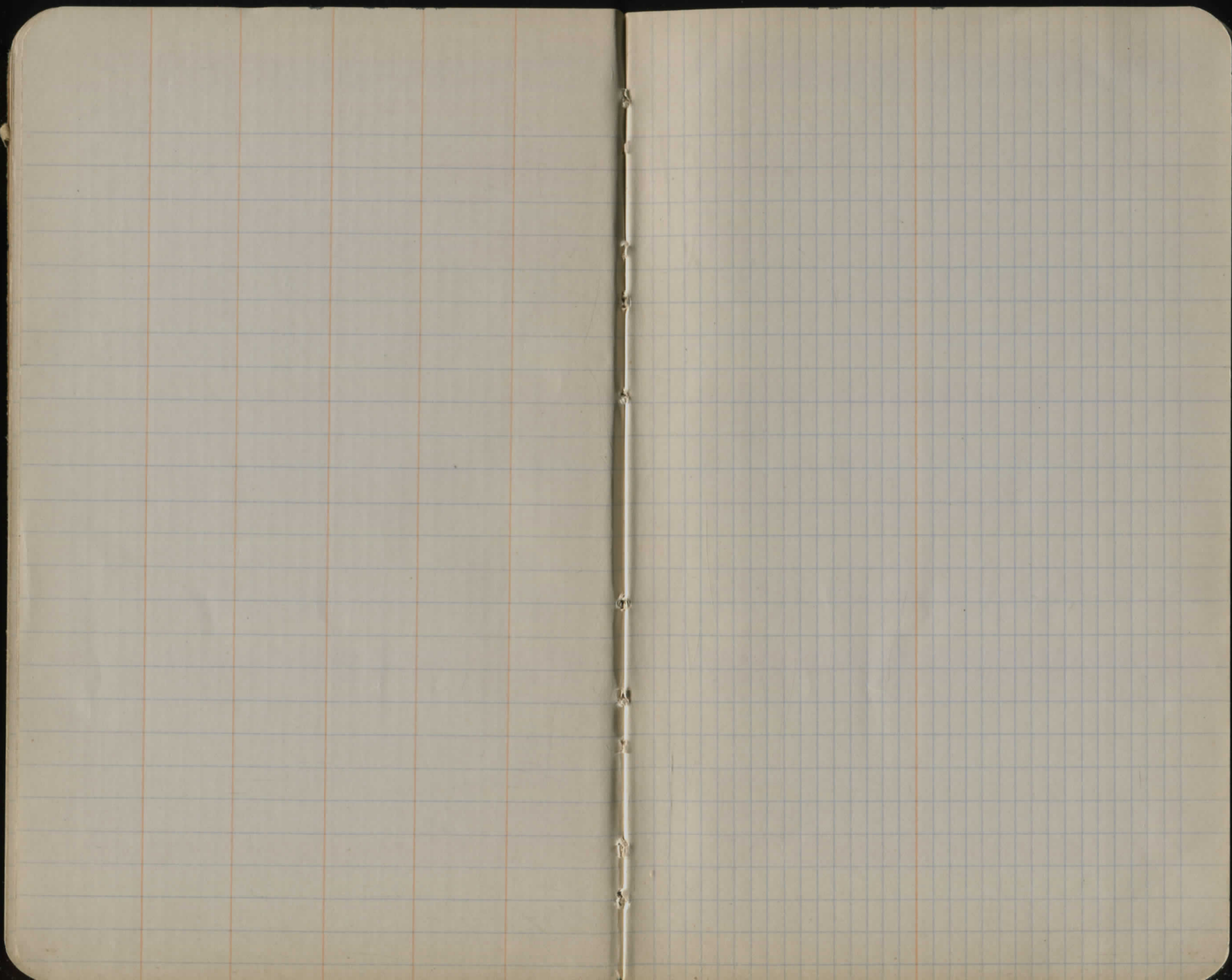












TOPO G

9-21-27  
Hanning  
Snyder

21 +70  
24' M  
22 53+35

PL 49+03

= DW 47+81  
Rd 24"

PL 47+42

= DW 45+45  
Rd 24"

Paul Farley  
Paul H. Arabellian  
Farley, L.

44+31 PL

= RW 37+05  
Rd 15"

35+05

C.D. Hosmer  
Charles D. Hosmer  
Laura M. Hosmer

F. Browning ✓

34+48

F. Browning ✓

U.S. Gen. Ail. [unclear]

28+60

Frank B. Browning ✓

F. Browning

27+26 PL

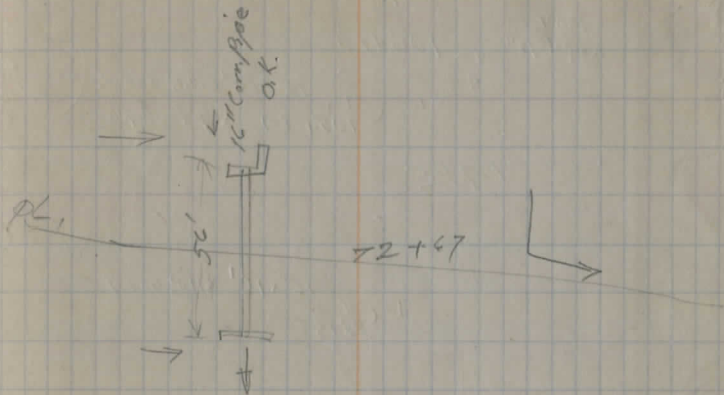
G.B. Norton  
G. Norton

33+13  
reg. 8"

500'

Cem

23+26 PL



DW. Nappa  
Rd 10" = 69+40

14" C.P.  
64+65 Rd 15"

63+75 PL

+97 50' [H]

+50 = <sup>make summit</sup> [B]

62+35 60' [B]

61+08 PL

(Ella M. Colvin)

L. Richards  
1 Ave

+59 = DW Rd 10" [30 B]

56+35 40' [B]

54+50 [B]

(make summit)

DW. summit 53+90

[H] 65' 53+30

Ford Ests, Inc.

Ford Ests, Inc.

Ford Ests, Inc.

Ford Ests, Inc.

W.M.H. & Gertrude E.  
W.H. Davison

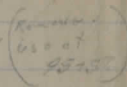
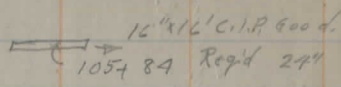
Reuben Randall

Stephen Voder  
C. Hersberger  
118 A

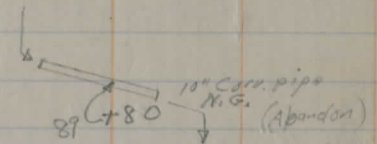
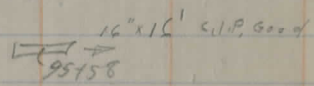


80' 106+25

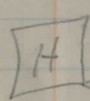
D.W. Reg'd 18" = 106+10



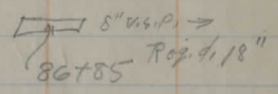
PL. 98+475



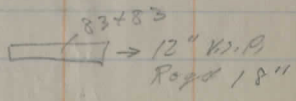
D.W. Reg'd 15" = 87+50



80' 88+90



PL. 84+57

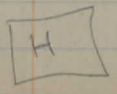


D.W. Reg'd 10" = D.W. +75



100 77+60

D.W. Reg'd 12" = 77+75



50' 77+5

Ford Ests. Inc.

Christian I & Lizzie C Hersberger

S. Yoder  
Stephen Voder

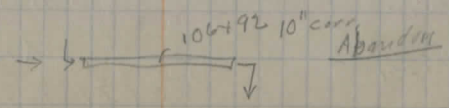


D.W. Reg'd 10" Pipe = 125+30  
125+10  
70

PL. 117+80

120+30 60'   
120+18 D.W. Reg'd 15" Pipe

113+84 PL.

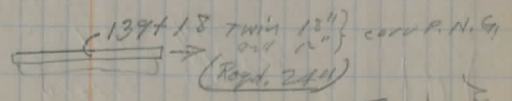


D.W. Reg'd 18" pipe = 145  
141+75 12" x 16" corr. P. Remov. Abandon



141+10

D.L. 137+55



137+95 65  
137+82 D.W. Reg'd 10" pipe



Moses E  
Martha M  
Mr. Burkholder

128+56 PL.

(Stephen Voder & Joe J. Yoder)  
J. Yoder



E. Miller  
Eli N. Miller  
DW. = 179+55 = DW Reg'd 12" =  
= DW, 179+15  
125' 178+80

169+80 → 169+95 Reg'd 18" x 40' curb  
→ X Road 169+80

Reg'd 164+65  
18" x 40' Curv 110'

H 100' DW, 177+8  
Reg'd 12" pipe 177+10  
176+60 Plank culv. Abandoned

DW, 166+50 12" 172+10 15" curv Abandoned  
164+25 = DW, Reg'd 12" pipe  
B

162+85 70' Levi M & Fanny Hersberger  
L. M. Hersberger  
159+43

The Allegheny  
Basket Co.

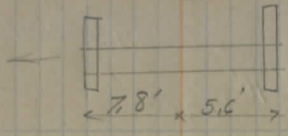
0152+00  
0152+100  
151+60 130' H

151+48 = DW Reg'd 18" pipe

D.W. Summit = 146+70  
Katie Mallet

Manassas Katherine Hersberger M. Burkholder  
143+71 P.L. 1

channel is filled.  
(should be New)



204+42.9  
27' x 31' Bridge  
stone abutts. Conc slab.  
Fair cond.

S.P. Infield  
203+28 P.L. 1  
J. Miller

Parker H.W.  
Barnett J.W.

George W.  
Go. H. 7A

38+90 Twp. P. Line Approx  
Parkman

DW, Reg'd 15" pipe 189+50  
189+40

P.L. 188+90

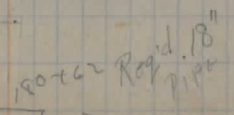
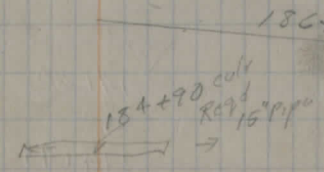
189+18 = DW, Reg'd 12" pipe

H 65' 188+30

Reg'd 12" pipe  
DW, 187+70

stone

187+52 P.L.



Eli N. Miller  
E. Miller

~~H.D. Williams~~

60' oak to inside  
← 10' →  
+26

228+13 ← PL

228+03

□ Shop 21' Lt

□ Ho Lt.

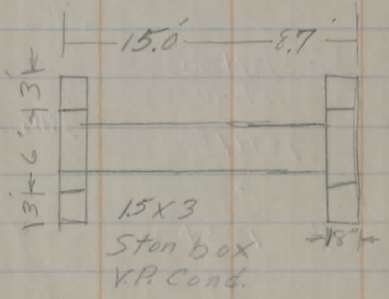
227+81

Dr Lt. =

227+06

Solomon P In field

224+10.6

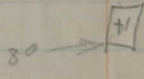


Z. Miller

Levi E. & Clara B.

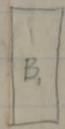
Miller

214+60



214+45 = DWG 10' x 10' RPT

213+35 ~~3~~ DW

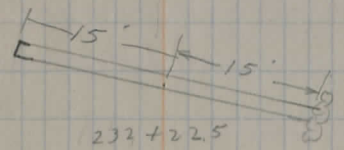


217+25 120

S.P. In field

207+9A PL

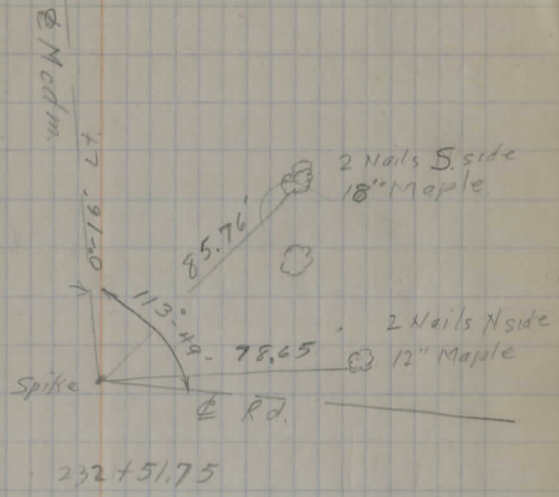
Levi E & Clara B. Miller



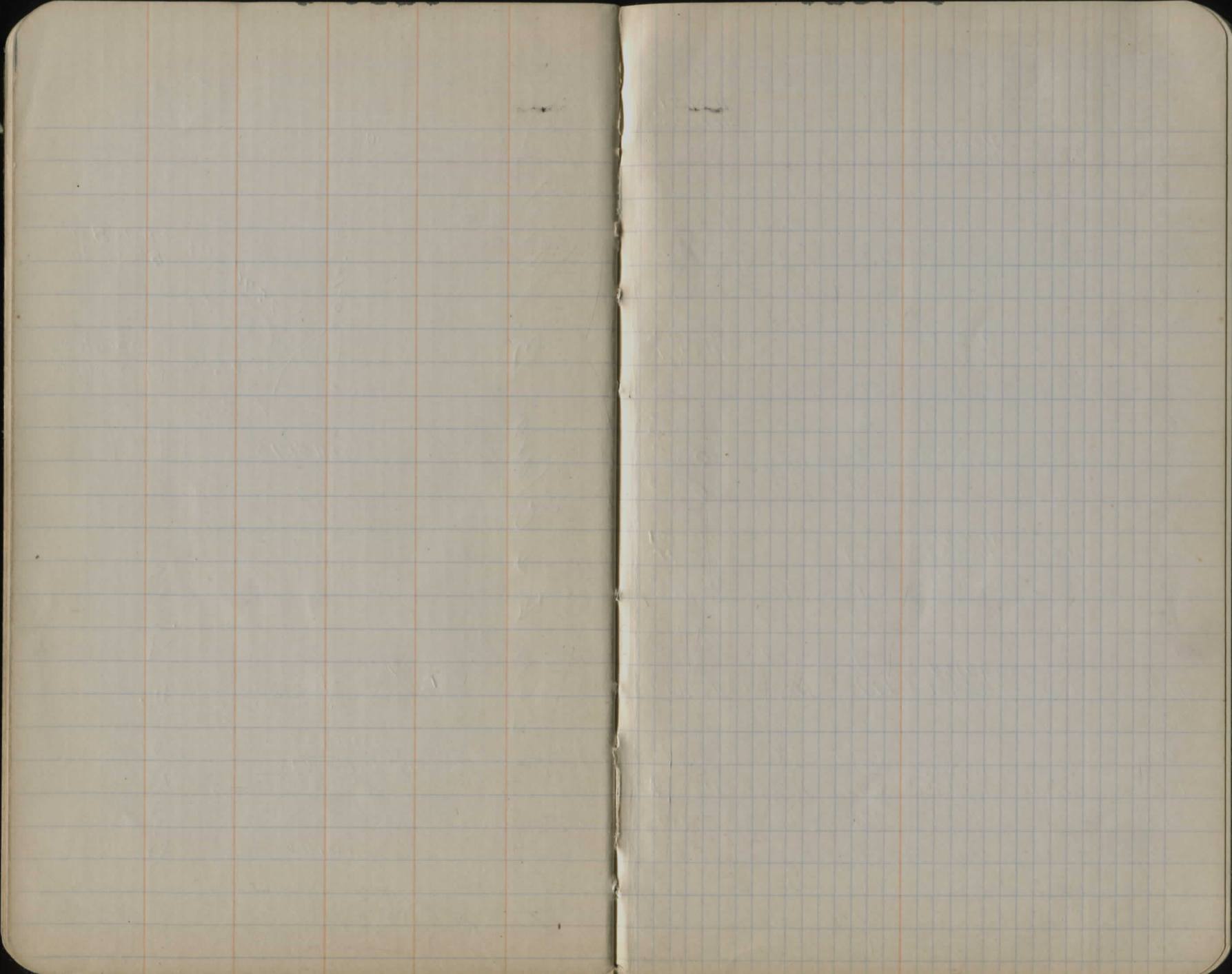
232+22.5  
12" Corro CIP

230+166

35' x 3'

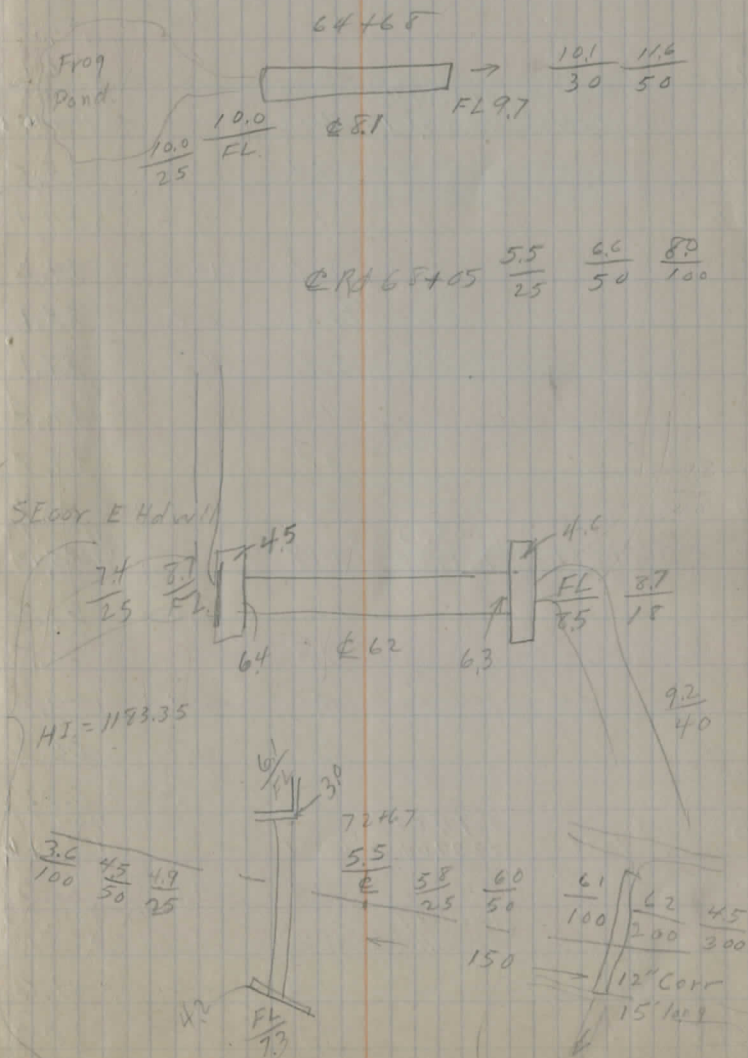


Bertha F. Lilley



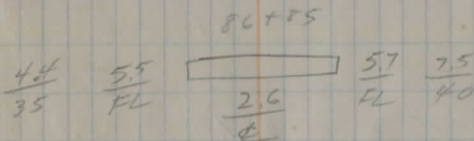
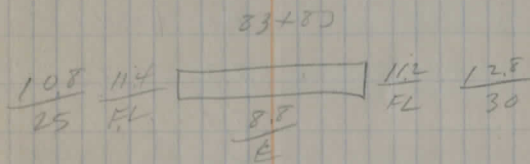
Sta	BS	HT	I	Stk	1159.51 <del>1172.23</del>
	2.08	1161.59 <del>1174.36</del>			
62			2.7	5.1	58.9
63			5.3	0.5	56.3
64			7.6	6.1	54.0
65			8.0	10.4	53.6
66			6.9	7.1	54.7
T.P.	11.36	1166.28 <del>1179.05</del>	6.67		1154.92 <del>1177.9</del>
67			9.7	7.4	56.0
68			6.4	3.9	59.9
69			3.5	5.0	62.5
70			3.4	6.8	62.9
71			3.0	4.2	63.3
T.P.	4.57	1170.58 <del>1183.35</del>	0.27		1166.01 <del>1178.8</del>
72			6.1	7.5	64.5
73			4.2	1.9	65.8
74			1.7	-1.7	68.9
T.P.	12.10	1181.54 <del>1194.31</del>	1.14	<del>1192.24</del>	1169.44
75			8.8	6.5	72.7
76			5.4	3.7	76.1
T.P.	11.27	1192.08 <del>1204.95</del>	0.73	1193.55	1180.81
77			1.1	9.1	81.0
+35			8.4		83.7
78			6.2	6.2	85.9
79			5.1	3.9	87.0
80			4.2	2.9	87.9

BM Hickory



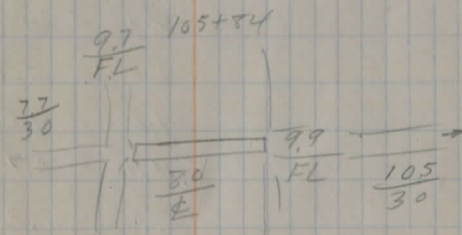
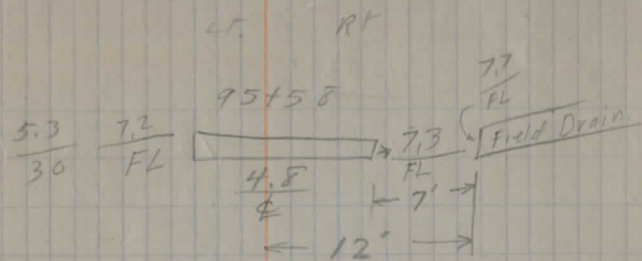
		1192.05 <del>1201.55</del>	e	5+K	90.2
81					<del>1192.25</del>
+ 75					91.6
82					90.9
175					86.1
T.P.	7.84	1192.90 <del>1205.47</del>			1185.06 <del>1197.83</del>
83					85.5
+ 50					84.4
84					84.2
+ 50					85.1
85					87.1
+ 40					88.9
86					89.7
87					90.7
T.P.	12.31	1205.03 <del>1217.80</del>			1192.72 <del>1205.49</del>
88					92.9
89					96.2
90					99.5
91					02.2
92					04.7
T.P.	10.15	1214.87 <del>1227.64</del>			1204.69 <del>1217.16</del>
93					06.0
B.M.	4.62	1214.87 <del>1227.64</del>			1210.25 <del>1223.02</del>
94					09.6
+ 45					10.8
95					09.9

LT RT



12" Maple 25' + Sta 93+45 Bent Spike

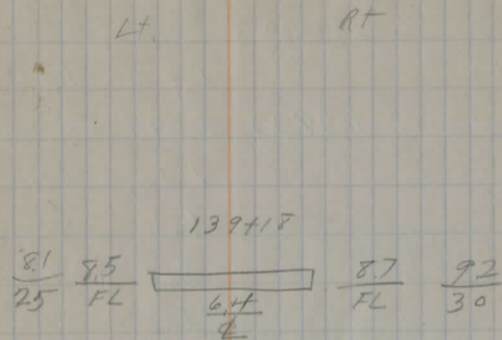
		1214.87 <del>1221.64</del>	Φ	STK	
96			4.7	6.0	10.2
97			3.7	3.7	11.2
98			1.5	-0.4	13.4
T.P.	9.38	1223.02 <del>1225.79</del>	1.23		1213.64 <del>1224.41</del>
99			5.0	9.8	15.0
100			7.3	7.6	15.7
101			5.5	6.0	17.5
102			5.0	6.9	18.0
103			3.5	2.4	19.2
104			1.4	-0.1	21.6
T.P.	784	1229.35 <del>1234.72</del>	1.51		1221.51 <del>1234.28</del>
150			7.3		22.1
105			8.0	7.4	21.4
106			7.7	9.8	21.7
107			5.8	7.3	23.6
108			3.7	3.9	25.7
T.P.	11.35	1239.10 <del>1251.57</del>	1.60		1227.75 <del>1240.52</del>
109			11.1	8.9	28.0
110			7.5	4.4	31.6
111			2.7	0.2	36.4
T.P.	11.06	1249.96 <del>1262.73</del>	0.20		1238.90 <del>1251.01</del>
112			8.8	7.5	41.2
113			5.9	4.8	44.1
114			4.0	2.5	46.0
T.P.	5.86	1253.28 <del>1266.05</del>	2.54		1247.42 <del>1260.23</del>



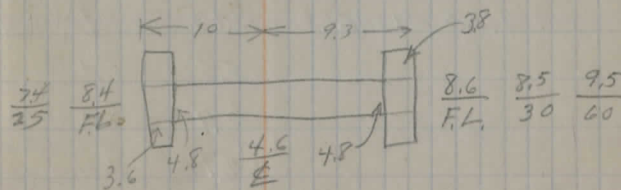
		1253.25 <del>+26605</del>	±	STR	1250.15 <del>(+26692)</del>
B.M. T.P.	5.20	1255.35	3.3		
115			7.3	7.1	48.1
116			5.1	6.5	50.3
117			4.0	5.0	51.4
118			3.3	3.3	52.1
119			2.2	1.3	53.2
T.P.	7.73	1261.85	1.23		1254.12
120			7.2	7.0	54.7
121			6.0	5.7	55.9
122			5.3	5.9	56.6
123			5.2	5.8	56.7
124			4.8	5.6	57.1
125			4.6	4.8	57.3
126			4.3	3.7	57.6
127			2.9	3.2	59.0
T.P.	5.05	1264.32	2.58		1259.27
128			4.5	4.6	59.8
129			3.6	3.2	60.7
+50			2.9		61.4
130			3.8	3.8	60.5
131			4.7	4.9	59.6
132			5.2	5.6	59.1
133			5.5	6.3	58.8
134			5.4	5.7	58.9
T.P.	1.71	1260.54	5.49		1258.83

✓ Spike in E. root 18" ~~134~~ 23' L + Sta 114 + 90.

			±	STR	
		1260.54			
135			1.6	1.5	58.9
136			3.1	2.4	57.4
137			4.4	4.7	56.1
138			5.6	5.9	54.9
139			6.3	7.7	54.2
140			6.3	6.8	54.2
T.P.	9.73	1264.54	5.73		1254.81
141			9.0	7.2	55.5
142			4.7	7.7	57.8
143			5.8	6.5	58.7
144			4.9	4.9	59.6
145			3.6	2.8	60.9
146			1.8	1.6	62.7
147			0.5	0.8	64.0
T.P.	3.54	1267.72	0.36		1264.18
B.M.	3.06	1267.72	3.06		1264.66
148			4.6	3.9	63.1
149			5.8	6.7	61.9
150			5.3	7.4	62.4
151			5.2	5.5	62.5
T.P.	8.77	1272.10	4.39		1263.33
152			9.3	6.6	63.8
153			6.7	5.8	65.4
154			4.7	2.7	67.2
155			2.7	2.2	69.4



147 + 18 Spike in E root 20" Maple 26 LT



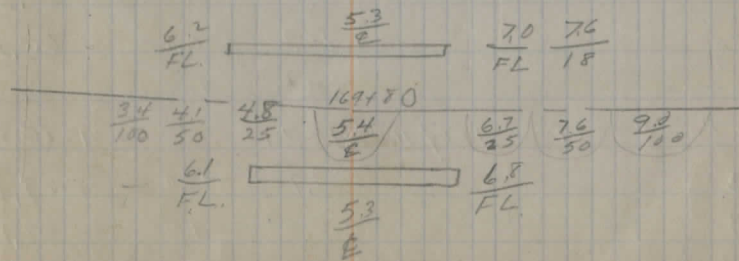


LT

RT

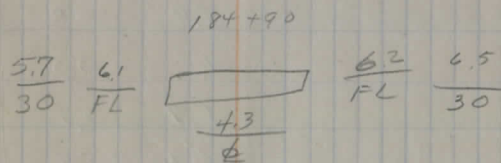
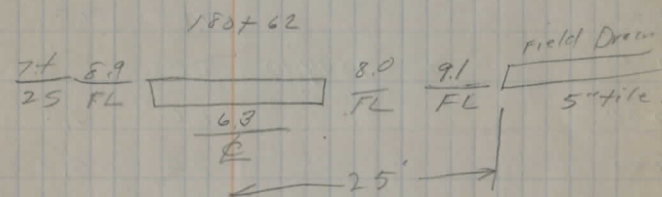
		127210	£	5th	
156			1.4	1.4	70.7
T.P.	72.8	1279.29	0.09		1272.01 ✓
157			7.2	6.6	72.1
158			6.2	6.0	73.1
159			5.2	4.4	74.1
160			3.2	3.6	76.1
161			1.4	1.8	77.9
T.P.	8.73	1287.39	0.63		1278.66 ✓
162			7.5	7.8	79.9
163			5.2	4.7	82.2
164			2.3	0.6	85.1
T.P.	6.34	1293.56	0.17		1287.22 ✓
165			5.6	5.5	88.0
166			4.9	6.3	88.7
167			4.4	4.5	89.2
168			3.4	3.3	90.2
B.M.	5.23	1296.66	2.13		1291.43 ✓
169			5.6	7.1	91.1
170			5.4	6.2	91.3
171			4.9	6.4	91.8
172			4.9	6.4	91.8
173			5.8	5.5	90.9
T.P.	5.25	1297.22	4.59		1292.07 ✓
174			4.5	4.6	92.8
175			4.3	4.8	93.0

Spike in root of triple Maple 168750 22' LT.



		€	STK	
	129732			
176		5.0	5.4	92.3
177		5.3	5.1	92.0
178		5.3	6.0	92.0
T.P.	0.05	1293.31	4.06	1293.26
179		4.1	2.7	89.2
180		6.0	5.5	87.3
181		7.4	8.1	85.9
182		5.6	5.0	87.7
T.P.	1.42	1286.38	8.35	1284.96
183		1.8	0.7	84.6
184		3.5	2.7	82.9
185		4.6	5.9	81.8
186		4.7	5.2	81.7
187		4.5	5.6	81.9
188		6.0	5.7	80.4
189		8.9	7.0	77.5
BM.	0.12	1279.55	6.75	1279.43
190		6.1	3.9	73.5
191		10.2	6.4	69.4
<del>192</del>		<del>14.4</del>	<del>10.6</del>	
T.P.	0.27	1267.11	12.71	1266.84
192		1.7	-3.0	65.4
193		5.0	1.8	62.1
194		8.4	6.5	58.7
195		10.9	10.2	56.2

X on Boulder 178+25 20' Lt

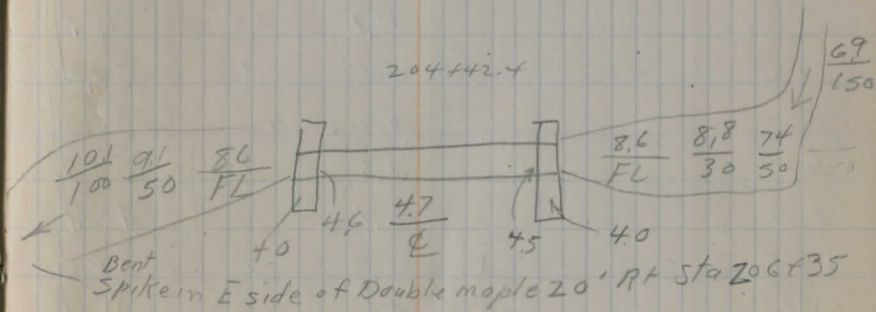


Spike in w. root 20" Maple 31' Rt Sta 189+27

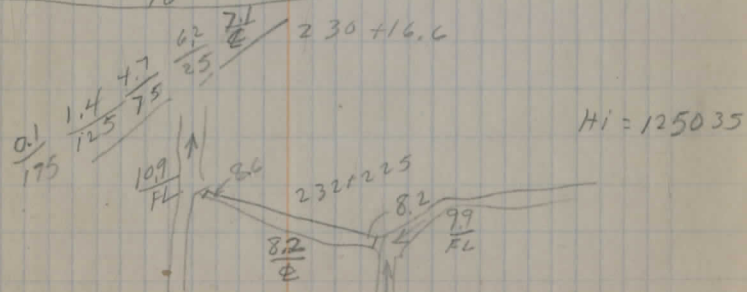
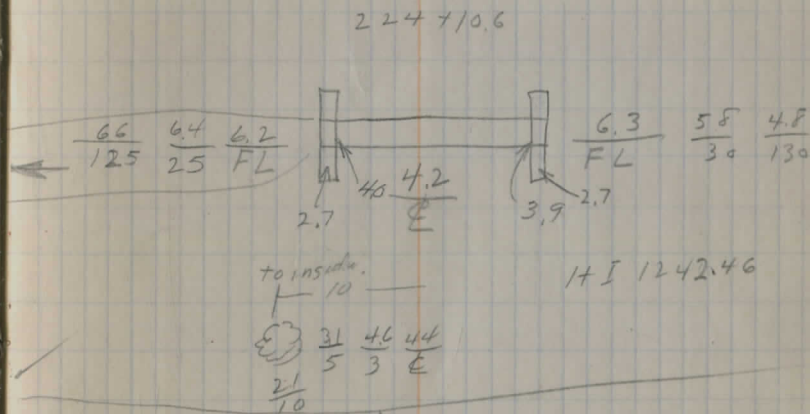
Σ STR.

1267.11

T.P.	0.50	1255.66	11.95		1255.16
196			1.8	1.5	53.9
197			4.0	4.0	51.7
198			6.0	5.9	49.7
199			7.8	7.8	47.9
T.P.	2.10	1249.13	8.63		1249.03
200			2.6	3.3	46.5
201			3.6	5.2	45.5
202			4.4	5.5	44.7
203			5.0	6.0	43.1
204			4.8	5.5	44.3
205			5.7	6.5	43.4
206			5.2	5.4	43.9
B.M.	4.97	1251.20	2.90		1248.23
207			6.2	5.9	45.0
208			5.6	5.5	45.6
209			5.1	4.9	46.1
210			4.2	5.9	47.0
211			3.8	4.2	47.4
212			4.0	4.5	47.2
213			4.0	4.2	47.2
T.P.	2.56	1250.29	3.47		1247.73
214			3.4	1.4	46.9
215			3.9	3.0	46.4
216			4.4	3.0	45.9

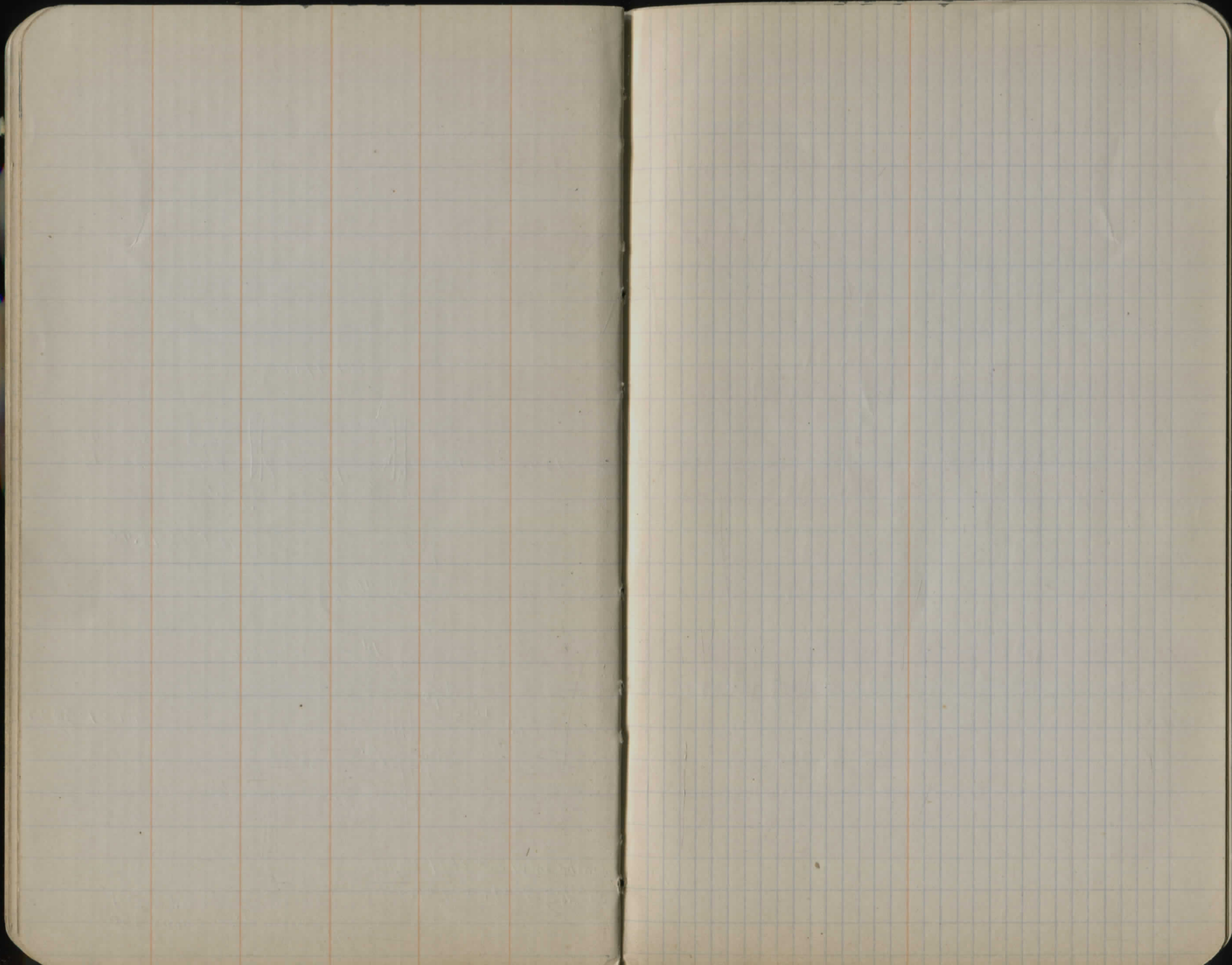


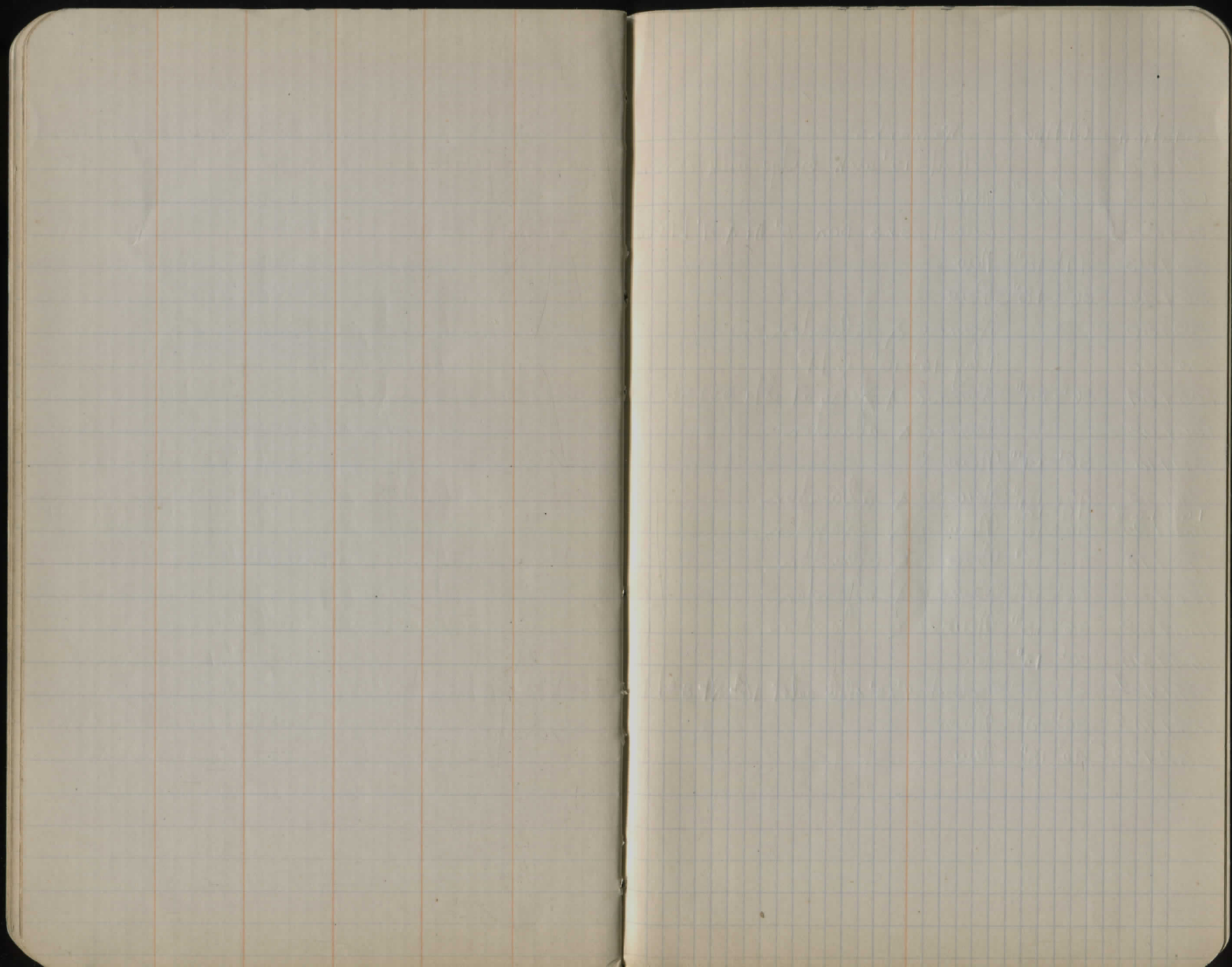
	125029	£	STK.	
217		6.0	57	44.3
218		7.6	66	42.7
219		9.4	8.0	40.9
220		10.9	102	39.4
T.P.	3.75	1242.46	11.58	1238.71
221		3.8	3.7	38.7
222		4.7	4.0	37.8
223		5.2	4.3	37.3
224		4.7	5.5	37.8
225		5.0	4.9	37.5
226		4.5	4.2	38.0
227		3.3	2.1	39.2
+35		2.4		40.1
228		3.5	2.7	39.0
T.P.	3.41	1240.35	5.52	1246.94
229		4.1	4.0	36.3
230		6.5	6.3	33.9
231		7.9	7.4	32.5
232		8.4	8.6	32.0
+51.75		7.8		32.6
+100		7.9		32.5
+200		8.4		32.0
B.M.		7.16		1233.19



Spike in W root of 14" Maple  
25' Rt of Sta 231 + 24

7.8	8.5	8.3	8.0	7.4
E	25	50	100	150

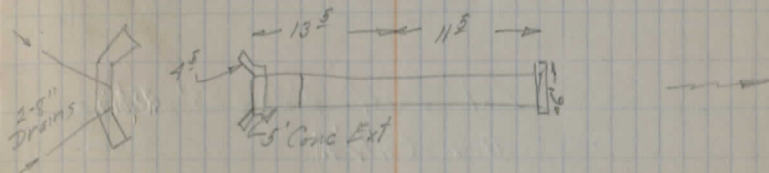




Station	C.I. Pipe	Remarks
49+03		Extend 15' arch bridge with conc.
64+68	36'-15"	New
71+32		Extend 3x3 box - 5' Rt & 4' Lt Con
83+83	44'-18"	New
86+85	36'-18"	New
89+80		Remove & abandon
95+58		Relay 16'-16" C.I.P.
105+84	36'-24"	Remove & relay at Sta 95+58
106+92		Remove & abandon
139+18	36'-24"	New
141+75		Remove & abandon
169+65	40'-18"	New
169+25	40'-18"	New
172+10		Remove & abandon
176+60		Remove & abandon
180+62	36'-18"	New
184+90	36'-15"	New
204+42 <sup>±</sup>		Extend 7x3' slab culvert 10' Rt & 8' Lt
224+10 <sup>±</sup>	36'-24"	New
232+22 <sup>±</sup>	40'-18"	New

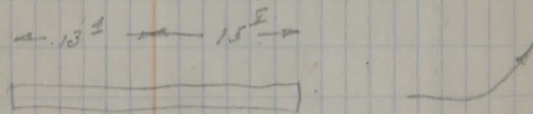
#23  
Sta.

3 x 3 Stone Box Culvert  
with Conc Box Ext. with  
Sta. Hd'w's 19' LT & 21' RT  
of L



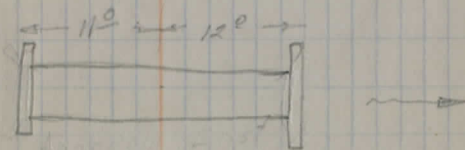
Station

12" Vit Pipe Not Enc.  
No Work



#24  
Sta.

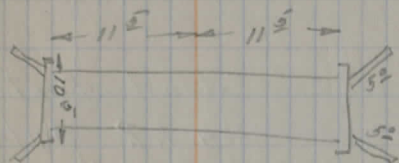
2<sup>5</sup> x 2<sup>5</sup> x 23<sup>5</sup> Stone Box  
Remove Top & Build New  
Conc Top & Bottom





#20  
Sta

Ext Exist 8'x33' 23' ~~Station~~  
Box Culvert.



#21  
Sta

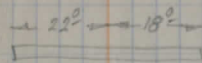
New Std 3'x3'x40' Conc  
Box Culvert.

#22  
Sta

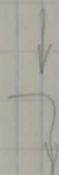
New Std 3'x3'x10' Conc  
Box Culvert.

# 17  
Sta

Extend Exist 18"  
Corr. I.P. Build Side  
Rd Hdwl Lt &  
Straight Hdwl Rt

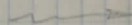
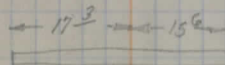


New 23° Lt & 20° Rt



# 18  
Sta.

Extend Exist 12"  
Corr. I.P. Build Side  
Rd Hdwl Lt & Straight  
Rt



# 19  
Sta

Remove Exist 3x2x23  
Conc Box Culit  
Build New 20' Culit

#13  
Sta

Exist 15" - 40' Corr.  
1. Pipe

#14  
Sta

Exist 18" - 40' Corr / P

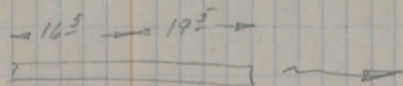
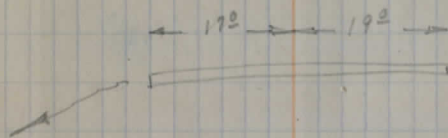
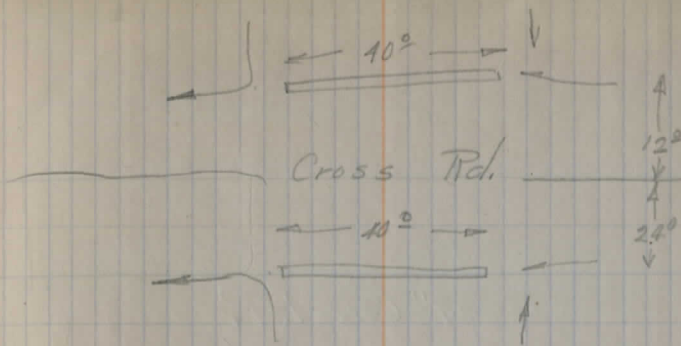
#15  
Sta

Extend Exist 15"  
Corr. 1. Pipe

7' x 3' Stone Box Culvert with  
16' Conc Ext. Rt  
9' Conc Ext Lt.

#16  
Sta.

Extend Exist 24"  
Corr. 1. P. Culvt.

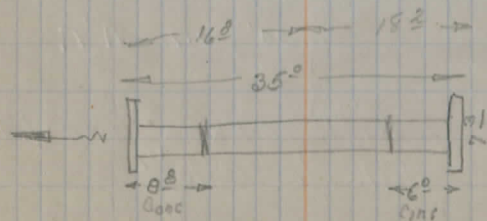
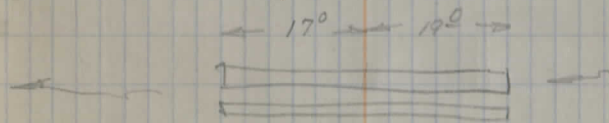
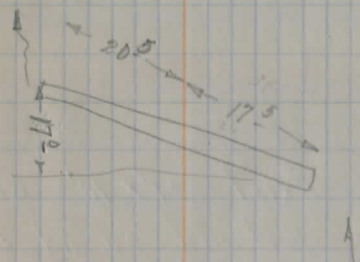
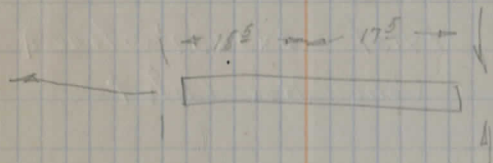


24" Corr. I.P.

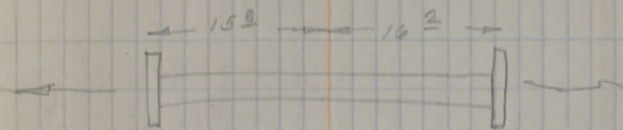
18" Corr. I.P.

36<sup>5</sup>/<sub>8</sub> - 18" Corr. I.P.  
36<sup>5</sup>/<sub>8</sub> - 24" Corr. I.P.

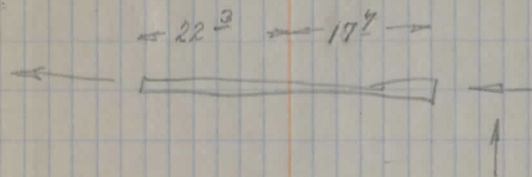
2<sup>5</sup>/<sub>8</sub> x 3' Stone Box Culvert With  
Conc Ext. Lt. side Only



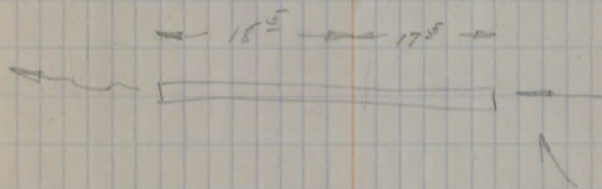
Exist 3x3x32' Stone &  
Conc Box Culvt



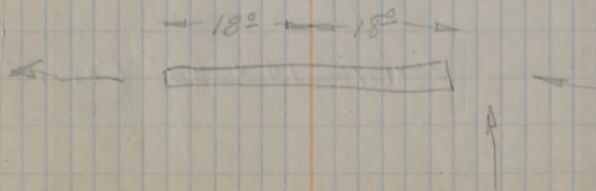
Exist 24"x40" Corr. I. Pipe  
Extend 20' RT & 24' LT



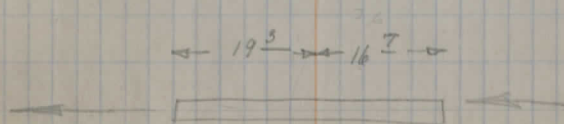
Exist 18"x36" Corr. I.P.  
Hillside Culvt  
Ext to 22' on LT  
20' on RT.

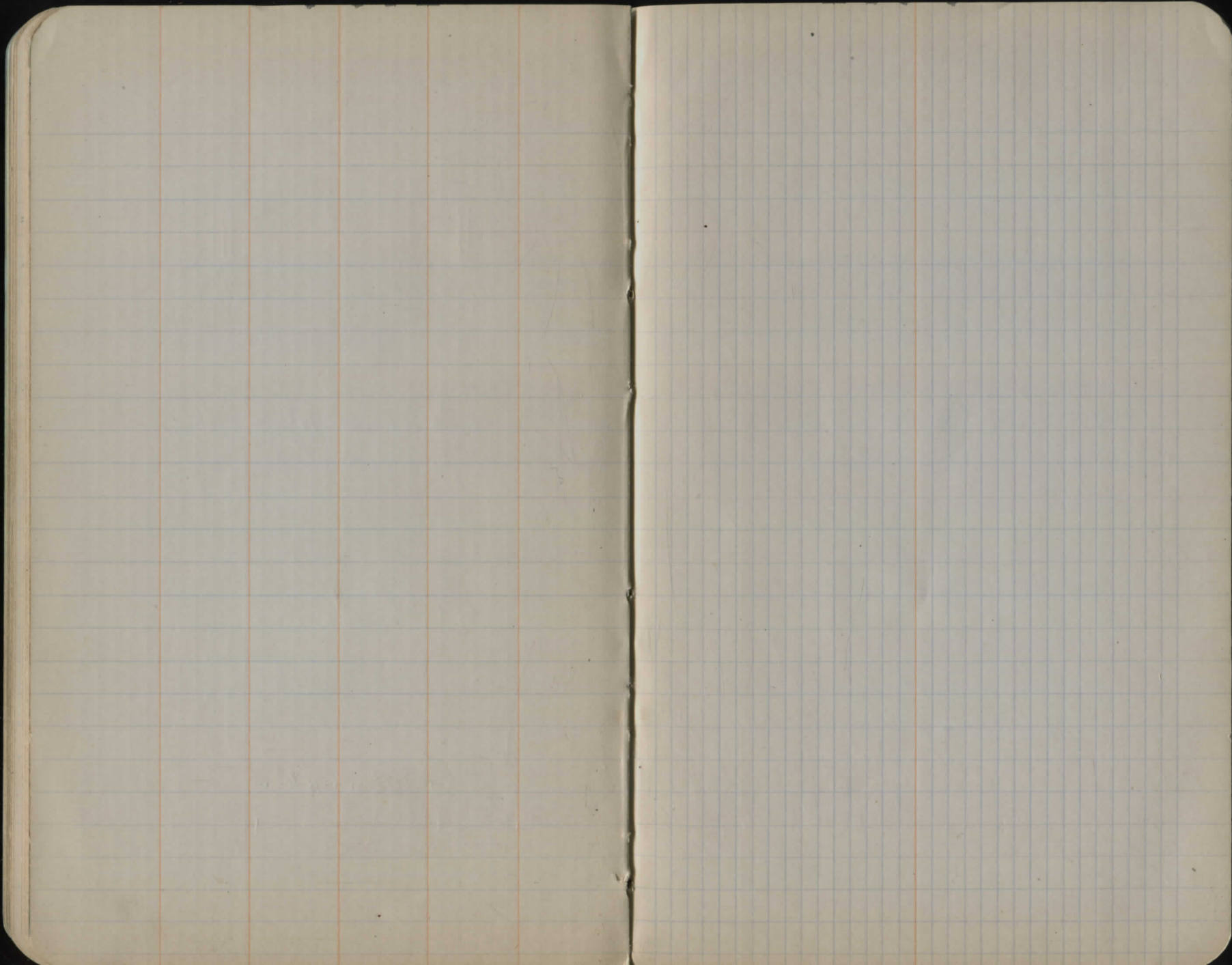


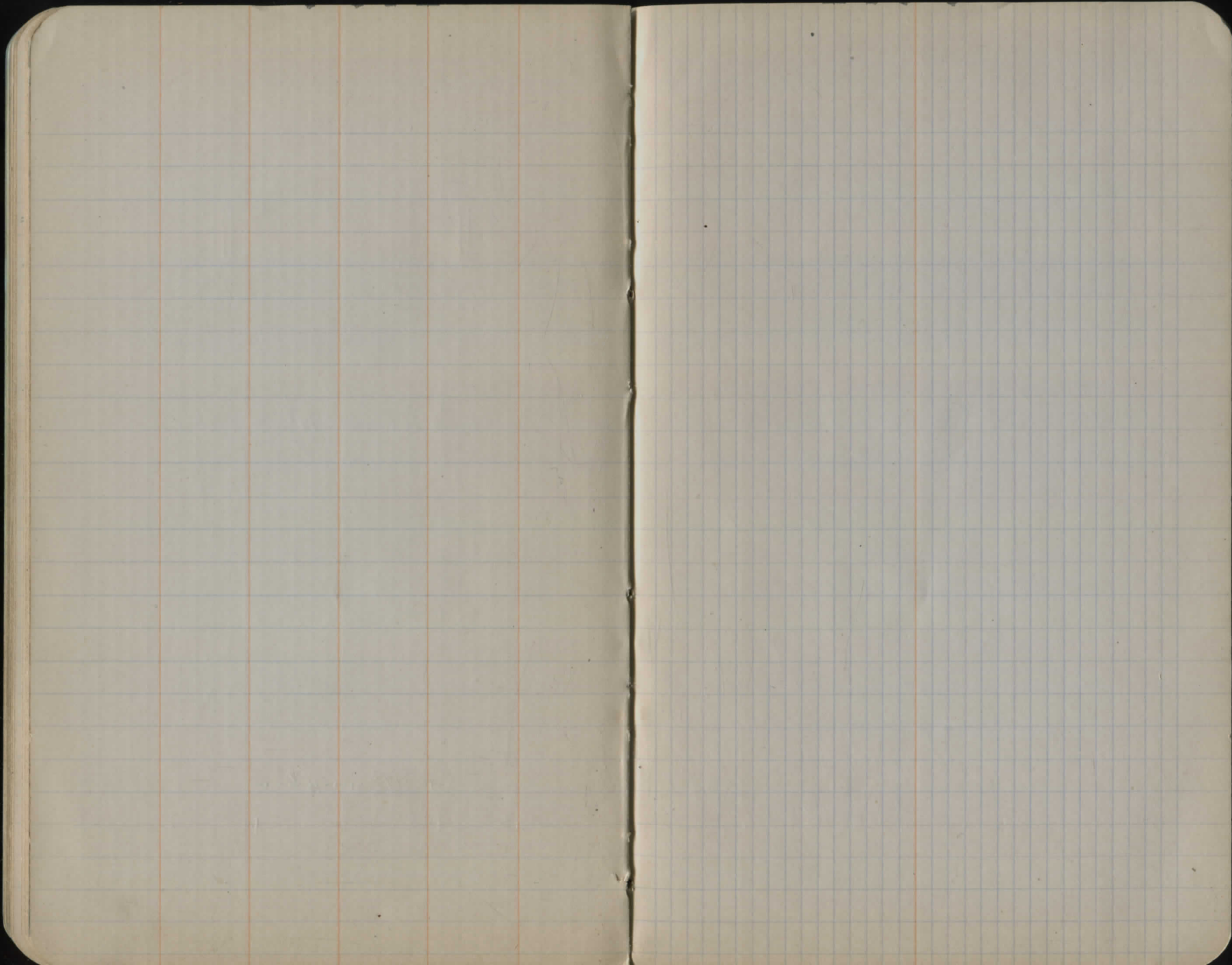
Exist. 24"x36" Corr. I. Pipe  
Hillside Culvt.



Exist 15" x 36' Corr. h P.

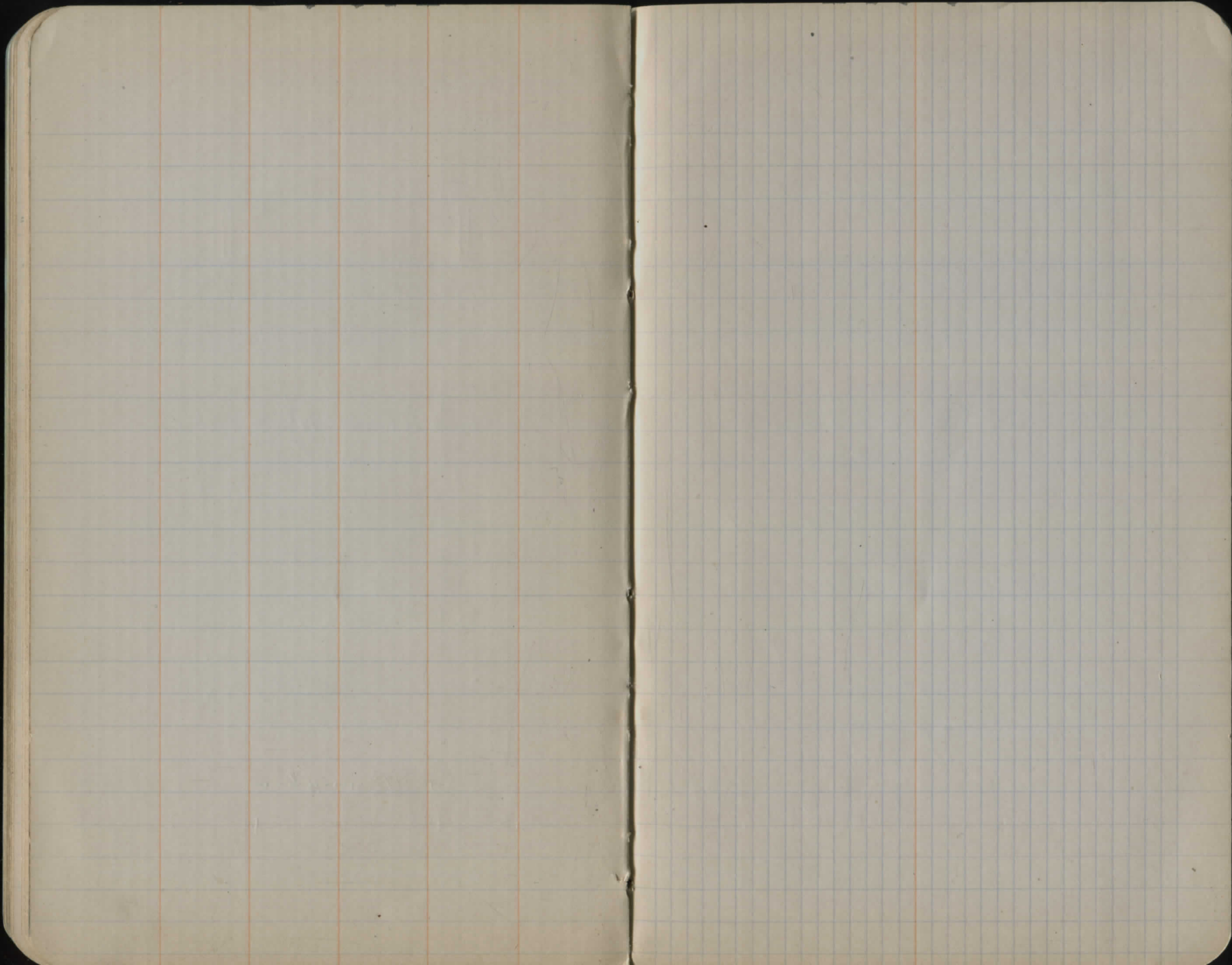


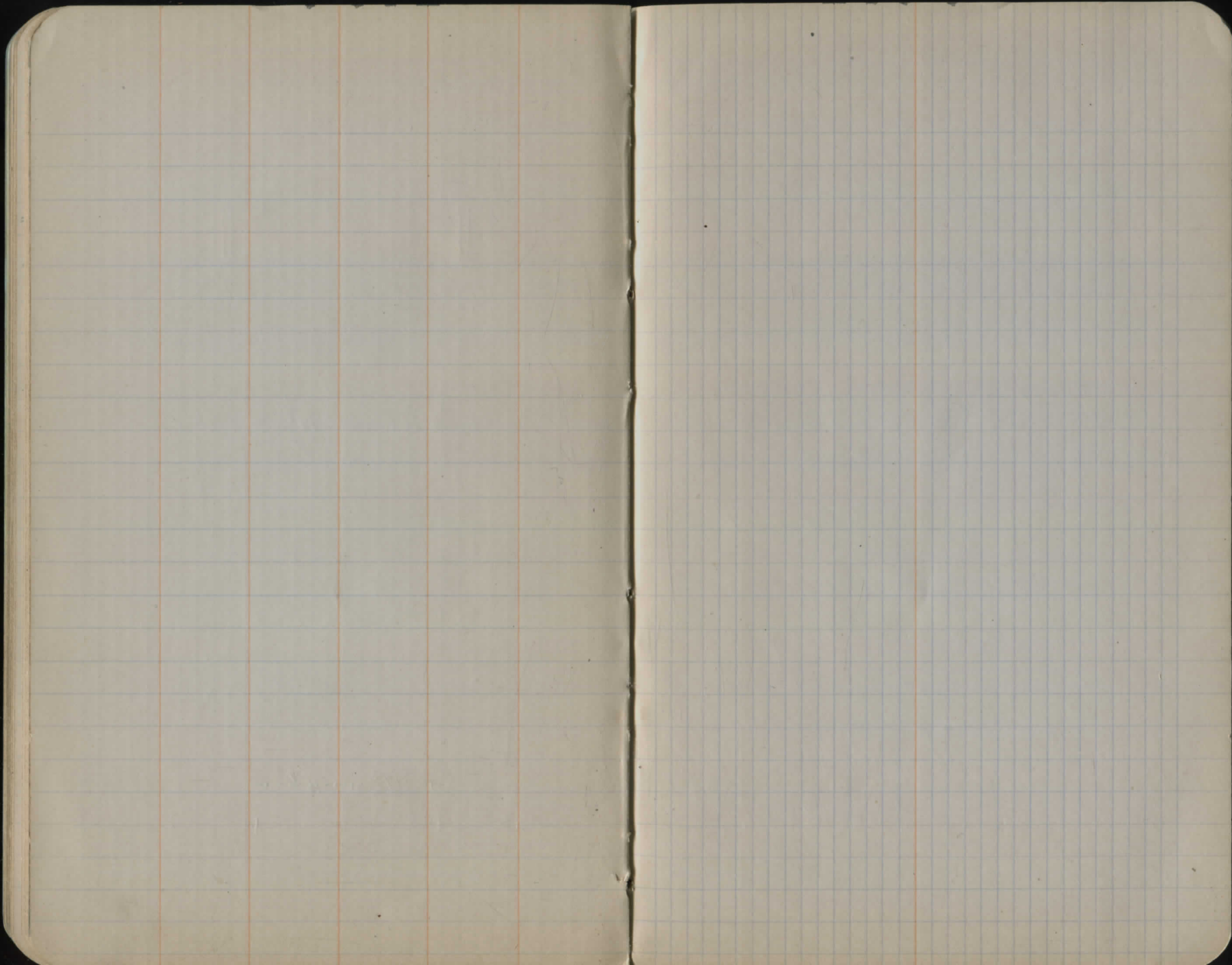


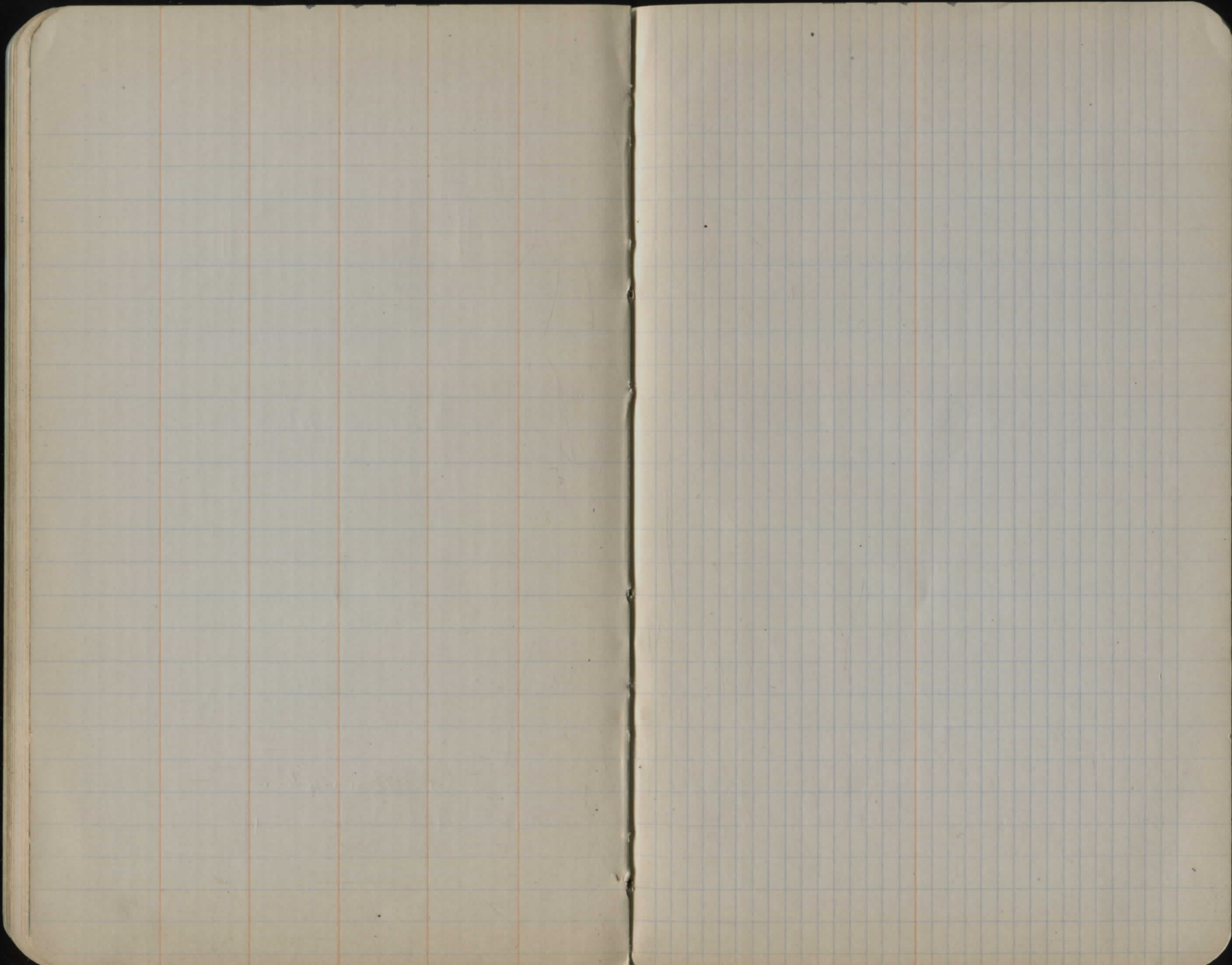


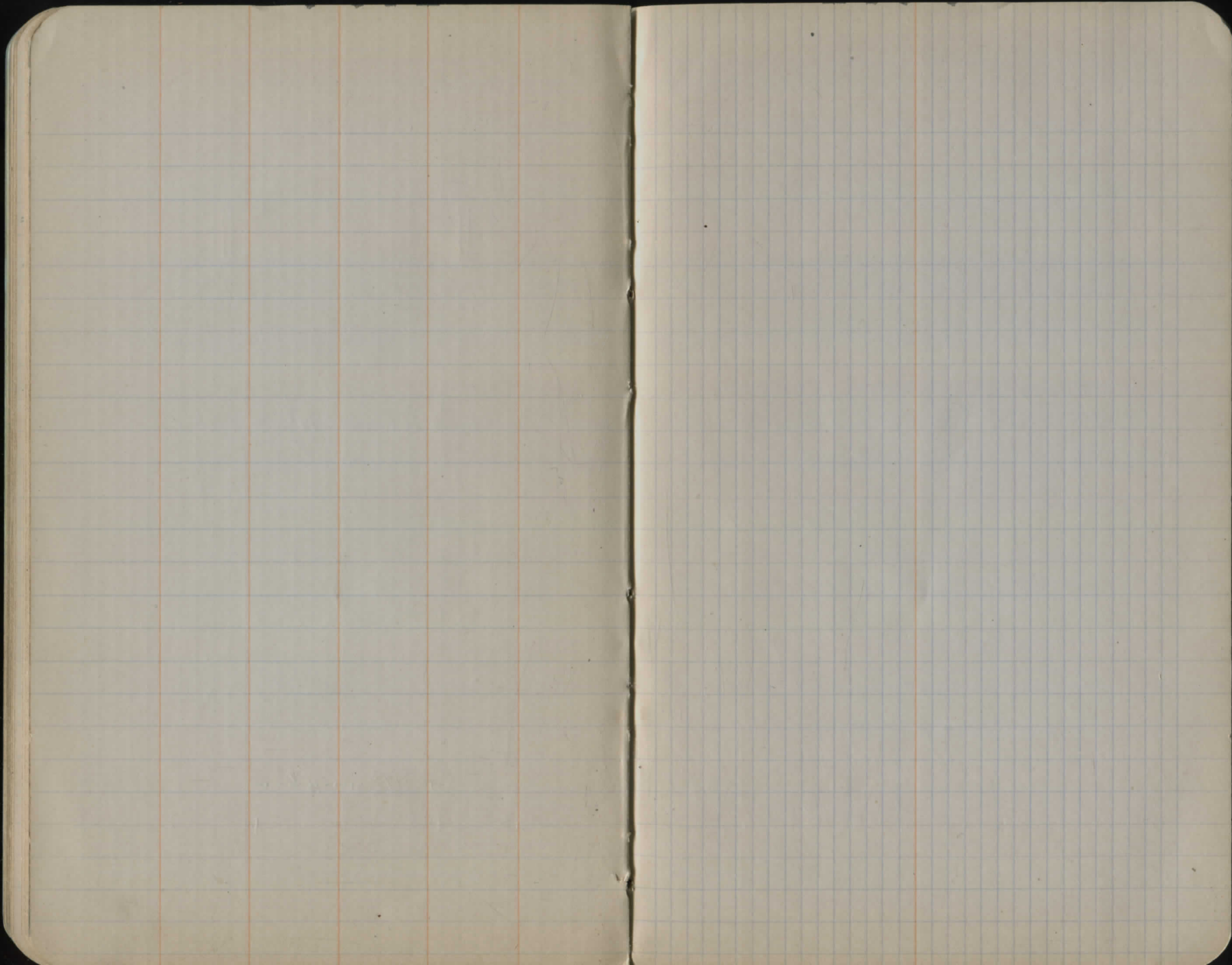


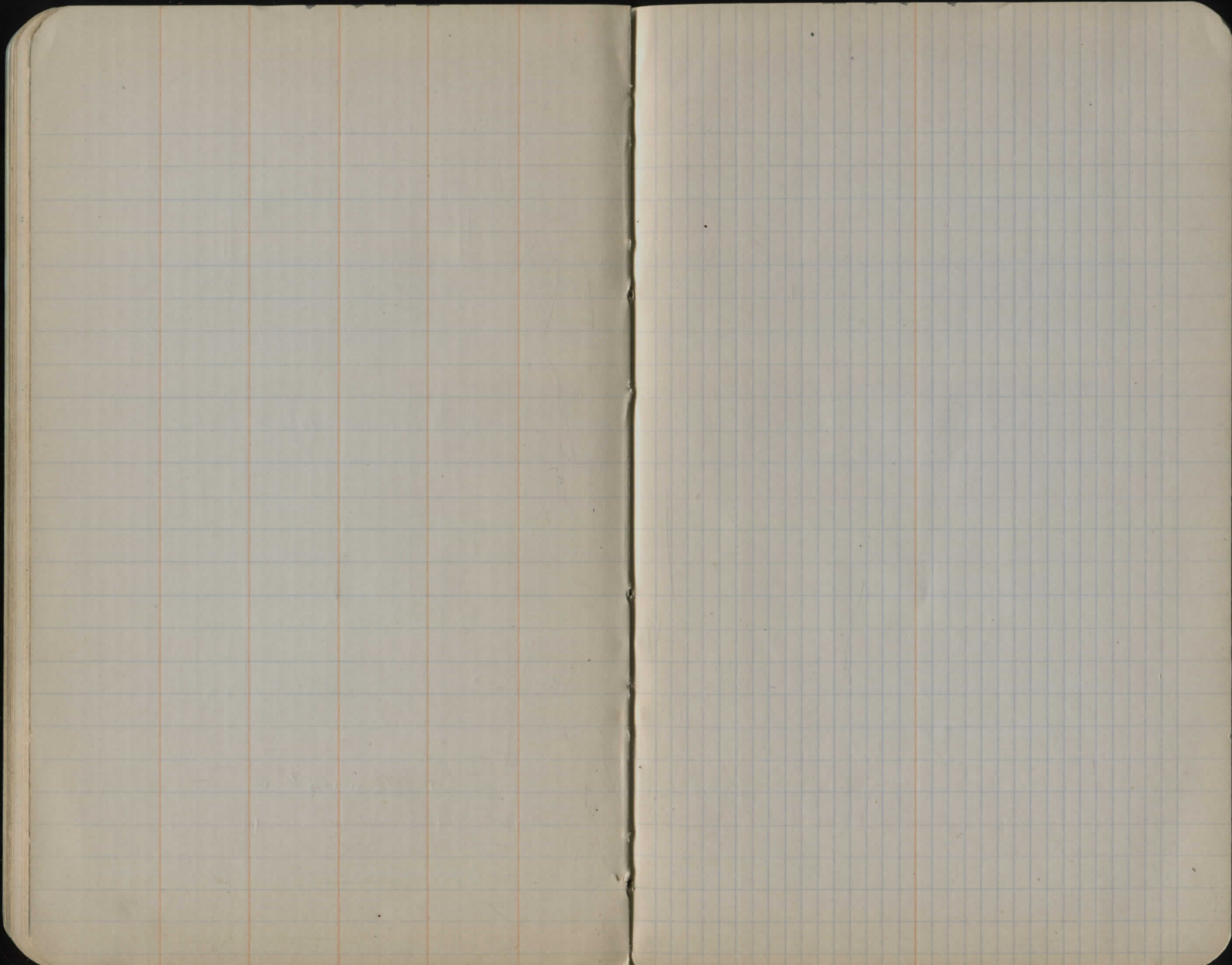
- 1- 12" Vit Pipe 6' Ext
- 2- 12" Con. & Pipe 5' Ext Std Hd Rt & Hilled Lt.
- 3- 12" Con & Pipe
- 4- 24" Con Pipe 4' Ext.
- 5- 18" Con. Pipe 4' Ext.
- 6- 18" Con. Pipe 4' Ext
- 7- 16" Con. Pipe 4' Ext
- 8- 24" Con. Pipe 4' Ext
- 9- 18" Con. Pipe 4' Ext
- 10- 24" Con. Pipe
- 11- 18" Con. Pipe 4' Ext
- 12- 18" " " "
- 13- 18" " " " Side Rd Hdwl
- 14- 18" " " "
- 15- 16" " " "
- 16- 24" " " "
- 17- 18" " " " Side Rd Hdwl
- 18- 12" " " " " " "
- 19- 12" Vit Pipe Take up & Relay
- 20- Remove old Stone Culot Build New 3x3 Conc Box
- 21- 2<sup>5</sup> x 2 x 24 Stone Culot Extend 6' Conc Slab Top & Floor
- 22- 3 x 3 x 24 Stone Culot Extend 4' Rt & 9' Lt.
- 23- 4 x 4 x 24 Stone Culot Build New 4 x 3 x 10 Conc Box
- 24- 2<sup>5</sup> x 2 x 26' Extend 6' Slab Top & Floor

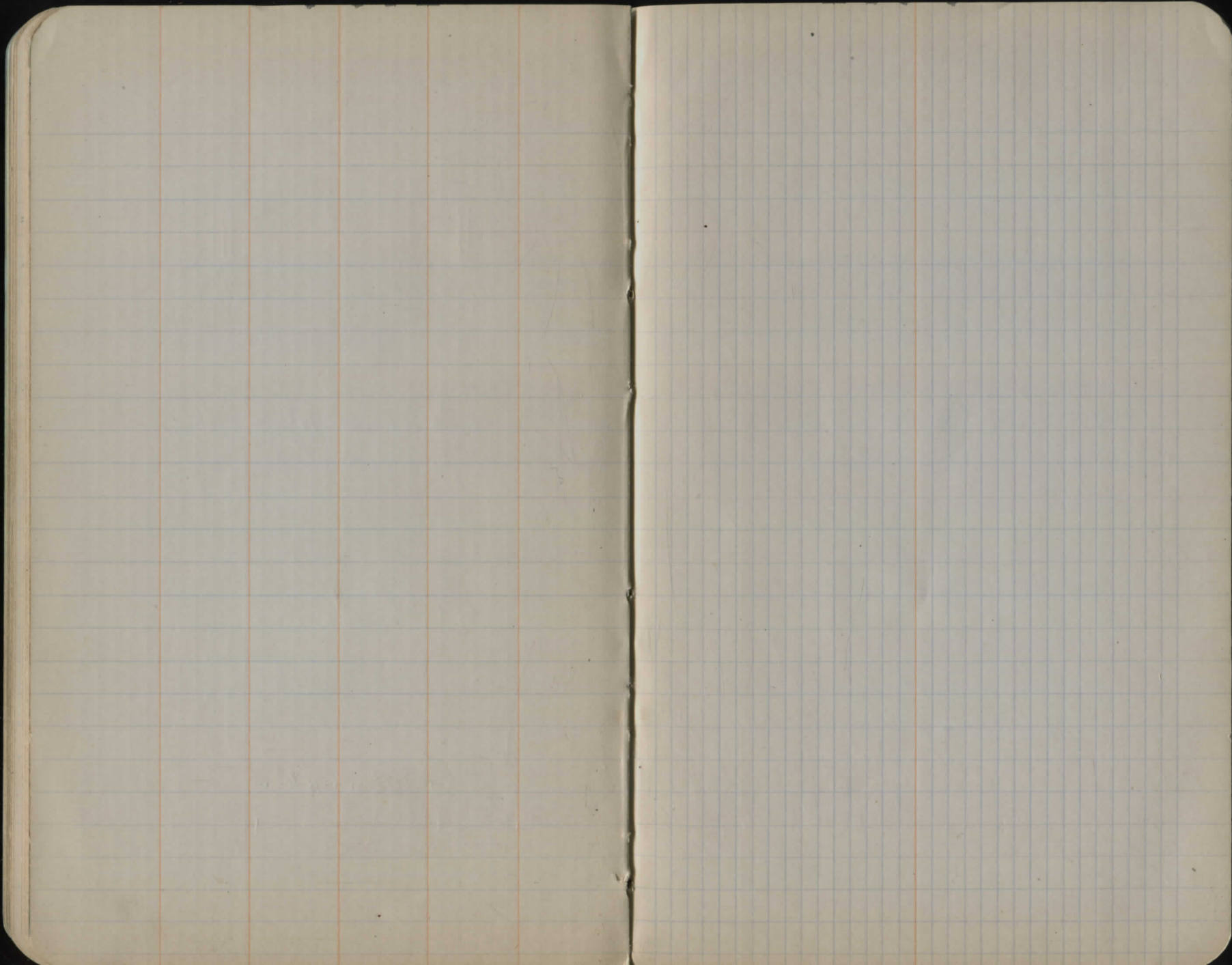


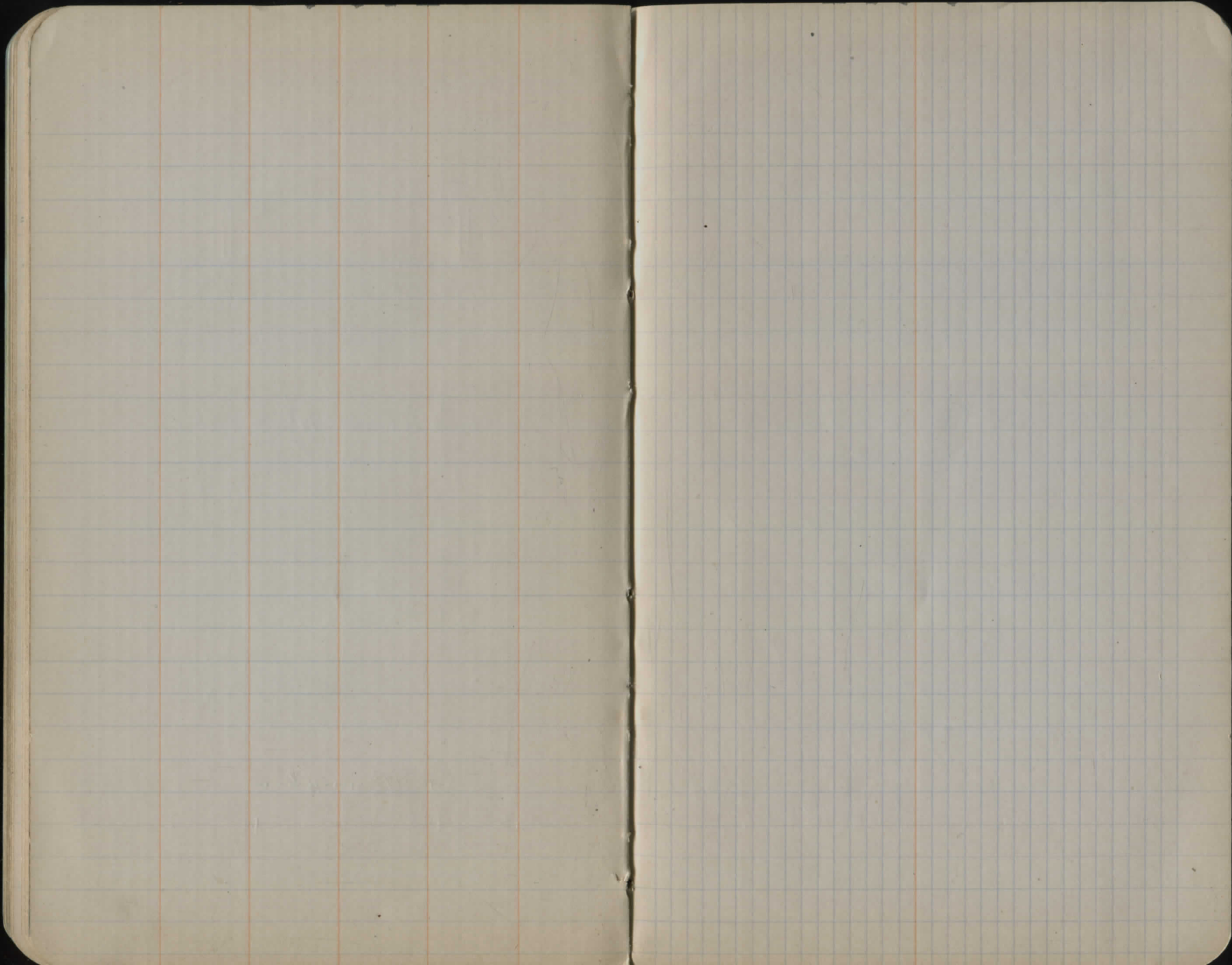




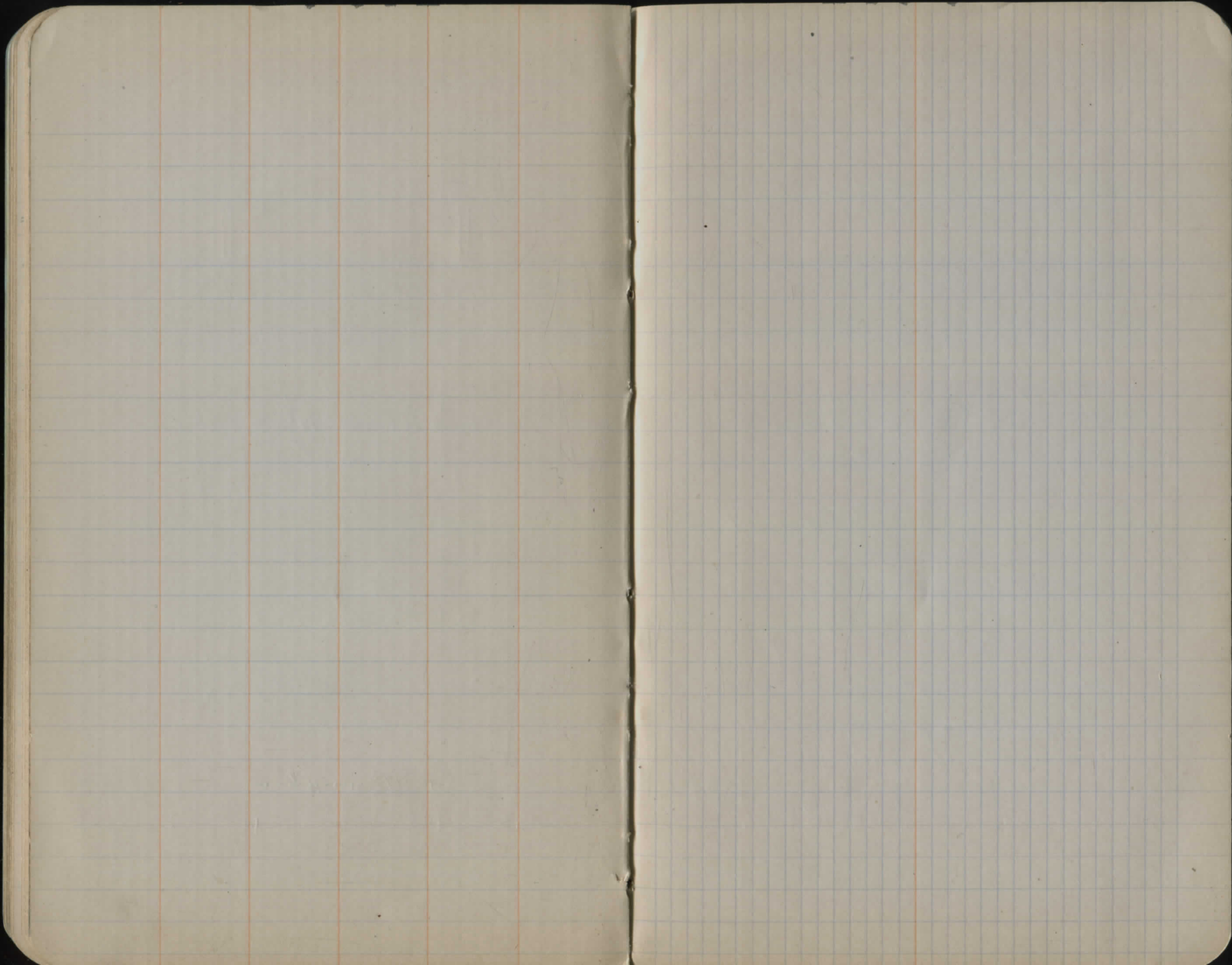


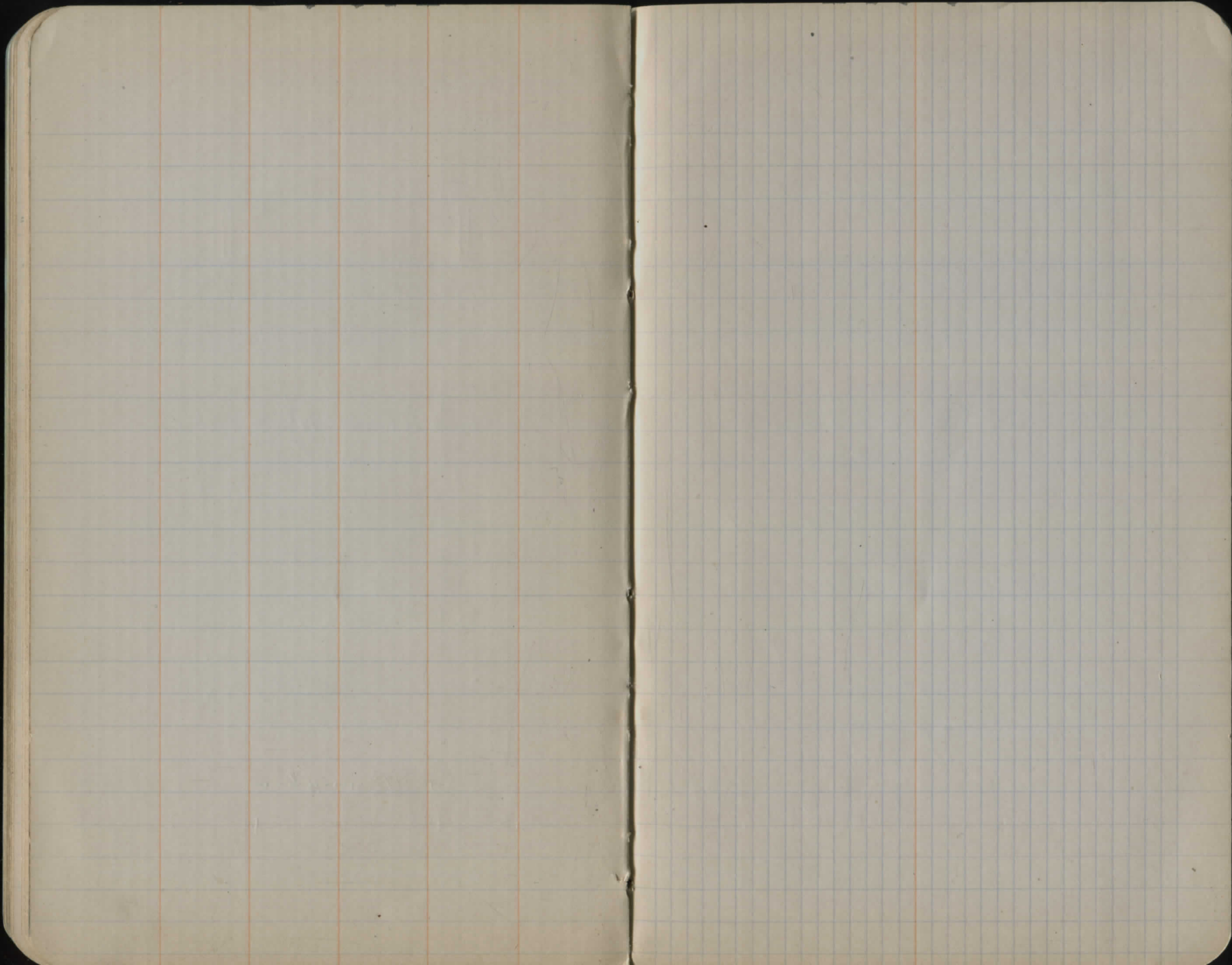


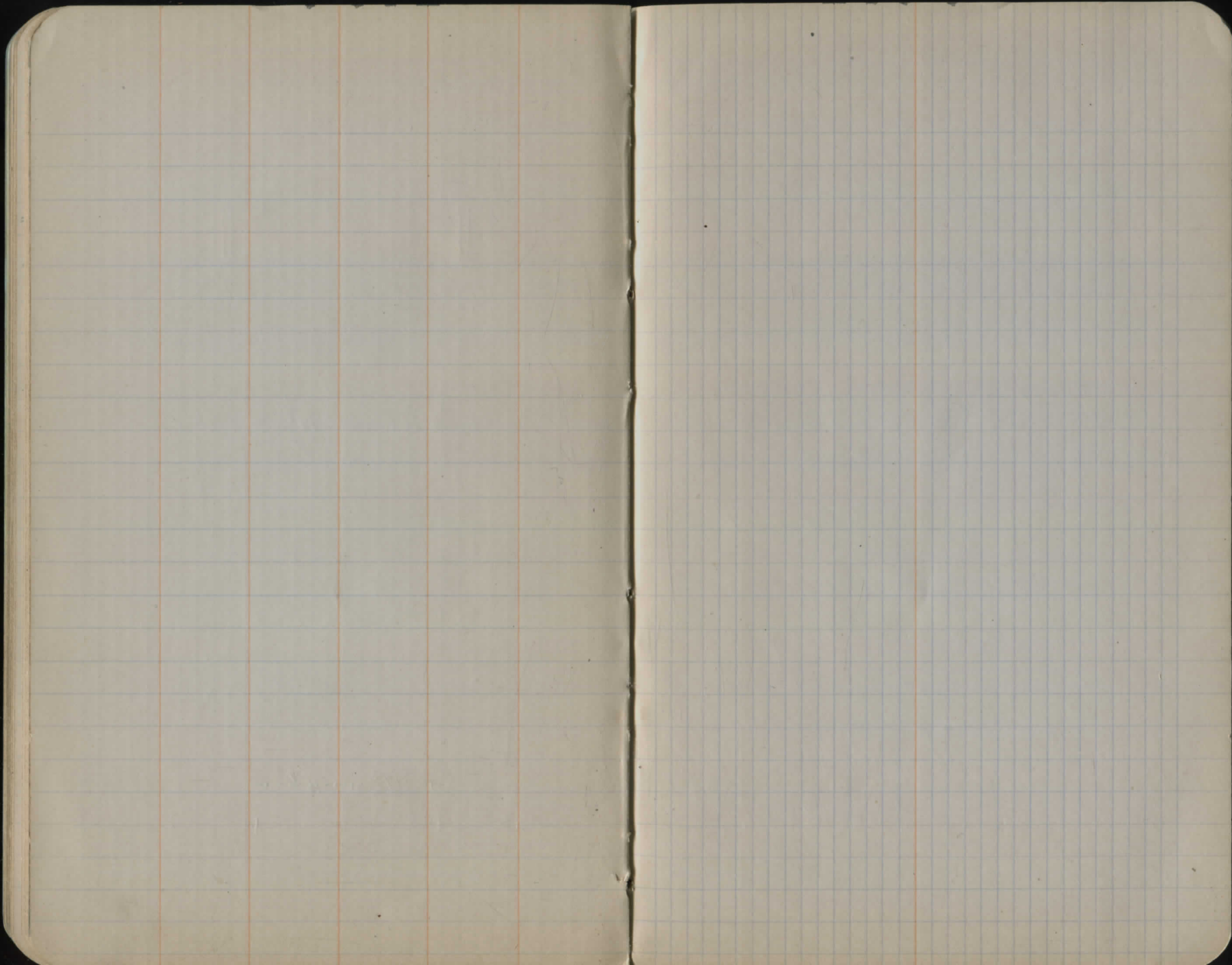


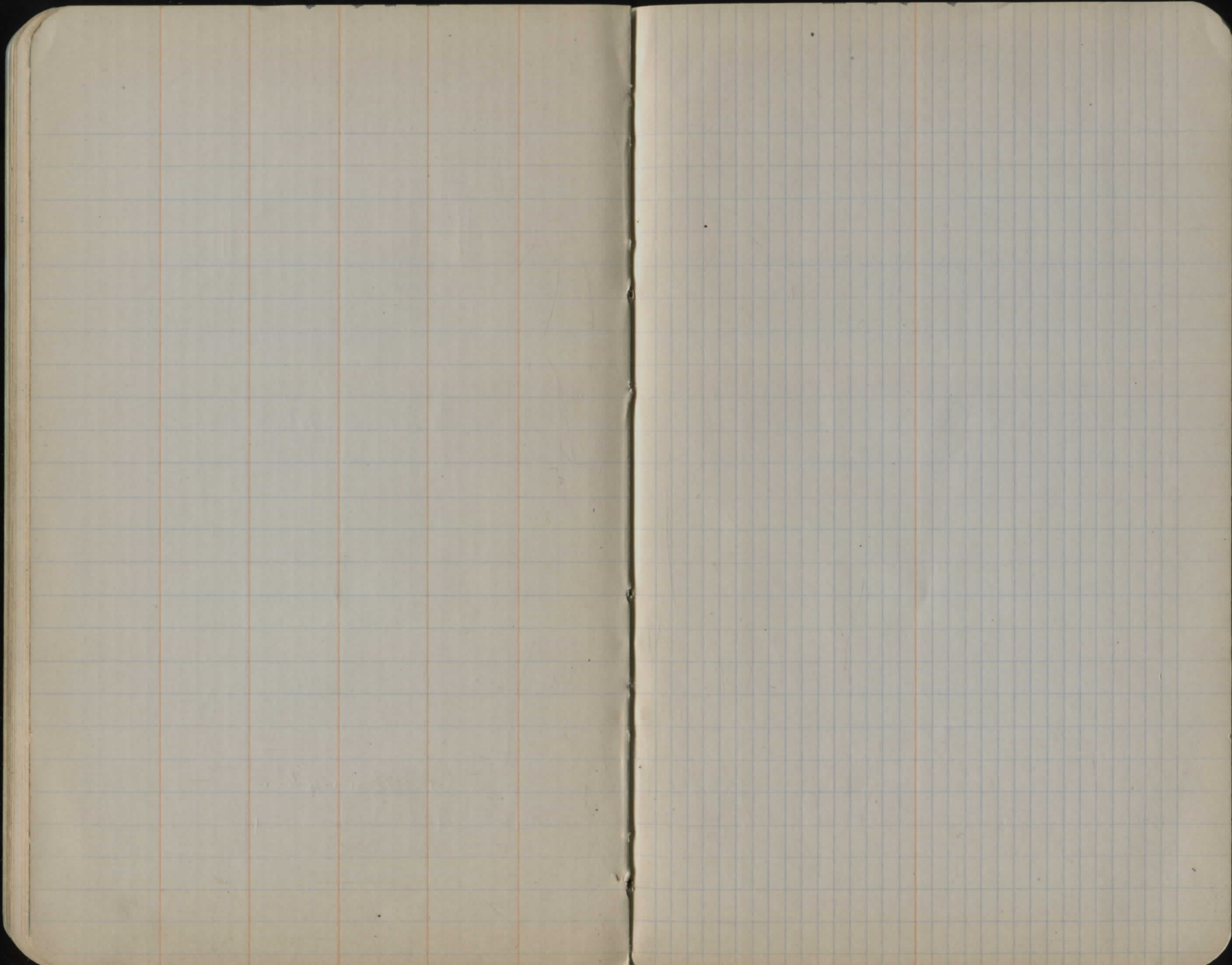


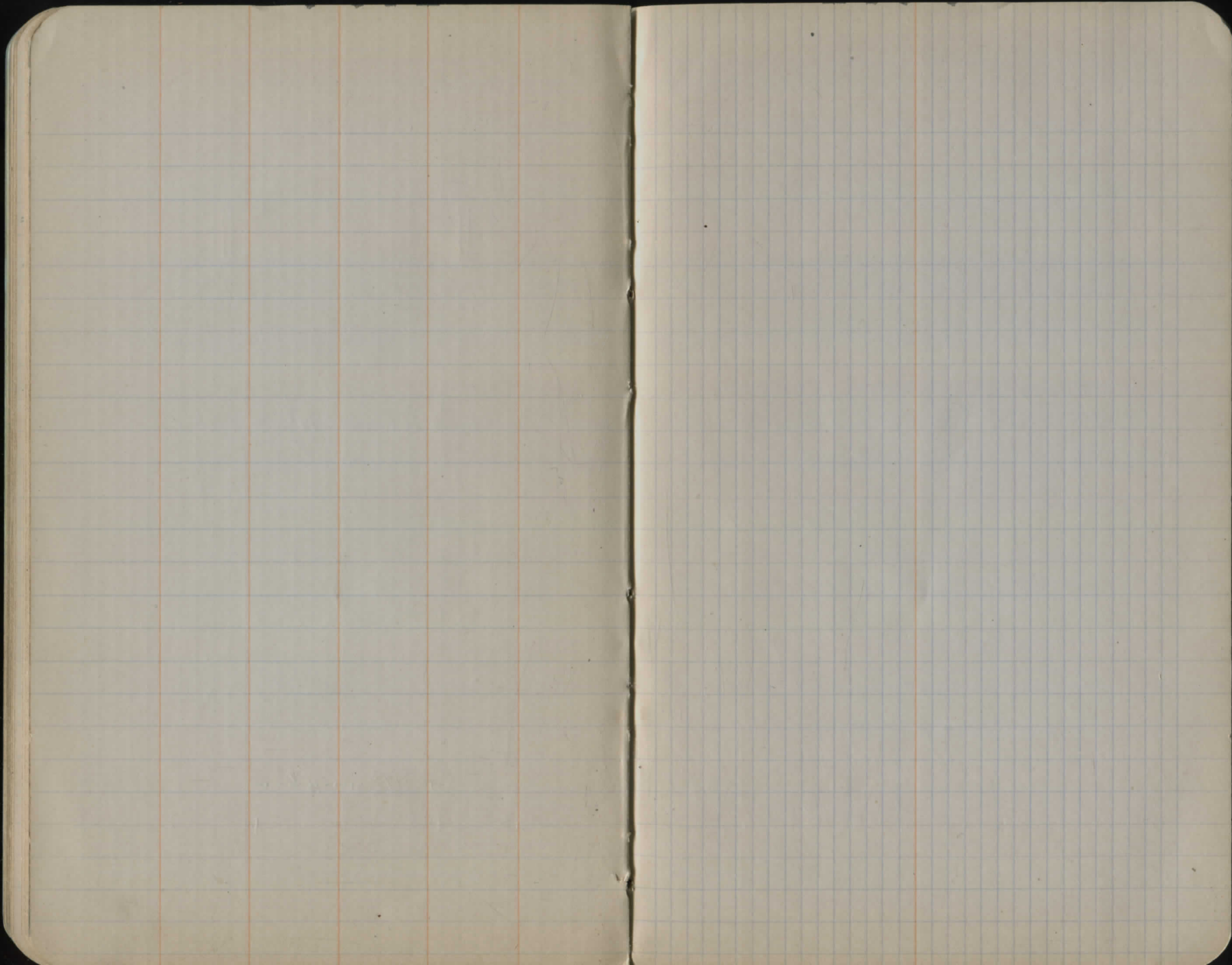


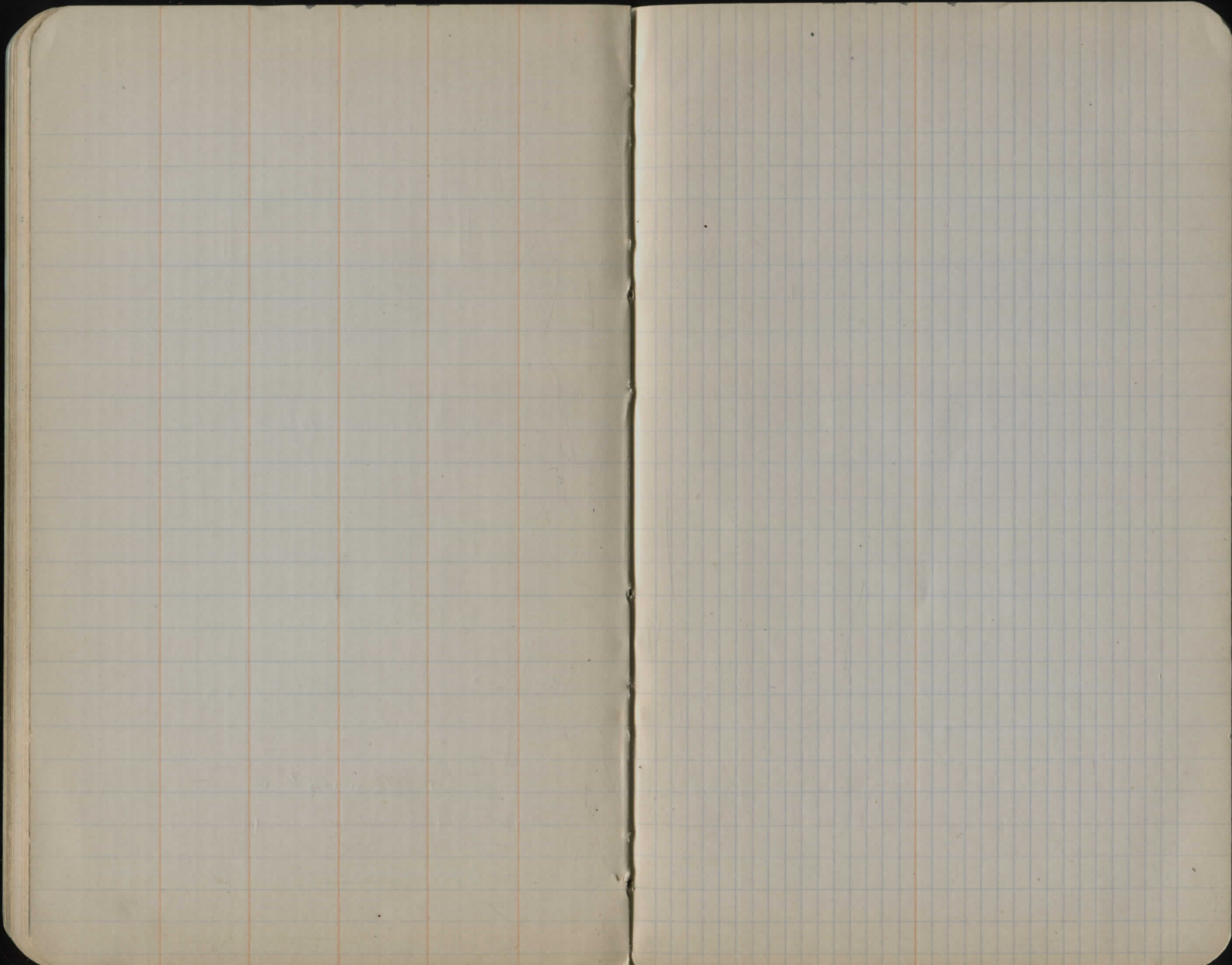


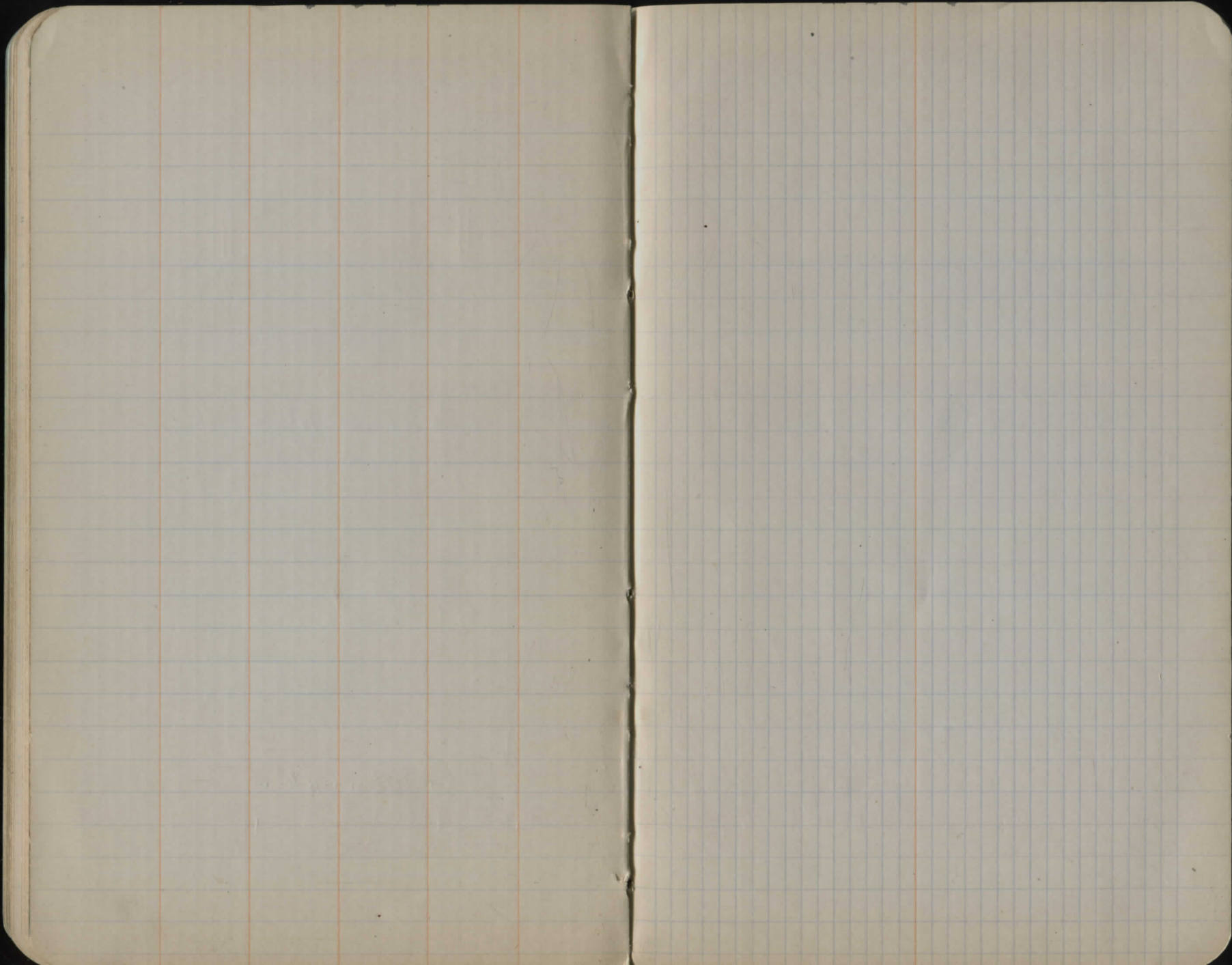


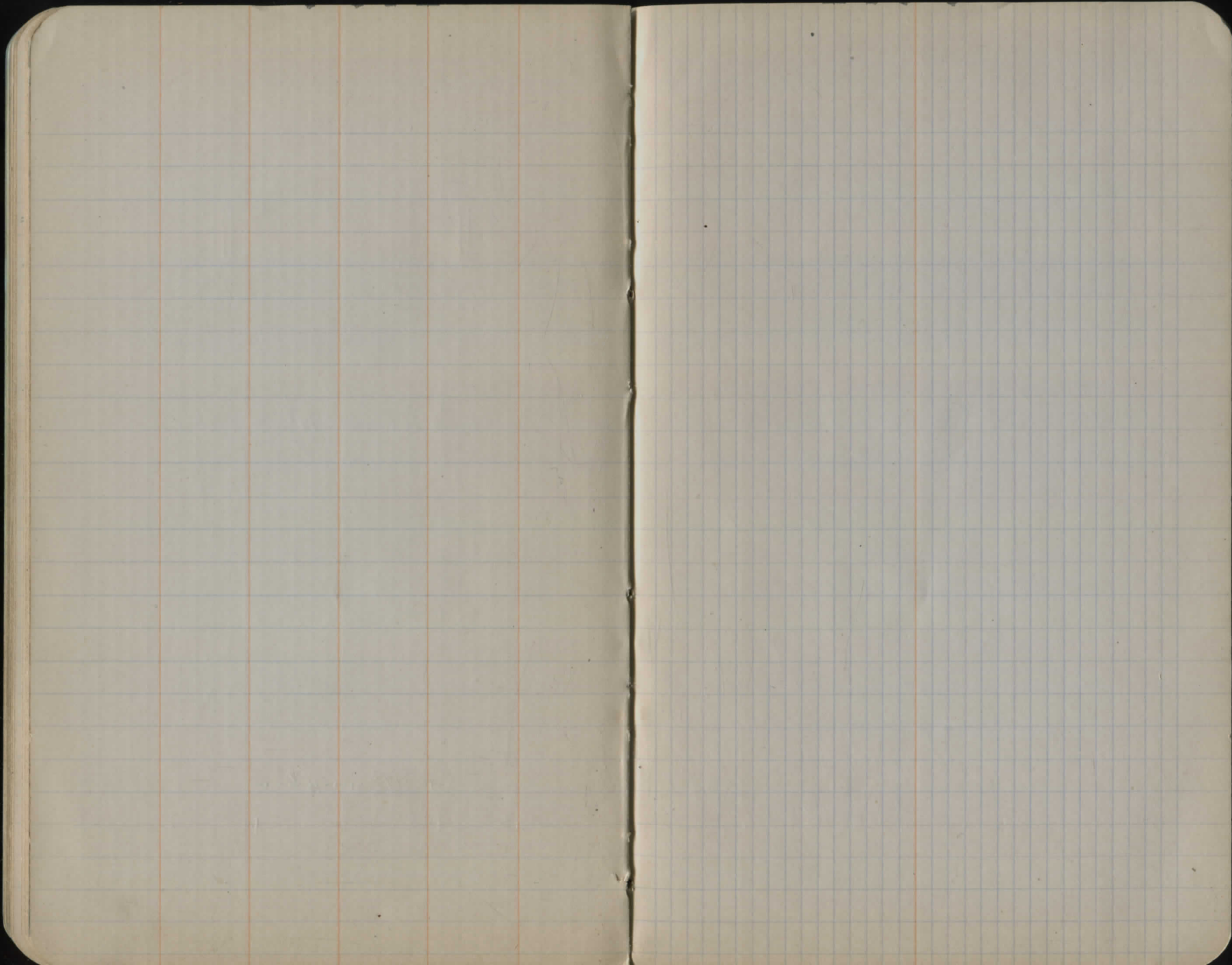




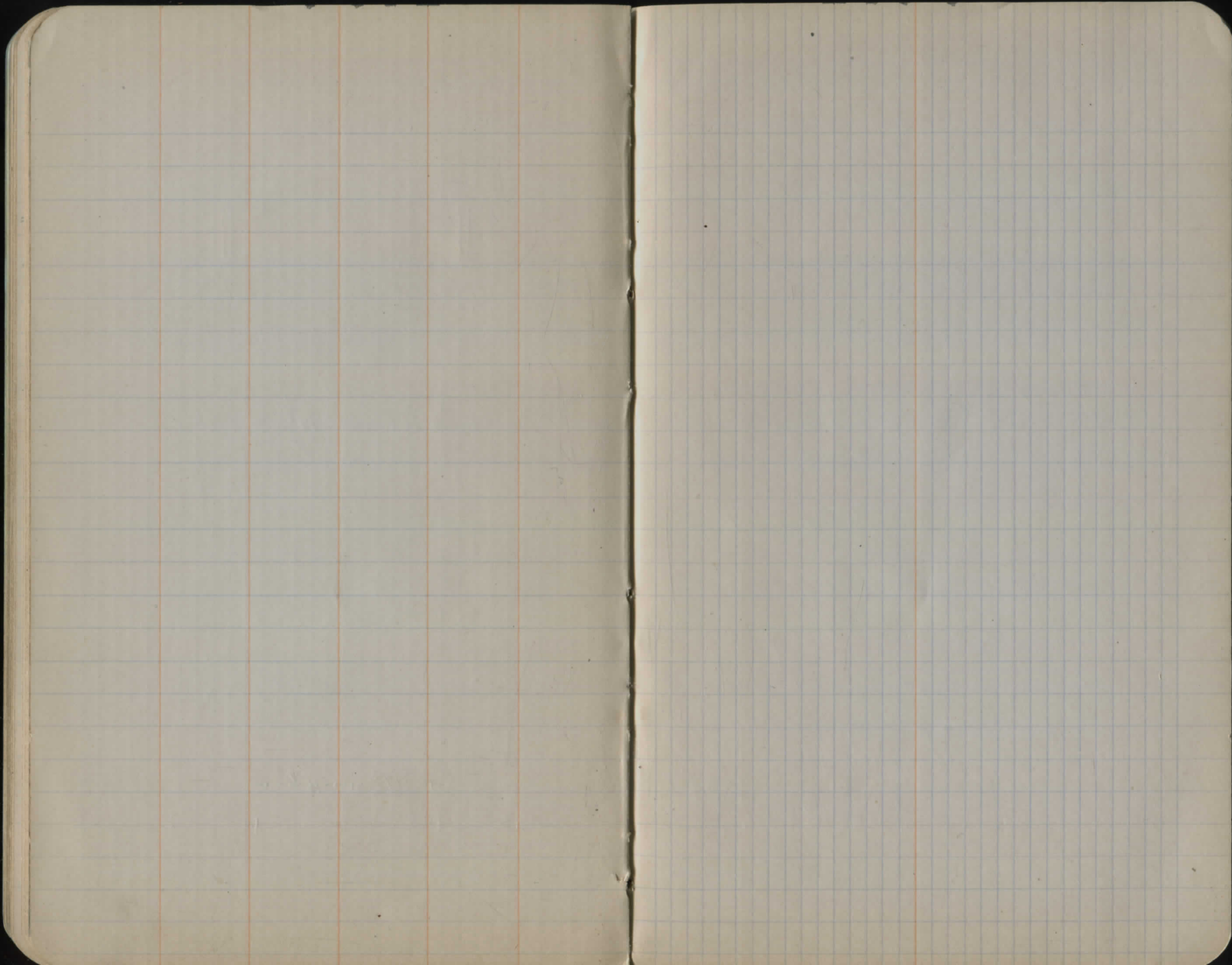


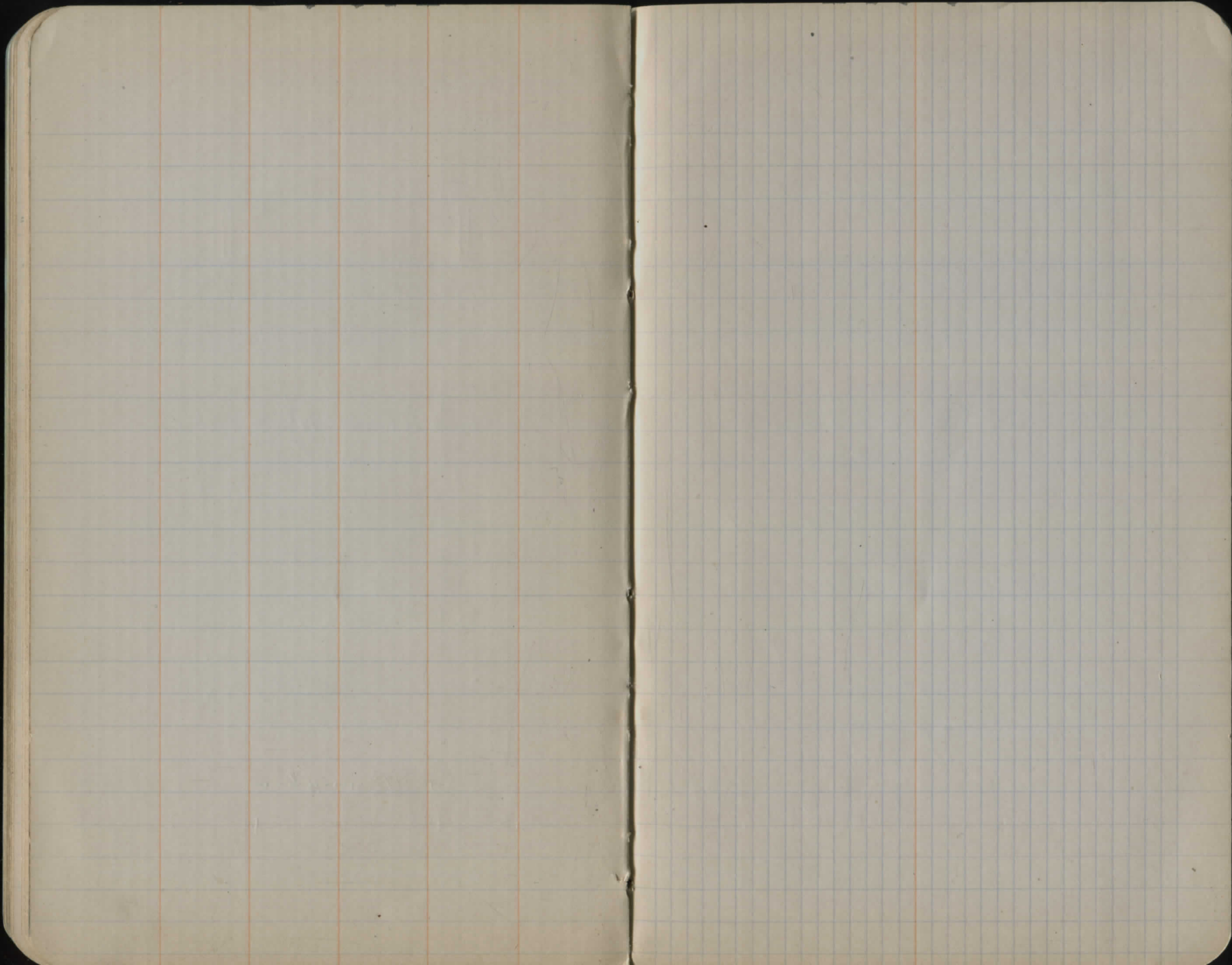


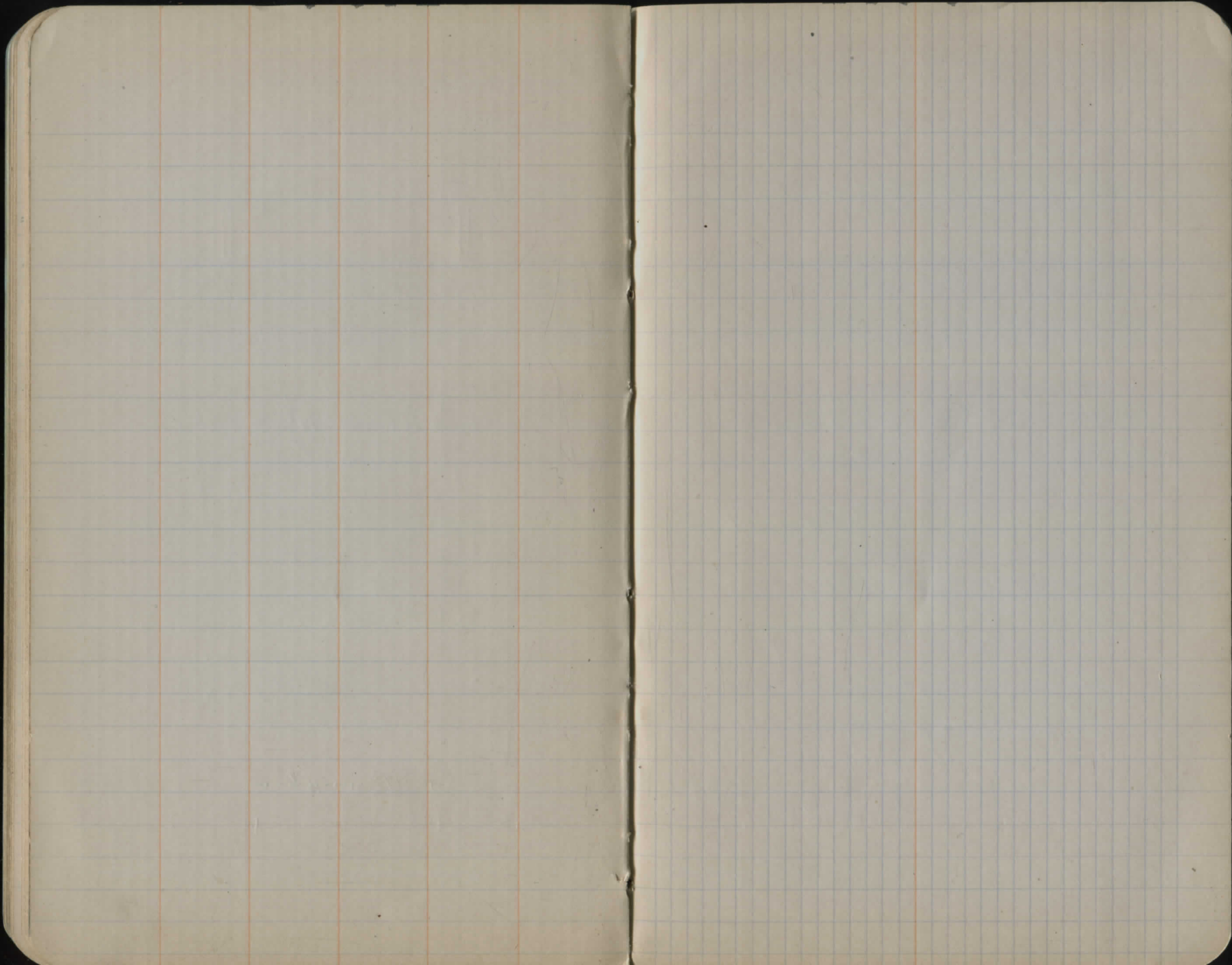


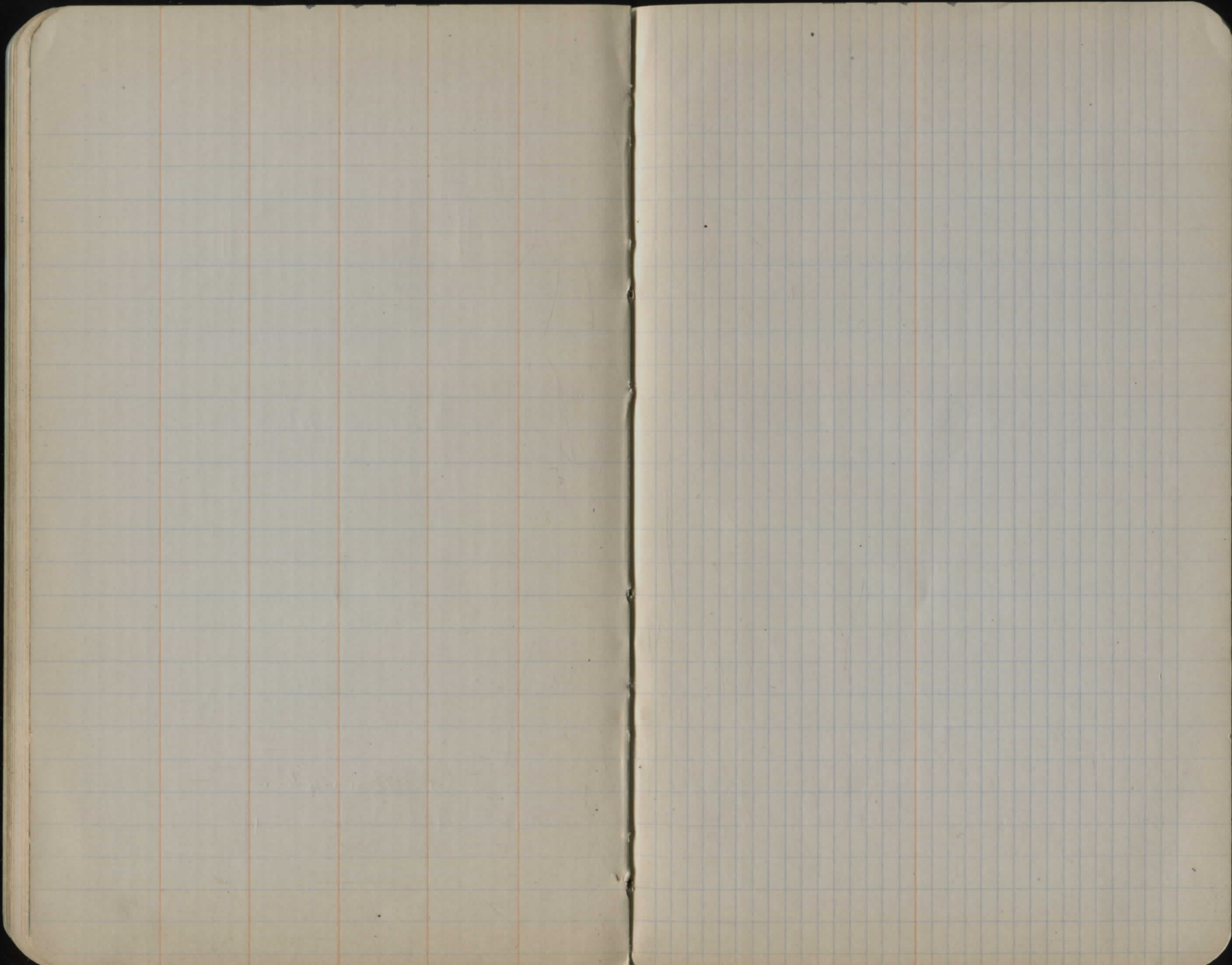


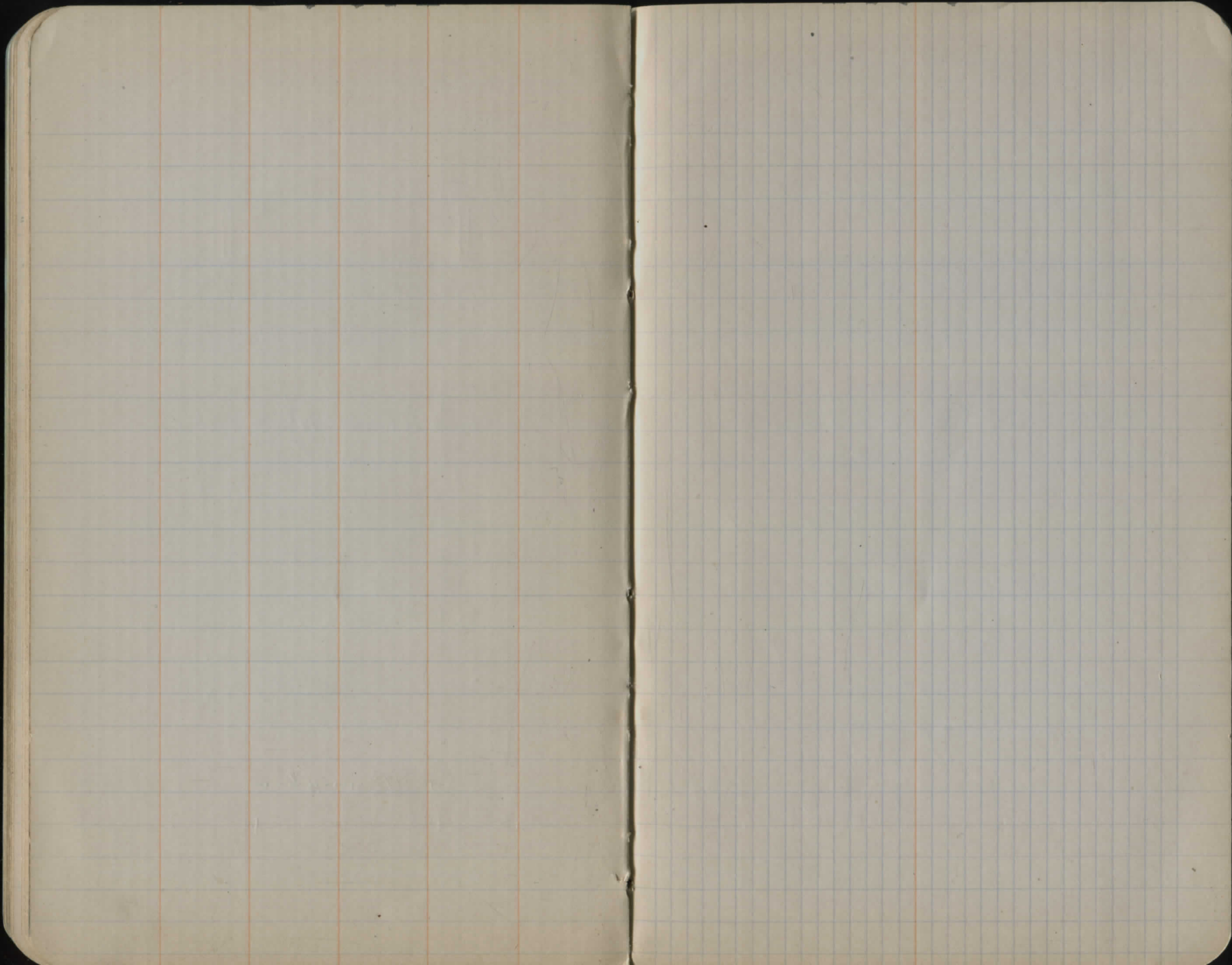


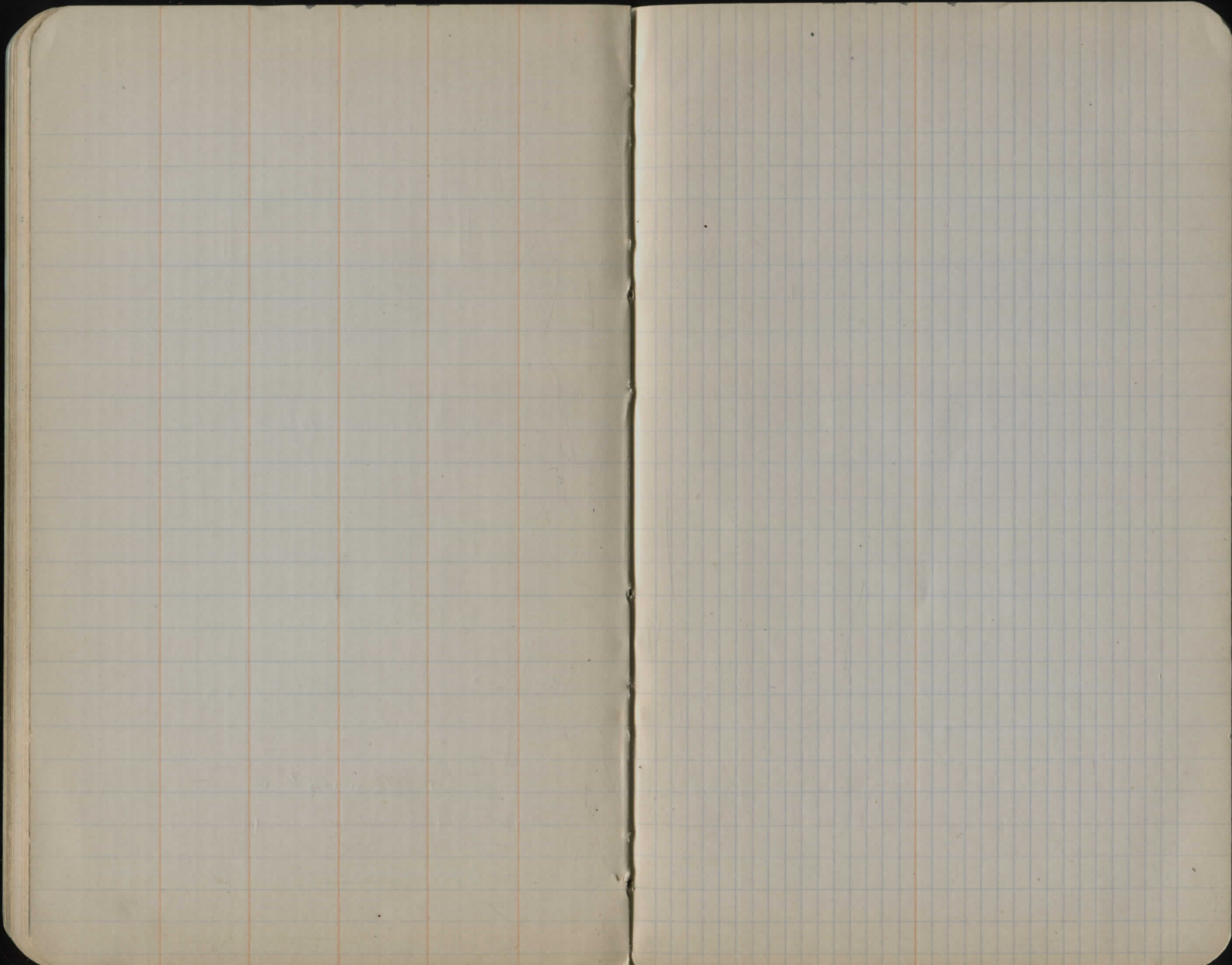


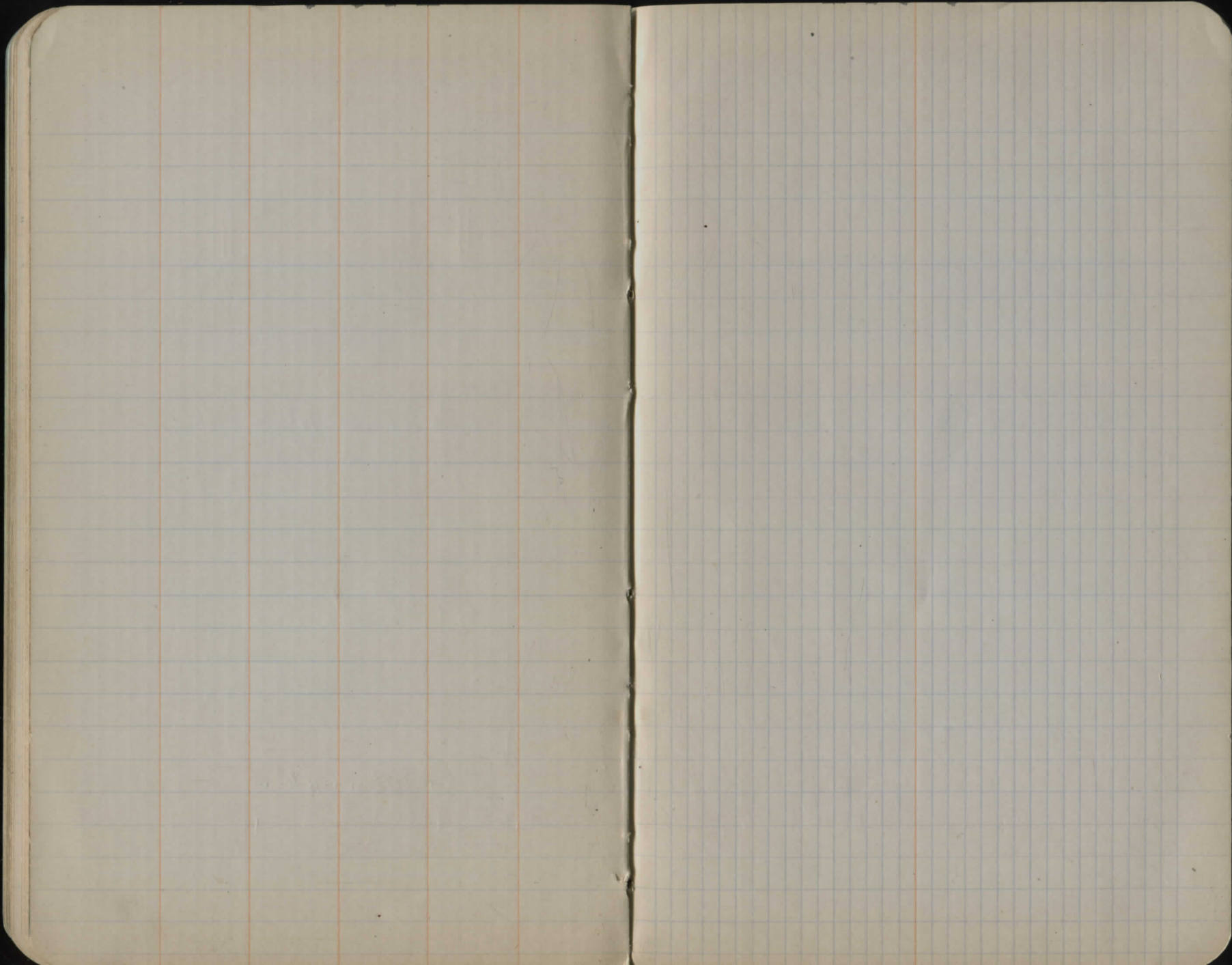


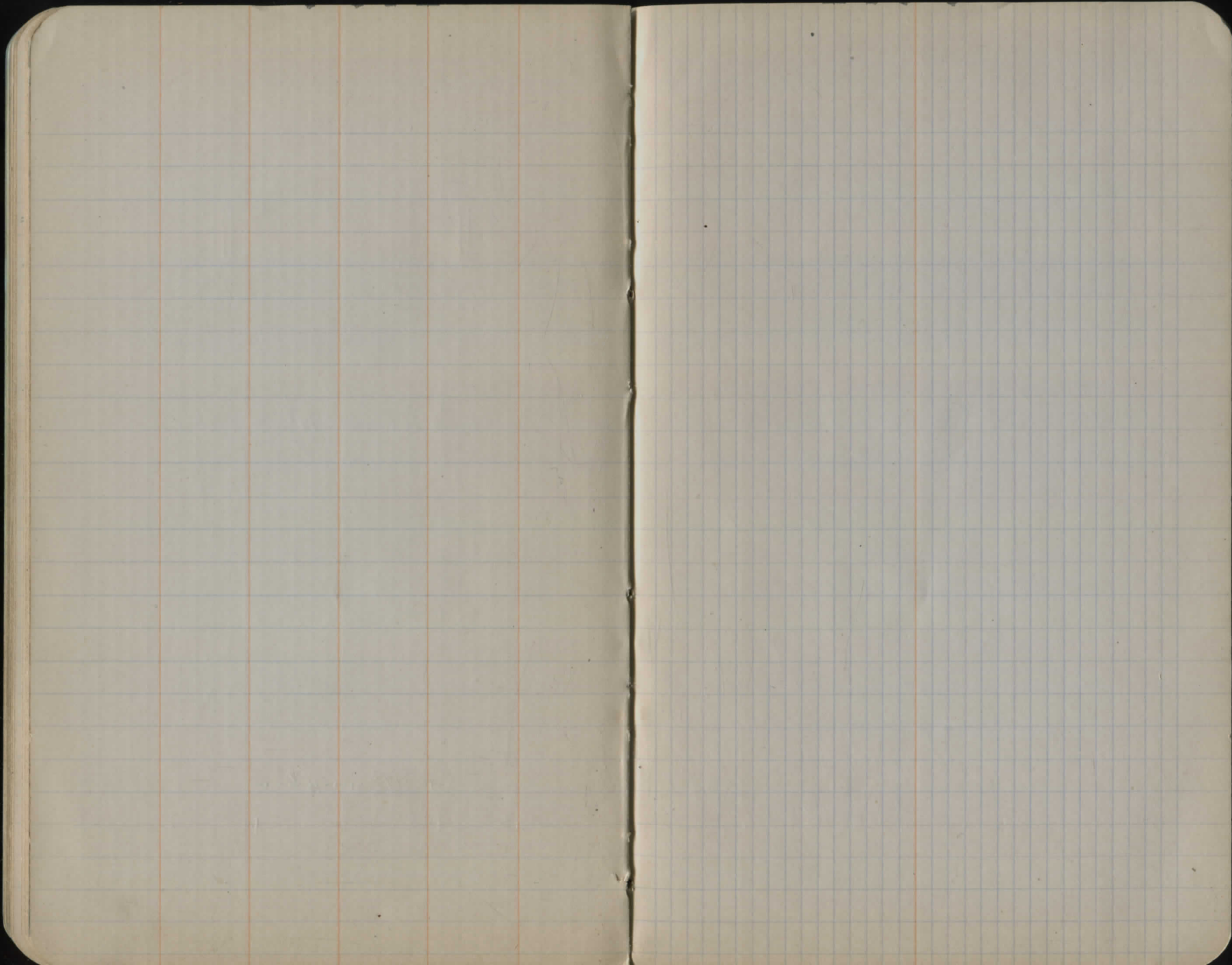




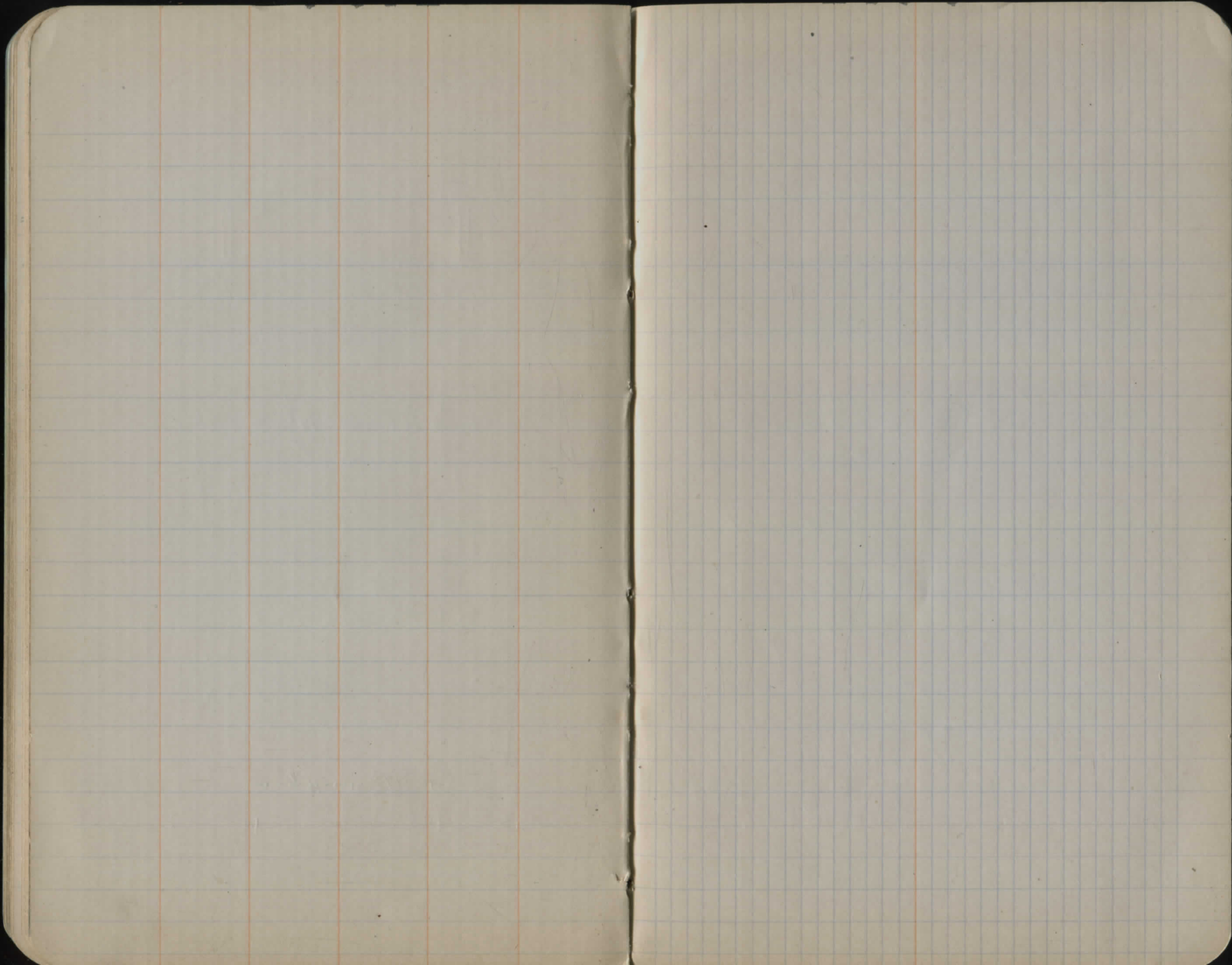












DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope 1% to 1%. If ground is nearly level, the cut or fill at side stake is located by the double entry method in

IMPROVED TABLES

AND

INFORMATION

TABLE No. 2.

To find T, tangent and L, lateral for curve of any other degree, divide by degree of curve and add correction found in column of constants.

Degree of curve with a given L may be found by dividing tangent (or external), opposite by given tangent (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

## DIRECTIONS FOR USE OF TABLES

TABLE No. 1.

Distance of slope stake from side or shoulder stake for any width roadway, slope  $1\frac{1}{2}$  to 1. If ground is nearly level, the cut or fill at side stake is located by the double entry method in left column and top row. The number in body of table in same row and column gives distance from side stake to slope stake. If ground is not level estimate the difference in elevation between the side stake and slope stake, lower target by this amount if cut, elevate if fill. Add this amount to cut or fill and find distance in table. Set up rod at this point, and line of sight should cut target. If it does not make the slight adjustment necessary.

TABLE No. 9.

To find Tangent and External for curve of any other degree, divide by degree of curve and add correction found in column of corrections.

Degree of curve with a given I may be found by dividing tangent, (or external), opposite I by given tangent, (or external).

The distance from a point on the tangent to the curve is very nearly the square of the tangent length divided by twice the radius.

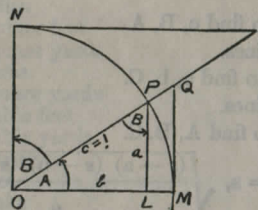


TABLE II  
TRIGONOMETRIC FORMULÆ.

$$\angle A = \angle MOP \quad \angle B = \angle PON = \angle OPL$$

$$R = OB = c = 1$$

$$\sin A = \frac{a}{c} = \frac{a}{1} = a = \cos B = LP$$

$$\cos A = \frac{b}{c} = \frac{b}{1} = b = \sin B = OL$$

$$\tan A = \frac{a}{b} = \frac{MQ}{OM} = \frac{MQ}{1} = MQ = \cot B = MQ$$

$$\cot A = \frac{NT}{ON} = \frac{NT}{1} = NT = \tan B = NT$$

$$\sec A = \frac{OQ}{OM} = \frac{OQ}{1} = OQ = \csc B = OQ$$

$$\csc A = \frac{OT}{ON} = \frac{OT}{1} = OT = \sec B = OT$$

$$\text{vers } A = \frac{LM}{OP} = LM = \text{covers } B \#$$

$$\text{covers } A = \frac{OP - LP}{OP} = OP - LP = \text{vers } B$$

$$\text{exsec } A = PQ = \text{coexsec } B$$

$$\text{coexsec } A = PT = \text{exsec } B$$

$$\sin \frac{1}{2} A = \sqrt{\frac{1 - \cos A}{2}} \quad \cos \frac{1}{2} A = \sqrt{\frac{1 + \cos A}{2}}$$

$$\sin 2A = 2 \sin A \cos A \quad \cos 2A = \cos^2 A - \sin^2 A$$

$$\text{Law of Lines} \quad \frac{\sin A}{a} = \frac{\sin B}{B} = \frac{\sin C}{C}$$

$$\text{Law of Cosines} \quad c^2 = a^2 + b^2 - 2ab \cos C$$

$$\text{Law of Tangents} \quad \frac{a+b}{a-b} = \frac{\tan \frac{1}{2}(A+B)}{\tan \frac{1}{2}(A-B)}$$

TABLE II—Continued  
TRIGONOMETRIC FORMULAE (continued)

In any triangle:

Given a, b, C; to find c, B, A.

Use Law of Lines.

Given A, B, c; to find a, b, C.

Use Law of Lines.

Given a, b, c; to find A, B, C.

$$\text{Let } \frac{a+b+c}{2} = s, \sqrt{\frac{(s-a)(s-b)(s-c)}{s}} = r$$

$$\cos \frac{1}{2} A = \sqrt{\frac{s(s-a)}{bc}}$$

$$\tan \frac{1}{2} A = \frac{r}{s-a}$$

$$\tan \frac{1}{2} B = \frac{r}{s-b}$$

$$\tan \frac{1}{2} C = \frac{r}{s-c}$$

Area of a triangle:

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

PRISMOIDAL FORMULA.

$$\text{Vol.} = \frac{h}{6} (B+b+4M)$$

h = altitude; b, B = bases; M = midsection

TABLE III  
INCHES AND FRACTIONS OF AN INCH IN DECIMALS OF A FOOT

	0	1	2	3	4	5	6	7	8	9	10	11	
$\frac{1}{16}$	.0052	.0885	.1719	.2552	.3385	.4219	.5052	.5885	.6719	.7552	.8385	.9219	$\frac{1}{16}$
$\frac{1}{8}$	.0104	.0938	.1771	.2604	.3438	.4271	.5104	.5938	.6771	.7604	.8438	.9271	$\frac{1}{8}$
$\frac{3}{16}$	.0156	.0990	.1823	.2656	.3490	.4323	.5156	.5990	.6823	.7656	.8490	.9323	$\frac{3}{16}$
$\frac{1}{4}$	.0208	.1042	.1875	.2708	.3542	.4375	.5208	.6042	.6875	.7708	.8542	.9375	$\frac{1}{4}$
$\frac{5}{16}$	.0260	.1094	.1927	.2760	.3594	.4427	.5260	.6094	.6927	.7760	.8594	.9427	$\frac{5}{16}$
$\frac{3}{8}$	.0313	.1146	.1979	.2813	.3646	.4479	.5313	.6146	.6979	.7813	.8646	.9479	$\frac{3}{8}$
$\frac{7}{16}$	.0365	.1198	.2031	.2865	.3698	.4531	.5365	.6198	.7031	.7865	.8698	.9531	$\frac{7}{16}$
$\frac{1}{2}$	.0417	.1250	.2083	.2917	.3750	.4583	.5417	.6250	.7083	.7917	.8750	.9583	$\frac{1}{2}$
$\frac{9}{16}$	.0469	.1302	.2135	.2969	.3803	.4635	.5469	.6302	.7135	.7969	.8802	.9635	$\frac{9}{16}$
$\frac{5}{8}$	.0521	.1354	.2188	.3021	.3854	.4688	.5521	.6354	.7188	.8021	.8854	.9688	$\frac{5}{8}$
$\frac{11}{16}$	.0573	.1406	.2240	.3073	.3906	.4740	.5573	.6406	.7240	.8073	.8906	.9740	$\frac{11}{16}$
$\frac{3}{4}$	.0625	.1458	.2292	.3125	.3958	.4792	.5625	.6458	.7292	.8125	.8958	.9792	$\frac{3}{4}$
$\frac{13}{16}$	.0677	.1510	.2344	.3177	.4010	.4844	.5677	.6510	.7344	.8177	.9010	.9844	$\frac{13}{16}$
$\frac{7}{8}$	.0729	.1563	.2396	.3229	.4063	.4896	.5729	.6563	.7396	.8229	.9063	.9896	$\frac{7}{8}$
$\frac{15}{16}$	.0781	.1615	.2448	.3281	.4115	.4948	.5781	.6615	.7448	.8281	.9115	.9948	$\frac{15}{16}$
1	.0833	.1667	.2500	.3333	.4167	.5000	.5833	.6667	.7500	.8333	.9167	1.000	1
	0	1	2	3	4	5	6	7	8	9	10	11	

TABLE IV  
USEFUL RELATIONS.

Lineal feet	×.00019	= miles
Lineal yards	×.0006	= miles
Square inches	×.007	= square feet
Square feet	×.111	= square yards
Square yards	×.0002067	= acres
Acres	×4840	= square yards
Cubic inches	×.00058	= cubic feet
Cubic feet	×.03704	= cubic yards
Links	×.22	= yards
Links	×.66	= feet
Feet	×1.5	= links
360°	= 21600'	= 1296000"
Radius	= arc of 57.2957790°	
Arc of 1°	(radius = 1)	= .017453292
Arc of 1'	(radius = 1)	= .000290888
Arc of 1"	(radius = 1)	= .000004848

$$\pi = 3.141592654 \quad \sqrt{\frac{1}{4}} = 0.564190$$

$$\frac{\pi}{4} = 0.785398163 \quad \sqrt[3]{\frac{6}{\pi}} = 1.240700982$$

$$\frac{\pi}{6} = 0.523598776 \quad \pi^2 = 9.869604401$$

$$\sqrt{\frac{4}{\pi}} = 1.128379167 \quad \frac{1}{\pi^2} = 0.101321184$$

$$\frac{\pi}{6} = 0.523598776 \quad \sqrt{\pi} = 1.772453851$$

$$\frac{4\pi}{3} = 4.188790205 \quad \frac{1}{\pi} = 0.3183099$$

Curvature of Earth's surface = about 0.7 feet in 1 mile

Curvature in feet = 0.667 (Dist. in miles)<sup>2</sup>

Difference between arc and chord length, 0.05 feet in 11½ miles

$$\text{Probable error of a single observation} = 0.6754 \sqrt{\frac{\sum v^2}{n-1}}$$

Error in chaining of 0.01 feet in 100 feet:

Due to—

1. Length of tape error of 0.01 feet
2. Alignment. One end 1.4 feet out of line
3. Sag of tape at centre of 0.61 feet.
4. Temperature difference of 15°
5. Difference of pull of 15 lbs.

STADIA REDUCTION FORMULAE.

Horizontal Distance = R — R sin<sup>2</sup> a + C cos a

Vertical Distance = R ½ sin 2 a + C sin a

distance from Object glass to cross hairs

$$R = \text{Reading} \times \frac{\text{distance from Object glass to cross hairs}}{\text{distance between cross hairs}}$$

C = distance from Object glass to cross hairs + distance from Object glass to center of instrument.

a = angle of elevation for mid Reading



TABLE VI (continued)  
SINES, COSINES, TANGENTS, COTANGENTS (continued)

de	sin	tan	sin	tan	sin	tan	sin	tan	sin	tan	sin	tan	de
0'	0'	10'	10'	20'	20'	30'	30'	40'	40'	50'	50'	60'	90'
46	7193	1.0355	7214	1.0416	7234	1.0477	7254	1.0533	7274	1.0599	7294	1.0661	43
47	314	.0724	333	.0786	353	.0850	373	.0913	392	.0977	412	.1041	42
48	431	.1106	451	.1171	470	.1237	490	.1303	509	.1369	528	.1436	41
49	547	.1504	566	.1571	585	.1640	604	.1708	623	.1778	642	.1847	40
50	660	1.1918	7679	1.1988	7698	1.2059	7716	1.2131	7735	1.2203	7753	1.2276	39
51	771	2.349	790	2.423	808	2.497	826	2.572	844	2.647	862	2.723	38
52	880	3.2799	898	2.876	916	2.954	934	3.032	951	3.111	969	3.190	37
53	986	3.2799	8004	3.351	8021	3.452	8039	3.514	8056	3.597	8073	3.680	36
54	8090	.3764	107	.3848	124	.3934	141	.4019	158	.4106	175	.4193	35
55	192	4.281	208	4.370	225	4.460	241	4.550	258	4.641	274	4.733	34
56	290	4.826	307	4.919	323	5.013	339	5.108	355	5.204	371	5.301	33
57	387	5.399	403	5.497	418	5.597	434	5.697	450	5.798	465	5.900	32
58	480	6.003	496	6.107	511	6.212	526	6.319	542	6.426	557	6.534	31
59	572	6.643	587	6.753	601	6.864	616	6.977	631	7.090	646	7.205	30
60	660	1.7321	8675	1.7437	8689	1.7556	8704	1.7675	8718	1.7797	8732	1.7917	29
61	746	8.040	760	8.165	774	8.291	788	8.418	802	8.546	816	8.676	28
62	829	8.807	843	8.940	857	9.074	870	9.210	884	9.347	897	9.486	27
63	910	9.626	923	9.768	936	9.912	949	2.0057	962	2.0204	975	2.0353	26
64	988	2.0503	9001	2.0655	9013	2.0809	9026	.0965	9038	1.123	9051	1.283	25
65	9063	1.445	075	1.609	088	1.775	100	.1943	112	.2113	124	.2286	24
66	135	2.460	147	2.637	159	2.817	171	.2998	182	.3183	194	.3369	23
67	205	3.559	216	3.750	228	3.945	239	.4142	250	.4342	261	.4545	22
68	272	4.751	283	4.960	293	5.172	304	.5386	315	.5605	325	.5826	21
69	336	6.051	346	6.279	356	6.511	367	.6746	377	.6985	387	.7228	20
70	397	2.7475	9407	2.7725	9417	2.7980	9426	2.8239	9436	2.8502	9446	2.8770	19
71	455	9.042	465	9.319	474	9.600	483	.9887	492	3.0178	502	3.0475	18
72	511	3.0777	520	3.1084	528	3.1397	537	3.1716	546	3.2041	555	3.2371	17
73	563	2.709	572	3.052	580	3.402	588	.3759	596	.4124	605	.4495	16
74	613	4.874	621	5.261	628	5.656	636	.6059	644	.6470	652	.6891	15
75	659	7.321	667	7.760	674	8.208	681	.8657	689	9.136	696	9.617	14
76	703	4.0108	710	4.0611	717	4.1126	724	4.1653	730	4.2193	737	4.2747	13
77	744	3.315	750	3.897	757	4.494	763	.5107	769	.5736	775	.6382	12
78	781	7.046	787	7.729	793	8.430	799	.9152	805	9.894	811	5.0658	11
79	816	1.446	822	5.2257	827	5.3093	833	5.3955	838	5.4845	843	5.5764	10
80	9848	5.6713	9853	5.7694	9858	5.8708	9863	5.9758	9868	6.0844	9872	6.1970	9
81	877	6.3138	881	6.4348	886	6.5606	890	6.6912	894	6.8269	899	6.9682	8
82	903	7.1154	907	7.2687	911	7.4287	914	7.5958	918	7.7704	922	7.9530	7
83	925	8.1443	929	8.3450	932	8.5555	936	8.7769	939	9.0098	942	9.2553	6
84	945	9.5144	948	9.7882	951	10.078	954	10.385	957	10.711	959	11.059	5
85	962	11.430	964	11.826	967	12.250	969	12.706	971	13.197	974	13.727	4
86	976	14.300	978	14.924	980	15.605	981	16.350	983	17.169	985	18.075	3
87	986	19.081	988	20.206	989	21.470	990	22.903	992	24.542	993	26.432	2
88	994	28.636	9995	31.242	9996	34.368	997	38.189	997	42.964	9998	49.104	1
89	9998	57.290	9999	68.750	9999	85.940	9999	114.58	1.000	171.88	1.000	343.77	0
de	60'	60'	50'	50'	40'	40'	30'	30'	20'	30'	10'	10'	de
cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	cos	cot	cos	de

TABLE VII  
RODS IN FEET AND INCHES

Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches	Rods	Feet Inches
1	16-6	21	346-6	41	676-6	61	1006-6	81	1336-6
2	23-0	22	363-0	42	693-0	62	1023-0	82	1353-0
3	49-6	23	379-6	43	709-6	63	1039-6	83	1369-6
4	66-0	24	396-0	44	726-0	64	1056-0	84	1386-0
5	82-6	25	412-6	45	742-6	65	1072-6	85	1402-6
6	99-0	26	429-0	46	759-0	66	1089-0	86	1419-0
7	115-6	27	445-6	47	775-6	67	1105-6	87	1435-6
8	132-0	28	462-0	48	792-0	68	1122-0	88	1452-0
9	148-6	29	478-6	49	808-6	69	1138-6	89	1468-6
10	165-0	30	495-0	50	825-0	70	1155-0	90	1485-0
11	181-6	31	511-6	51	841-6	71	1171-6	91	1501-6
12	198-0	32	528-0	52	858-0	72	1188-0	92	1518-0
13	214-6	33	544-6	53	874-6	73	1204-6	93	1534-6
14	231-0	34	561-0	54	891-0	74	1221-0	94	1551-0
15	247-6	35	577-6	55	907-6	75	1237-6	95	1567-6
16	264-0	36	594-0	56	924-0	76	1254-0	96	1584-0
17	280-6	37	610-6	57	940-6	77	1270-6	97	1600-6
18	297-0	38	627-0	58	957-0	78	1287-0	98	1617-0
19	313-6	39	643-6	59	973-6	79	1303-6	99	1633-6
20	330-0	40	660-0	60	990-0	80	1320-0	100	1650-0

TABLE VIII  
LINKS IN FEET AND INCHES

Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches	Links	Feet Inches
1	0-7.92	18	11-10.56	35	23-1.20	52	34-3.84	69	45-6.48
2	1-3.84	19	12-6.48	36	23-9.12	53	34-11.76	70	46-2.40
3	1-11.76	20	13-2.40	37	24-5.04	54	35-7.68	71	46-10.32
4	2-7.68	21	13-10.32	38	25-0.96	55	36-3.60	72	47-6.24
5	3-3.60	22	14-6.24	39	25-8.88	56	36-11.52	73	48-2.16
6	3-11.52	23	15-2.16	40	26-4.80	57	37-7.44	74	48-10.08
7	4-7.44	24	15-10.08	41	27-0.72	58	38-3.36	75	49-6.00
8	5-3.36	25	16-6.00	42	27-8.64	59	38-11.28	76	50-1.92
9	5-11.28	26	17-1.92	43	28-4.56	60	39-7.20	77	50-9.84
10	6-7.20	27	17-9.84	44	29-0.48	61	40-3.12	78	51-5.76
11	7-3.12	28	18-5.76	45	29-8.40	62	40-11.04	79	52-1.68
12	7-11.04	29	19-1.68	46	30-4.32	63	41-6.96	80	52-9.60
13	8-6.96	30	19-9.60	47	31-0.24	64	42-2.88	81	53-5.52
14	9-2.88	31	20-5.52	48	31-8.16	65	42-10.80	82	54-1.44
15	9-10.80	32	21-1.44	49	32-4.08	66	43-6.72	83	54-9.36
16	10-6.72	33	21-9.36	50	33-0.00	67	44-2.64	84	55-5.28
17	11-2.64	34	22-5.28	51	33-7.92	68	44-10.56	85	56-1.20

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=10°	I	T	E	I=20°	I	T	E	I=30°
1°	50.00	.218	+	11°	551.70	26.500	+	21°	1061.9	97.577	+
10'	58.34	.297	5° C.	10'	560.11	27.313	5° C.	10'	1070.6	99.155	5° C.
20'	66.67	.388	T	20'	568.53	28.137	T	20'	1079.2	100.75	T
30'	75.01	.491	.03	30'	576.95	28.974	.06	30'	1087.8	102.35	.10
40'	83.34	.606	E	40'	585.36	29.824	.13	40'	1096.4	103.97	.17
50'	91.68	.733	.001	50'	593.79	30.686	.023	50'	1105.1	105.60	.023
2°	100.01	.873	10° C.	12°	602.21	31.561	10° C.	22°	1113.7	107.24	10° C.
10'	108.35	1.024	T	10'	610.64	32.447	T	10'	1122.4	108.90	T
20'	116.68	1.188	.06	20'	619.07	33.347	.13	20'	1131.0	110.57	.19
30'	125.02	1.364	.003	30'	627.50	34.259	.011	30'	1139.7	112.25	.025
40'	133.36	1.552	T	40'	635.93	35.183	T	40'	1148.4	113.95	T
50'	141.70	1.752	E	50'	644.37	36.120	E	50'	1157.0	115.66	E
3°	150.04	1.964	15° C.	13°	652.81	37.070	15° C.	23°	1165.7	117.38	15° C.
10'	158.38	2.188	T	10'	661.25	38.031	T	10'	1174.4	119.12	T
20'	166.72	2.425	.06	20'	669.70	39.006	.13	20'	1183.1	120.87	.19
30'	175.06	2.674	.003	30'	678.15	39.993	.011	30'	1191.8	122.63	.025
40'	183.40	2.934	T	40'	686.60	40.992	T	40'	1200.5	124.41	T
50'	191.74	3.207	E	50'	695.06	42.004	E	50'	1209.2	126.20	E
4°	200.08	3.492	20° C.	14°	703.51	43.029	20° C.	24°	1217.9	128.00	20° C.
10'	208.43	3.790	T	10'	711.97	44.066	T	10'	1226.6	129.82	T
20'	216.77	4.099	.06	20'	720.44	45.116	.13	20'	1235.3	131.65	.19
30'	225.12	4.421	.003	30'	728.90	46.178	.011	30'	1244.0	133.50	.025
40'	233.47	4.755	T	40'	737.37	47.253	T	40'	1252.8	135.35	T
50'	241.81	5.100	E	50'	745.85	48.341	E	50'	1261.5	137.23	E
5°	250.16	5.459	25° C.	15°	754.32	49.441	25° C.	25°	1270.2	139.11	25° C.
10'	258.51	5.829	T	10'	762.80	50.554	T	10'	1279.0	141.01	T
20'	266.86	6.211	.06	20'	771.29	51.679	.13	20'	1287.7	142.93	.19
30'	275.21	6.606	.003	30'	779.77	52.818	.011	30'	1296.5	144.85	.025
40'	283.57	7.013	T	40'	788.26	53.969	T	40'	1305.3	146.79	T
50'	291.92	7.432	E	50'	796.75	55.132	E	50'	1314.0	148.75	E
6°	300.28	7.863	30° C.	16°	805.25	56.309	30° C.	26°	1322.8	150.71	30° C.
10'	308.64	8.307	T	10'	813.75	57.498	T	10'	1331.6	152.69	T
20'	316.99	8.762	.06	20'	822.25	58.699	.13	20'	1340.4	154.69	.19
30'	325.35	9.230	.003	30'	830.78	59.914	.011	30'	1349.2	156.70	.025
40'	333.71	9.710	T	40'	839.27	61.141	T	40'	1358.0	158.72	T
50'	342.08	10.202	E	50'	847.78	62.381	E	50'	1366.8	160.76	E
7°	350.44	10.707	35° C.	17°	856.30	63.634	35° C.	27°	1375.6	162.81	35° C.
10'	358.81	11.224	T	10'	864.82	64.900	T	10'	1384.4	164.86	T
20'	367.17	11.753	.06	20'	873.35	66.178	.13	20'	1393.2	166.95	.19
30'	375.54	12.294	.003	30'	881.88	67.470	.011	30'	1402.0	169.04	.025
40'	383.91	12.847	T	40'	890.41	68.774	T	40'	1410.9	171.15	T
50'	392.28	13.413	E	50'	898.95	70.091	E	50'	1419.7	173.27	E
8°	400.66	13.991	40° C.	18°	907.49	71.421	40° C.	28°	1428.6	175.41	40° C.
10'	409.03	14.582	T	10'	916.03	72.764	T	10'	1437.4	177.55	T
20'	417.41	15.184	.06	20'	924.58	74.119	.13	20'	1446.3	179.72	.19
30'	425.79	15.799	.003	30'	933.13	75.488	.011	30'	1455.1	181.89	.025
40'	434.17	16.426	T	40'	941.69	76.869	T	40'	1464.0	184.08	T
50'	442.55	17.065	E	50'	950.25	78.264	E	50'	1472.9	186.29	E
9°	450.93	17.717	45° C.	19°	958.81	79.671	45° C.	29°	1481.8	188.51	45° C.
10'	459.32	18.381	T	10'	967.38	81.092	T	10'	1490.7	190.74	T
20'	467.71	19.058	.06	20'	975.96	82.525	.13	20'	1499.6	192.99	.19
30'	476.10	19.746	.003	30'	984.53	83.972	.011	30'	1508.5	195.25	.025
40'	484.49	20.447	T	40'	993.12	85.431	T	40'	1517.4	197.53	T
50'	492.88	21.161	E	50'	1001.7	86.904	E	50'	1526.3	199.82	E
10°	501.28	21.887	50° C.	20°	1010.3	88.389	50° C.	30°	1535.3	202.12	50° C.
10'	509.68	22.624	T	10'	1018.9	89.888	T	10'	1544.2	204.44	T
20'	518.08	23.375	.06	20'	1027.5	91.399	.13	20'	1553.1	206.77	.19
30'	526.48	24.138	.003	30'	1036.1	92.924	.011	30'	1562.1	209.12	.025
40'	534.89	24.913	T	40'	1044.7	94.462	T	40'	1571.0	211.48	T
50'	543.29	25.700	E	50'	1053.3	96.013	E	50'	1580.0	213.86	E

T = R tan ½ I

E = R exsec ½ I

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=40°	I	T	E	I=50°	I	T	E	I=60°
31°	1589.0	216.3	+	41°	2142.2	387.4	+	51°	2732.9	618.4	+
10'	1598.0	218.7	5° C.	10'	2151.7	390.7	5° C.	10'	2743.1	622.8	5° C.
20'	1606.9	221.1	T	20'	2161.2	394.1	T	20'	2753.4	627.2	T
30'	1615.9	223.5	.03	30'	2170.8	397.4	.06	30'	2763.7	631.7	.09
40'	1624.9	226.0	.06	40'	2180.3	400.8	.10	40'	2773.9	636.2	.12
50'	1633.9	228.4	.09	50'	2189.9	404.2	.13	50'	2784.2	640.7	.15
32°	1643.0	230.9	.023	42°	2199.4	407.6	.037	52°	2794.0	645.2	.056
10'	1652.0	233.4	T	10'	2209.0	411.1	T	10'	2804.9	649.7	T
20'	1661.0	235.9	.06	20'	2218.6	414.5	.06	20'	2815.2	654.3	.09
30'	1670.0	238.4	.03	30'	2228.1	418.0	.03	30'	2825.6	658.8	.06
40'	1679.1	241.0	.06	40'	2237.7	421.4	.06	40'	2835.9	663.4	.09
50'	1688.1	243.5	.09	50'	2247.3	425.0	.09	50'	2846.3	668.0	.12
33°	1697.2	246.1	10° C.	43°	2257.0	428.5	10° C.	53°	2856.7	672.7	10° C.
10'	1706.3	248.7	T	10'	2266.6	432.0	T	10'	2867.1	677.3	T
20'	1715.3	251.3	.06	20'	2276.2	435.6	.06	20'	2877.5	682.0	.09
30'	1724.4	253.9	.03	30'	2285.9	439.2	.03	30'	2888.0	686.7	.06
40'	1733.5	256.5	.06	40'	2295.6	442.8	.06	40'	2898.4	691.4	.09
50'	1742.6	259.1	.09	50'	2305.2	446.4	.09	50'	2908.9	696.1	.12
34°	1751.7	261.8	15° C.	44°	2314.9	450.0	15° C.	54°	2919.4	700.9	15° C.
10'	1760.8	264.5	T	10'	2324.6	453.6	T	10'	2929.9	705.7	T
20'	1770.0	267.2	.06	20'	2334.3	457.3	.06	20'	2940.4	710.5	.09
30'	1779.1	269.9	.03	30'	2344.1	461.0	.03	30'	2951.0	715.3	.06
40'	1788.2	272.6	.06	40'	2353.8	464.6	.06	40'	2961.5	720.1	.09
50'	1797.4	275.3	.09	50'	2363.5	468.4	.09	50'	2972.1	725.0	.12
35°	1806.6	278.1	20° C.	45°	2373.3	472.1	20° C.	55°	2982.7	729.9	20° C.
10'	1815.7	280.8	T	10'	2383.1	475.8	T	10'	2993.3	734.8	T
20'	1824.9	283.6	.06	20'	2392.8	479.6	.06	20'	3003.9	739.7	.09
30'	1834.1	286.4	.03	30'	2402.6	483.4	.03	30'	3014.5	744.6	.06
40'	1843.3	289.2	.06	40'	2412.4	487.2	.06	40'	3025.2	749.6	.09
50'	1852.5	292.0	.09	50'	2422.3	491.0	.09	50'	3035.8	754.6	.12
36°	1861.7	294.9	25° C.	46°	2432.1	494.8	25° C.	56°	3046.5	759.6	25° C.
10'	1870.9	297.7	T	10'	2441.9	498.7	T	10'	3057.2	764.6	T
20'	1880.1	300.6	.06	20'	2451.8	502.5	.06	20'	3067.9	769.7	.09
30'	1889.4	303.5	.03	30'	2461.7	506.4	.03	30'	3078.7	774.7	.06
40'	1898.6	306.4	.06	40'	2471.5	510.3	.06	40'	3089.4	779.8	.09
50'	1907.9	309.3	.09	50'	2481.4	514.3	.09	50'	3100.2	784.9	.12
37°	1917.1	312.2	30° C.	47°	2491.3	518.2	30° C.	57°	3110.9	790.1	30° C.
10'	1926.4	315.2	T	10'	2501.2	522.2	T	10'	3121.7	795.2	T
20'	1935.7	318.1	.06	20'	2511.2	526.1	.06	20'	3132.6	800.4	.09
30'	1945.0	321.1	.03	30'	2521.1	530.1	.03	30'	3143.4	805.6	.06
40'	1954.3	324.1	.06	40'	2531.1	534.2	.06	40'	3154.2	810.9	.09
50'	1963.6	327.1	.09	50'	2541.0	538.2	.09	50'	3165.1	816.1	.12
38°	1972.9	330.2	35° C.	48°	2551.0	542.2	35° C.	58°	3176.0	821.4	35° C.
10'	1982.2	333.2	T	10'	2561.0	546.3	T	10'	3186.9	826.7	T
20'	1991.5	336.3	.06	20'	2571.0	550.4	.06	20'	3197.8	832.0	.09
30'	2000.9	339.3	.03	30'	2581.0	554.5	.03	30'	3208.8	837.3	.06
40'	2010.2	342.4	.06	40'	2591.0	558.6	.06	40'	3219.7	8	

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=70°	I	T	E	I=80°	I	T	E	I=90°
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	5° C.	20'	4112.1	1322.9	5° C.	20'	4922.5	1824.1	5° C.
30'	3408.8	937.3	T	30'	4124.8	1330.3	T	30'	4937.0	1833.6	T
40'	3420.1	943.1	.25	40'	4137.4	1337.7	.30	40'	4951.5	1843.1	.36
50'	3431.4	948.9	E	50'	4150.1	1345.1	E	50'	4966.1	1852.6	E
62°	3442.7	954.8	.080	72°	4162.8	1352.6	.110	82°	4980.7	1862.2	.149
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	10° C.	73°	4239.7	1398.0	10° C.	83°	5069.2	1920.5	10° C.
10'	3522.6	996.2	T	10'	4252.6	1405.7	T	10'	5084.0	1930.4	T
20'	3534.1	1002.3	.51	20'	4265.6	1413.5	.61	20'	5099.0	1940.3	.72
30'	3545.6	1008.3	E	30'	4278.5	1421.2	E	30'	5113.9	1950.3	E
40'	3557.2	1014.4	.159	40'	4291.5	1429.0	.220	40'	5128.9	1960.2	.299
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	15° C.	75°	4396.5	1492.4	15° C.	85°	5250.3	2041.7	15° C.
10'	3661.9	1070.2	T	10'	4409.8	1500.5	T	10'	5265.6	2052.1	T
20'	3673.5	1076.6	.76	20'	4423.1	1508.6	.91	20'	5281.0	2062.5	.109
30'	3685.4	1082.9	E	30'	4436.4	1516.7	E	30'	5296.4	2073.0	E
40'	3697.2	1089.3	.240	40'	4449.7	1524.9	.332	40'	5311.9	2083.5	.450
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	20° C.	77°	4557.6	1591.6	20° C.	87°	5437.2	2169.2	20° C.
10'	3804.4	1148.0	T	10'	4571.2	1600.1	T	10'	5453.1	2180.2	T
20'	3816.4	1154.7	.102	20'	4584.8	1608.6	.122	20'	5469.0	2191.1	.145
30'	3828.4	1161.3	E	30'	4598.5	1617.1	E	30'	5484.9	2202.2	E
40'	3840.5	1168.1	.321	40'	4612.2	1625.7	.445	40'	5500.9	2213.2	.603
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	25° C.	79°	4723.2	1695.8	25° C.	89°	5630.5	2303.5	25° C.
10'	3950.2	1229.7	T	10'	4737.2	1704.7	T	10'	5646.9	2315.0	T
20'	3962.5	1236.7	.128	20'	4751.2	1713.7	.153	20'	5663.4	2326.6	.183
30'	3974.8	1243.7	E	30'	4765.3	1722.7	E	30'	5679.9	2338.2	E
40'	3987.2	1250.8	.403	40'	4779.4	1731.7	.558	40'	5696.4	2349.8	.756
50'	3999.5	1257.9		50'	4793.6	1740.8		50'	5713.0	2361.5	
70°	4011.9	1265.0		80°	4807.7	1749.9		90°	5729.7	2373.3	
10'	4024.4	1272.1		10'	4822.0	1759.0		10'	5746.3	2385.1	
20'	4036.8	1279.3		20'	4836.2	1768.2		20'	5763.1	2397.0	
30'	4049.3	1286.5		30'	4850.5	1777.4		30'	5779.9	2408.9	
40'	4061.8	1293.6		40'	4864.8	1786.7		40'	5796.7	2420.9	
50'	4074.4	1300.9		50'	4879.2	1796.0		50'	5813.6	2432.9	

T = R tan 1/2 I

E = R exsec 1/2 I

TABLE IX. TANGENTS AND EXTERNALS TO A 1° CURVE

I	T	E	I=100°	I	T	E	I=110°	I	T	E	I=120°
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	4407.2	+
20'	5864.6	2469.3	5° C.	20'	6992.0	3310.1	5° C.	20'	8388.9	4429.2	5° C.
30'	5881.7	2481.5	T	30'	7012.7	3326.1	T	30'	8415.1	4450.9	T
40'	5898.8	2493.8	.43	40'	7033.6	3342.3	.51	40'	8441.5	4472.7	.62
50'	5916.0	2506.1	E	50'	7054.5	3358.5	E	50'	8468.0	4494.6	E
92°	5933.2	2518.5	.200	102°	7075.5	3374.9	.268	112°	8494.6	4516.6	.360
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	10° C.	103°	7203.2	3474.4	10° C.	113°	8656.6	4651.3	10° C.
10'	6055.4	2606.8	T	10'	7224.7	3491.3	T	10'	8684.0	4674.2	T
20'	6073.1	2619.7	.86	20'	7246.3	3508.2	.103	20'	8711.5	4697.2	.125
30'	6090.8	2632.6	E	30'	7268.0	3525.2	E	30'	8739.2	4720.3	E
40'	6108.6	2645.5	.401	40'	7289.8	3542.4	.536	40'	8767.0	4743.6	.721
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'	6162.2	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	15° C.	105°	7467.0	3682.3	15° C.	115°	8993.8	4934.1	15° C.
10'	6271.1	2764.8	T	10'	7489.6	3700.2	T	10'	9022.7	4958.6	T
20'	6289.4	2778.3	1.30	20'	7512.2	3718.2	1.56	20'	9051.7	4983.1	1.93
30'	6307.9	2792.0	E	30'	7534.9	3736.2	E	30'	9080.9	5007.8	E
40'	6326.3	2805.6	.604	40'	7557.7	3754.4	.806	40'	9110.3	5032.6	1.09
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	20° C.	107°	7743.2	3902.9	20° C.	117°	9349.9	5236.2	20° C.
10'	6495.2	2931.6	T	10'	7766.8	3921.9	T	10'	9380.5	5262.3	T
20'	6514.3	2946.3	.809	20'	7790.5	3940.9	1.08	20'	9411.3	5288.6	1.46
30'	6533.4	2960.3	E	30'	7814.3	3960.1	E	30'	9442.2	5315.0	E
40'	6552.6	2974.7	.174	40'	7838.1	3979.4	.208	40'	9473.2	5341.5	.252
50'	6571.9	2989.2	E	50'	7862.1	3998.7	E	50'	9504.4	5368.2	E
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.										



**TABLE X.**  
MIDDLE ORDINATES OF RAILS  
Length of Rail (feet)

C o /	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch	C o	R Feet	30 Inch	28 Inch	26 Inch	24 Inch	22 Inch	20 Inch
0-20	17189	.08	.07	.06	.05	.04	.03	8	716.8	1.88	1.64	1.42	1.20	1.01	.84
0-40	8594	.16	.14	.12	.10	.08	.07	9	637.3	2.12	1.84	1.60	1.35	1.14	.94
1-0	5730	.24	.20	.18	.15	.13	.10	10	573.7	2.36	2.05	1.78	1.50	1.27	1.04
1-20	4297	.31	.27	.23	.20	.17	.13	11	521.7	2.59	2.26	1.95	1.65	1.39	1.15
1-40	3438	.39	.34	.29	.25	.21	.17	12	478.3	3.83	2.47	2.15	1.81	1.54	1.26
2-0	2865	.47	.41	.35	.30	.25	.20	13	441.7	3.05	2.66	2.30	1.96	1.66	1.36
2-20	2456	.55	.48	.41	.35	.29	.23	14	410.3	3.30	2.87	2.48	2.10	1.78	1.46
2-40	2149	.63	.55	.47	.40	.33	.27	15	383.1	3.54	3.08	2.68	2.26	1.91	1.57
3-0	1910	.71	.62	.53	.45	.38	.31	16	359.3	3.76	3.28	2.83	2.40	2.04	1.67
3-20	1719	.78	.68	.59	.50	.42	.35	17	338.3	4.00	3.48	3.02	2.57	2.16	1.78
3-40	1563	.86	.75	.65	.55	.46	.38	18	319.6	4.21	3.67	3.18	2.70	2.28	1.87
4-0	1433	.94	.82	.71	.60	.50	.42	19	302.9	4.45	3.89	3.36	2.86	2.41	1.98
4-20	1323	1.02	.89	.77	.65	.55	.45	20	287.9	4.70	4.09	3.55	3.00	2.54	2.09
4-40	1228	1.10	.96	.83	.70	.59	.48	22	262.0	5.16	4.44	3.84	3.30	2.80	2.29
5	1146	1.18	1.03	.89	.75	.63	.52	24	240.5	5.64	4.92	4.20	3.59	3.04	2.50
6	955.3	1.41	1.23	1.06	.90	.76	.62	26	222.3	6.07	5.29	4.58	3.88	3.29	2.70
7	819.0	1.65	1.44	1.24	1.05	.89	.73								

**TABLE XI.**  
SHORT RADIUS CURVES

Radius Feet	Chord Feet	Central Angle	Deflection Angle	Deflection for 1 Foot
35	10	16-26	8-13	49.3
45	10	12-46	6-23	38.3
50	15	17-16	8-38	34.5
60	15	14-22	7-11	28.8
75	15	11-30	5-45	23.0
100	20	11-30	5-45	17.3
120	20	9-34	4-47	14.3
150	20	7-39	3-49	11.5
190	25	7-32	3-46	9.15
200	25	7-10	3-35	8.6
225	25	6-25	3-12	7.7
240	25	5-58	2-59	7.2
250	25	5-44	2-52	6.9
275	25	5-12	2-36	6.2
288	50	9-58	4-59	6.0
300	50	9-32	4-46	5.7
350	50	8-12	4-06	4.9
376	50	7-40	3-50	4.6
400	50	7-10	3-35	4.3
410	50	7-00	3-30	4.2

To find length of curve divide angle from P. C. to P. T. by central angle of chord and multiply by length of chord.

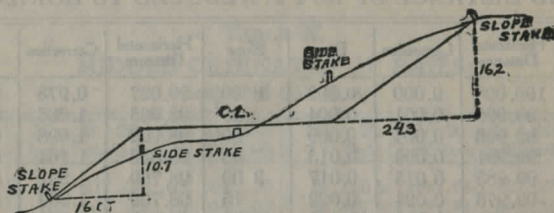
**TABLE XII.**  
INCLINED DISTANCE OF 100 FT. REDUCED TO HORIZONTAL

Slope	Horizontal Distance	Correction	Rise	Slope	Horizontal Distance	Correction	Rise
0°00'	100.000	0.000	0.000	8°00'	99.027	0.973	0.139
15'	99.999	0.001	0.004	15'	98.965	1.035	0.143
30'	99.996	0.004	0.009	30'	98.903	1.098	0.148
45'	99.991	0.009	0.013	45'	98.836	1.164	0.152
1 00	99.985	0.015	0.017	9 00	98.769	1.231	0.156
15	99.976	0.024	0.022	15	98.700	1.300	0.161
30	99.966	0.034	0.026	30	98.629	1.371	0.165
45	99.953	0.047	0.031	45	98.556	1.444	0.169
2 00	99.939	0.061	0.035	10 00	98.481	1.519	0.174
15	99.923	0.077	0.039	15	98.404	1.596	0.178
30	99.905	0.095	0.044	30	98.325	1.675	0.182
45	99.885	0.115	0.048	45	98.245	1.755	0.187
3 00	99.863	0.137	0.052	11 00	98.163	1.837	0.191
15	99.839	0.161	0.057	15	98.079	1.921	0.195
30	99.813	0.187	0.061	30	97.992	2.008	0.199
45	99.786	0.214	0.065	45	97.905	2.095	0.204
4 00	99.756	0.244	0.070	12 00	97.815	2.185	0.208
15	99.725	0.275	0.074	15	97.723	2.277	0.212
30	99.692	0.308	0.078	30	97.630	2.370	0.216
45	99.657	0.343	0.083	45	97.534	2.466	0.221
5 00	99.619	0.381	0.087	13 00	97.437	2.563	0.225
15	99.580	0.420	0.092	15	97.338	2.662	0.229
30	99.540	0.460	0.096	30	97.237	2.763	0.233
45	99.497	0.503	0.100	45	97.134	2.866	0.238
6 00	99.452	0.548	0.105	14 00	97.030	2.970	0.242
15	99.406	0.594	0.109	15	96.923	3.077	0.246
30	99.357	0.643	0.113	30	96.815	3.185	0.250
45	99.307	0.693	0.118	45	96.705	3.295	0.255
7 00	99.255	0.745	0.122	15 00	96.593	3.407	0.259
15	99.200	0.800	0.126	15	96.479	3.521	0.263
30	99.144	0.856	0.131	30	96.363	3.637	0.267
45	99.087	0.913	0.135	45	96.246	3.754	0.271

For each foot take one one-hundredth of each reading.

**TABLE XIII.**  
MINUTES IN DECIMALS OF A DEGREE.

0 30"	.00833	10' 30"	.17500	20' 30"	.34167	30' 10"	.50833	40' 30"	.67500	50' 10"	.84167
1 00	.01667	11 00	.18333	21 00	.35000	31 00	.51667	41 00	.68333	51 00	.85000
30	.02500	30	.19167	30	.35833	30	.52500	30	.69167	30	.85833
2 00	.03333	12 00	.20000	22 00	.36667	32 00	.53333	42 00	.70000	52 00	.86667
30	.04167	30	.20833	30	.37500	30	.54167	30	.70833	30	.87500
3 00	.05000	13 00	.21667	23 00	.38333	33 00	.55000	43 00	.71667	53 00	.88333
30	.05833	30	.22500	30	.39167	30	.55833	30	.72500	30	.89167
4 00	.06667	14 00	.23333	24 00	.40000	34 00	.56667	44 00	.73333	54 00	.90000
30	.07500	30	.24167	30	.40833	30	.57500	30	.74167	30	.90833
5 00	.08333	15 00	.25000	25 00	.41667	35 00	.58333	45 00	.75000	55 00	.91667
30	.09167	30	.25833	30	.42500	30	.59167	30	.75833	30	.92500
6 00	.10000	16 00	.26667	26 00	.43333	36 00	.60000	46 00	.76667	56 00	.93333
30	.10833	30	.27500	30	.44167	30	.60833	30	.77500	30	.94167
7 00	.11667	17 00	.28333	27 00	.45000	37 00	.61667	47 00	.78333	57 00	.95000
30	.12500	30	.29167	30	.45833	30	.62500	30	.79167	30	.95833
8 00	.13333	18 00	.30000	28 00	.46667	38 00	.63333	48 00	.80000	58 00	.96667
30	.14167	30	.30833	30	.47500	30	.64167	30	.80833	30	.97500
9 00	.15000	19 00	.31667	29 00	.48333	39 00	.65000	49 00	.81667	59 00	.98333
30	.15833	30	.32500	30	.49167	30	.65833	30	.82500	30	.99167
10 00	.16667	20 00	.33333	30 00	.50000	40 00	.66667	50 00	.83333	60 00	1.00000



**DISTANCES FROM SIDE STAKES FOR CROSS-SECTIONING.**

SLOPE  $1\frac{1}{2}$  TO 1. ROADWAY OF ANY WIDTH.

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	0 00	0 15	0 30	0 45	0 60	0 75	0 90	1 05	1 20	1 35	0
1	1 50	1 05	1 80	1 95	2 10	2 25	2 40	2 55	2 70	2 85	1
2	3 00	3 15	3 30	3 45	3 60	3 75	3 90	4 05	4 20	4 35	2
3	4 50	4 65	4 80	4 95	5 10	5 25	5 40	5 55	5 70	5 85	3
4	6 00	6 15	6 30	6 45	6 60	6 75	6 90	7 05	7 20	7 35	4
5	7 50	7 65	7 80	7 95	8 10	8 25	8 40	8 55	8 70	8 85	5
6	9 00	9 15	9 30	9 45	9 60	9 75	9 90	10 05	10 20	10 35	6
7	10 50	10 65	10 80	10 95	11 10	11 25	11 40	11 55	11 70	11 85	7
8	12 00	12 15	12 30	12 45	12 60	12 75	12 90	13 05	13 20	13 35	8
9	13 50	13 65	13 80	13 95	14 10	14 25	14 40	14 55	14 70	14 85	9
10	15 00	15 15	15 30	15 45	15 60	15 75	15 90	16 05	16 20	16 35	10
11	16 50	16 65	16 80	16 95	17 10	17 25	17 40	17 55	17 70	17 85	11
12	18 00	18 15	18 30	18 45	18 60	18 75	18 90	19 05	19 20	19 35	12
13	19 50	19 65	19 80	19 95	20 10	20 25	20 40	20 55	20 70	20 85	13
14	21 00	21 15	21 30	21 45	21 60	21 75	21 90	22 05	22 20	22 35	14
15	22 50	22 65	22 80	22 95	23 10	23 25	23 40	23 55	23 70	23 85	15
16	24 00	24 15	24 30	24 45	24 60	24 75	24 90	25 05	25 20	25 35	16
17	25 50	25 65	25 80	25 95	26 10	26 25	26 40	26 55	26 70	26 85	17
18	27 00	27 15	27 30	27 45	27 60	27 75	27 90	28 05	28 20	28 35	18
19	28 50	28 65	28 80	28 95	29 10	29 25	29 40	29 55	29 70	29 85	19
20	30 00	30 15	30 30	30 45	30 60	30 75	30 90	31 05	31 20	31 35	20
21	31 50	31 65	31 80	31 95	32 10	32 25	32 40	32 55	32 70	32 85	21
22	33 00	33 15	33 30	33 45	33 60	33 75	33 90	34 05	34 20	34 35	22
23	34 50	34 65	34 80	34 95	35 10	35 25	35 40	35 55	35 70	35 85	23
24	36 00	36 15	36 30	36 45	36 60	36 75	36 90	37 05	37 20	37 35	24
25	37 50	37 65	37 80	37 95	38 10	38 25	38 40	38 55	38 70	38 85	25
26	39 00	39 15	39 30	39 45	39 60	39 75	39 90	40 05	40 20	40 35	26
27	40 50	40 65	40 80	40 95	41 10	41 25	41 40	41 55	41 70	41 85	27
28	42 00	42 15	42 30	42 45	42 60	42 75	42 90	43 05	43 20	43 35	28
29	43 50	43 65	43 80	43 95	44 10	44 25	44 40	44 55	44 70	44 85	29
30	45 00	45 15	45 30	45 45	45 60	45 75	45 90	46 05	46 20	46 35	30
31	46 50	46 65	46 80	46 95	47 10	47 25	47 40	47 55	47 70	47 85	31
32	48 00	48 15	48 30	48 45	48 60	48 75	48 90	49 05	49 20	49 35	32
33	49 50	49 65	49 80	49 95	50 10	50 25	50 40	50 55	50 70	50 85	33
34	51 00	51 15	51 30	51 45	51 60	51 75	51 90	52 05	52 20	52 35	34
35	52 50	52 65	52 80	52 95	53 10	53 25	53 40	53 55	53 70	53 85	35
36	54 00	54 15	54 30	54 45	54 60	54 75	54 90	55 05	55 20	55 35	36
37	55 50	55 65	55 80	55 95	56 10	56 25	56 40	56 55	56 70	56 85	37
38	57 00	57 15	57 30	57 45	57 60	57 75	57 90	58 05	58 20	58 35	38
39	58 50	58 65	58 80	58 95	59 10	59 25	59 40	59 55	59 70	59 85	39
40	60 00	60 15	60 30	60 45	60 60	60 75	60 90	61 05	61 20	61 35	40
41	61 50	61 65	61 80	61 95	62 10	62 25	62 40	62 55	62 70	62 85	41
42	63 00	63 15	63 30	63 45	63 60	63 75	63 90	64 05	64 20	64 35	42
43	64 50	64 65	64 80	64 95	65 10	65 25	65 40	65 55	65 70	65 85	43
44	66 00	66 15	66 30	66 45	66 60	66 75	66 90	67 05	67 20	67 35	44
45	67 50	67 65	67 80	67 95	68 10	68 25	68 40	68 55	68 70	68 85	45
46	69 00	69 15	69 30	69 45	69 60	69 75	69 90	70 05	70 20	70 35	46
47	70 50	70 65	70 80	70 95	71 10	71 25	71 40	71 55	71 70	71 85	47
48	72 00	72 15	72 30	72 45	72 60	72 75	72 90	73 05	73 20	73 35	48
49	73 50	73 65	73 80	73 95	74 10	74 25	74 40	74 55	74 70	74 85	49
50	75 00	75 15	75 30	75 45	75 60	75 75	75 90	76 05	76 20	76 35	50

Computed by L. Leland Locke.



# Standard Engineer's Field Book

## Description

	Size	Rulings
No. 1307	7 $\frac{1}{4}$ x 4 $\frac{5}{8}$	"Level"
No. 1308	"	"Field"

Specify by Number, the Book desired

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H. Schrock? (S. V. Yoder Goodwin)  
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J. Miller

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L. Hershberger

? K. Mallet sold

M. Burkholder

J. Yoder

180 00  
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133-70

H. Williams  
about 1 acre  
Not shown

45  
3.00

45  
1.30  
2.15  
3.00

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