

W. 26

LEVEL BOOK

400

H. S. CROCKER COMPANY

DRAWING MATERIALS AND
SURVEYING INSTRUMENTS

SAN FRANCISCO

TABLES FOR EXCAVATIONS AND EMBANKMENTS

DISTANCES FROM CENTER OF ROADWAY FOR CROSS-SECTIONING

Roadway 18 Feet Wide. Side Slopes 1 to 1.
For Single Track Excavation.

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

	0	.1	.2	.3	.4	.5	.6	.7	.8	.9	
0	9.0	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	0
1	10.0	10.1	10.2	10.3	10.4	10.5	10.6	10.7	10.8	10.9	1
2	11.0	11.1	11.2	11.3	11.4	11.5	11.6	11.7	11.8	11.9	2
3	12.0	12.1	12.2	12.3	12.4	12.5	12.6	12.7	12.8	12.9	3
4	13.0	13.1	13.2	13.3	13.4	13.5	13.6	13.7	13.8	13.9	4
5	14.0	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9	5
6	15.0	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9	6
7	16.0	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9	7
8	17.0	17.1	17.2	17.3	17.4	17.5	17.6	17.7	17.8	17.9	8
9	18.0	18.1	18.2	18.3	18.4	18.5	18.6	18.7	18.8	18.9	9
10	19.0	19.1	19.2	19.3	19.4	19.5	19.6	19.7	19.8	19.9	10
11	20.0	20.1	20.2	20.3	20.4	20.5	20.6	20.7	20.8	20.9	11
12	21.0	21.1	21.2	21.3	21.4	21.5	21.6	21.7	21.8	21.9	12
13	22.0	22.1	22.2	22.3	22.4	22.5	22.6	22.7	22.8	22.9	13
14	23.0	23.1	23.2	23.3	23.4	23.5	23.6	23.7	23.8	23.9	14
15	24.0	24.1	24.2	24.3	24.4	24.5	24.6	24.7	24.8	24.9	15
16	25.0	25.1	25.2	25.3	25.4	25.5	25.6	25.7	25.8	25.9	16
17	26.0	26.1	26.2	26.3	26.4	26.5	26.6	26.7	26.8	26.9	17
18	27.0	27.1	27.2	27.3	27.4	27.5	27.6	27.7	27.8	27.9	18
19	28.0	28.1	28.2	28.3	28.4	28.5	28.6	28.7	28.8	28.9	19
20	29.0	29.1	29.2	29.3	29.4	29.5	29.6	29.7	29.8	29.9	20
21	30.0	30.1	30.2	30.3	30.4	30.5	30.6	30.7	30.8	30.9	21
22	31.0	31.1	31.2	31.3	31.4	31.5	31.6	31.7	31.8	31.9	22
23	32.0	32.1	32.2	32.3	32.4	32.5	32.6	32.7	32.8	32.9	23
24	33.0	33.1	33.2	33.3	33.4	33.5	33.6	33.7	33.8	33.9	24
25	34.0	34.1	34.2	34.3	34.4	34.5	34.6	34.7	34.8	34.9	25
26	35.0	35.1	35.2	35.3	35.4	35.5	35.6	35.7	35.8	35.9	26
27	36.0	36.1	36.2	36.3	36.4	36.5	36.6	36.7	36.8	36.9	27
28	37.0	37.1	37.2	37.3	37.4	37.5	37.6	37.7	37.8	37.9	28
29	38.0	38.1	38.2	38.3	38.4	38.5	38.6	38.7	38.8	38.9	29
30	39.0	39.1	39.2	39.3	39.4	39.5	39.6	39.7	39.8	39.9	30
31	40.0	40.1	40.2	40.3	40.4	40.5	40.6	40.7	40.8	40.9	31
32	41.0	41.1	41.2	41.3	41.4	41.5	41.6	41.7	41.8	41.9	32
33	42.0	42.1	42.2	42.3	42.4	42.5	42.6	42.7	42.8	42.9	33
34	43.0	43.1	43.2	43.3	43.4	43.5	43.6	43.7	43.8	43.9	34
35	44.0	44.1	44.2	44.3	44.4	44.5	44.6	44.7	44.8	44.9	35
36	45.0	45.1	45.2	45.3	45.4	45.5	45.6	45.7	45.8	45.9	36

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

FROM
LORING'S BOOK STORE
SAN DIEGO, CAL.

4634
W. 6.49
E. 3.00
3.90 diff

0002
MILLS

Rock 3' x 3' x 4' sta 134 +
3' x 3' x 3' sta

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Grade S end Savage tunnel; grade N end of Tunnel #4; grade Sta #356; S.M.'s	1
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0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

Grade 5 end Savage Tunnel 1503.
192+08 15.36
Old Sta. 300 (New 190) 1486.64
1490.64

N. end of Tunnel #4 Bottom 1481.52
Sta 265+20 Bench 1485.52

Sta 356 Bottom 1474.16
Bench 1478.16

B. M. 37 1506.48

B. M. 36 1507.12

B. M. 32 1506.86

B. M. 33 1506.94

Relocation. Ditch Grades
Tunnels #3 to #4

1/19/07

Hall
LaRue

B. No. 36		1507.12
	0.31	1507.43
o		10.33 1497.05
	0.44	1497.49
244 +73		10.33
245		10.35
+50		10.39
o		10.30 1487.19
	4.52	1491.71
246		4.65
+50		4.69
247		4.73
+50		4.77
o		0.96 1490.75
	7.68	1498.43
248		11.53
	12.95	21.64

(+4) 1487.16 Tunnel grade N83.06
Exit Tunnel #3 (Eagle Cliff)

1487.14

.10

1487.06

.02

86.98

.94

86.90

1498.43

248 +50

11.57

1486.86

249

11.61

.82

+50

11.65

.78

250

11.69

.74

+50

11.73

.70

0

8.16

1490.27

7.22 1497.49

251

10.83

1486.66

+50

10.87

.62

252

10.91

.58

+50

10.95

.54

253

10.99

.50

+50

11.03

.46

254

11.07

.42

+50

11.11

.38

255

11.15

.34

7.74

1489.75

7.22

15.90

4.
1487.75
4.47 1494.22

255 +50 7.92

256 7.96 1486.30

+50 8.00 .26

257 8.04 .22

+50 8.08 .18

1.74 1492.48

0.66 1493.14

258 7.04 1486.10

+50 7.08 .06

259 7.12 .02

+50 7.16 1485.98

260 7.20 .94

9.48 1483.66

4.01 1487.67

+50 1.77 1485.90

261 7.81 .86

9.14 11.22

5
261+50

1487.67

1.85

1488.82

262

1.89

.78

0

1.89 1485.75

5.00 1490.78

+50

5.04

1485.74

263

5.08

.70

0

5.96 1484.82

11.51 1496.33

0

4.21 1492.12

11.81 1503.93

0

1.77 1502.16

9.09 1511.25

5.87 1505.38

37.41

19.70

Grade for Tunnel #3 N. end

		1501.94
3.95	1505.89	
0		5.03 1500.86
0.76	1501.62	
0		12.25 1489.37
0.47	1489.84	
0		9.57 1480.27
2.16	1487.43	
		2.90
0		7.21 1480.22
12.79	1493.01	
0		1.34 1491.67
12.66	1504.33	
		2.29 1501.94

7/20/27

B.M. 33

Hall
La Rue

OK.

1484.53 Tunnel #3 N. End. - 1 226 + 36

Changed to 14 84.64

B.M. 33

7. Grades for Ditch Bench
 Sta 209+50 - 197
 Superseding same Stations Book #1.

			1506.86	
	0.67	1507.53		
o			5.64	1501.89
	0.25	1502.14		
209+50				12.27
209				12.23
+50				12.19
208				12.15
o			12.19	1489.95
	9.93	1499.88		
+50				9.86
207				9.81
+50				9.77
206				9.73
o			9.73	1490.15
	7.52	1497.67		
+50				8 7.48
	18.37		27.56	

= B. No. 33.

(+4)	1489.87
	.91
	.95
	.99
	1490.03
	.07
	.11
	.15
	1490.19

2706
 1837
 919

205

1497.67

205 7.44

+50 7.40

204 7.36

+50 7.32

0 7.32 1470.35

8.99 1499.34

203 8.95

+50 8.91

202 8.87

+50 8.83

201 8.79

+50 8.75

8.75 1490.59

5.14 1495.73

200 5.09

+50 5.05

199 5.01

14.13 16.07

+4

1490.23

.27

.31

.35

1490.39

.43

.47

.51

.55

.59

1490.64 ✓

.68

.72

	1495.73		
198 + 50			4.97
195			4.93
		4.93	1470.80
	7.07	1497.87	
+ 50			7.03
197			6.99
0		6.99	1490.88
	11.77	1502.65	
196 + 50			11.73
196			11.69
195 + 50			11.65
195			11.61
	11.84		
		11.92	

continued work at

Sta 196 + 50 7-23-07

1490.76
.80
.84
1490.88
1490.92
90.96
91.00
91.04

E. H. Lopez
 P. W. Wrenth
 P. H. Waterson
 J. M. La Rue
 Cassin Carter

10.

1502.65

194 +50

11.57

194

11.53

193 +50

11.49

0

11.49

1491.16

12.48

1503.64

193

12.44

192 +50

12.40

192

12.36

191 +50

12.32

191

12.28

12.48

11.49

Grade (+450)

1491.08

91.12

91.16

91.20

91.24

91.28

91.32

91.36

1503.64

190 + 50 12.20

189 + 50 12.20

0 12.20 1491.34

4.11 1495.55

189 + 50 14.07

189 + 03 4.03

188 + 50 3.99

188 3.95

187 3.87

186 + 50 3.53

4.11 12.20

Grade (+4.0)

1491.40

91.44

91.48

91.52

91.56

91.60

91.68

91.72

91.60 m. Kupfer 188 & 187 spring gutt

186	8.08	1495.55	178	1492.77
185 + 44				10.05
184 + 81				9.99
+40				9.97
184				9.93
182 + 55				9.89
0	2.92	1498.60	6.17	1495.68
183				6.60
182 + 50				6.55
	11.00		7.95	

grade (440)

1491.76

91.80

91.86

91.88

91.92

91.96

92.00

92.04

1149.60

0 12.10 1504.14 650 1149.04

1182 12.16

1181 + 50 12.22

1181 11.91

150 + 50 11.94

0 11.27 1503.47 1194 1192.20

1180 11.23

1179 + 60 11.19

1179 11.15

1178 + 50 11.11

23.37

12.50

grads (1450)

1192.06

92.12

92.16

92.20

92.24

92.28

92.32

92.36

11.

1503.47

178

1157

Grade (+4.0')

1492.40

177 +50

1103

9244

177

1099

9245

176 +50

1095

9252

176

1091

9256

175 +50

1087

9260

0	1231	1504.91	1089	1492.60
	539	1509.75	0.55	1504.36
			26	1507.10

= hub 174 +80

17.7

14.07

15.

11.21

1503.91

1492.60

Grade (+40')

1492.64

175

11.17

174 +50

11.13

92.68

174

11.09

92.72

0

11.09 1492.72

565 1491.37

173 +50

561

92.76

173

559

92.80

172 +50

553

92.84

172

549

92.88

171 +50

545

92.92

16.86

11.09

16.					
0		149837		545	149293
	9.06	150198			
171					902
170 + 48					898
170					894
169 + 50					890
169					886
168 + 50					882
168					878
0	6.43	1499.19	9.22		149276
	13.49		14.67		

commenced work at
 Sta 171 7-24-07
 E. L. Cape
 P. White
 Polio Station
 Don La Rue
 Cassin Carter
 1 laborer 1/2 da.

902 (4.0)		
149296		
93.00		
93.04		
93.08		
93.12	McKen	
93.16		
93.20		

17

1499.19

167 + 50

59

166 + 79

59

+ 52

59

166

59

165 + 50

59

165

59

164 + 50

59

0

1121

1504.69

571

1493.41

131

1503.38

Grad. (+ 4.0)

1493.24

93.30

93.32

93.36

93.40

93.44

93.48

= 8m 29 (1503.42)

1121

7.02

18.

12.32

1505.10

1493.48

12.64 + 50

Grade (+4.0)

164

12.21

1493.52

163 + 50

12.24

93.56

162

12.20

93.60

162 + 50

12.16

93.64

162

12.23

93.68

0

592

1499.60

12.22

1493.68

161 + 50

12.19

93.72

161

12.14

93.76

160 + 50

12.10

93.80

12.24

12.12

149					576
160		1499.60			
0	12.20	1505.99	581	1493.79	
159 + 50					1211
159					1207
156 + 50					1203
158					1197
157 + 50					1195
157					1191
156 + 50					1187
	12.20		581		

Grade (14.0)

1493.84
93.88
93.92
93.96
94.00
94.04
94.08
94.12

20.

150599

Grade (+4.0)

1494.16

156

o

1133

150549

1182

1494.16

077

1504.72

- BM 28 (1504.75)

1181

150597

1494.16

9420

155 +50

1177

9424

155

1173

9428

154 +50

1169

9432

154

1165

o

1165

1505.97

1165

1494.32

9436

153 +50

1161

9440

153

1157

2346

1165

1505.97

152 + 50

1153

153

1149

151 + 50

1145

151

1141

150 + 50

1137

0

1094

1505.54

1137

1494.60

150

1090

149 + 50

1086

149 + 05

1082

1094

1137

Grade (+4.0)

1494.64

944.8

944.2

945.6

946.0

946.4

946.8

947.2

1505.54

148 +50

1071

148

1071

147 +50

1070

0

7.10

1501.94

1070

1194.84

147

700

146 +67

704

+29

700

145 +50

694

145

690

7.10

1070

Grade (+7.0')

1494.76

94.80

94.64

94.88

94.90

94.94

95.00

95.04

150.194

144 + 50

6.78

144

6.82

143 + 50

6.78

0

9.18 1304.34

6.78 1495.16

143

9.04

142 + 50

9.04

142

9.06

0

9.52 1507.62

6.22 1498.09

141 + 50

12.30

141

12.36

18.71

13.03

Commenced work at

Sta. 141 + 50

7-25-07

grad (+4c)

1495.08

95.12

95.16

95.20

95.24

1495.28

95.52

95.56

E. H. Cope
 R. W. Wood
 T. H. Waterman
 J. H. LaRue
 Cassin Carter

24

1507.62

140 + 50

140

139 + 50

139

0

11.21

1506.73

12.10

1495.52

138 + 45

138

137 + 50

137

11.21

12.10

Grade (+4.0)

1495.40

9544

9548

9552

9556

9560

9564

9568

25

136 + 50

136

1192 1507.69 1097 1495.76

1069 1515.89 249 1505.20

2325 1513.65 ✓

~~~~~

9.12 1504.88 1495.76

135 + 50 9.08

135 + 10 9.05

134 + 50 9.00

134 8.96

133 + 48 8.92

2nd (40)

1495.72

95.76

-10 or 137 + 20 (1513.569)

1495.90

95.93

95.88

95.92

95.96

26.

1504.88

647

150243

892

149596

128

132 +50

132

131 +50

131

0

635

150251

627

1476.16

130 + 67

+17

130

12.82

12.19

Grade (+9.0)

1496.00

96.04

96.08

96.12

96.16

96.19

96.23

96.24

27

150251

521 1501.45 627 1496.24

129 + 50

128 + 96

1132 1511.91 086 1500.50

134 1510.57

205 1512.65

1034 1502.31

230 1504.61

128 + 50

128

127 + 50

127

126 + 50

126

0.57 1497.12 905 1496.56

Grade (+40)

9636

(cont. hand) 9632

= BM 26 (1510.503)

7-27-07

9636

Mrs. O'Donoghue  
E. Co. Pa.  
P. West  
Rt. 1  
Douglas Run  
Cassidy Co. Pa.  
Xelapora

9640

9644

9648

9652

9656

(outlet no 1)

1492.56 = Tunnel grade

26. Grade Halls - Dilyana Condint -

042 1507.26

1506.88

1067 1496.61

215 1498.76

210

893

+39

896

211

901

+50

905

905 1499.71

209+50 - Entrance Tunnel #2

= Bl 32.

Grade (+40)

1489.13

8980

8978

8971

7-25-07

En. cap.  
D. West  
D. Water  
Don la P.  
L. C. C.

29  
BM 37

1.65

1507.13

1505.48

o

2.31

1497.40

12.34 1494.79

T.P.

2.62

1490.69

9.03 1488.07

260

4.58

1486.11

260+96

4.66

1486.03

261+50

4.70

1485.99

262

4.74

85.95

262+50

4.78

85.91

6.58

21.37

Commenced sta 262+50  
side (+4.0)

E.L. Gape

R. Wanta

P.W. Wootman

son La Rue

T.P. on rock below BM 37  
on chise level m. m. 05



|        |         |         |         |
|--------|---------|---------|---------|
|        | 1490.69 |         |         |
| 0      |         | 4.78    | 1485.91 |
| 4.63   | 1490.54 |         |         |
| 263    |         |         | 4.67    |
| 263+50 |         |         | 4.71    |
| 264.   |         |         | 4.75    |
|        | 4.63    | 4.78    |         |
| Bm 37  | 2.59    | 1508.07 | 1505.48 |
| 0      |         | 10.75   | 1497.32 |
| 0      | 1.68    | 1499.00 |         |
| 0      |         | 11.17   | 1487.83 |
|        | 2.06    | 1489.89 |         |
| 265    |         |         |         |
|        | 6.33    | 2192    |         |

grad (+4.0)

1485.87

85.83

85.75

85.71 No hole

1489.89

848

1481.71 Tunnel grade

BM 23 1.73 1517.19 1515.46

o 12.24 1504.95

1.77 1506.72

o 11.23 1495.49

5.81 1501.30

114 o 7.63 1493.67 7.63

6.23 1499.90

114 2.23

113+50 2.19

15.44

31.40

8/8/07 P.M.  
Commenced N. end tunnel #1

E. J. Cape Level  
R. W. Winters Rod  
D. La Rue chain  
Mexican Buck-

1493.67 Tunnel grade

1497.67 Ditch grade

<sup>5/2</sup>  
1497.71

1499.90

grade (+ v.o)

0

11.45

1488.45

11.89

1500.34

113

2.59

1497.75

112+45

2.55

1497.79

112

2.51

1497.83

111+50

2.47

97.87

111

2.43

97.91

110

3.65

1496.69

97.85

7.17

1503.86

110+50

5.91

97.95

19.06

15.10

1503.86

|        |         |       |         |
|--------|---------|-------|---------|
| 0      |         | 5.91  | 1497.95 |
| 629    | 1504.24 |       |         |
| 110    |         |       | 6.25    |
| 109+50 |         |       | 6.21    |
| 108+80 |         |       | 6.15    |
| 108    |         | 6.97  | 1497.27 |
| 11.95  | 1509.22 |       |         |
| 108+50 |         |       | 11.11   |
| 108+05 |         |       | 11.07   |
| 107+50 |         |       | 11.03   |
| 18.24  |         | 12.88 |         |

8/10/07-

Commenced on Sta 110+50

|               |                                                         |
|---------------|---------------------------------------------------------|
| Grade (+4.0') | Cape Level -<br>to River Chain<br>Wetman Rod.<br>Indian |
| 1497.99       |                                                         |
| 98.03         |                                                         |
| 98.09         |                                                         |
| 98.11         |                                                         |
| 98.11         |                                                         |
| 98.11         |                                                         |
| 98.15         |                                                         |
| 98.19         |                                                         |

107+00

1509.22

1099

Grade (+4.0)

1498.23

106+50

10.95

98.27

106

10.91

98.31

o

10.91

1498.31

9.82

1508.13

105+38

9.77

98.36

104+78

9.72

98.41

104

9.66

98.47

o

9.66

1498.47

12.73

1511.20

103+50

12.69

98.51

22.55

20.57

36

1511.20

Grade (v.o.)

1498.55

103+00

12.65

102+50

12.61

98.59

0

12.61

1498.59

9.49

1508.08

102+00

9.45

98.63

101+47

9.41

98.67

101+00

9.37

98.71

100+50

9.33

98.75

0

13.4

1506.74

7.49

1514.23

16.98

13.95

1514.23

BM 22

372

1510.51 (1510.55)

0

749

1506.74

0.33 1507.07

100+00

828

1498.79

99+50

824

98.83

99+00

820

no hub

98.87

98+44

816

98.91

0

816

1498.91

350 1502.41

98+00

341

98.95

97+50

342

no hub

98.99

3.83

15.65

Grade (4.0')



|       |        |         |                   |
|-------|--------|---------|-------------------|
| 97+00 | 150241 |         | 3.38              |
| 96+50 |        |         | 3.34              |
| ○     | 11.02  | 1505.56 | 7.87 1594.54 3.30 |
| 95+80 |        |         | 6.43              |
| 95+30 |        |         | 6.39              |
| 95+00 |        |         | 6.37              |
| 94+50 |        |         | 6.33              |
| 94+15 |        |         | 6.30              |
| ○     | 6.30   | 1499.26 |                   |

grade (+4.0)

1499.03

99.07

99.11

99.13

99.17

99.19

99.23

99.26



40

1507.02

89

78

o

897 1509.83

616 1500.86

88

+50

10.15

88

10.01

87

+65

10.01

87

10.00

o

1082 1514.30

635 1503.48

o

543 1518.38

135 1512.95

031

15101

= Bm 19

(1518.013)

#

845 1511.93

1503.48

= P.P. above

86

+ 67

12.07

9986

86

12.02

9991

Grade +40

149967

9971

9975

9978

9983

= P.P. on 11k

151193

95 + 50

0

410

150405

1198

149995

85

84 + 50

84

83 + 45

83

0

963

1509.78

390

1500.15

82 + 50

82 + 15

81 + 48

13.73

15.88

9000 + 40

149995

9999

150003

1500.07

1500.11

1500.15

1500.19

1500.22

1500.27

1509.78

80 + 96

947

+50

943

80

939

79 + 40

934

0

1192 1512.36 934 1500.44

79 + 05

1189

78 + 65

1186

78

1181

77 + 50

1177

0

11975 23.945 039 1511.97

0.075 23.87 ✓

23.895

9805

(1523.642)

= BM 17

Grade +4.0

1500.31

1500.35

1500.39

1500.44

1500.47

1500.50

1500.55

1500.59

1.58 1525.45

1523.87

9805 1515.645

1.085 1516.700

1144 1505.26

1.03 1506.29

76 + 99

5.66

1500.63

+ 53

5.62

1500.67

0

6.02 1512.08

6.23 1506.06

+ 04

11.37

1500.71

75 + 50

11.33

1500.75

75

11.29

1500.79

74 + 50

11.25

1500.83

74

11.21

1500.87

9.685

21A75

= BM 17

Grade 4.5

Commenced Sta. 76 + 99

9-9-07

Winstet

Waterman

Sa. P. U.

44

1512.08

73 +50

11.7

+30

11.5

72 +80

11.11

o

7.16 1508.13

11.11

1500.97

+50

7.4

71 +99

7.0

+63

7.7

+23

7.4

70 +80

7.0

o

6.04 1507.17

7.00

1501.13

+42

6.01

13.20

15.11

Grade +40

1500.91

1500.93

1500.97

1500.99

1501.03

01.06

01.09

01.13

01.16

|         |       |         |       |         |     |
|---------|-------|---------|-------|---------|-----|
| 45      |       |         |       |         |     |
|         |       | 1507.17 |       |         | 599 |
| 70 + 12 |       |         |       |         |     |
| o       | 731   | 1505.48 | 900   | 1498.17 | 426 |
| 69 + 67 |       |         |       |         |     |
| + 14    |       |         |       |         | 422 |
| o       | 852   | 1509.78 | 422   | 1501.26 |     |
| 68 + 60 |       |         |       |         | 848 |
| 68      |       |         |       |         | 843 |
| 67 + 50 |       |         |       |         | 839 |
| 67      |       |         |       |         | 838 |
| o       | 343   | 1509.94 | 327   | 1506.51 |     |
| 66 + 44 |       |         |       |         | 847 |
| + 10    |       |         |       |         | 844 |
|         | 19.26 |         | 16.49 |         |     |

|             |                                                       |
|-------------|-------------------------------------------------------|
| Grade + 4.0 |                                                       |
| 1501.28     |                                                       |
| 01.22       |                                                       |
| 01.26       |                                                       |
| 01.30       |                                                       |
| 01.32       |                                                       |
| 01.39       |                                                       |
| 01.43       |                                                       |
| 01.47       | 66 + 44 - 66 + 10 spans<br>steep-sided gulch 18' deep |
| 01.50       |                                                       |



46.

1509.94

65 + 90

842

o

5.69

1507.21

842

1501.52

+40

566

65

562

64 + 50

559

64

554

o

8.55

1510.22

5.54

1501.67

63 + 50

851

63

849

11.285

1513.035

847

1501.75

11.85

1524.155

0.73

1512.305

37.375

23.16

039

1523.765

Grade + 4.0

1501.52

01.55

01.59

01.63

01.67

01.71

01.75

= BM 14

(1523.700)

Commenced Sta 62+54

= Sta 63

(Grade + 40)  
1501.79

9-10-'07

Wrest  
Watman  
Sa Rue  
O'Bryan 1/2

#7  
62 + 54  
62  
61 + 50  
61  
60 + 50  
60  
59 + 50  
59 + 02  
58 + 50

4.37 1506.12

1501.75

940 1510.66

486 1501.26

802 1511.45

723 1503.43

21.79

12.09

4.33  
4.29  
4.25  
8.73  
8.7  
8.67  
8.63  
8.59  
9.34

01.83  
01.87  
01.91  
01.95  
01.99  
02.03  
02.07  
02.11

48.

1511.45

58 +20

932

57 + 70

921

+20

924

0

7.27 1509.48

9.24 1502.21

56 +47

7.21

Grad + 4.0

1502.13

02.17

02.21

02.27

56

7.17

02.31

55 +52

7.13

02.36

0

6.20 1511.86

3.82 1505.66

55

9.47

02.39

54 +44

9.43

02.43

54

9.39

02.47

13.47

13.06

49

1511.86

53 + 50

935

0

86.1 1511.19

935 1502.51

Grade + 4.0

1502.51

53

864

1502.55

52 + 50

86

02.59

52

85

02.63

0

51 + 50

85

02.67

51

84

02.71

50 + 50

844

02.75

0

647 1507.80

986 1501.33

02.79

50

50

0

49 + 50

49

02.83

15.15

19.21

50. + HI - S ELEV

1507.80

49

493

48 + 50

489

+ 15

486

0 1127 1514.21 486 1502.94

0 1106 1519.14 613 1508.08

0 1180 1528.60 234 1516.80

0 1158 1539.32 086 1527.74

47 + 10

25

0 080 1530.40 972 1529.60

489 1525.51

BM 10

588 1531.39

46 + 50

12.00

1519.39

16.32

03.07

0

8.55 1522.84

Grade + 40

1502.87

02.91

02.94

03.02

= BM 10 (1525.495)

Began BM 10 Oct. 4, '07

S. L. Cope - Level  
H. W. Swan - Rod  
- Alameda - chain

511

+ HI. - ELEV  
1522.84

272 1525.56

o 10.39 15.17

0.99 1516.16

o 9.40 06.76

1.33 1508.09

46+00

4.98

1503.11

45+50

4.94

03.15

44+95

4.90

03.19

44+50

4.86

03.23

o

3.79

04.30

8.60 1512.90

44+00

9.63

(01 low)

03.27

13.64

23.58

52

1512.90

43+40

9.51

Grade  
(+4.0)

1503.32

42+96

9.53

03.35

42+50

9.51

03.29

o

5.47

1507.43

5.54

1512.97

42+00

9.54

03.43

41+50

9.50

(no book)

03.47

41+00

9.46

03.51

40+50

9.42

03.55

o

2.01

1510.96

6.64

1517.60

11.70

12.18

7.48

53.

1517.60

BM #9

3.82

1513.78

0.17

1513.95

grade (+4.0')

Byan Box #9 Oct. 16, 1967  
50' tape - Ball  
400' chain - Rod  
Rouis - Chain

(1513.756)

~~1503.59~~

40+00

10.36

(mark on rock)

1503.59

~~FLUME FROM HERE DOWN~~

39+50

10.32

(mark on rock)

1503.63

39+00

10.28

(mark)

1503.67

o

10.37

1503.58

on rock with 39+50

\$ 11.55

1515.13

38+50

11.43

(mark)

1503.71

38+00

11.38

(L)

1503.75

37+50

11.34

(L)

1503.79

11.72

14.19



37+00 1515.13

36+30

11.24

(No grade)

grade (+4.0)

1503.83

36+00

11.22

(cut)

1503.91

35+30

11.6

(cut)

1503.97

34+80

11.12

1504.01

34+30

11.09

1504.05

o

838

1506.75

on rock at 34+30

11.79

1518.54

o

262

1515.92

10.07

1525.99

BM 8

0.77

1525.22

(1525.73)

551

T.P. 77.13 1513.88 77.3 1506.75

tree to 24+30

Grade 4.0

33+80 9.79

1504.09

33+30 9.75

1504.13

32+80 9.71

1504.17

32+30 9.67

1504.21

31+30 9.59

1504.29

30+40 9.56

1504.33

30+50 9.53

1504.35

11.53 1502.35

On road opp 20+50

4.40 1506.75

11.53 11.53

36.

1506.75

29+50

2.32

grade  
(+4.0)

1504.43

28+49

2.78

on rock

1504.47

28+00

2.20

1504.51

o

2.07

1504.68

7.30

1511.98

27+39

7.42

1504.56

26+69

7.36

1504.62

26+00

7.31

1504.67

25+50

7.27

1504.71

57

|       |         |         |         |
|-------|---------|---------|---------|
|       | 1511.98 |         |         |
| 11.00 |         | 7.30    | 1504.68 |
| 17.3  | 1506.41 |         |         |
| 25+00 |         | *       | 1.66    |
|       |         | 17.3    | 1504.68 |
|       | 11.83   | 1516.51 |         |
|       |         | 9.07    | 1516.44 |
|       | 11.82   | 1528.26 |         |
| BM #6 |         | 19.0    | 1526.36 |
|       | 1.06    | 1527.42 |         |
|       |         | 11.42   | 1516.00 |
|       | 4.04    | 1520.04 |         |
|       |         | 7.26    | 1512.78 |
|       | 1.26    | 1514.04 |         |
| 24+00 |         |         | 9.21    |
|       | 31.74   | 29.68   |         |

Grade (+4.0)

Began Oct 18. BM 6 -  
 S.T. Cap. - Carl Geo. Swan - Rod  
 B.S. Alexander - chain.  
 cloudy.

1504.75

(1526.297 vs. 6.00)

1504.83

38.

1514.00

23+50

9.17

23+11

9.14

(in rock)

22+11

9.06

21+61

9.02

(in rock)

21+00

8.97

20+50

8.93

20+00

8.89

19+50

8.85

1510.56

1503.48

grade (4.0)

1504.87

1504.90

1504.98

1505.02

1505.07

1505.11

1505.15

1505.19

END OF TUNNEL.

the work off the 19+50

59

|                   |         |       |         |
|-------------------|---------|-------|---------|
|                   |         |       | 1503.46 |
| 11.20             | 1514.68 |       |         |
| 0                 |         | 3.95  | 1510.73 |
| 6.70              | 1517.23 |       |         |
| 0                 |         | 0.36  | 1517.07 |
| 17.92             | 1528.99 |       |         |
| 87.5              |         | 15.0  | 1527.49 |
|                   |         |       | 1503.48 |
| T.P. (p) Sta 1470 | 5.06    |       | 1508.54 |
| 0                 |         | 11.86 | 1496.68 |
| 2.55              | 1499.23 |       |         |
| 0                 |         | 11.41 | 1487.82 |
| 1.42              | 1489.24 |       |         |
| 0                 |         | 11.52 | 1477.72 |
| 0.65              | 1478.37 |       |         |
| 0                 |         | 0.31  | 1478.06 |
| 11.77             | 1489.83 |       |         |
| 21.45             |         | 35.10 |         |

(1507.437 old elev.)

mark outside road opp. Sta 1440

Tunnel end cut Sta 1450 to  
Sta 1450 = 800 feet

60.

1489.83

o

0.89 1488.94

10.63 1499.57

0.12 1499.45

o

10.27 1509.72

old TP (os)

59.1

1503.81 Opp station 12x92 05 elev 1503.77

Sta 11+50

0.85 1503.87 - 7.04 1505.83

11+50

3.89 1505.83

o

0.08 1509.64

mark elev 11+50

6.13 1515.77

11+00

9.90 on rocks 1505.87

10+00

9.82 on rocks 1505.95

cut to grade  
grad 11.0

to rock on road

61

1515.77

9+50

9.78 (hub)

Gradient 4.0  
1505.99

Fig. 22.07 at T.P.

near 8+50-

EE Eyo Level  
see. Loran Rod  
EE always clean

8+50

9.70 (hub)

1506.07

0

6.08 1509.69

Rock at 8+50

8.13 1517.82

8+00

11.71 (hub)

1506.11

7+50

11.67 (hub)

1506.15

7+05

11.63 (on rock)

1506.19

6+60

11.60 on rock

1506.22

6+00

11.55 (hub)

1506.27

5+<sup>35</sup>~~00~~

11.50

1506.36

8.13

6.08



62.

1517.82

1.28

1516.54

11.89

1528.43

2.12

1526.31

7.55

1533.86

5.75

1528.11

370 # 2

1528.07

3.19

1531.30

11.92

1519.38

2.68

1522.06

10.61

1511.38

4.31

1515.69

5+00

9.34

150635

4+50

9.30

150639

3+88

9.26

1506.44

29.62

31.75

(on road)

Grade + 40

Begin Oct 20 at 2M # 2.

E. L. Cooper

Geo. L. L. L. L.

E. L. L. L. L.

63.

1515.69

3+00

9.19

2+55

9.14

6

3.58

1512.11

3.88

1515.99

2+00

9.40

1+50

9.36

1+50

1+00

9.32

0+50

9.28

0+50  
13

0+00

9.22

9

0.39

1515.60

11.92

1527.52

Grade  
(+4.0)

1506.51

1506.55

1506.59

1506.63

~~1506.67~~

1506.71

1506.77

64.

1527.52

|   |     |         |
|---|-----|---------|
| 0 | 041 | 1527.11 |
|---|-----|---------|

|      |         |
|------|---------|
| 3.77 | 1530.88 |
|------|---------|

BM #1.

|      |         |
|------|---------|
| 2.10 | 1528.78 |
|------|---------|

(1528.715 old elev.)

North end Tunnel 1/2

|      |      |         |         |
|------|------|---------|---------|
| T.P. | 1.22 | 1505.03 | 1503.91 |
|------|------|---------|---------|

2.10

2.71

Loc. S. Capri, Cooper, Newton

T.P. opp. sta 12+92.

T.P. 124

12+95

|      |         |
|------|---------|
| 3.31 | 1501.72 |
|------|---------|

1501.72

1505.72

T.P.

|      |         |
|------|---------|
| 3.21 | 1507.02 |
|------|---------|

New BM.

|      |         |
|------|---------|
| 5.16 | 1506.86 |
|------|---------|

Bench 12+85

1.30

1505.72

South End Tunnel 1/2

|       |      |         |         |
|-------|------|---------|---------|
| BM #5 | 0.32 | 1527.81 | 1527.49 |
|-------|------|---------|---------|

0

|       |         |
|-------|---------|
| 11.37 | 1516.44 |
|-------|---------|

|      |         |
|------|---------|
| 0.32 | 1516.76 |
|------|---------|

20+50 0

|       |         |       |
|-------|---------|-------|
| 11.65 | 1505.11 | 11.65 |
|-------|---------|-------|

1505.11

Grade (+4.0)

65.

1505.11

3.92 1509.03

20+28

7.90

1501.13

20+50 2.34 1507.45 1505.11

BM spike in rock 4.98 1502.47

Tunnel grade

66.

$N \frac{1}{4}$

Nov 15

Old T.P.  
12+92

2.50

1506.31

1503.81

Tempade  
12+85

4.59

1501.72

click

sta 13+85

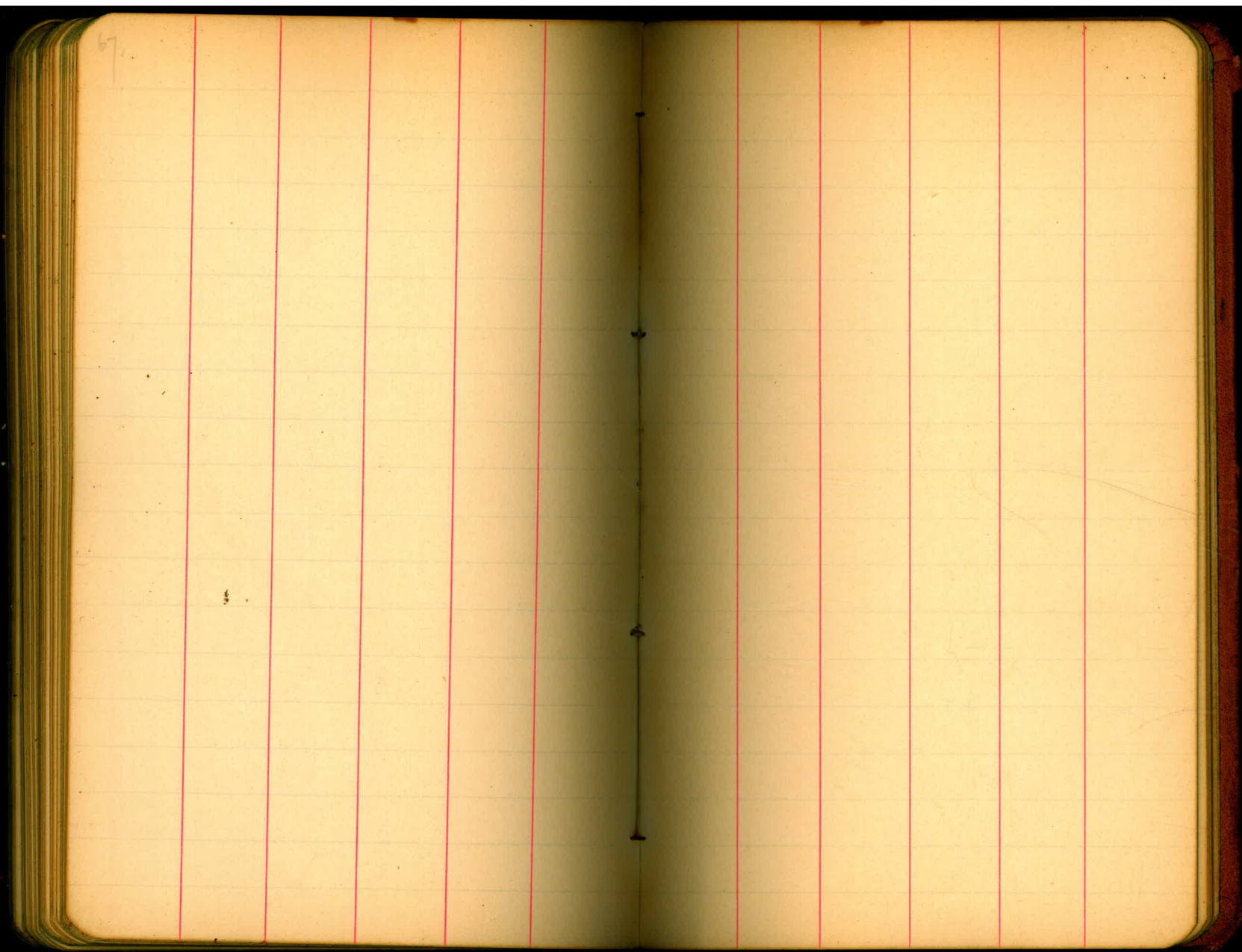
4.67

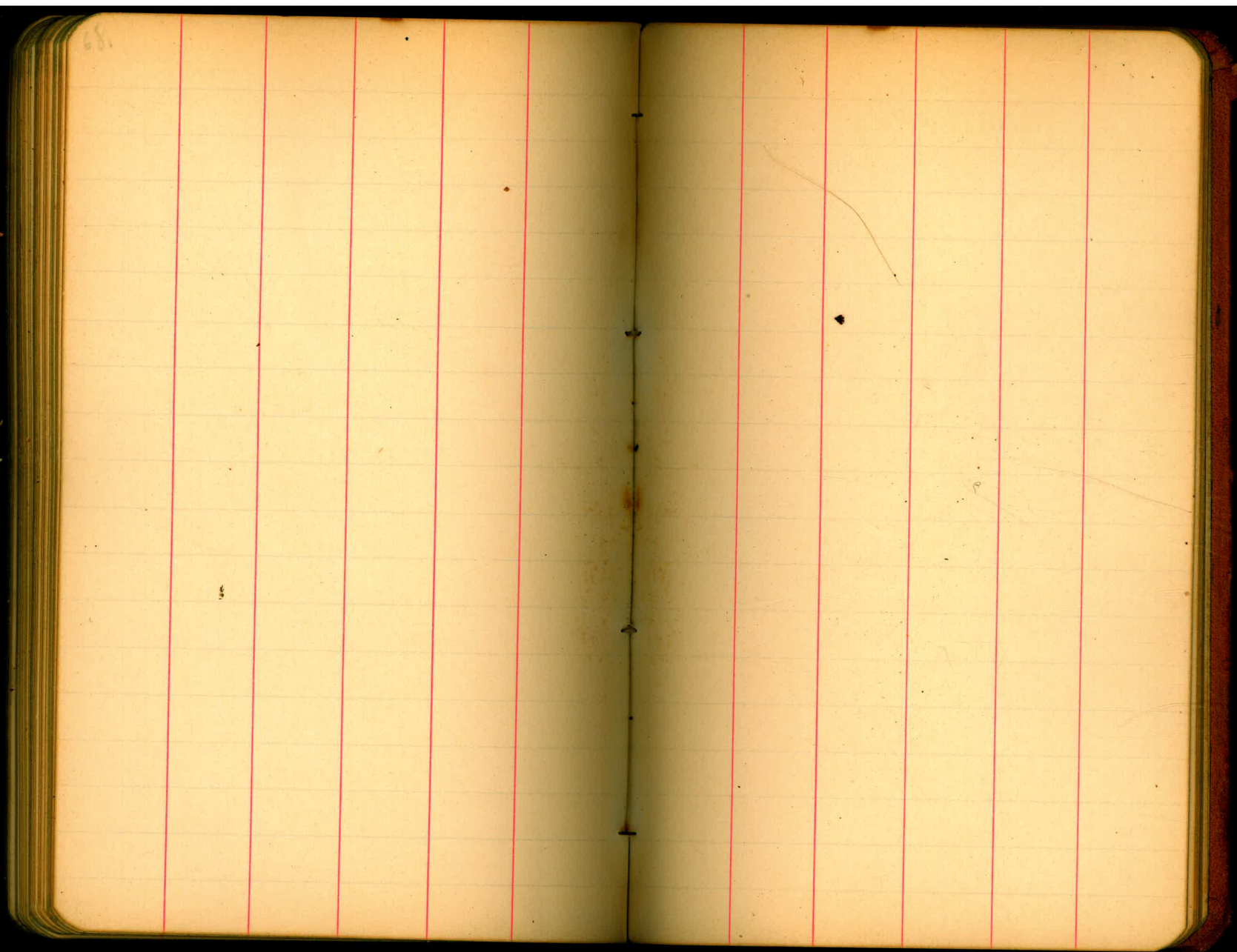
1501.64

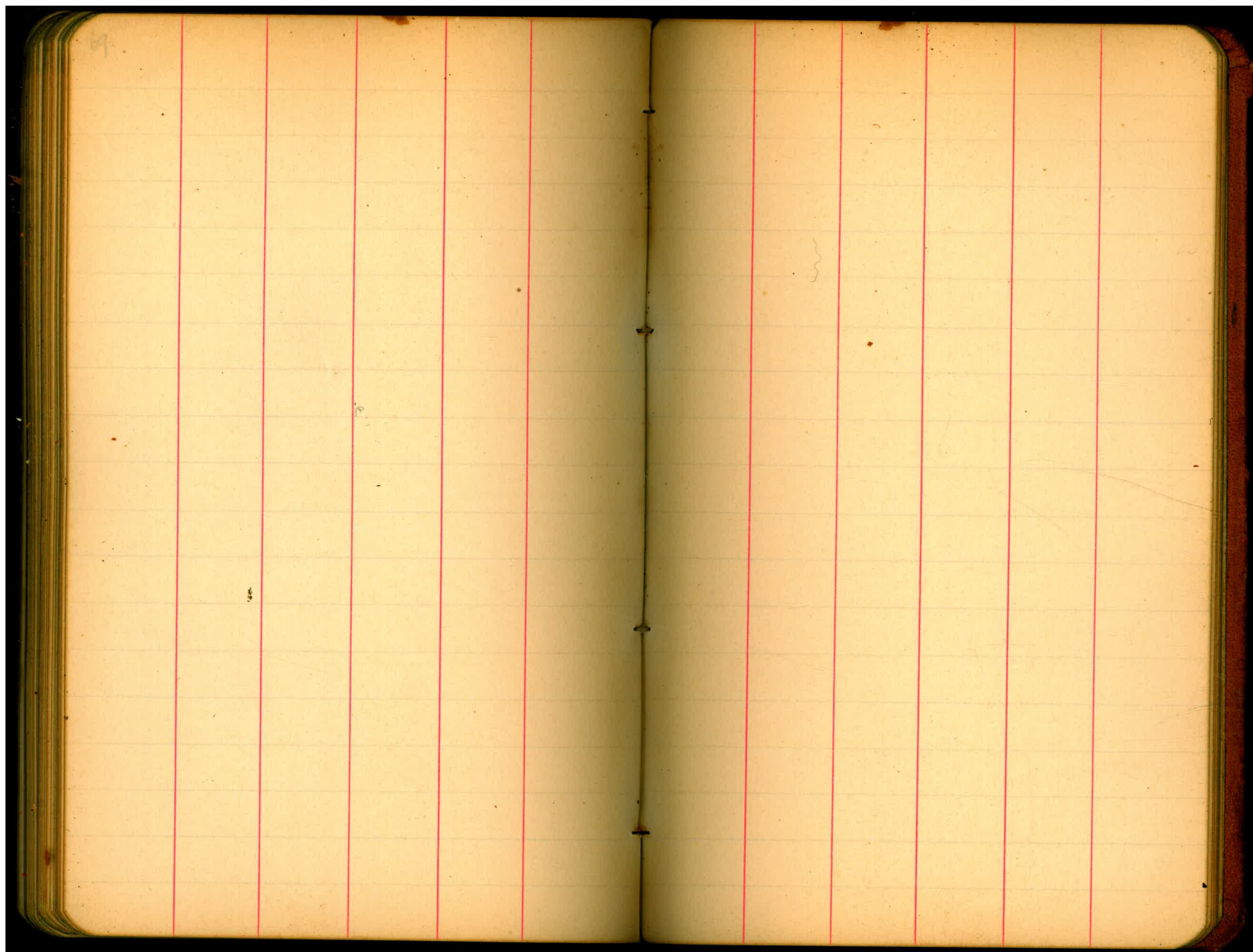
Iron pin either side Tuna

10' m from outside wall

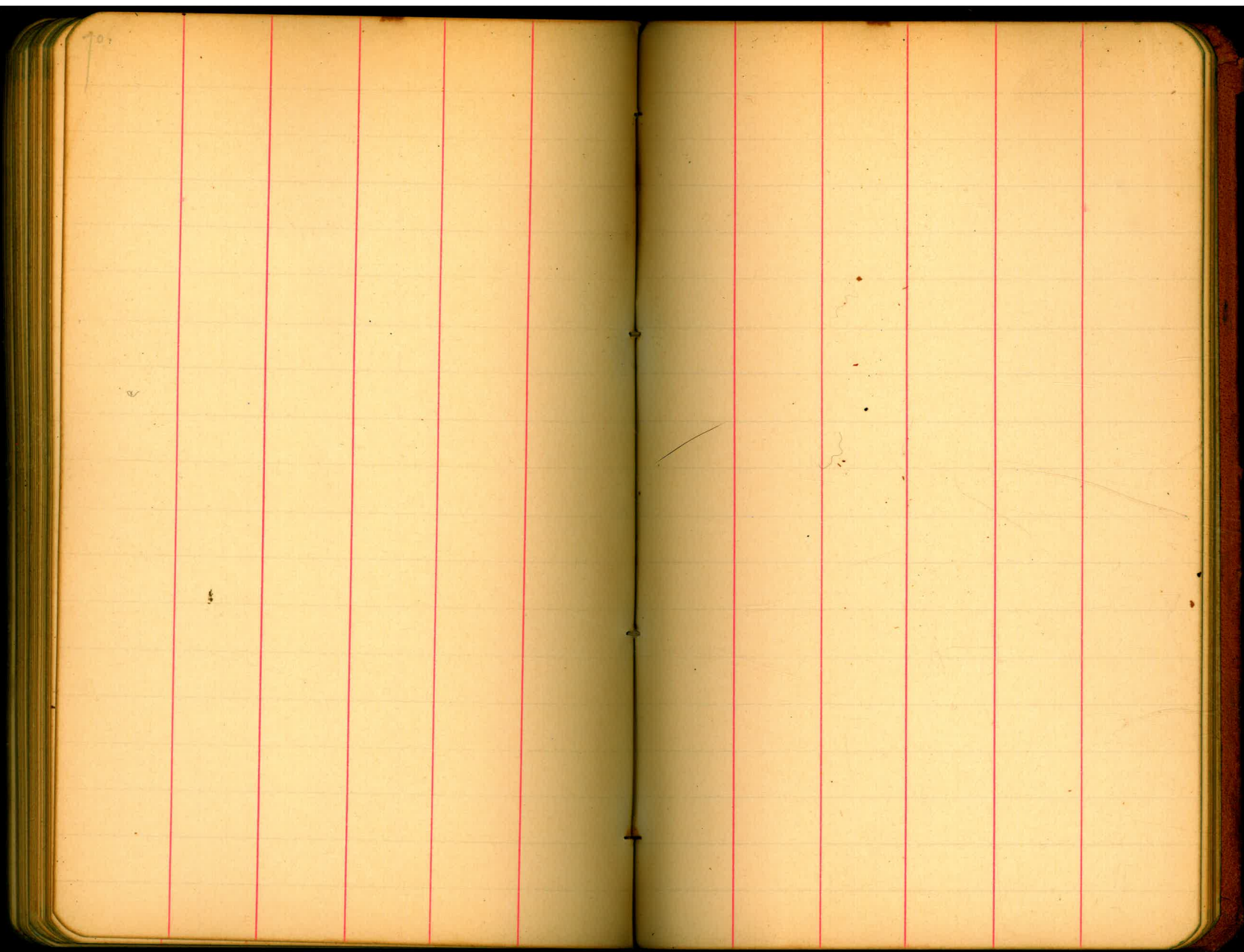
Cape, Newton

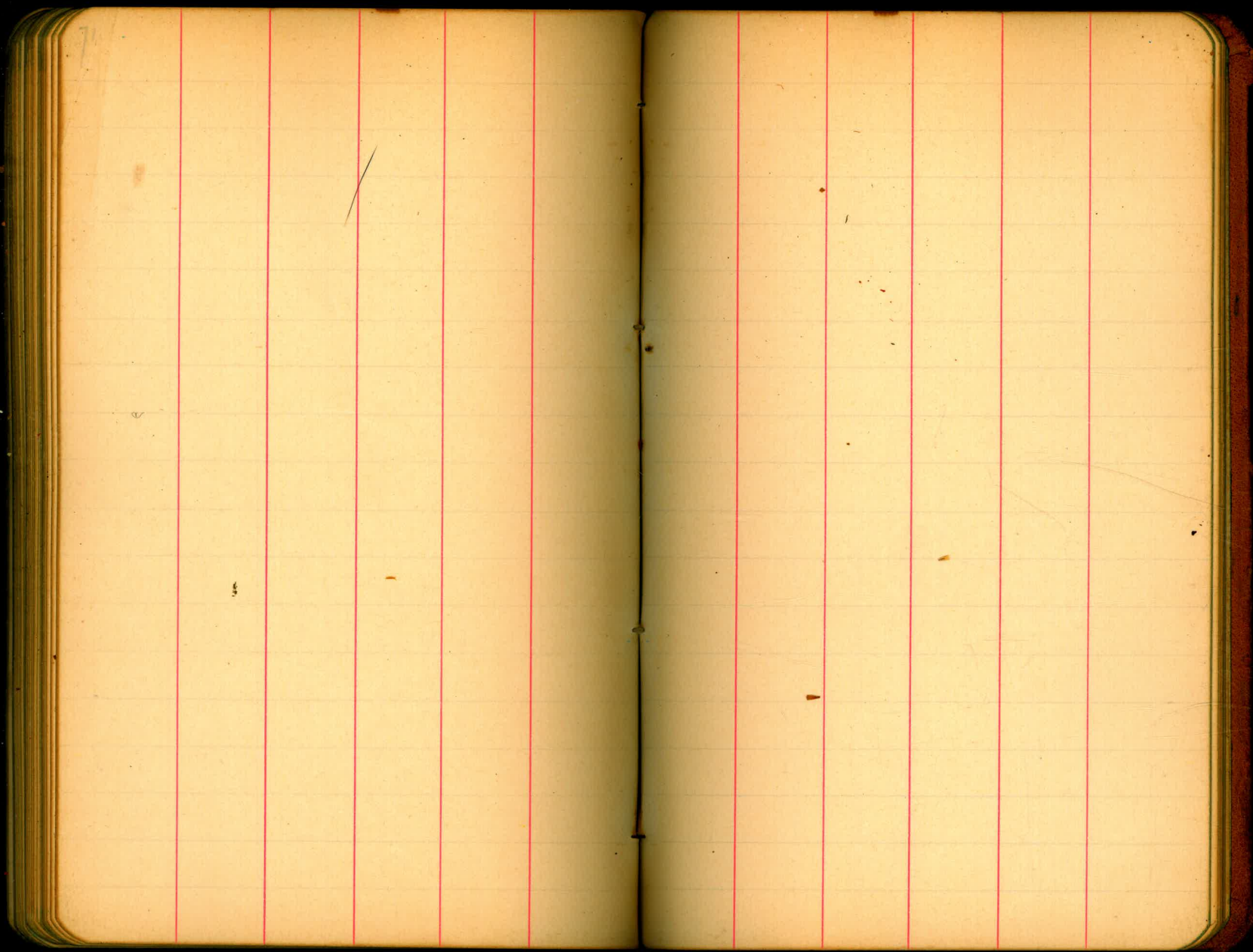


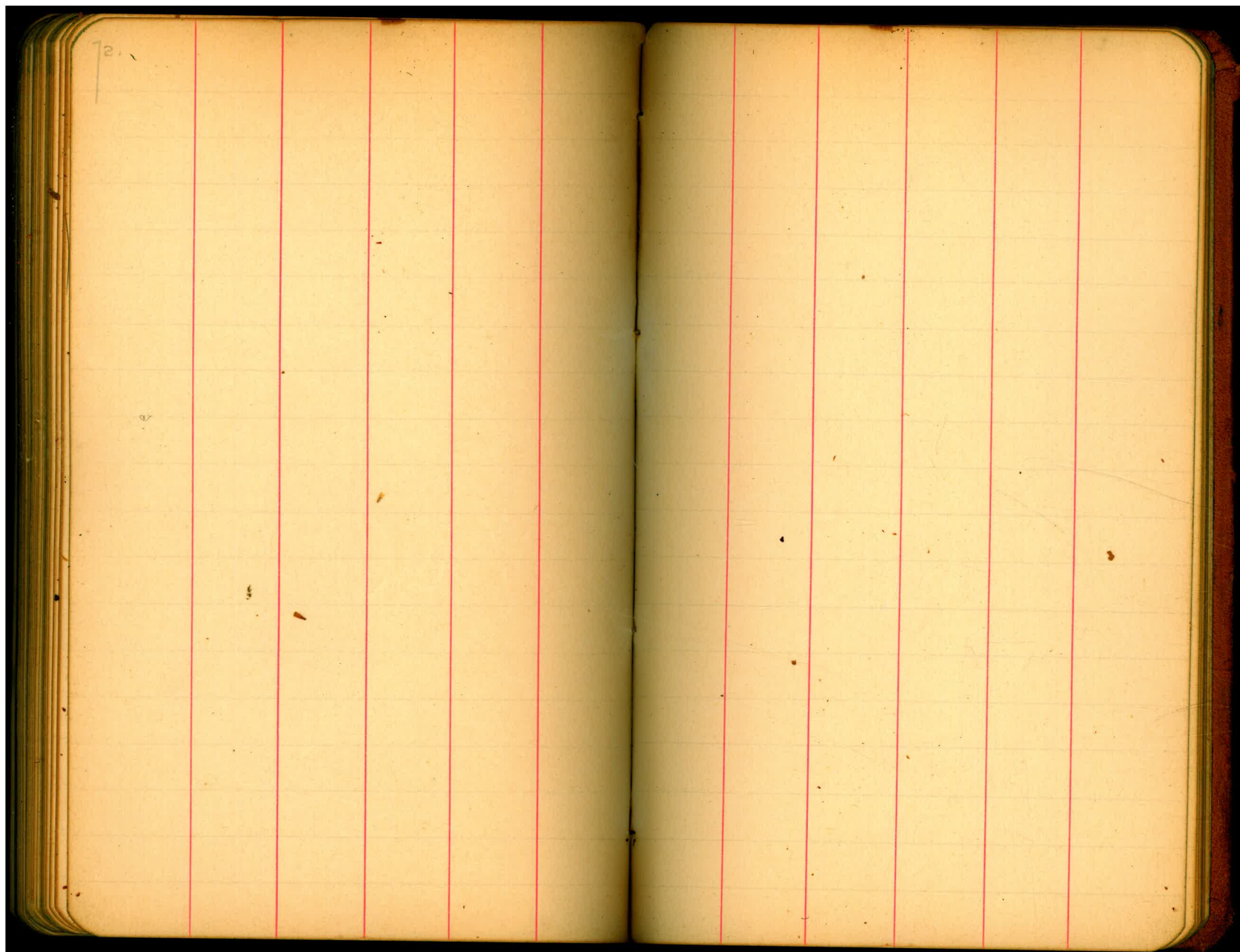


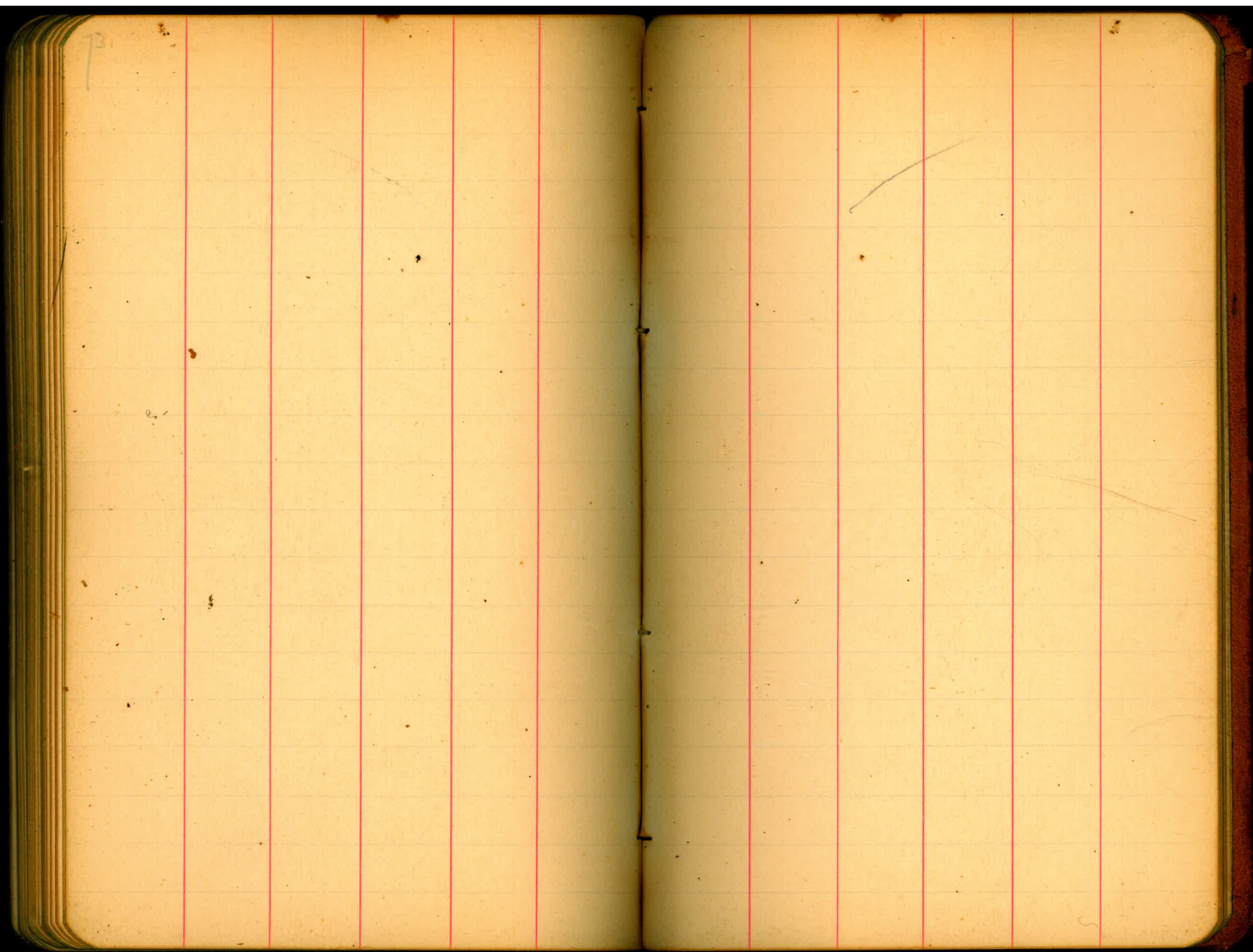


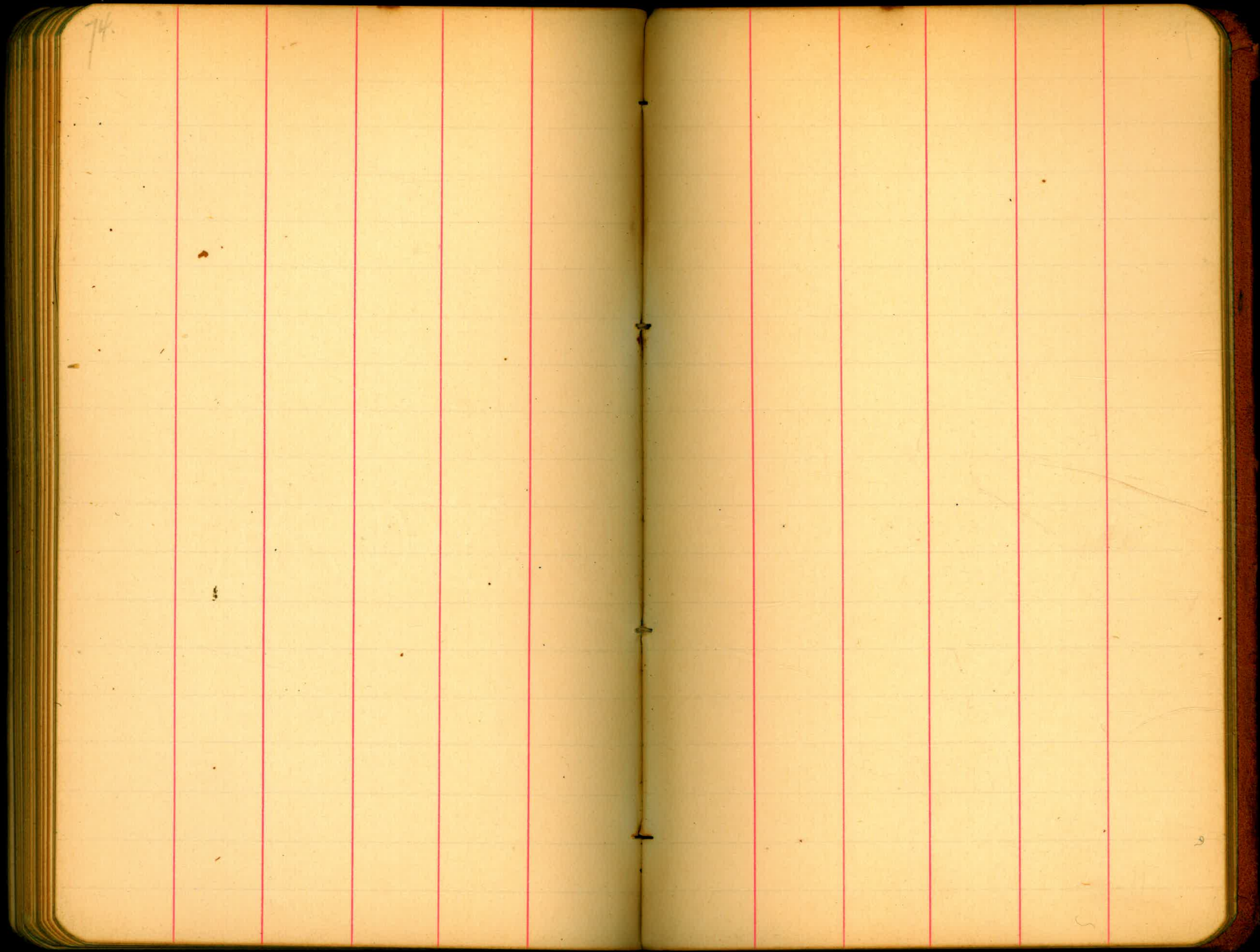




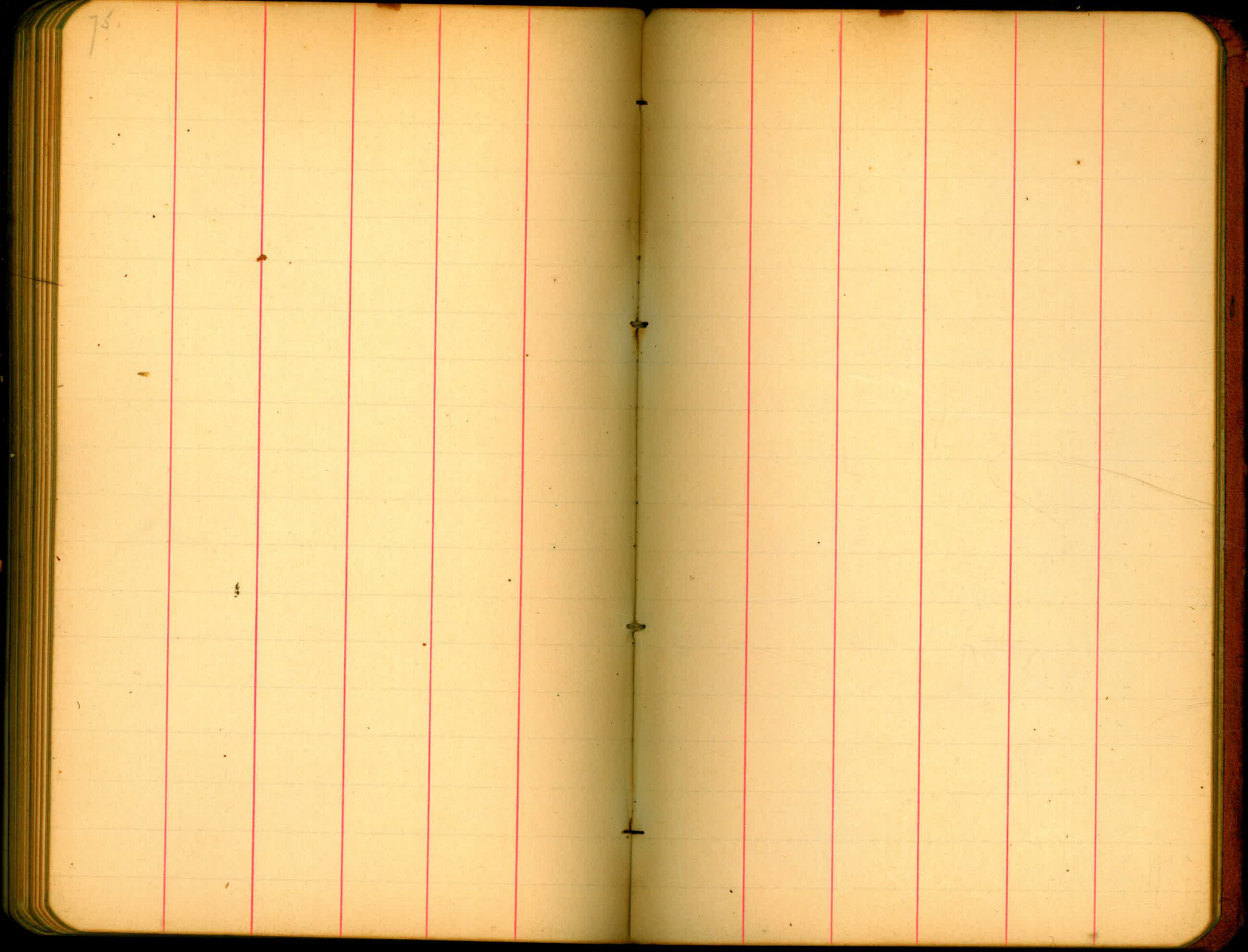








75



76

Grade Nubs Exit # 3

378 1486.84

148306

378

- prou Rock ser by O's

8-28-07

west  
sabr

148306

Grade Nubs Entrance # 4

088 1506.36

150548

1470 1494.66

085 1495.51

1149 1484.02

146 1485.48

383

- Bm 37

8-28-07

west  
sabr

1481.65 = tunnel grade

Grade Nubs Exit # 4

441

8-28-07

west  
capp.

-40

438

1490.07

-40

438

(2' out from face)

77

Grade Hub #1  
Exit #1  
1510.603

273 1513.33

943 1503.90

121 1505.11

1151 1493.60

309 1496.69

412 1492.57 ✓

125 + 93  
+ 70 (9-14-07)

4.11

Grade Hub Entrance #3

453 1489.06

1484.53

?

4.37

-26

4.35

8-28-07  
R. W. W. W.  
R. G. Baker

= Bm 26

(1492.56) = check on MK on RK at Outlet

1492.58  
This rise 15' left of C.C.

(2 1/2' from Tunnel top)

= Hub set by O'Shaughnessy on Hall's Tunnel (p. 6)

(5.5' from top) 1484.69

= Tunnel grade (1900')  
(Supersedes page 6)

84.71



Grade into to entrance tunnel no. 1 (1000)

1.82 1517.278

1515.458

11.95 1506.328

14.00 1506.728

17.22 1495.508

0.30 1495.808

2.248

22.11 1492.56

9.24 1502.50

5.24

#

2.62 1518.078

1515.458

11.69 1506.188

3.21 1509.398

11.89 1497.508

4.18 1501.688

8.018 1498.67

10.01

3.1.798

Superceding work on page 79.

= Bm 23

7-27-07

E. L. copy

P. W. West

Don. L. R. R.

(connected with tunnel)

1495.56 = grade of Sta 126 + 1 Foot

1497.56 = Ditch grade of Sta 126 + 1 Foot

= Bm 23

8-27-07

P. W. West

E. L. copy

D. G. Dalton

= New Tunnel grade

74. Grade Subs. For Entrance Tunnel. No 1.

503 1515.565 1510.335

4.00 1511.565

121 1512.795

124 1501.555

0.71 1502.265

8.345

4.345

219 1500.075

277 1512.845

225 1510.565 ✓

Abandoned.

7-25-07

= BM 22

St. Cape  
R. Whitt  
D. W. Weston  
Don la Ross  
Cassin Gate

1493.92 = Grade of Bottom of Tunnel & Entrance

9792 = Grade of Bench for Pitch

BM 22

55

$$\begin{array}{r} 6.97 \\ \underline{16} \\ 591 \\ \underline{2} \\ 597 \\ \underline{497} \end{array}$$

$$\begin{array}{r} 6.97 \\ \underline{16} \\ 595 \end{array}$$

$$\begin{array}{r} 110972 \\ 150667 \\ \hline 95 \end{array}$$

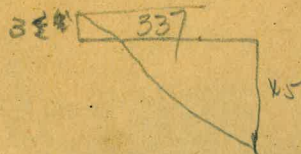
$$\begin{array}{r} 1505.19 \\ \underline{.64} \\ 1505.83 \end{array}$$

Length old line 337

Tunnel #2

offset S end 45' W

offset N end 9' E



$$\frac{48'}{337} = \frac{x}{50} \quad 2 \quad \checkmark$$

$$\begin{array}{r} 337 \overline{) 2400} \quad (7.12 \\ \underline{2359} \\ 410 \\ \underline{337} \\ 730 \end{array}$$

Elev. Sta 12 = 1505.67

$$\begin{array}{r} 1505.67 \\ \underline{4} \\ 1501.67 \\ \underline{2} \\ 1508.67 \end{array}$$

26520  
 24473  
 20.47  
 .08  
 1290  
 994  
 1950  
 659  
 1104  
 979  
 1104  
 125  
 983  
 150854  
 1365  
 150489  
 150348  
 1305  
 1760  
 148571  
 160  
 148731  
 08  
 7  
 56  
 990  
 490  
 9415  
 106  
 9249

3560  
 48  
 48  
 1505  
 1501  
 1508  
 147816  
 48  
 ROADWAY 14 FEET WIDE. SIDE SLOPES 1 1/2 TO 1.

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

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

990  
 986