

KG
11365
461



11365.467



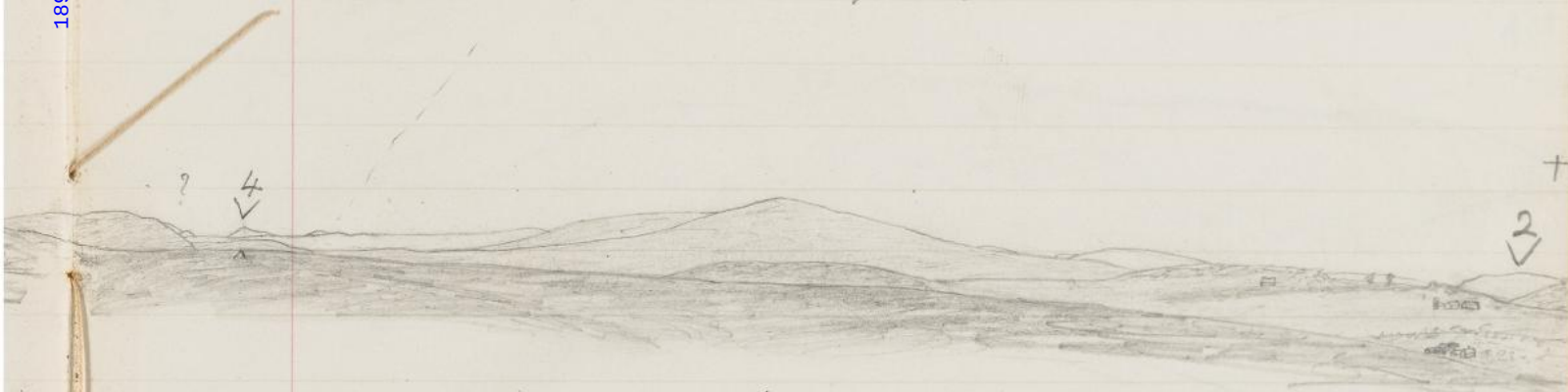




(Mt. Ing, Lemington Vermont,
J.R.E. 1875)

E.S. 3rd Sta
(Prospect Hill, J.R.E. 75)

Telescopic view of Manafield (?)

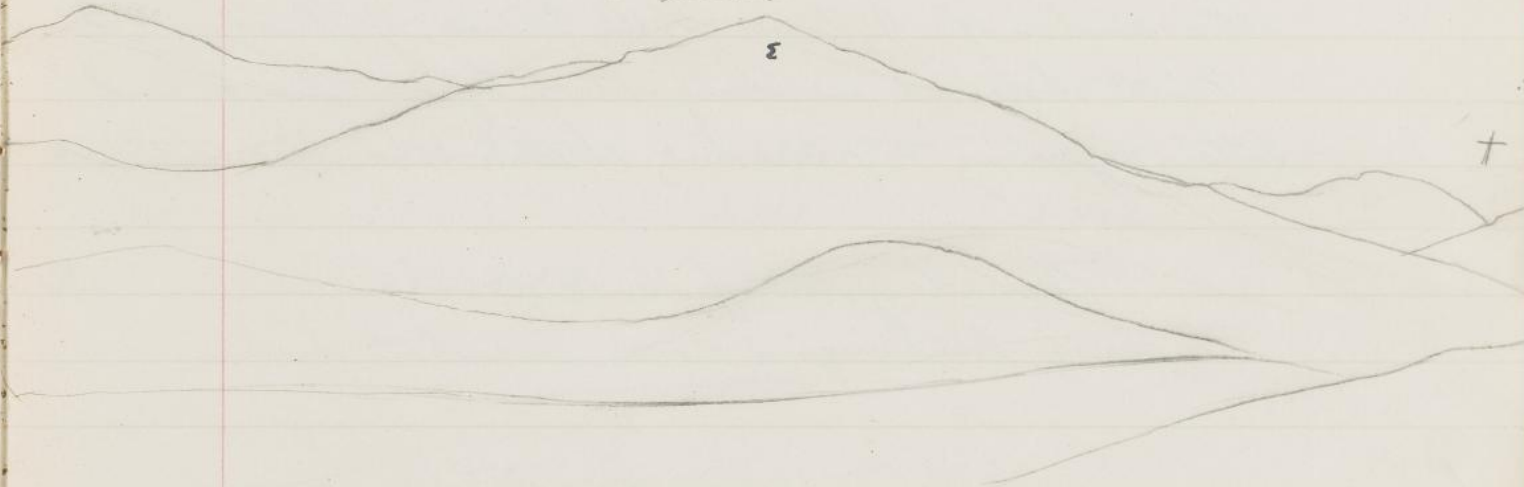




Description of points observed.

1. a, Top of tree on portion of Dalton Mts. marked in profile.
b, Top of small boulder on ledge on Bray Hill at point marked.
2. a, Top of distant mountain marked.
b, Ridgepole of right hand of two barns below and a little to left of a.
 The barns are on a hill just west of Connecticut R. - shown in profile.
c, Ridgepole of house on nearer hill, shown in profile.
3. a, Tops of trees on distant mountain at point marked.
b, Top of fir tree on mountain immediately below a.
c, Top of chimney of brown store near cemetery.

(Burke, B.S. 2nd of La)
J.R.E. 1878



4. a, Top of distant mountain marked.

b, Top of tree on Bray Hill under a, - maple tree having a little tuft at top and making one of a group of four or five trees, one of which just to right of b is dead and bare.

The distances of the points observed are estimated to be in the following order beginning with the nearest: -

3c, 1b, 4b, 2c, 1a, 2b, 3b, 3a, 2a, 4a.
 nearly the same

Observations of Apparent Elevation, as measured by the Micrometer-Level, of points visible from north at the window of Jefferson Hill House, Jefferson, N.H.

Points observed are designated by numbers and letters referring to preceding sketch and description.

Thursday, Aug. 16, 1877.

Heavy, low-hanging clouds, somewhat broken.

1.

		a	b
11:05 AM	1.69, 0.83 - 2.07	3.099	2.899
		95	98
		94	95
		95	95
11:13	1.69, 0.85 - 2.08	95	96
		3.0956	2.8966

2. (a very faint)

		a	b	c
11:20	1.70, 0.92 - 2.15	1.489	1.098	0.389
		.524	.106	92
		25	.110	95
		15	13	94
11:30	1.73, 0.97 - 2.20	15	12	91

1.5136 1.1078 0.3922

		a	b	c
3. 4:00 PM	1.71, 0.76 - 1.93	2.607	2.295	0.250
(a & b hazy)		01	90	54
		01	95	55
		01	91	56
4:10	1.71, 0.87 - 2.06	400	300	58

2.4020

2.2942

5.2546

		a	b
1.	1.72, 0.90-2.17	3,113	2,902
5:30 P.M.		10	06
		11	02
		11	899
5:37	1.71, 0.89-2.14	10	901
		3,111	2,902
3.	1.72 0.84-2.10	Shower	

Saturday, Aug. 18, 1877.
 Afternoon clear - scattered cumuli.

		a	b	c
1.	1.71, 1.02-2.23,	3,090	2,893	
4:35 P.M.		89	94	
		90	90	
		90	89	
4:45	1.70, 1.00-2.21	90	88	
		3,0898	2,8908	
2.				
4:48	1.70, 1.02-2.22,	1,480	1,119	0,389
		.515	15	96
		13		85
		05		90
		12		93
		14		89
		05		85
5:08	1.72, 0.96-2.16	07		84

1,5063

1,117

0,3888

		a	b	c
3.	1.74 0.80-1.98, 2.445	2.319	0.292	
5:10 P.M.		40	09	97
		48		
		2.4443	2.314	0.2945
		a	b	c
3, 5:17	1.73, 0.98-2.17, 2.451	2.331	0.306	
Instrument imperfectly shaded by umbrella, a+b danced a little on account of smoke from c.		60	40	05
		57	37	08
		60	35	10
		63	45	10
5:27	1.76, 0.80-1.99	2.4582	2.3376	0.3078

Sunday, Aug. 19, 1877.

1.	Clear - scattered cumuli			
12:20 P.M.	1.73, 0.77-1.99	a 3.105	b 2.908	
		02	10	
		05	04	
		00	02	
12:27	1.71, 0.98-2.20	03	04	
		3.103	2.9056	
4.				
12:30	1.74, 0.97-2.20	a 1.291	b 0.938	
		89	35	
		99	38	
		91	40	
12:37	1.74, 1.00-2.24	93	40	
		90	36	
		91	39	
		94	40	
		90	40	
12:43	1.74, 1.00-2.24	93	40	

4.	1.74, 0.99-2.20	^a 1.289	^b 0.939	
1:00 PM.		92	35	
		97	35	
		94	40	
1:06	1.74, 1.00-2.24	<u>93</u>	<u>40</u>	0.9378
1:07	1.74, 1.03-2.27	95	36	
		93	36	
		94	39	
		96	38	
1:11	1.74, 1.04-2.28	94	35	
		1.2944	0.9368	
2.	1:14 1.73, 0.98-2.20	^a 1.501	^b 1.098	^c 0.987
		10	107	88
		07	05	87
		10	03	82
1:22	1.73, 0.93-2.16	06	05	85
		1.5068	1.1036	0.9858
3.	1:24 1.73, 1.00-2.22	^a 2.423	^b 2.297	^c 0.274
		17	80	83
		18	85	67
		10	95	68
1:34	1.73 0.99-2.21	12	97	68
		13	90	70
		19	97	71
		11	92	70
		10	93	69
1:42	1.73, 1.02-2.25	17	90	68
		2.415	2.2916	0.2708

20

4.	1.66, 0.99-2.20	a 1.250	b 0.857
4:26 P.M.		56	
4:31	1.66, 0.90-2.11	1.256	0.859
		52	56
		62	55
		72	58
4:38	1.66, 0.99-2.20	72	60
4.		1.2628	0.8576
		a	b
4:42	1.66, 0.99-2.20	1.253	0.855
		61	60
		54	52
		61	55
4:48	1.66, 1.10-2.30	58	53
		1.2574	0.855

Monday, Aug. 20, 1877.
Clear - cumuli around horizon.

4.	1.75, 0.79-2.02,	a 1.315	b 0.960
12:13 P.M.		20	60
		20	59
		27	61
12:22	1.75, 0.82-2.05	11	62
		1.3186	0.9604

1.	1.75, 0.78-2.00,	^a 3,119	^b 2,929	
12:25		20	29	
		20	29	
		20	28	
12:34	1.73, 0.93-2.16,	19	29	
		3,1196	2,9288	
2.				
12:39	1.72, 0.85-2.10,	^a 1,510	^b 1,120	^c 0,410
		33	33	11
		28	25	12
		32	27	08
12:49	1.75, 0.96-2.18,	31	24	03
		1,5268	1,1258	0,4088
3.				
12:53	1.73, 0.88-2.09	^a 2,421	^b 2,290	^c 0,271
		16	87	71
		20	87	73
		25	97	73
1:03	1.73, 0.94-2.16	16	85	70
		2,4196	2,2892	0,2728

Tuesday, Aug. 21, 1877.
Clear - some very light cirrus clouds.

		a	b	
4.	1.74, 0.85-2.16,	1.423	0.948	
8:23 AM.		21	48	
		30	43	
		30	47	
8:33	1.74, 0.85-2.16	25	47	
		1.42 ⁵ ₈	0.9466	
1.				
8:36	1.74, 0.78-2.09,	3.114	2.912	
		09	12	
		11	08	
		13	10	
8:44	1.72, 0.89-2.20,	09	08	
		3.1112	2.910	
2.				
9:01	1.72, 0.93-2.24	1.548	1.115	0.401
		53	24	06
		50	25	07
		50	22	11
	(forgot to take)	52	26	10
		1.5506	1.1224	0.407
3.	1.74, 0.75-2.04	2.453	2.311	0.288
9:14		46	10	90
		50	14	89
		53	09	87
9:24	1.75, 0.90-2.20	54	16	90

2.4512

2.3121

0.2885

4.

		a	b
2:30 P.M.	1.75, 1.04-2.27,	1,310	0.942
		06	44
		07	44
		08	44
2:38	1.75, 1.06-2.28	07	42
		1,3076	0.9433

1.

		a	b
2:44	1.75, 0.95-2.17,	3,115	2.912
		13	08
		13	10
		11	10
2:53	1.73, 1.01-2.24	11	11
		3,1126	2.9102

2.

		a	b	c
2:57	1.72, 1.04-2.27	1,502	1,107	0.403
		22	11	395
		25	10	94
		19	08	98
3:10	1.74, 0.90-2.11,	20	06	97
		1,5176	1,1084	0.3974

3.

		a	b	c
3:13	1.74, 0.91-2.12,	2,425	2,289	0.279
		20	93	75
		23	93	78
		20	93	77
3:24	1.73, 1.05-2.26	19	97	75
		2,4214	2,293	0.2765

24

4.

		a	b
6:51 P.M.	1.75, 1.01-2.26,	1.321	0.950
		29	49
		28	50
		23	50
6:56	1.75, 1.00-2.25,	22	52
		1.3246	0.9502

2.

		a	c
6:58	1.75 1.00-2.25,	1.540	0.410
		45	22
		43	22
		44	21
7:03	1.75, 1.00-2.26,	47	21
		1.5438	0.4192

3.

		a	b	c
7:06	1.75, 0.83-2.07,	2.467	2.334	0.286
		67	33	90
		66	Can't see	92
		63		90
7:14	1.75, 0.93-2.17,	60		93
		2.4646	2.3335	0.2902

4.

		a	b
7:16	1.75, 1.02-2.27,	1.334	
		40	Can't see
		39	
		39	
7:19	1.75, 1.00-2.24,	35	
		1.3374	

Wednesday, Aug. 22, 1877.
Smoky, but few clouds.

1.

		a	b
3:00 PM	1.75, 1.10-2.30,	3.100	2.900
		01	.898
		.098	98
		95	97
3:08	1.72, 1.09-2.29,	96	98
		3.098	2.8984

2.

		a	b	c
3:10	1.71, 1.02-2.22,	1.491	1.096	0.388
		.517	.100	87
		13	106	84
		17	.096	88
3:20	1.73, 0.90-2.08,	20	.102	87
		1.5716	1.100	0.3868

3.

		a	b	c
3:28	1.73, 0.83-2.00	2.425	2.297	0.280
		24	98	77
		20	97	76
		20	99	76
3:39	1.73, 0.95-2.13	24	97	75
		2.4226	2.2976	0.2768

4. a not visible

26

Sunday, Aug 26, 1872.
Clear - Cumuli around horizon.

4.

2:25 P.M.	1.73, 0.87-2.10,	^a 1.290	^b 0.948
		96	46
		97	48
		99	53
2:33	1.74, 0.98-2.21,	96	53
		1.2956	0.9496

1.

2:39	1.74, 0.98-2.21,	^a 3.092	^b 2.889
		96	88
		97	94
		94	91
2:47	1.72, 1.08-2.31,	93	93
		3.0944	2.891

2.

2:54	1.71, 0.92-2.16	^a 1.500	^b 1.097	^c 0.393
		21 1.5105	100 1.0985	90 0.3915
		a obscured by shower.		

3.

3:03	1.76, 0.89-2.11,	^a 2.455	^b 2.334	^c 0.306
		61	30	05
		58	36	08
		56	40	07
3:12	1.76, 0.87-2.10,	56	36	08
		2.4572	2.3352	0.3068

Friday, Aug. 31, 1877.
 Air rather hazy. - Storm appearing in the west.

4.

		a	b
12:08 PM.	1.75, 1.02-2.28,	1.308	0.974
		03	76
		03	72
		05	70
12:15	1.75, 0.92-2.18,	10	74
		1.3058	0.9732

1.

		a	b
12:17	1.75, 0.87-1.10,	3.114	2.924
		13	19
		13	20
		12	20
12:24	1.73, 1.01-2.26,	11	24
		3.1126	2.9214

2.

		a	b	c
12:29	1.72, 0.85-2.09,	1.518	1.126	0.415
		38	32	14
		39	28	19
		39	32	18
12:38	1.75, 0.87-2.11,	40	27	16

3.

		a	b	c
12:42	1.75, 0.78-2.01,	2.450	2.326	0.303
		51	24	.298
		48	35	.302
		53	28	.300
12:52	1.75, 0.78-2.01	49	29	.302

2.4502

2.3284

0.301

Sunday, Sept. 2, 1877.

Air not very clear — Cumulus clouds rising in the west.

1.		a	b
11:10 AM.	1.75, 0.82-2.15,	3.122	2.923
		24	23
		20	24
		20	23
11:20	1.73, 0.93-2.26,	22	22
		3.1216	2.923

2.		a	b	c
11:26	1.72, 0.78-2.09,	1.523	1.130	0.422
		34	33	18
		46	33	18
		41	31	17
11:38	1.75, 0.79-2.10	47	32	19
		1.5382	1.1318	0.4188

3.		a	b	c
11:45	1.76, 0.76-2.06	2.463	2.350	0.306
		68	35	07
		63	42	10
		60	50	10
11:56	1.76, 0.83-2.12,	65	31	06
		2.4638	2.3416	0.3078

4.		a	b
12:04	1.76, 0.96-2.27,	1.322	0.968
		30	65
		25	66
		25	66
12:13	1.75, 0.90-2.20	23	67

1.325

0.9664

Tuesday, Sept. 4, 1877.
Very clear - Clouds just breaking after storm.

4.

1:53 P.M.	1.73, 0.73-2.05,	^a 1.296	^b 0.946
{ a at first very slightly, but after wards more and more, obscured by a shower.		.302	46
		.308	45
		.311	44
2:00	1.74, 0.80-2.11,	.307	47
		1.3048	0.9456

1.

2:04	1.74, 0.79-2.10,	^a 3.110	^b 2.910
		08	10
		08	06
		08	07
2:13	1.71, 0.78-2.09,	07	11
		3.1082	2.9088

4.

2:16	1.71, 0.80-2.11,	^a 1.291	^b 0.946
		99	47
		.307	48
		05	47
(forgot to take)		05	45
		1.3014	0.9466

2.

2:25	1.74, 0.87-2.19,	1.522	1.115	0.401
		29	17	.400
		26	18	.395
		24	22	.404
2:34	1.74, 0.87-2.18,	26	20	.405
		1.5254	1.1184	0.401

30

3.

		a	b	c
2:37	1.74, 0.90-2.21,	2.433	2.317	0.280
		30	16	77
		27	10	77
		33	12	78
2:47	1.73, 0.80-2.10,	28	13	75
		2.4302	2.3136	0.2774

Angles between points.

1.	130° 55'	10° 50'
4.	24° 45'	8° 40'
2.	33° 25'	49° 35'
3.	84°	

Saturday, Sept. 8, 1877.
Clear - a few cirrus clouds.

1.					
8:29 AM	1.70, 0.93-2.30,	3.095 ^a		2.887 ^b	
		94		85	
		94		84	
		92		84	
8:35	1.69, 0.79-2.16,	90		84	
		3.093		2.8848	
4.					
8:37	1.69, 0.79-2.16,	1.312		0.924	
		18		23	
		14		24	
		17		26	
8:44	1.72, 0.79-2.16,	14		26	
		1.315		0.9246	
2.					
8:47	1.72, 0.79-2.16,	1.513	1.100	0.986	
		27	05	84	
		25	08	85	
		27	05	83	
8:56	1.72, 0.74-2.10,	24	08	87	
		1.5232	1.1032	0.985	
3.					
8:59	1.75, 0.90-2.28,	2.452	2.320	0.287	
		53	27	83	
		50	25	80	
		48	20	80	
9:06	1.74, 0.86-2.11,	48	21	81	
		2.4502	2.3226	0.2822	

July 19. 1882
 47 J.B.H. 214

6 10

69.6

4

69.6

70.0

69.7

09.3

top line

96.3

96.4

96.6

89.3

line 8.4

80.0

8.4

after thunderstorm still raining here

69.4

68.8

68.8

207.0

95.4

95.8

95.4

86.6

79.6

line 96.0

92 8.0

July 20, 1882.
Hb of Mr. Adams Camp

7 15 Am.	Level	7.13	10.0	8.3	133.7	7.13
	Smoke Camp				138.2	12.40
	"					12.48
	Madison				136.0	16.61
	Adams				140.6	17.96
	Adams				140.6	17.95
	Madison				136.1	16.62
	Camp				138.2	12.52
	"				135.3	12.46
	Level	7.2	11.0		140.0	7.05
	"	6.4	12.0		130.0	7.05
	Below found Phillips head & left.					

July 22, 1882.
Sketch of Dick's B.



Rocky Sinter. Eden river - 2'
 at 58' - 18' = 40'
 42' - 2 = 44'
 68 - 2 = 70'

64° 28' Length to pt a
 - 30'
 31'

Eden river - 52' 00" before.

July 22. 1882

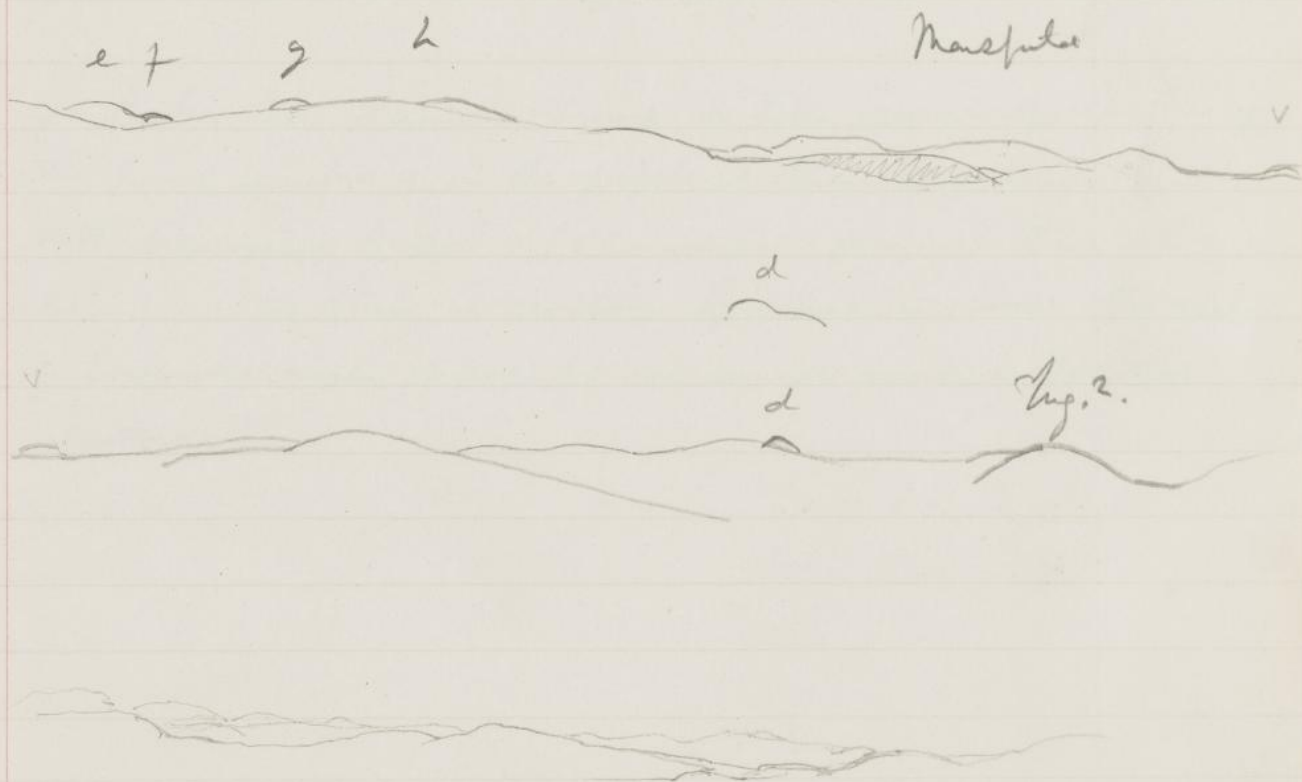
Level.

Level

E Table St King Ho.

8.3	9.6
1329.0	7.05
328.7	4.71

Two hours to	d =	70 35
Leaf. to Mars.		63° 28'
Two h to Mars		4 18
9 to Mars.		5 57



See page 139

Note by J. R. E. on profile p. p. 12 to 15

Dec. 1878

"4" looks like Canuti's bump, or like several eye-profiles of the point marked "q" on the profile at Star being printed in the N. H. Geological Report. (Characteristic form not there well shown.) As there is nothing by which to orient the system of horizontal angles of page 30 we cannot make a positive identification.

Collimation and Level Error.
Determined by aid of theodolite.
Saturday, Sept. 8, 1877.

(1.) Reading when set on
crosshairs of theodolite

1.403
1.387
1.409
1.398
1.409

(2) Reading of bubble and
screw when pointed to theodolite.

1.380 0.90 - 2.19
" 0.84 - 2.11
" 0.83 - 2.10
" 0.82 - 2.15
" 0.83 - 2.08

(3.) Reading when set on
distant object,

1.576
67
69
67
68

(4.) Reading of bubble and
screw when pointed to object.

2.76 0.73 - 2.00
0.75 - 2.01
0.72 - 1.98
0.79 - 2.03
0.72 - 1.97

(1.)
1.390
80
74
78
72

(2)
1.360 1.00 - 2.28
0.92 - 2.19
0.80 - 2.07
0.83 - 2.10
0.87 - 2.13

(3)

1.590

84

80

80

83

(4)

2.78 0.80-2.05

0.28-2.03

0.70-1.96

0.79-2.85

0.77-2.03

(1)

1.412

1.405

1.402

1.412

1.405

(2)

1.38, 0.95-2.22

0.85-2.12

0.84-2.11

0.86-2.13

0.80-2.06

(3)

1.545

43

41

43

46

(4)

2.74 0.87-2.14

0.87-2.09

0.84-2.10

0.72-2.93

0.70-1.95

42

Meteorological Observations—Jefferson, N.H.

North attic room of Jefferson Hill House, — 1877.

Date	Time	Barom.	Temp. of Mercury	Temp. of Air.	Remarks
Thursday, Aug. 2.	4:40 P.M.	28.253	77.0	77.8	
Friday, Aug. 3.	7:45 A.M.	28.598	68.3	59.	
" "	11:20 "	28.535	71.9	71.	
" "	5:00 P.M.	28.430	79.2	75.6	Barom. began to rise about 6 P.M.
Saturday, Aug. 4.	7:45 A.M.	28.473	65.4	61.2	
" "	6:00 P.M.	28.484	70.5	61.5	
Sunday, Aug. 5.	10:45 A.M.	28.477	66.7	64.7	
" "	6:05 P.M.	28.447	63.4	56.	
Monday, Aug. 6.	8:00 A.M.	28.445	63.1	57.	
" "	7:10 P.M.	28.455	67.5	65.	
Tuesday, Aug. 7.	7:40 A.M.	28.433	63.5	57.	
" "	1:05 P.M.	28.396	72.4	67.	
" "	3:05 P.M.	28.346	70.7	69.2	
" "	3:10 "	28.343			
" "	3:30 "	28.365			
" "	3:45 "	28.343			
" "	3:53 "	28.365			
" "	4:05 "	28.359			
" "	4:15 "	28.350			
" "	4:19 "	28.389			
" "	4:20 "	28.393			
" "	4:22 "	28.366			
" "	4:25 "	28.336			
" "	4:40 "	28.371			
" "	5:00 "	28.372			

Thunder storm

Several times barom. fell between showers and rose again while it rained.

Barom. very steady rest of evening. At 9 P.M. it had fallen

Date	Time	Barom.	Temp. of Mer.	Temp. of Air	Remarks
Wednesday, Aug. 8.	7:35 A.M.	28.384	68.7	60.5	At 5:30 A.M. barom. had
"	1:00 P.M.	28.427	76.6	72.7	fallen a few thousandths more. At 10:30 P.M. bar. about 28.45
Thursday, Aug. 9.	9:00 A.M.	28.468	72.1	69.5	At 6 A.M. barom. had fallen a few
"	5:45 P.M.	28.432	76.6	69.	hundredths over night
Friday, Aug. 10.	8:35 A.M.	28.385	68.8	65.7	
"	5:50 P.M.	28.423	72.1	68.7	Thunder shower, during
"	6:00 "	28.440			which bar. rose steadily.
Saturday Aug. 11.	8:00 A.M.	28.566	70.2	65.	
"	7:30 P.M.	28.623	72.0	66.	
Sunday, Aug. 12.	9:10 A.M.	28.667	71.8	66.	About 11:30 A.M. bar. 28.68
"	2:30 P.M.	28.655	79.5	74.	
"	5:58 P.M.	28.628	81.5	75.	
"	7:05 P.M.	28.608	77.9	71.	
Monday, Aug. 13.	7:45 A.M.	28.557	71.5	63.5	Bar. began to rise about
"	3:30 P.M.	28.559	80.8	73.5	8: A.M. - 1 P.M. 28.58
"	6:45 "	28.551	75.3	71.	
Tuesday, Aug. 14.	8:30 A.M.	28.542	70.0	64.2	Bar. same at 1 P.M. -
"	6:55 P.M.	28.520	74.5	70.	fell during afternoon.
Wednesday, Aug. 15.	8:30 A.M.	28.551	71.6	65.5	
Thursday, Aug. 16.	7:45 A.M.	28.452	70.3	63.8	
"	11:00 A.M.	28.459	74.8	68.5	
"	11:35 "	28.450	74.4	69.1	
"	3:55 P.M.	28.437	80.2	73.	
"	5:25 "	28.427	73.5	70.	
Friday, Aug. 17.	8:30 A.M.	28.504	69.6	64.5	
Saturday, Aug. 18.	8:15 A.M.	28.603	68.5	61.	
"	3:50 P.M.	28.591	77.8	73.	

Date	Time	Barom.	Temp. of Mer.	Temp. of Air.	Remarks.
Sunday, Aug. 19.	9:15 A.M.	28.664	71.4	65.8	
"	12:10 P.M.	28.660	76.1	72.5	
"	1:45 "	28.651	78.8	75.	
"	4:10 "	28.641	78.6	71.8	Barom. rose again towards evening.
Monday, Aug. 20.	7:40 A.M.	28.712	71.3	59.5	
"	11:55 "	28.708	75.3	73.5	Barom. fell during afternoon about
"	1:05 P.M.	28.704	77.4	74.7	.02, but rose again towards evening.
Tuesday, Aug. 21.	7:35 A.M.	28.729	66.2	55.7	
"	9:30 "	28.750	69.3	64.8	
"	2:00 P.M.	28.721	77.7	74.8	
"	3:35 P.M.	28.712	80.0	77.4	
"	6:45 "	28.705	76.0	68.8	
"	7:20 "	28.716	75.0	71.	
Wednesday, Aug. 22.	7:45 A.M.	28.719	67.1	59.1	
"	2:50 P.M.	28.696	81.1	78.2	
"	3:40 "	28.703	82.5	80.	
Thursday, Aug. 23.	8:25 A.M.	28.733	71.2	65.	
"	3:00 P.M.	28.737	84.1	82.7	
Friday, Aug. 24.	7:30 A.M.	28.771	76.0	64.3	
"	6:45 P.M.	28.727	78.4	72.7	About 11 A.M. bar. reached 28.78
Saturday, Aug. 25.	7:40 A.M.	28.733	77.2	66.5	
"	5:25 P.M.	28.699	75.6	71.8	About 1 P.M. bar. reached 28.74 about.
Sunday, Aug. 26.	7:50 A.M.	28.733	71.1	64.	
"	2:05 P.M.	28.739	76.2	73.3	
"	3:15 "	28.738	74.9	70.	
Monday, Aug. 27.	7:25 A.M.	28.823	66.5	61.	
Tuesday, Aug. 28.	7:20 A.M.	28.844	71.8	67.	Noon bar. 28.85, 10 P.M. 28.75

Date	Time	Barom.	Temp. of Mer.	Temp. of Air	Remarks.
Wednesday, Aug. 29.	8:20 A.M.	28.664	72.7	68.5	
" "	4:55 P.M.	28.523	82.0	74.8	10 P.M. bar. about 28.52
Thursday, Aug. 30.	8:05 A.M.	28.587	64.0	59.	
Friday, Aug. 31.	11:50 A.M.	28.651	71.6	69.7	
" "	12:55 P.M.	28.633	74.1	71.	10:25 P.M. barom 28.443
Saturday, Sept. 1.	7:20 A.M.	28.377	68.0	65.	Slight oscillations during afternoon,
" "	11:00 "	28.367			slow, but steady, rise beginning towards evening.
Sunday, Sept. 2.	10:20 A.M.	28.411	63.1	58.7	
" "	12:25 P.M.	28.397	67.5	62.7	
" "	6:45 "	28.363	64.5	58.7	
Monday, Sept. 3.	8:00 A.M.	28.295	58.0	47.	(Meanwhile bar. has risen, fallen again and is now rising.)
" "	5:45 P.M.	28.318	61.5	53.	
Tuesday, Sept. 4.	8:15 A.M.	28.469	53.5	50.2	
" "	1:25 P.M.	28.557	62.9	60.6	
" "	2:55 P.M.	28.577	64.9	62.	
" "	6:10 "	28.623	66.0	59.6	
Wednesday, Sept. 5.	8:15 A.M.	28.709	65.1	63.5	
" "	6:00 P.M.	28.714	65.0	61.	
Thursday, Sept. 6.	8:00 A.M.	28.902			
" "	8:35 "	28.902	59.2	52.	
" "	2:25 P.M.	28.918	67.7	64.	
Friday, Sept. 7.	8:45 A.M.	28.937	57.8	51.8	
" "	7:00 P.M.	28.853	60.0	58.	
Saturday, Sept. 8.	7:35 A.M.	28.820	59.7	50.2	
" "	9:10 "	28.813	60.2	57.	
Sunday, Sept. 9.	8:55 A.M.	28.746	61.0	53.7	

Subdivision of Millimetre into 10 parts
 Rulings by Rutherford. J. R. E. obs.

Apr. 30/79

11 1/2 A.M. Accuracy of single settings.

0.64	32.02
.61	.03
.57	.03
.60	.02
.59	.00
.58	.03
.57	.00
.60	.03
.61	.02
.60	.02

11-55 A. 14.

Bisection i.e. $\left\{ \begin{array}{cccccccccccc} 0 & 1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 & 9 & 10 \\ & & & & & & & & & & x \end{array} \right\}$

0
20 00.57
59
58

5

20 31.95

~~99~~~~96~~

52

2/1600

1 2 3 4 5 6 7 8 9 10
 x x x x

0
 2000.58

57

59

.580

2157.44

.50

.45

.46

.46

.47

.463

.53

.51

.51

.517

5
 2000.38

.43

.40

.403

2157.09

.09

.03

.04

.09

.07

.068

.40

.41

.42

.410

Alme-12-20 P. 16.

2157.463

2000.548

156.915

-.127

.661

31.576

.788

2157.068

2000.407

156.661

+ .127

For Double page, Mean of $-.127$ and $-.211 = -.169$
 = correction to line 5

12-25 P.M.

105

2157.06

09

08

.077
~~.038~~

2000.38

41

37

39

37

40

.387

.01

.05

06

05

03

.040

About 1-45 P.M.

2157.⁵⁸039

2000.387

156.652

7'

+ .210

+ .201

50 #

2157.01

04

02

Disturbance by
visitors

2157.03

.06

.04³

.040

2000.16

13

14

12

11

12

.130

.08

06

08

.073

2157.130

2000.057

157.073

6.652

31.725

.862

-.201

-.211

157.073

6.671

31.748

.872

2-05 P.M.

0	1	2	3	4	5	6	7	8	9	10
x				x						x

<u>0</u>			<u>4</u>			<u>4</u>			<u>10</u>	
----------	--	--	----------	--	--	----------	--	--	-----------	--

2000.28

.28

.27 .277

2125.81

.81

.81

.82

.83

.83

.818

.277

.21

.23

.237

2125.87

89

85

.870

2251.46

48

47

45

47

47 .467

85

87

88

.867

2000.13

.13

.17

.15

.145

2188.12

.12

.13

.17

.15

.16

.142

.13

.13

.13

.130

<u>0</u>	<u>4</u>	<u>4</u>	<u>10</u>
		2188.19	
		16	
		16	
		.170	
			² 2876.18
			3
2251.42			22
41			21
41			18
.413			18
	2876.97		21
	99		.197
	98	.12	
	97	13	
	98	15	
	98	.133	
	.978		
.39			
41			
41			
.403			

About 30.4.

.277	0.257	5.818	125.561		
.237	5.868	1.467	5.599	0.137	8.142
	1.408	6.978	5.570	8.152	6.197
					188.005
					8.048
					188.025
Cor. = -.136			125.577		
			188.025		
			~~34313.692~~		
			.4		
			125.439		
			125.441		
				Or, summed =	
				column	
				376.730	.340
				376.050	-.380
				376.390	.4
					-.136 = correction
					to 4 line.

The two methods of figuring agree.

	0	1	2	3	4	5	6	7	8	9	10
X		<u>6</u>					X				X
	~~2000.09~~		<u>10</u>			<u>0</u>			<u>6</u>		
	2000. ~~11~~										
	08										
	12	.103									
		2125.44									
		42									
		44				2000.19					
		44				19					
		42				20	.193				
		46	.437						2188. ~~56~~		
	.12								.51		
	13								.53		
	14								.50		
	13	.130							.57		
	~~2125.43~~								.50		
	42								.52		
	45								.512		
						.15					
						19					
						19	.177				

Mar-4-50

I discovered mistake reading it - doubtless
whether right part of screen was used; or else
whether right line was used, on this page.
The nature of the mistake discovered. Part not
scratched out all right.

S-00 P.M.

6
2000.09

12

09 .100

2125.39

38

39

40

39

41

.393

.11

11

11

.110

Repetition
of mistake
made on
previous
page

~~2125.28~~~~28~~~~31~~

2125.37

37

38

.373

2250.64

60

62

62

60

63

.618

.33

32

34

330

06

2000.01

~~09~~

01

03

.017

2188.41

40

40

40

40

39

.400

.01

03

02

.020

61006

2788.33

37

37

33

.350

2376.68

64

68

71

69

64

.680

2250.62

64

63

.630

2375.90

90

89

89

88

91

.895

.62

62

62

.620

.36

32

36

.347

0.1933 } 0.185 8.512 8.327

0.0173 } 0.018 8.400 8.382

0.010 } 0.018 8.400 8.382

188.355

8.348 6.690 8.332

188.343

125.280

313.623

.4

125.449

Correction to 6 line = -.169

5-50 P.M.

page 56
page 57 }
Lunar phase

0.103 } 0.117 5.437 125.320

0.130 } 0.117 5.437 125.320

0.105 5.393 125.288

125.304

5.352 0.618 5.266

0.625 5.475 5.270

125.280

Bisection - Redetermination of line 5.

- 50 P.M.

<u>0</u>	<u>5</u>
2000.16	
13	
13	
.140	
2157.07	
12	
10	
12	
10	
08	
.098	
18	
14	
17	
.163	
2157.098	
2000.152	
156.946	- .130
.687	
216.33	
.816	

.130
 .181
 .150

7-12
 Correction to the 5 line
 derived from this double
 Page = -.150

<u>5</u>	<u>10</u>
2000.15	
12	
13	
Discarded	2156.83
on account of	83
evidence of motion	
with mountains	86
just where to locate	84
it. Extra settings	83
taken to replace these	84
.23	
23	
20	
.220	
	.89
	88
	88
	91
	90
	91
	.895
.18	
21	
20	
197	

2156.895
 2000.208
 156.687 + .129

Alv 7-20

105

2157.07

07

07 .077

200.41

40

41

40

41

41

.467

.08

10

07

.083

Recurve here $\neq$ by mistake

2157.080

2000.467

156.613

+ .181

.975

21.588

.794

50

2157.09

09

10

.093

++ - - - 2000.11

13

12

13

15

12

.127

.12

12

08

11

.110

2157.102

2000.127

156.975

- .181

Alv 7-40

Correction to the 5 line.

Sum from pages 52 & 53

- .164⁴

" " " 60 & 61

- .150

Mean

- .160

.157

62

0	1	2	3	4	5	6	7	8	9	10	Redetermination
X				X						X	
7-55 P.M.	<u>10</u>			<u>4</u>				<u>4</u>		<u>0</u>	
								2125.50			
								50			
								50			
								.500			
									1999.83		
									83		
									87		
2188.02									87		
8.04									87		
7.99									84		
8.07									83		
1999.99									87		
2000.00									.849		
				0.01				45			
				9.99				48			
				0.00				45			
				0.01				.460			
				0.000				2251.12			
								16			
8.01								14			
8.02								.190			
8.00									2125.60		
.010									62		
									62		
									62		
									62		
									63		
									.618		
								.18			
								18			
								17			
								.177			

10
 2376.00
 6.00
 6.00
 6.000
 2188.02
 8.00
 7.99
 8.00
 8.04
 8.02
 8.023
 6.02
 6.04
 6.02
 6.027

4
0
 2376.09
 12
 12
 .110
~~5052.~~ 2250.52
 51
 55
 52
 56
 53
 0.532

Abur-8-40

8.017 } 8.013 0.000 188.013
 .010 }
 6.018 8.023 187.995
 188.004
 125.582
 313.586
 .4
 125.434

.11
 10
 10
 .103
 5.480 9.849 125.631
 1.158 5.618 5.540
 6.107 0.532 5.575
 125.542

Correction to ϕ line = -.148

64

0 1 2 3 4 5 6 7 8 9 10
x x x x

Redetermination

1/1/79

30 A. 4.

106602125.22 taken within ^{several preliminary} certain

27

27

27

.370

1999.94

97

96

99

98

95

.965

.24

27

26

.257

2250.58

57

59

.570

2125.34

31

32

32

32

31

.320

.60

60

57

.590

2188.27

31

27

.283

2000.00

0.03

0.01

0.00

0.03

0.04

0.018

.27

27

31

.283

Line 4

Page 54+55 Corveti = -0.136

Mean = -0.142

Diff
.012

" 62+63 " = -0.148

~~" 56+58 "~~

Line 6

" 56+58 Corveti = -0.169

Mean = -0.157

.023

" 64+65 " = -0.146

Line 2

" 67+68 Corveti = -0.099

Mean = -0.102

.006

" 76 " = -0.105

~~" 6 "~~

Line 8

" 69 Corveti = -0.165

Mean = -0.162

.006

" 77 " = -0.159

~~" 72+73 "~~ Line 3

" 72+73 Corveti = -0.166

Mean = -0.156

.019

" 78+79 " = -0.147

Line 7

" 74+75 Corveti = -0.160

Mean = -0.157

.005

" 80+81 " = -0.155

Line 5

" 52+53 " = -0.167

Mean = -0.160

.014

" 60+61 " = -0.150

0.157

.019

	0	2	10
	x	x	x
	0		2
145 P.M.	0	1999.99	
	0	9.98	
	+	0.02	
		9.997	
	0	2062.77	
	-	78	
	0	81	
	0	81	
	0	82	
	0	81	
		2.800	
-	9.99		
0	0.01		
0	9.997	9.99	
	-	2125.67	
	+	77	
0	2062.88	0	
0	90	70	
		5.713	
-	87		
+	92		
-	85		
+	92	+	74
	2.890	+	72
		0	72
			.727

	2	10
0	1999.98	
+	9.98	
0	9.99	+
	9.983	2250.80
0		72
0		73
+		77
0		73
-	9.97	0
0	0.01	77
+	0.01	0.753
	9.997	

Prefix sign always recorded before the setting is read.

Prefix residuals position in direction of prefix sign.
From series of six only.

+ .020
+ .047
+ .017
+ .020
+ .030
+ .040
+ .030
7.204
.029

Average value of prefix sign
for this page = .029

Mean	Diff	Corr ^{due to} (prefix)	Result
0 = 9.997	2 = 2.800	62.803	+ .029 ÷ 6 = +.005
2.890	5.720	62.830	- .056 ÷ 6 = -.010
2 = 9.990	10 = 0.753	250.763	- .029 ÷ 6 = -.005
			250.758

	<u>0</u>		<u>2</u>		<u>2</u>		<u>10</u>
-25	0	2126.01					
	0	01.					
	0	<u>00</u>	0	2188.77			
		6.009	0	78			
			+	82			
			0	79			
			0	76		+	2250.71
	0	5.98	+	81		+	.71
				8.788			
-		99		2125.997	+	~~1999.90~~	
				62.791	0	1999.98	
0		<u>99</u>		-1.008	0	0.00	
		5.987		62.788			

A mistake of 1.00 We will
venture to rectify it in the difference,
since there is to be an independent
check.

+	2188.93	0	2250.70		9.92		2250.715
-	85		69		9.93		1999.970
0	89		73		9.99		250.745
-	82		0.707		0.00		-1.008
+	92				9.970		250.753
0	<u>89</u>						

8.45 P.M.

8.883

2250.697
2188.88362.814
+1.02561.889
61.789

62.839

.66

70

70

.687

62.808
.820
.783
.839

62.812

250.758
.753250.755
62.812

51313.567

62.713
.812

-1.099

032 Value of prefix = correct .039
022 From previous page .029
047
083
037
050
040
030
0354
089

9-1584

0 1 2 3 4 5 6 7 8 9 10
x x x

08810

- 2000.06

+ .12 0 2062.66

- 1999.99 + .70

0 0.02 0 2251.00 0 08 0 265

+ 02 - 61

0 0.00 + 09 0.090 2.655

0 9.99 0 02 0.090 62.565

0.000 1.033 0.000 2125.03

251.032 .0 0 2062.42 0 4.99

0.58 7 204
0.15 9 354
0.25 11 393
0.35 27 851
- 0.45 1032
+ 0.40
+ 0.05
- 0.15
- 0.75
+ 0.75
+ 0.25
11293
36

0 40

+ 47 0 4.98

0 43 99

2.430 4.997

62.430

62.667

.0

- 2124.91

- 2251.00 0 91 0 2187.48

0 1999.99 0 .02 - 42

+ 0.00 0 .98 0 46

0 9.99 + 1.05 0 93 + 51

- 9.96 0 00 4.932 7.457

9.985 1.017 9.985 62.535

251.032 .0 2188.33 + 2250.95

62.573 2188.33 0 90

.567

.517

.550

62.552

251.032

.032

251.032

62.552

5313.584

62.717

.552

1.155

9-45

70

0123... 10
x x xQ3310

+ 2000.00

10 0.01 0 2094.17

+ 23

~~0 1999.70~~

0 0.00 0 19

0 1999.93 0 2219.31

0 9.99 0 19

0 95 0 30

0 96 0 32

+ 99 0 33

Q 20

+ 2187.47

0 45

0 44

0 2188.43

Disturbed

0 2094.22 0 45

9-20-44 + 2000.01

0 1999.98 0 2094.18

+ 1999.93

- 96 0 18

0 90 0 2219.30

0 9.98 - 12

+ 31

- 94

+ 92 - 26

- 87 - 26

0 2187.37

0 209

- 31

- 2186.36

0 2094.21 0 41

+ 23 + 43

+ 24 0 41

+ 23 + 45

9-45

<u>0</u>	<u>3</u>	<u>3</u>	<u>10</u>
0 2188.42			
- 38	- 2382.57		
	0 59		0 2219.27
- 34	0 60	~~1998.49~~	+ 30
0 38	0 59	0 84	
		0 85	
		+ 88	- 21
		0 86	- 20
	+ 2476.71		
0 2382.43	0 63		
0 42	+ 69		
0 41	0 65	~~2219.32~~	
+ 45	+ 70	~~39~~	
		~~34~~	
+ 2476.69		- 2219.33	
0 62	0 2570.80	0 35	- 2438.66
	+ 87	0 34	+ 76
+ 63	- 80	+ 40	0 70
0 61	- 79	+ 39	0 72
0 2570.72	0 2664.92		
- 69	+ 98		
0 71	0 96		
0 71	0 94		

Wrong

72
05
14

	<u>0</u>		<u>3</u>		<u>3</u>		<u>10</u>
0	2000.08						
+	11	0	2094.31				
		0	31		~~1999.99~~		
0	07	0	30		~~2000.17~~		
+	<u>12</u>	+	<u>34</u>	0	2000.00		
	0.095		4.315	0	01	0	2219.34
			0.095			0	35
		0	94.330				
			2187.51				
+	2094.33	0	48	0	00	+	41
-	27			0	01	-	32
0	31	+	57		0.005		9.355
0	<u>29</u>	0	<u>50</u>				0.005
	4.300		8.500				219.350
			4.300				
-	2188.50		94.200				
0	51	+	2282.80				
		-	72			0	2438.63
0	50	0	76	+	2219.31	0	65
-	48	0	73	0	31		
	<u>8.497</u>		2.752	0	30	+	.67
			8.497	0			
			94.255		26	0	65
		+	2377.17	-	<u>9.295</u>		8.650
0	2282.88	-	10				9.295
0	89						219.355
-	85	+	10				
0	<u>90</u>	0	<u>14</u>				
	2.880		7.127				
			2.880				
0	2377.14		94.247				
+	17	-	2371.36				
		+	44				
0	13	0	38				
0	13	0	39				
	<u>7.142</u>		<u>1.392</u>				

3.25 $\frac{1}{4}$

74

508.16.

0 7 8 9 10

x

x

x

020
02
2000.02
.020
010
2093.92

+ 2000.05

0 02

0

2219.71

0

.01

0

92

0

71

0

02

0

93

0 .02

-

66

0.017

3.917- 00

+

75

0

2093.97

0

2187.89

0.02290.707
219.685

0

+

4.00

+

4.01

0

87

0

3 97

-

83

3.9877.862

0

2187.80

3.987

-

77

0

2281.68

0

2439.29

0

69

0 2219.60

0

28

0

77

0

70

+ 65

0

79

0

69

0 61

0

.23

7.782

1.690

0 61

0

24

0

2375.62

+

27

0

2281.71

0

64

- 57

-

21

0

72

0

61

0 629.253
9.410
219.643

0

73

0

61

9.610

+

74

+

66

1.7255.632

Lead by next attempt to
infer that the many turn of the
screw may have been used, in spite
of the apparently correct reading.
Work repeated at foot of next page.

0

2375.66

1.725

98.907

0

70

0

2469.61

0

69

-

60

+

72

0

63

5.6929.617

	<u>0</u>		<u>2</u>		<u>2</u>		<u>10</u>	
0	~~2439.29~~				0	~~2439.27~~		
0	~~30~~				0	~~29~~		
0	2439.25							
0	27	0	2658.96					
		0	98				0	2563.40
0	.24	-	94				+	48
-	22	-	92	0	2469.52	0		45
	<u>9.245</u>		<u>8.950</u>	0	54			
			<u>9.245</u>	0	57	0		43
93.900			<u>219.705</u>	0				
.875				0	53	0		41
.908			219.685		<u>9.525</u>			<u>3.434</u>
~~.907~~			<u>.643</u>					<u>9.525</u>
~~.909~~			<u>.705</u>					<u>93.909</u>
.959			<u>312.033</u>	0	2563.43			
.952			<u>219.678</u>	+	47			
<u>.912</u>			<u>+ 5</u>	0	42	0		
93.914			219.683				7	2658.39
<u>+ 8</u>			<u>93.922</u>					
93.922			<u>313.605</u>	+	45	+		44
			<u>.3</u>	0	42	-		42
			<u>94.0875</u>		<u>3.438</u>			34
			S.P. 16.					<u>9.397</u>
			S.P. 16.					<u>3.434</u>
				0	2281.72			<u>93.909</u>
				+	78	0		2375.65
				0	<u>24</u>	0		64
				0	73	+		69
				0	<u>72</u>	-		<u>62</u>
					<u>1.718</u>			<u>5.650</u>
								<u>.718</u>
								<u>93.932</u>
						0		2469.56
				0	2375.63	0		54
				0	63			
				+	66	0		.57
				0	<u>62</u>	-		<u>5.2</u>
								<u>9.547</u>
								<u>5.635</u>
								<u>98.912</u>
								<u>9.547</u>

Correction to 7 line division
from this page = -.160

0 2 2 10

0	1999.96		
0	93	0	2062.77

		0	75
0	97	0	77
-	93	0	77

9-1544	0	93	0	77
-	-	<u>90</u>	-	<u>72</u>
		9.937		2.758
				9.937
				62.821

0	2062.83				62.83
0	85	0	2125.73		

	-	68	0	~~2000.05~~
+	89	74	-	01
+	90	69	+	~~89~~
	<u>2.867</u>	<u>5.710</u>	0	2000.01
		3.862		
		<u>62.843</u>		

	0	2188.52	-	9.97	0	2250.78
-	2125.71	0	54	0	0.02	0
						78

0	76					0	78
0	73	0	.52	0	0.00	0	77

$\begin{array}{r} 70 \\ 5.725 \\ \hline \end{array}$	0	$\begin{array}{r} 5.2 \\ 8.575 \\ 5.725 \\ \hline 62.800 \end{array}$	0	$\begin{array}{r} 03 \\ 00 \\ \hline 0,005 \end{array}$	0	$\begin{array}{r} 78 \\ 0.778 \\ 0.005 \\ \hline 250.773 \end{array}$
--	---	---	---	---	---	---

[illegible]
$$\begin{array}{r} 62.821 \\ .843 \\ .800 \\ .855 \\ \hline .830 \\ + \quad 4 \\ \hline 62.826 \end{array}$$

Correct to 2 line
drive from obs.
page = - .105

9-454, A.

+	.59	0	43
0	<u>.57</u>	-	<u>41</u>
	8.575		1.430
			8.575
			<u>62.855</u>
			8.575
			<u>880</u>

0.0008910
x x x
9.50
A. 16.

08810

77

				0	2000.01		
				0	03	0	2062.58
						+	63
				0	02	0	60
				0	03	+	63
					0.022		2.612
							0.022
							62.590
						0	2125.10
				-	2062.52	+	13
+	2000.03			0	57		
-	9.98			0	54	-	5.06
0	0.00	-	2250.97	+	58	+	.13
					2.552		5.105
		0	98				2.552
		+	1.04			0	62.553
0	0.00	0	0.99	0	2124.98	0	2187.50
0	0.00	0	1.00	0	5.00		51 7.505
+	0.04		0.9	+	5.03	+	.56
	0.008		0.998	-	4.98	0	54
			0.008		4.997	0	53
	62.590		250.990				7.530
	1.553		+				5.000
	5.30		250.995	0	5.00	0	62.530
	5.68		62.550	0			7.530
	62.560		313.545	0	5.01		7.530
	- 10		12				7.530
	62.550		62.709		5.005		7.530

5 min delay.

Correct to 8 min delay
from this page = -.159

10-25 A. 16.

+	2187.50		
0	50	0	2250.03
		0	05
-	45	+	07
+	52	+	09
	7.492		0.060
			7.492
			62.568

⁰ 78	³ x	¹⁰ x	<u>0</u>	<u>3</u>	<u>3</u>	<u>10</u>
0	40.1.16.	0	1999.99 0.00	0	2094.17	
		+		21		
-	96	0		20	0	2000.06
0	01	0		18	+	10
	9.990			4.190 9.990 94.100		0
		0		2188.37	-	03
0	2094.13	0		50	-	04
0	12					0.057
0	11	+		37		
0	12	0		31		
		+		36		
0	09	0		32		
0	4.110 09			8.355 4.110 94.245		
+	2188.38					
-	30	0		2282.53		
0	34	0	2.520 8.338 94.182	54	~~2438~~	0
0	34	-		50	+	2219.46
0	33	0	2.520	51	0	44
	8.338					*
		+		2376.87	0	43
+	2282.57	0		82	0	44
0	51					9.442
0	53	0		80		
0	54	0		80		
	2.537			6.822 2.537 94.285		
+	2376.87					
0	84	+		2471.04		
		0		00		
0	81	0	1.027 6.837 94.190	02		
+	83	0		02		

03310

79

0

3438.73

-

70

0

2658.06

0

06

0

02

0

02

+

71

+

05

8.707

8.042

8.707

219.335

+

2565.42

0

38

0

69

0

02

0

2471.13

0

14

0

12

0

40

0

14

+

42

1.132

5.405

1.132

94.273

0

2565.31

0

33

-

2659.50

0

57

0

30

0

54

0

30

-

49

5.310

9.525

5.310

94.215

94.200

.245

.182

.285

.273

.215

219.378

.358

.335

.357

- 12

219.355

94.219

313.574

.3

94.072

94.200

.245

.182

.285

.190

.273

.215

71190

94.227

- 18

94.219

11-40 A.M.

Correction to 3 line derives from
this page = -.147

80
1050.14.

0	1	1	10
0 2000.07	- 2219.71	- 2000.02	209 ⁴ 1.00
- 05	+ 80	0 04	4 03
+ .12	0 77	+ 08	3 99
0 09	+ 80	- 05	4 01
0.082	9.770	0 06	4.007
	0.082	0.050	0.057
	219.688		2187.00
		0 2093.11	0 02
		0 14	0 01
		0 12	0 00
		+ 16	0 00
		~~2~~	~~2~~
		0 2187.83	0 83
		- 2099.91	0 82
		0 92	0 83
		+ 96	7.827
		0 93	3.936
		3.930	98.897
		+ 2187.93	2281.85
0 2219.80	0 2439.5	+ 90	0 82
- 80	- 46	0 88	0 80
- 78	0 49	0 87	77
0 81	0 47	+ 90	1.810
9.797	9.480	7.896	7.896
9.797	9.797	0 2281.77	2375.65
	219.683	0 75	70
		0 76	64
		+ 78	71
		1.765	5.675
			1.765
			93.910
			5.675

<u>0</u>	<u>7</u>	<u>7</u>	<u>10</u>
		0 2375.77	
		0 81	0 2469.71
			+
		6 79	0 74
		- 74	0 71
		5.777	0 71
			9.717
			9.777
			93.990
			0 2563.70
		0 2469.77	0 67
		0 78	
0 2439.41	0 2659.13	+	0 69
0 44	0 08	0 79	0 70
	+	9.790	3.690
	12		9.790
			93.900
0 2439.40		0 2563.69	
- 37	- 2659.03	- 63	~~2657.63~~
	+	66	0 2657.60
0 41	0 03	-	56
0 36	+	0 69	57
0 40	0 05	0 65	60
9.388	9.058	3.664	7.562
	9.388	93.957	3.664
	219.670	93.897	93.918
		.914	
		.910	
		.940	
		.900	
		.918	
		.919	
		93.919	
		219.660	
		313.579	
		94.074	

Correction to 7 line
derive from this page
= .155

$\frac{1}{2} = \frac{1}{2} + 0$
 82

Apr May 5/79 Spaces.

Measurements

Corrected
Differences

Preliminary

The importance
of independent
focusing is
manifest.

We will therefore
take only two
measurements of each
space (unless a wide
discordance results in
a particular case)
and then proceed to
the next, preparing
to repeat with indepen-
dent focusing.

Focus the instrument
and readjust
between each space.

Optical settings taken
in case of discordance
on assumption that
the discordance is
due to fact that
the particular pair of
lines (or one of them)
is not so easy to set
up on, either intrinsic-
ally or as focused at
the time

Spaces.

3.5 P.M.

1

Estimate	Reading	Estimate	Reading	Corrected Differences
+4	2000.03	-2	2031.41	31.44
-2	9.97	-2	X	X

#				
+2	0.02	+4	.47	.43
-2	9.97	0	.41	.42

-2	.96	-4	37	.43
0	99	+2	43	.42

10

-2	82.19	0	13.33	31.12
-2	19	0	13.34	.13

+2	.23	+2	.39	.16
0	17	+4	.40	.19

Focused

+2	.33	0	.56	.25
-2	.27	+4	.58	.25

+4	.20	+4	.46	.26
+2	.18	0	.41	.25

1

0	9.97	0	41	.44
+4	0.00	0	39	.43

+4	9.96	+4	38	.42
0	93	+2	35	.40

Focused

4-10 P.M.

4-2³ P. 16.

10

+2
+2

10

x

2000.05

0

.03

+4

2031.31

31.24

-4

01

+2

31

24

-4

01

0

30

25

31.243

+

+2

+2

1

-2

1999.97

0

2031.44

31.45

+2

.99

0

44

47

.460

2

+2

.99

0

.41

44

-2

.96

-4

.37

43

.435

3

0

.96

+4

.40

38

+2

.48

0

.37

41

.395

4

0

.93

0

.32

39

-4

.91

0

.32

37

.380

5

+4

2000.11

+4

.50

39

0

.07

-2

.47

42

+4

.13

0

.35

36

.420

6

+2

.03

+2

.45

42

0

.03

+4

.46

39

.405

7	-2	.96	+4	.40	31.38
	0	.98	+4	.40	38 31.380

~~8~~

~~8~~	~~+4~~	~~.98~~	~~+2~~	~~.33~~	
	~~+4~~	~~.94~~	~~+4~~	~~.35~~	
	~~0~~	~~.90~~	~~+2~~	~~.33~~	

Since from this it may
be necessary to turn back
further on the screw before
setting

8	0	.93	+4	.38	41
	+4	.96	0	.32	40
	0	.93	+4	.36	39 .400

9	-4	.99	0	.34	31
	-2	.01	-2	.32	31 .310

10	-2	~~.04~~ .93	+4	.31	21
	0	.04	+2	.32	26
	-2	.04	+4	.34	24 .237

5-08

01	0	.04	+4	.57	49
	0	.06	-4	.49	47 .480

5-13

	Pages 83+84	86+87	Mean
1	$\frac{460+480}{2} = 470$	$\frac{443+417}{2} = 430$	450
2	435	460	447
3	395	430	412
4	380	375	377
5	420	360	390
6	405	440	422
7	380	440	410
8	400	407	403
9	310	375	342
10	$\frac{243+237}{2} = 240$	$\frac{263+205}{2} = 234$	237

The ^{of the difference} resulting magnitude, between the result of the two sets reveals it - improbable that a more repetition over more of the double set-mill answer.

A set-mill now be tried refocusing every time.
(Commencing 7-35 ~~5-27 P.M.~~ 7-35 P.M.)

86

-27 P.M.

1	+2	.95	+4	31.43	.46	
	0	93	-4	33	44	
	-2	91	0	36	43	31.443

10	+4	.13			out of focus	
	0	02	+4	32	26	
	-2	02	0	31	27	
	-2	01	+2	31	26	.262

9	+2	98	0	35	39	
	0	97	-2	33	36	.375

8	+4	92	+4	27		
	+4	87	+4	28	39	
	-2	82	+4	27	39	
	0	82	-2	24	44	.407

7	+4	02	-2	41	45	
	+2	02	-2	41	43	.440

68	+4	06			Revised	
	+4	06	-2	45	45	
	-2	00	-4	41	43	.440

5	+4	01	0	33	36	
	+4	01	0	33	36	.360

48	0	.07	0	31.44	.37	
	+2	10	+2	48	38	31.375
3	0	05	+2	50	43	
	+4	09	+4	52	43	.430
2	-2	01	+2	51	46	
	0	02	+2	50	46	.460
1	-4	00	-4	41	41	
	+2	03	-2	43	44	
	-4	98	0	42	40	
	0	00	0	42	42	.417
10	-2	97	+4	23	20	
	~~+2~~	~~00~~			lost	
	+2	00	+4	23	21	.205

6-13 P. 4.

88 7-35 P.M.

10	-4	.93	-2	.23	31.28
	-2	.12	0	41	27
	-2	00	0	31	29
	0	02	-2	28	28
	-4	11	+4	44	25 31.274

1	+4	95	-2	31	42
	-2	95	+4	42	41
	+4	03	-2	43	46
	0	96	-4	33	41
	+2	03	+4	48	43 .426

7-55 P.M.

2	0	93	+4	40	43
	0	92	-2	33	43 .430

3	+4	99	+4	43	44
	0	87	-4	27	44 .440

4	0	16	+4	57	~~45~~ 37
	-2	09	-2	51	42
	+4	15	0	51	40
	-4	06	-4	47	41 .400 ~~.420~~

5	+2	09	-4	41	38
	-4	12	-4	51	39 .385

6	-4	90	-4	30	40	
	+4	02	0	43	45	
	0	97			low	
	+4	99	+4	40	41	
	+4	95	-4	30	43	.422
7	-2	14	+2	53	35	
	-4	15	-4	53	38	.365
8	-4	92	+4	37	37	
	+4	83	-2	20	43	
	0	82	+2	22	38	
	+4	89	-2	27	44	.405
9	0	00	+2	40	38	
	0	99	-4	30	35	.365
10	+4	00	0	26	30	
	-4	94	+2	25	25	
	-4	92	+2	22	24	.263
1	0	09	+4	53	40	
	0	00	+4	44	38	
	+4	16	+2	60	46	.413

8-50 P. 14.

90

May 6/79

10-00

H.A.M.

+4

.99

-2

.20

31.27

10

+4

09

+4

32

23

+4

02

0

20

22

31.240

1

-4

83

0

22

35

-2

80

-2

20

40

-2

53

-4

22

41

.387

2

0

99

+4

46

43

0

91

-4

31

44

.435

3

0

11

+4

61

46

0

08

+2

51

41

-4

97

-2

45

46

.443

4

0

11

+4

53

38

+2

06

-2

43

41

.395

~~.363~~

5

-2

07

-2

50

43

-2

06

0

45

37

0

93

-4

27

38

.387

6

+4

04

0

42

42

-4

94

0

40

42

.420

7

0

08

+4

58

46

0

98

0

39

41

+4

02

0

38

40

.423

8	~~-4~~	~~.10~~	~~-4~~	~~.20~~		
	+2	28	-4	.63	41	
	+4	17	0	.57	38	
	+4	30	-4	.62	40	.397
9	+4	11	-2	.46	~~41~~	
	+4	01	-4	.28	35	
	-2	93	+2	.31	34	.387
						~~.383~~
10	+2	07	+4	.39	29	
	+4	11	+2	.36	27	.280
1	0	00	0	.43	43	
	-2	00	+4	.52	46	.445

11-10 A.M.

Comparison with last evening.

1	$\frac{.426 + .413}{2} =$	.420	$\frac{.387 + .445}{2} =$	.416	Diff	- .004
2		430		435		+ .005
3		440		443		+ .003
4		~~400~~ 420		~~.375~~ 363		- .005
5		385		387		+ .002
6		422		420		- .002
7		365		423		+ .058
8		405		397		- .008
9		365		367		+ .002
10	$\frac{.274 + .263}{2} =$	.268	$\frac{.240 + .240}{2} =$	.240		- .008

92

-45-4.44.

1

-4	.91			
+2	03	-4	39	42
-4	97	-4	42	45

low-

31.435-

10

+4	02	-2	20	.24
0	00	-2	18	20

.220

7

+2	11	+2	46	35
0	99	+4	40	37

.360

8

+4	13	-4	47	42
+4	00	0	40	44

.430

7

0	01	+4	46	41
+2	10	+4	63	51
+4	13	-4	45	40
+4	21	+4	65	44
-4	98	-4	42	44

probably mislabeled of .10 in reading

.422

68

+2	22	+4	68	44
+2	10	+4	52	40

.420

5

+4	10	-4	45	43
-4	15	+4	67	44

.435

$$\begin{array}{r} 220 \\ 270 \\ \hline 255 \end{array}$$

$$\begin{array}{r} .435 \\ .420 \\ \hline .427 \end{array}$$

93

4	-4	.00	-4	.40	40	
	+4	96	+4	38	39	.395
3	-4	01	+4	52	43	
	0	16	-4	54	42	.425
2	-4	06	-2	57	43	
	-4	93	+2	40	41	.420
1	+4	01				lost
	+4	05	0	43	42	
	0	00	-4	38	42	.420
10	-4	16	-2	48	30	
	+4	23	+4	51	28	.290

12-25 P.M.

Comparison with preceding
 $\begin{array}{r} 415 \\ 427 \\ \hline +.011 \end{array}$

2	435	420	- 0.15
3	443	425	- 0.18
4	~~375~~ 375	395	$\begin{array}{r} .000 \\ \hline .30 \end{array}$
5	387	435	+ 0.48
6	420	420	.000
7	423	422	- 0.1
8	397	430	+ 0.33
9	330	360	+ 0.30
10	260	255	- 0.05

Results of Spacing

Since the accuracy is as largely proportional to the independence of focusing as of setting, the means of ten sets given on page 85 are to have only the same weight as the subsequent single sets.

	Page 85	Page 88+89	Page 90+91	Page 92+93	Mean	
1	31.450	.420	.416	.427	31.428 - .035	0
2	447	430	435	420	.433 - .40	-.035
3	412	440	443	425	.430 - .37	-.075
4	377	400	395	395	.392 + .1	-.112
5	390	385	387	435	.399 - .6	-.111
6	422	422	420	420	.421 - .28	-.117
7	410	365	423	422	.405 - .12	-.145
8	403	405	397	430	.409 - .16	-.157
9	342	365	367	360	.358 + .35	-.173
10	237	268	260	255	.255 + .138	-.138
	<u>3890</u>	<u>3900</u>	<u>3943</u>	<u>3989</u>	<u>31.393</u>	0
		~~365~~		~~435~~		
Residuals	1	+ 22	- 8	- 12	- 1	
	2	+ 14	- 3	+ 2	- 13	
	3	- 18	+ 10	+ 13	- 5	
	4	- 15	+ 8	+ 2	+ 3	
	5	- 9	- 14	- 12	+ 36	
	6	+ 1	+ 1	- 1	- 1	
	7	+ 5	- 40	+ 18	+ 17	
	8	- 6	- 4	- 12	+ 21	
	9	+ 16	+ 7	+ 9	+ 2	
	10	- 18	+ 13	+ 5	0	

Line	See page 66 Independent.	See page 94 I band	Diff	Mean of contiguous	Mean of 2 preceding columns
0	0	0			
1		-.035	(Assumed zero for adjusting purpose)		(assumed) 0
2	-.102	-.075	.027	.022	.0245 ^{+0.0245}
3	-.156	-.112	.044	.029	.0365 ^{+0.012}
4	-.142	-.111	.031	.0435	.037 ^{+0.005}
5	-.160	-.117	.043	.0215	.032 ^{+0.005}
6	-.157	-.145	.012	.0215	.017 ^{+0.015}
7	-.157	-.157	.000	.0005	.000 ^{+0.017}
8	-.162	-.173	-.011	.000	-.005 ^{+0.005}
9		-.138	(Assumed zero for adjusting purpose)		(assumed) 0
10	0	0			

Line	From above	Unvolved	Brought Down	Correction	Final result	Original Final
0					0	0
1	(0)					
2	.0245 ^{-0.008³}	.027 ^{0.027}	.027	-.000	-.102	-.102
3	.0365 ^{-0.002³}	.040	.044	+0.004	-.156	-.152
4	.037 ^{-0.002¹}	.038	.031	-.007	-.142	-.149
5	.032 ^{-0.003³}	.035	.043	+0.008	-.160	-.152
6	.017 ^{-0.002⁰}	.019	.012	-.006	-.157	-.162
7	.000 ^{+0.002³}	-.003	.000	+0.003	-.167	-.154
8	-.005 ^{+0.002³}	-.008	-.011	-.003	-.162	-.165
9	(0)					
10					0	0

96

	Thickness of padding layer	Decline spaces	Measure spaces	Lift
0	0			
1				
2	-.102	-.050	-.037	-.013
3	-.152	+.003	+.001	+.002
4	-.149	-.003	-.006	+.003
5	-.152	-.010	-.028	+.018
6	-.162	+.008	-.012	+.020
7	-.154	-.010	-.016	+.005
8	-.165			
9				
10	0			

These differences
seem large.

There are doubtless however about the adequacy of the "smoothing" process of adjustment. And since it has appeared that the adjustments for "smoothing" do not exceed the millionth of an inch, we may safely leave that process for any other which is recommended for other reasons.

Series 2 & 8 The weight of the independent motion is ~~probably~~ ^{many} ~~times~~ twice that of the space motion for these lines, assuming the observation to have been carried to the extent of attainable accuracy.

	Independent	Space	(2x Ind)	Sum	Mean	Mean
2	-.102	-.075	(-.204)	-.279	-.140	-.093
8	-.162	-.173	(-.324)	-.497	-.24	-.166

Residuals			{	Differences between two methods of adjustment = .102 - .093 = .009 i.e. There is an uncertainty of a millionth of an inch in the value.
2	.009	.008		
8	.004	.007		

Independent Space	Data			Independent Diff (Arbitrary)
0	0			
1	-.035			
2	-.040	-.093	-.093	-.093
3	-.037	-37	-.041	-33
4	+0.001	+1	-.003	+5
5	-.006	-6	-.010	-3
6	-.028	-28	-.032	-24
7	-.012	-12	-.016	-8
8	-.016	-16	-.030	-12
9	+0.035	98		
10	+0.138	73		
		6135		
		004		

Let us now "smooth" the last column of differences.

						Sum		Mean	Adjusted
2	.000	9	9			.009	.000	.093	-.093
3	30	18	18	+5	+0.001	.017	13	-.156	-.143
4	31	32	32	+17	-2	.036	5	-.142	-.137
5	37	29	29	-3	-11	.032	5	-.160	-.155
6	10	15	15	+14	+2	.015	5	-.157	-.152
7	2	3	3	-12	+8	.002	1	-.157	-.156
8	-8	-1	-1	-4	+2	-.005	0	-.166	-.166

	Adjusted from space	Indefinite	1 st "	2 nd " Adjusted	Diff	
2	-.093	2	-.102	102	093	9
3	-.126	3	-.156	152	143	9
4	-.121	4	-.142	149	137	12
5		5	-.160	152	155	3
6		6	-.157	162	152	10
7		7	-.157	154	156	2
8		8	-.162	165	166	1

If the coordinate of the "smoothed" curve of page 95 be applied as correction (with the proper sign) to the "space" curve results we shall merely by a different system of figuring get the "Final" figures.

$$\text{Thus } -.075 - .027 = -.102, \quad -.112 - .040 = -.152 \text{ etc.}$$

In this system we use the space measure to show relation of line to its next neighbor, neglecting its bearing upon the ^{to end line} direct relation. Should we give this up, calculate relation ^{to end line} neighbor for the two methods as applied to each line, and take mean of results determination we use the space measure for each

If now we take the ordinates of the "smoothed" curve, ~~multiply~~ ^{multiply} ~~multiply~~ each by the ratio of the weight of the ~~independent~~ ^{"independent"} to the sum of "independent" & "spaced", and apply the results as corrective to the spaced, we use both relations.

Weight.

n = number of line ~~- nearest line by zero~~
 ~~$\frac{1}{n}$ one line by zero~~

$\eta =$ " " " " " " " "

σ = reflection of a spin on same part of nerve.

$$\frac{n}{p} = \frac{m-n}{q} \text{ necessarily. } \therefore q = p \left(\frac{m}{n} - 1 \right)$$

~~$$\text{Error in sum of squares of } \underline{O \text{ to } m} = \sqrt{\frac{p^2 + q^2}{2}} = p \sqrt{\frac{m}{n}} = \sqrt{\frac{pm}{nr}}$$~~

" " " " " $0 \leq v = \sqrt{p/r}$

Result is got by subtracting length of 0 to m from $\frac{n}{m} \times$ length of 0 to m .

$\therefore$ Error in $\text{meas.} = \sqrt{\left\{ p + \frac{p^2}{m^2} \cdot \frac{p m}{p} \right\}} = \sqrt{4p(1 + \frac{p}{m})} = \sqrt{\frac{1 + \frac{p}{m}}{pr}}$
 $\therefore$ independent

~~$\forall$ independent $\rightarrow$ $\forall$ $p=1$ $\forall$ we have $m=10$~~

~~$\therefore$ For $n = 2$, $\text{Error} = \sqrt{\frac{6}{5}} = \sqrt{1.2}$~~

$$n = 3 \quad n = \sqrt{1.3}$$

$$n = 4 \quad n = \sqrt{1.4}$$

$$n = 5 \quad n = \sqrt{1.5}$$

~~$$E_{\text{non}} = \sqrt{\frac{p}{r} \left(1 + \frac{n}{m}\right)}$$~~

~~For the independent-determination we must add~~
~~Let r = number of times each space is repeated.~~

~~Then Error =~~

~~For a given determination $p = n$~~

~~$$\therefore \text{Error} = \sqrt{\frac{\frac{1}{n} + \frac{1}{m}}{r}} \quad \text{Error} = n \sqrt{\frac{\frac{1}{n} + \frac{1}{m}}{r}} = \sqrt{\frac{n + \frac{n^2}{m}}{r}}$$~~

~~With $m = 10$ & $r = 1$~~

~~Let $n = 1$ Error = $\sqrt{1.1}$~~

~~Let $n = 2$ Error = $\sqrt{\frac{0.60}{r}}$~~

~~Let $n = 2$ " = $\sqrt{2.4}$~~

~~" $n = 3$ " = $\sqrt{\frac{0.43}{r}}$~~

~~" $n = 3$ " = $\sqrt{3.9}$~~

~~" $n = 4$ " = $\sqrt{\frac{0.35}{r}}$~~

~~" $n = 4$ " = $\sqrt{5.6}$~~

~~" $n = 5$ " = $\sqrt{7.5}$~~

~~For independent-determination the rule might be adopted~~

~~Let $n = 2$ Error = $\sqrt{\frac{p}{r}}$ $p = 1 = \frac{1}{2}n$~~

~~Error = $\sqrt{2.4 \frac{p}{r}} = \sqrt{1.2 \frac{n}{r}}$ $\& = \sqrt{\frac{6}{r}}$~~

~~Let $n = 3$ for $p = 3 = n$ Error = $\sqrt{3.9 \frac{p}{r}} = \sqrt{3.9 \frac{n}{r}} = \sqrt{\frac{11.7}{r}}$~~

~~" $n = 4$ $p = 2 = \frac{1}{2}n$ Error = $\sqrt{5.6 \frac{p}{r}} = \sqrt{2.8 \frac{n}{r}} =$~~

Error in sum of space 0 to $m = \sqrt{\frac{p+q}{r}} = \sqrt{\frac{p}{r} \left(1 + \frac{m}{n} - 1\right)} = \sqrt{\frac{pm}{nr}}$

" " " " " 0 to $m = \sqrt{\frac{p}{r}}$

~~Result is got by dividing length 0 to m by p , and dividing~~
~~length 0 to m by $p+q = p \frac{m}{n}$, and using the difference.~~

~~Error in result = $\frac{1}{p^2} \cdot \frac{pm}{nr} + \frac{1}{p \frac{m}{n}}$~~
 ~~$= \frac{1}{p^2} \cdot \frac{pm}{nr}$~~

~~Error in result = $\left(\frac{1}{p/r}\right)^2 \cdot \frac{pm}{nr} + \left(\frac{1}{p \frac{m}{n}}\right)^2 \cdot \frac{pm}{nr}$~~

~~Error =~~

~~$$\text{Error in result} = \left(\frac{1}{p}\right)^2 \cdot \frac{p}{r} + \left(\frac{1}{p \frac{n}{m}}\right)^2 \cdot \frac{p m}{n r}$$~~

~~$$\text{Error} = \sqrt{\frac{1 + \frac{n}{m}}{p r}}$$~~

Result = diff. betn 0 to n and $\frac{n}{m}$ off 0 to n

~~$$\text{Error}^2 \text{ in result} = \frac{n^2}{m^2} \cdot \frac{p m}{n r} + \frac{p}{r} = \frac{p}{m r} = \frac{p}{r} \left(1 + \frac{n}{m}\right)$$~~

For span measures $p = n$

For independent measures $p = 1$

~~$$\text{Error} = \sqrt{\frac{1}{m r}}$$~~

~~$$\text{Error} = \sqrt{\frac{1}{m n r}}$$~~

~~$$\text{Error} = \sqrt{\frac{n + \frac{n^2}{m}}{r}}$$~~

~~$$\text{Error} = \sqrt{\frac{1 + \frac{n}{m}}{r}}$$~~

With $m = 10$

~~$$n = 1 \quad \text{Error} = \sqrt{1.1 \div r}$$~~

~~$$n = 1 \quad \text{Error} =$$~~

~~$$2 \quad 2.4$$~~

~~$$n = 2 \quad \text{Error} = \sqrt{1.2 \div r}$$~~

~~$$3 \quad 3.9$$~~

~~$$3 \quad 1.3$$~~

~~$$4 \quad 5.6$$~~

~~$$4 \quad 1.4$$~~

~~$$5 \quad 7.5$$~~

~~$$5 \quad 1.5$$~~

In our case, for the span determination call $r = \text{unity}$, and determine corresponding r for the independent.

But the independent-determination must be assumed to have equal weight with right span. Assume this to be so. Then if $\text{unity} = \text{weight of an independent-determination}$ we have

~~$$\text{Weight of span determination} = \frac{1.1 \div r}{\text{Error}^2}$$~~

~~$$\text{Independent + span} = 1 + \frac{1.1 \div r}{\text{Error}^2} = \frac{1.1 \div r}{\text{Error}^2} \quad \text{Rth proportional of square}$$~~

Assume $r = 1$.

~~$$\text{For } n = 2 \quad R = 1 + \frac{1.1}{2.4} = 1.46$$~~

~~$$\text{For } n = 3 \quad R = 1 + \frac{1.1}{2.9} = 1.28$$~~

~~$$\text{For } n = 4 \quad R = 1 + \frac{1.1}{5.6} = 1.2 \quad R = 5 \quad R =$$~~

Weight of Budget + spend = $1 + \frac{1.1 \div n}{E_{\text{err}}^2} = \frac{\cancel{E_{\text{err}}^2} + 1.1 \div n}{E_{\text{err}}^2}$

L_{10} = reciprocal of decline rate

Weight of Budget $\div$ by above = $\frac{1}{1 + \frac{1.1 \div n}{E_{\text{err}}^2}}$

For spend in term	$\frac{1.1 \div n}{E_{\text{err}}^2}$	Coefficient
$n = 1$	1	1
2	.46	
3	.28	
4	.2	
5	.15	

Weight of Budget + spend $\div$ net of spend = $1 + \frac{E_{\text{err}}^2}{1.1 \div n} = R =$

= Coefficient $\div$ decline decision divisor

n	R	Smooth	Smooth	
1	$1 + \frac{1.1}{1.1} = 2$	~~.627~~	Lynn T. Helgerson	
2	$1 + \frac{2.4}{1.1} = 3.2$	~~.047~~	8.5798	6.0835 0.000121
3	$1 + \frac{3.9}{1.1} = 4.5$	~~.044~~	8.9685	6.4722 297
4	$1 + \frac{5.6}{1.1} = 6.1$	~~.031~~	9.1614	6.6651 463
5	$1 + \frac{7.5}{1.1} = 7.8$	~~.043~~	9.1553	6.6690 467
6	6.1	.012	9.1673	6.6710 469
7	4.5	.000	9.2014	6.7051 507
8	3.2	-.011	9.1903	6.6940 494
			9.2227	6.7264 533
			9.1367	6.6404 437

Wt. of Budget + Spend (for use on page 116) = $1 + \frac{E_{\text{err}}^2}{1.1 \div n}$

n	$E_{\text{err}}^2 \times n$	Fraction	Reciprocal
2	2.4	$1 + 2.17$	.32
3	3.9	$1 + 3.55$	.22
4	5.6	$1 + 5.09$	.16
5	7.5	$1 + 6.82$	.13

n	reciprocal ratio	Sum	Spaced	Adjusted		
1	$1+1=2$		0.03 copies for p.03			
2	$1+\frac{1.1}{2.4}=1.46$	.027	.018	-.075		
3	$1+\frac{1.1}{3.9}=1.28$	.040	.033	-.112		
4	$1+\frac{1.1}{5.2}=1.2$	.038	.032	-.111		
5	$1+\frac{1.1}{7.5}=1.15$	.035	.030	-.117		
6	1.2	.017	.014	-.145		
7	1.28	-.003	-.002	-.157		
8	1.46	-.008	-.006	-.173		
Adjusted	Independent	Diff.	Adjusted ^{0.01 copies} Spaced	Mean Spaced	Diff	
0	0					
1	-.038 copies		-.038	-.035	.003	
2	-.093	-.102	.009	-.055	-.040	.015
3	-.145	-.156	011	-.052	-.037	.015
4	-.143	-.142	001	+0.002	+0.001	.001
5	-.147	-.160	013	-.004	-.006	.002
6	-.159	-.157	002	-.012	-.028	.016
7	-.155	-.157	002	+0.004	-.012	.008
8	-.167	-.162	005	-.012	-.016	.004
9	-.137 copies		+0.030	+0.035	.005	
10	0		+0.137	+0.135	.002	

Value of the unit in millimeter.

Reciprocals

156.661	313.602	313.567	313.574	313.473
156.652	.623	.584	.579	.585
313.313	313.612	.545	.605	.575
		.605	.588	.586
156.946	313.586	313.586	.586	313.585
156.687	.530	313.575		313.585
313.633	313.578			
.313	.612			
313.473	313.586			

mean on scan
So $313.555_n = 1 \text{ mm. on plate.}$ $\log = 2.4963$

	Adjusted line	Moment Share			Page 94	Adopted are copied to page 103
0	0			0		
1		31.428	~~-.044~~	- .044	- .035	- .038
2	-.093	<u>.433</u>	.049	- .093		
*		.861				
*		<u>-.093</u>				
		<u>2) 7.68</u>				
		.384				
8	-.167			- .167		
9		.358	+ .032	- .135	- .138	- .137
10	0	.255	+ .135	0		
		<u>.613</u>				
		.167	.613 + .033			
		<u>2) 7.80</u>	.169 + .136			
		.390	<u>2) 7.82</u>			
			.391			

Since the above it has turned out that the
span .428 should be .431 (see page 107)

.049	+ .032	<u>.433</u>	or -.047 instead of -.044	
.038	+ .037	.864	the same involves	.047
.044	+ .0345	<u>-.093</u>	-.037 instead of -.035	.037
		<u>3) 7.71</u>		.042
		.384		
		+ .135		
		- .140		
		- .137		

	In turns of Scum = $\frac{1}{80}$ inch about.	In inches assuming turn of scum = $\frac{1}{80}$ inch	In centimeters assuming unit on plate = 1 mm	
0	0	0	0	- 0.000012
1	-.038	-0.00004	-0.000012	- 0.000018
2	-.093	-0.00012	-0.000030	- 0.000016
3	-.145	-0.00018	-0.000046	- 0.000001
4	-.143	-0.00018	-0.000047	0.000000
5	-.147	-0.00018	-0.000047	- 0.000004
6	-.159	-0.00020	-0.000051	+ 0.000002
7	-.155	-0.00019	-0.000049	+ 0.000004
8	-.167	-0.00021	-0.000053	+ 0.000009
9	-.137	-0.00017	-0.000044	+ 0.000044
10	0	0	0	

The criticism which J. R. E. is inclined to make upon these figures is that the smoothing was applied to the wrong set.

Notice the process of adjustment. Differences between ^{independent} linear and accumulative space are "smoothed" into a ^{curve} ~~region~~ whose ordinates first appear in column "Smoothed" on page 95. The corrections in the next column having been applied to the independent measurements to get the column "? Final", the curve is the difference between the accumulative space and the "? Final". Now the next process was to duly assign these values as errors to the respective determinations in proportion to their weight. A very different proceeding would have been to take differences of the curves as ~~substantive~~ ^{substantive} ~~and to convert them to~~

discrepancies in the space, and the proper adjustment:

	Smoothed		Mean Space	Adjusted Space	Summed	Product Mean	Diff
0	0	$\frac{1}{2}$ preceding			0	0	
1		+027	+013	-.075	-.088		
2	~~027~~	+013	+007	~~-3~~	-.088	-.102	014
3	040	-002	-001	-37	-.132	-.156	024
4	038	-003	-002	+1	-.130	-.142	012
5	035	-018	-009	-6	-.134	-.160	026
6	017	-020	-010	-28	-.153	-.157	004
7	-003	-005	-002	-12	-.155	-.167	002
8	-008	+008	+004	-16	-.169	-.162	-007
9				+173	+169		
10					0		

Comparison of the adjusted

0	0	0	0
1	-093		
2	-145	-093	-.088
3	-143	-145	-132
4		-143	-130
5		-147	-134
6		-159	-153
7		-155	-155
8		-167	-169
9		-137	-2
10		0	0

Let us try rejecting something.

On page 83 neglect the observation 31.38 for the third space.

Then on page 85 we use 410 with half weight instead of .395

Mean (with respective weights given in taking it) = .423 instead of .412

Then on page 94 use .423 with $\frac{3}{4}$ weight instead of .412

$$\begin{array}{r} 440 \\ 443 \\ 425 \\ \hline 108 \\ 4 \\ \hline 432 \\ 69 \\ 15 \overline{) 501} \\ 433 \end{array}$$

$$\begin{array}{r} .423 \\ 3 \\ \hline .69 \end{array}$$

Then for mean (respective weights given) we have .433

$$\begin{array}{r} 395 \\ 430 \\ 440 \\ 443 \\ 425 \\ \hline 2123 \\ 6.5 \end{array}$$

Then the residue of the rejected observation exceeds 5x the mean residual taken with it left out.

On page 90 in first space try omitting 31.35

Mean on page 90 = .405 instead of .387

" " " 91 (fort) = .425 instead of .416

" " " 94 = " " " "

$$\begin{array}{r} .450 \\ .420 \\ .425 \\ .427 \\ .431 \\ \hline 3.50 \\ 81 \end{array} \quad \begin{array}{r} 19 \\ 11 \\ 6 \\ 4 \\ 10 \end{array} \quad \begin{array}{r} 11 \\ 6 \\ 4 \\ 7 \end{array}$$

This only makes the discrepancy of the .450 more marked, so that we cannot reject the 350 without. Thus 0.81 is more than 70% of the mean deviation with it left out, while 19 (corresponding to .450) must be kept. So use .431 on page 94 instead of .428

$$\begin{array}{r} 31.431 \\ .433 \\ .433 \\ .392 \\ 399 \\ 421 \end{array}$$

$$\begin{array}{r} 31.431 \\ .433 \\ .433 \\ .392 \\ 399 \\ .421 \\ .431 \\ .433 \\ .433 \\ .392 \\ .399 \\ .421 \\ .431 \\ .413 \\ .309 \\ .255 \end{array}$$

On page 89 try rejecting 31.35 for space 7

Then on page 94 use .380 with half weight instead

of .365, and use .413 instead of .405

$$\begin{array}{r} 31.431 - .037 \\ .433 - .038 \\ 433 - .039 \\ 392 + .002 \\ 399 - .005 \\ 421 - .026 \\ 413 - .019 \\ 409 - .015 \\ 358 + .037 \\ 255 + .140 \\ \hline 31.3944 \end{array} \quad \begin{array}{r} -.037 \\ -.075 \\ -.114 \\ -.112 \\ -.117 \\ -.143 \\ -.162 \\ -.177 \\ -.140 \\ 0 \end{array} \quad \begin{array}{r} -.102 \\ -.156 \\ -.142 \\ -.160 \\ -.157 \\ -.157 \\ -.162 \\ 0 \end{array} \quad \begin{array}{r} 027 \\ 043 \\ 030 \\ 043 \\ 014 \\ -005 \\ -015 \\ 0 \end{array}$$

$$\begin{array}{r} 410 \\ 423 \\ 422 \\ 1255 \\ \hline 2510 \\ 380 \\ \hline 172590 \\ 413 \end{array}$$

	Space after repeat	Space between irregularities	Diff	$\frac{1}{3}$ Diff	Adjusted space	Sum
0	0					0
1	-.037	-.075	0.27	.009	-.084	-.084
2	-.038					-.084
3	-.039	-.054	0.15	0.05	-.044	-.128
4	+.002	+.014	-0.12	-0.04	+.006	-.122
5	-.005	-.018	0.13	0.04	-.009	-.131
6	-.026	+.003	-0.29	-0.10	-.016	-.147
7	-.019	0.00	-0.19	-0.06	-.013	
8	-.015	-.005	-0.10	-0.03	-.012	
9	+.037	+.177	+.162	0.05	+.172	
10	+.140					

	Sum of spaces after repeat	Sum of Adjusted space	Product of numbers
0	0	0	
1	-.037		
2	-.075	-.084	-1.02
3	-.114	-.128	-1.56
4	-.112	-.122	-1.42
5	-.117	-.131	-1.60
6	-.143	-.147	-1.57
7	-.162	-.160	-1.57
8	-.177	-.172	-1.62
9	-.140		
10	0	0	0

Comparison of 1st & last adjustments

Space

0								
1								
2	-.093	-.102	-.084	-9	}	-.093	-.084	-9
3	-.145	-.156	-.128	-17		-.052	-.044	-8
4	-.143	-.142	-.122	-21		+0.002	+0.006	-4
5	-.147	-.160	-.131	-16		-.004	-.009	5
6	-.159	-.157	-.147	-12		-.012	-.016	4
7	-.155	-.157	-.160	5		+0.004	-.013	19*
8	-.167	-.162	-.172	5		-.012	-.012	0
9					}	+0.167	+0.172	-5
10								

Lines - 1 st Adjust				Space - Last Adjust			
Mean	Adjust	Diff		Mean	Adjust	Diff	
0	0						
1				-.0377			
2	-.102	-.093	-009	-.038	-.075	-.084	009
3	-.156	-.145	-011		-.039	-.044	005
4	-.142	-.143	001		+0.002	+0.006	-004
5	-.160	-.147	-013		-.005	-.009	004
6	-.157	-.159	002		-.026	-.016	-010
7	-.157	-.155	-002		-.019	-.013	-006
8	-.162	-.167	005		-.015	-.012	-003
9				+0.0377			
10	0	0		+0.140	+0.177	+0.172	005

* This seems to be due to the "smoothing" of line 6 whereby the first adjustment of that line was made to be farther from the space maximum than before adjustment. In this case it seems reasonable

to use the unadjusted figure.

Suppose we adopt the rule to smooth the curve without reference to which side the result falls, then apply the next adjustment, and finally to discuss those ^{results of} adjustments which fall in the ~~wrong~~ direction.

Then we have ($a = \text{adjusted}$, and $u = \text{unadjusted}$)

	Line Adjustments	Line means	Diff		Repeat, span adjustment	
1						
2	-0.093 a	-.102	-0.009	}	-0.093	-.084 .009
3	-.145 a	-.156	-.011		-.052	-.044 .008
4	-.142 u	-.142	0		+0.003	+0.006 .003
5	-.147 a	-.160	-.013		-.005	-.009 .004
6	-.157 u	-.157	0		-.000	-.016 .006
7	-.157 u	-.157	0		0	-.013 .013
8	-.167 a	-.162	0.005		~~-0.010~~ +0.005	-.012 .002
9				}	+0.167	+0.172 .005
10						

Lines	Spaces	Results of Measurements	Differences between Line Measurements & Sum of Spaces	Discrepancies
0		0		
	1	-0.042	(-0.042)	0
1		-0.042	(-0.042)	0
	2	-0.044	(-0.058)	+0.007
2		-0.093	(-0.086)	-0.007
	3	~~-0.14~~ -0.044	(-0.052)	+0.008
3		-0.145	(-0.130)	-0.015
	4	+0.006	(+0.003)	+0.003
4		-0.142	(-0.124)	-0.018
	5	-0.009	(-0.005)	-0.004
5		-0.147	(-0.133)	-0.014
	6	-0.016	(-0.010)	-0.006
6		-0.157	(-0.149)	-0.008
	7	-0.013	(0)	-0.013
7		-0.157	(-0.162)	+0.005
	8	-0.012	(-0.010)	-0.002
8		-0.167	(-0.174)	+0.007
	9	+0.035	(+0.029)	+0.006
9		-0.138	(-0.139)	+0.001
	10	+0.138	(+0.138)	0
10		0		

	Quante	Measurements (page 107)	Discrepancy
0	0	0	0
1	-0.042	-0.037	+0.005
1	-0.042		
2	-0.044	-0.038	+0.006
2	-0.093	-0.102	-0.009
3	-0.044	-0.039	+0.005
3	-0.145	-0.156	-0.011
4	+0.006	+0.002	-0.004
4	-0.142	-0.142	0
5	-0.009	-0.005	+0.004
5	-0.147	-0.160	-0.013
6	-0.016	-0.026	-0.010
6	-0.157	-0.157	0
7	~~-0.157~~ -0.013	-0.019	-0.006
7	-0.157 ~~-0.013~~	-0.157	0
8	~~-0.157~~ -0.012	-0.015	-0.003
8	-0.167 ~~-0.012~~	-0.162	+0.005
9	~~-0.167~~ +0.035	+0.037	+0.002
9	-0.138 ~~+0.035~~	~~+0.14~~	
10	~~-0.138~~ +0.138	~~0~~ +0.140	+0.002
10	0	0	0

0			0	
				-0.000014
1	8.6232	⁵ 8.1469	-0.000014	
	⁸ 8.6435	⁵ 8.1472	-0.000014	
2	8.9685	⁵ 8.4722	-0.000030	
			-0.000014	
3	9.1614	⁵ 8.6651	-0.000046	
	7.7782	⁴ 8.2819	+0.000002	
4	9.1523	⁵ 8.6560	-0.000045	
	7.9542	⁴ 8.4579	-0.000003	
5	9.1673	⁵ 8.6710	-0.000047	
	8.2041	⁴ 8.7078	-0.000005	
6	9.1959	⁵ 8.6996	-0.000050	
	8.1139	⁴ 8.6176	-0.000004	
7			-0.000050	
	8.0792	⁴ 8.5829	-0.000004	
8	9.2227	⁵ 8.7364	-0.000053	
	8.5441	⁵ 8.0478	+0.000011	
9	9.1399	⁵ 8.6436	-0.000044	
			+0.000044	
10			0	

Rutherford Millimeter Plate marked $\frac{68}{360}$ rev

	Screw	Inches.	Centimeters
0	0	0	0.000000
	-.042	-0.0000005	-0.000014
1	-.042	-0.0000005	-0.000014
	-.044	-0.0000005	-0.000014
2	-.093	-0.0000012	-0.000030
	-.044	-0.0000005	-0.000014
3	-.145	-0.0000018	-0.000046
	+0.006	+0.0000001	+0.000002
4	-.142	-0.0000018	-0.000045
	-.009	-0.0000001	-0.000003
5	-.147	-0.0000018	-0.000047
	-.016	-0.0000002	-0.000005
6	-.157	-0.0000020	-0.000050
	-.013	-0.0000002	-0.000003
7	-.157	-0.0000020	-0.000050
	-.012	-0.0000001	-0.000004
8	-.167	-0.0000021	-0.000053
	+0.035	+0.0000004	+0.000011
9	-.138	-0.0000017	-0.000044
	+0.138	+0.0000017	+0.000044
10	0	0	0.000000

These ^{results} figures are given in two columns, the first giving the correction to each line considered ~~as~~ with reference to the end line, and the second giving corrections to each space considered with reference to the mean of the spaces. The figures in the ^{second} column are not exact difference of those in the ~~first~~, nor are they ~~wholly~~ derived from wholly independent measurements, but each figure given is the result of a discussion of all the observations bearing on it.

Note. The ^{under Centimeter} figures, and remarks on the opposite page were copied upon a sheet of paper, sealed in an envelope and handed to Prof. Wm. A. Rogers. J. R. E. See below however.

Harvard College Observatory
Cambridge May 8, 1879

Received of J. Rogers Edwards a sealed envelope purporting to contain Results of Measurements of Puttford Millimeter Plate marked $\frac{68}{360}$ rev.

But Prof. R. declines to receive them on the ground that the plate had not left the building. Hence we are still at liberty to discuss the process of arriving at the result. I am not quite satisfied with them, the astronomical conditions between space and time not being rigidly fulfilled. Let us re-adjust from the beginning, discarding the smoothing, but using successive approximations.

Utricularia data

<i>Line page 5</i>	<i>Line p. 107</i>	<i>Line sum</i>	<i>Line difference</i>	<i>Discrepancy</i>	<i>W.L. Coefficient</i>
0		0			
	-.037				
~~-.102~~		-.037			
	-.038				
-.102		-.075			
	-.039	~~-.114~~	-.054	-.027	1 ÷ 2
-.156		-.114		+.042	.33
	+.002	~~-.112~~	+.014	-.015	1 ÷ 3
-.142		-.112		+.012	.22
	-.005	~~-.117~~	-.018	+.030	.16
-.160		-.117		-.013	1 ÷ 3
	-.026	~~-.143~~	+.003	+.043	.13
-.157		-.143		+.029	1 ÷ 3
	~~-.019~~	-.162	0	+.014	.16
-.157		-.162		+.019	1 ÷ 3
	-.015	~~-.175~~	-.005	-.005	.22
-.162		-.177		+.010	1 ÷ 3
	+.037	~~-.13~~		-.015	.32
		-.140		-.015	1 ÷ 2
	+.140				
0		0			

at Abbey

Correction	Line	Space	Space surface	Space	Space	Space	Space	Space	Space
	0								
	<i>Since 0.1 K in sp. of scattering</i>								
-0.014		-0.088		-0.014	-0.013	-0.088		-0.093	-0.005
+0.009	-0.093		-0.088			-0.088	-0.088		+0.005
-0.005		-0.044		-0.005	-0.004	-0.043		-0.054	-0.011
+0.009	-0.147		-0.132				-0.131		+0.016
+0.004		+0.006		+0.004	+0.005	+0.007		+0.010	+0.003
+0.005	-0.135		-0.126				-0.124		+0.013
-0.004	-0.137			-0.004	-0.003	-0.008		-0.017	-0.004
+0.006	-0.154		-0.135				-0.132		+0.022
+0.010		-0.016		+0.010	+0.011	-0.015		-0.001	+0.014
+0.002	-0.155		-0.151				-0.147		+0.008
+0.006		-0.013		+0.006	+0.007	-0.012		-0.003	+0.009
-0.001	-0.155		-0.164				-0.159		-0.001
+0.003		-0.012		+0.003	+0.004	-0.011		-0.009	+0.002
-0.005	-0.157		-0.176				-0.170		-0.003
-0.008		+0.170		-0.008	-0.007	+0.170		+0.167	-0.003
				-0.008					
				-0.001					

A question now arises as to relative weight in next adjustment. But notice that the quantities involved are now so small that an exact settling of the question is not necessary. Probably we cannot do better than to keep the relative weight already used. So the W.C. coefficients of page 116 are used.

2 nd Approx.				3 rd Approx.			
Corrections		Result		Space	Line	Diff.	Discrepancy
Line	Space	Line	Space	Line	Space	Line	Space
0		0					
	-0.002		-0.090		-0.091	-0.001	-0.001
+0.002		-0.091		-0.090		+0.001	0.000
	-0.004		-0.047		-0.053	-0.006	-0.003
+0.003		-0.144		-0.137		+0.007	+0.002
	+0.002 ¹		+0.008		+0.009	+0.001	+0.001
+0.002		-0.135		-0.129		+0.005	+0.001
	-0.004 ³		-0.012		-0.016	-0.005	-0.002
+0.003		-0.151		-0.140		+0.011	+0.002
	+0.005		-0.010		-0.003	+0.007	+0.003
+0.001		-0.154		-0.150		+0.004	+0.001
	+0.003		-0.009		-0.004	+0.005	+0.002
0		-0.158		-0.159		-0.001	0.000
	+0.001		-0.010		-0.010	0	0.001
+0.001		-0.168		-0.169		-0.001	0.000
	-0.001	-0.168	+0.169		+0.168	-0.001	0.000
	0.000						
		0		0		0	

3 rd Approx					4 th Approx				
Lower	Upper	Diff	Lower	Upper	Discrepancy	Lower	Upper	Sp	Diff
0			0		0	0	0		
	-.091				0	0	~~-.091~~	-.091	-.091
-.091				-.091	0	0	-.091	~~-.091~~	-.091
	-.049	-.057			-.002	-.001	~~-.050~~	-.050	-.050
-.042				-.140	+0.002	+0.001	~~-.141~~		-.141
	+0.009	+0.008 ⁵			-.001	0	~~+0.008~~	+0.009	+0.009
-.134				-.134 ²	+0.002	0	-.134		-.134
	-.013	-.013 ⁵			-.002	-.001	~~-.016~~	-.013	-.013
-.149				-.149 ⁷	+0.002	~~0~~	-.149		-.149
	-.008	-.004			+0.004	+0.001	-.007	-.006	-.006
-.153				-.152	+0.001	0	-.153		-.153
	-.007	-.006			+0.001	+0.001	-.006	-.006	-.006
-.159				-.159	0	0	-.159		-.159
	-.010	-.010			0	0	-.010	-.010	-.010
-.169				-.169	0	0	-.169		-.169
	+0.169 ⁹	+0.169			+0.000 ⁰	0	+0.169	+0.169	+0.169
0				0	0	0	0	0	0

Taking for the 4th line $-.134 + 0.001 = -.133$
 and for the ~~next~~ space $+.009 - 0.001 = +.008$
 the rest of the 4th approximation, the discrepancy will all
 lie within .001 Hence use the line determined.

	Adjusted Screw mic		Mean		Discrepancy
	(Line) Lin	Diff.			
0	0	0	0	0	
		-.043	-.037		+0.006
1	-.091	-.043			
		-.048	-.038		+0.010
2	-.050	-.091	-.102	-.011	
		-.050	-.039		+0.011
3	+0.009	-.141	-.156	-.015	
		+0.008	+0.002		-0.006
4	-.016	-.133	-.142	-.009	
		-.014	-.005		+0.009
5		-.147	-.160	-.013	
		-.006	-.026		-.020
6		-.153	-.157	-.004	
		-.006	-.019		-.013
7		-.159	-.157	+0.002	
		-.010	-.015		-.005
8		-.169	-.162	+0.007	
		+0.030	+0.037		+0.007
9		-.189			
		+0.139	+0.140		+0.001
10	0			0	

Evidently the process has failed to satisfactorily adjust the ~~3rd~~ 4th line, its error of measurement being in such a direction that there is an unfortunate combination for it. The trouble lies in the fact that the worst discrepancy lies in the measurement of the first two spaces. Let us have an adjustment upon lines 2 to 10.

Lair	Measure from 107 of four	Diff line measure	Discord between measures	Corresponding Discord from page 116	
2	.433 <u>-.048</u>	-.054	-.068	-.020	-.015
3	.392 <u>-.007</u>	+.014	0	+.007	+.012
4	.399 <u>-.014</u>	-.018	-.032	-.018	-.013
5	.421 <u>-.036</u>	+.003	~~-.011~~ +.014	+.025	+.029
6	.413 <u>-.028</u>	0.000	-.014	+.014	+.019
7	.409 <u>-.024</u>	-.005	-.019	+.005	+.010
8	.358 <u>+0.023</u>				
9	.255 <u>+0.130</u>	+0.157 +0.162 +0.148	-.009	-.015	
10	813.080 385	71+0.096 +0.014-3/4			

This would certainly give better $\frac{1}{100}$ approx to spaces, but how
could the line be similarly got?

Try again.

<i>Spaced from 107</i>	<i>Continued from page 116</i>	<i>Diff. measure line</i>		
10	.255 (1) .255		+0.162 (2) +0.051	
9	.358 (2) .306		-.005 (3) -.002	
8	.409 (3) .337		0 (4) 0	
7	.413 (4) .355		+0.003 (5) +0.001	
6	.421 (5) .367		-.015 (6) -.003	
5	.399 (6) .376	- - - - x	+0.014 (7) +0.002	x -.005
4	.392 (7) .378	- - - x -.002	-.054 (8) -.007 x	+0.009 +0.004
3	.433 (8) .385	- x -.007 -.009		
2	.433 (9) .390	-.005 -.012 -.014		
1	.431 (10) .394	-.009 -.014 -.028		
		<u>394</u> 385		

This appears
does not
work.

Measure to in	Diff.	4 th App. to open	Measure from	from	4 th App. to in	Discrepancy Mr. Gov. Factor
0						
- .102	- .102	- .091	- .075	- .075	- .091	+ .011 1/2 + .005
						- .016 .32 - .005
	- .054	- .050	- .039			+ .004 1/3 + .001
- .156				- .114	- .141	+ .027 .22 - .006
	+ .014	+ .008	+ .002			- .006 1/3 - .002
- .142				- .112	- .133	- .011 .16 - .002
	- .018	- .014	- .005			+ .004 1/3 + .001
- .160				- .117	- .147	- .030 .13 - .003
	+ .003	- .006	- .026			- .003 1/3 - .001
- .157				- .143	- .153	- .010 .16 - .002
	0	- .006	- .019			- .006 1/3 - .002
- .157				- .162	- .159	+ .003 .22 + .001
	- .005	- .010	- .015			- .005 1/3 - .002
- .162				- .177	- .169	+ .008 .32 + .003
	+ .162	+ .169	+ .177			+ .007 1/2 + .003
0						

This does not promise well. Let us rather adopt the correction $\bar{x}.016$ to the first ² stars aggregate and approximate again.

Line meas. Specimen Diff Line Specimen

0					
	$\begin{matrix} -.075 \\ -.016 \end{matrix}$	$\begin{matrix} -.091 \\ \text{corrected} \end{matrix}$	$-.102$	$-.091$	$-.089$
$-.102$				$-.091$	
	$-.039$	$-.054$		$-.039$	$-.039$
$-.156$			$-.130$		$-.130$
	$+0.002$	$+0.014$		$+0.002$	$+0.014$
$-.142$			$-.128$		$-.128$
	$-.005$	$-.018$		$-.005$	$-.003$
$-.160$			$-.133$		$-.133$
	$-.026$	$+0.003$		$-.026$	
$-.157$					$-.159$
	$-.019$	0		$-.019$	
$-.157$					$-.178$
	$-.015$	$-.005$		$-.015$	
$-.162$					$-.193$
	$+0.177$	$+0.162$		$+0.177$	
				$10) -.016$	$-.016$
				$-.0016$	$10) .996$
					$-.100$

$.431 + .016 = .447$
 $.433$
 $.864 + .016 = .880$
 $-.088$
 $.433$
 $.392 + .004 = .396$
 $.399$
 $.421$
 $.413$
 $.409$
 $.358$
 $.255$
 $10) 3.960$
 396

396
 792

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	Page 122	Page 124	Page 126	Page 128	Page 130	Page 132
	low. Measure	low	low	low	low	low
0	0					
1						
2	$\bar{x}.005$	$\bar{x}.075$	$\bar{x}.004$	$(-.091)$	$-.098$	$-.088$
3	$+0.005$	$-.102$	$+.004$	$-.098$	$-.091$	$-.088$
4	$\bar{x}.001$	$\bar{x}.039$	$+.006$	$-.045$	$-.052$	$-.042$
5	$+0.006$	$-.157$	$+0.006$	$-.150$	$-.136$	$-.130$
6	$+0.002$	$+0.002$	$+0.003$	$+0.005$	$+0.008$	$+0.008$
7	$+0.002$	$-.142$	$(+.003)$	$(-.142)$	$-.128$	$-.128$
8	$-.001$	$-.005$	$-.005$	$-.010$	$-.014$	$-.007$
9	$+0.004$	$-.157$	$+0.004$	$-.157$	$-.143$	$-.143$
10	$+0.001$	$-.026$	$+0.009$	$-.017$	0	$-.014$
11	$+0.002$	$-.157$	$+0.001$	$-.156$	$-.168$	$-.168$
12	$+0.002$	$-.019$	$+0.006$	$-.013$	$-.003$	$-.010$
13	$+0.001$	$-.157$	$-.002$	$-.159$	$-.181$	$-.181$
14	$+0.002$	$-.015$	$+0.003$	$-.012$	$-.008$	$-.009$
15	$-.003$	$-.142$	$-.005$	$-.167$	$-.193$	$-.193$
16	$-.003$	$+0.177$	$-.008$	$+0.069$	$+0.167$	$+0.172$
17				87.014	87.014	87.014
18				$-.003$	$-.003$	$-.003$
19				$.001\frac{3}{4}$	$.001\frac{3}{4}$	$.001\frac{3}{4}$
20	0					

Apper Sum Diff. Line 2nd Apper
 Space Space Direct, Direct, Corr.

- .090	- .090	- .088	- .089	- .098	- .009	- .008	- .092
- .094	- .134	- .082	- .043	- .052	+ .009	+ .003	- .095
+ .006	- .128	- .130	+ .006	- .132	+ .018	+ .004	- .146
- .009	- .137	- .122	- .008	- .126	+ .016	+ .003	- .139
- .015	- .153	- .129	- .015	- .134	+ .018	+ .002	- .154
- .011	- .163	- .143	- .011	- .149	+ .007	+ .001	- .155
- .011	- .174	- .153	- .011	- .169	- .001	0	- .159
+ .170	+ .172	- .162	+ .171	+ .167	- .004	- .001	- .168
					- .004	- .002	+ .170

2^m Affix3^m Affix

	Space Lines	Diff Line	Sum Space	Discarding	corr.	Diff Line	Sum Space	Disc.
0								
1								
2	-0.092	-0.095	-0.003	-0.001	-0.093	-0.094	-0.001	
	-0.095	-0.092	+0.003	+0.001	-0.094	-0.093	+0.001	
	-0.046	-0.051	-0.005	-0.002	-0.048	-0.050	-0.002	
3	-0.146	-0.138	+0.008	+0.003	-0.144	-0.141	+0.003	
	+0.006	(+0.004)	-0.002	-0.001	+0.005	+0.004	-0.001	
4	(-0.142)	-0.132	+0.010	+0.002	-0.140	-0.136	+0.004	
	-0.010	(-0.012)	-0.002	-0.001	-0.010	-0.012	-0.002	
5	-0.152	-0.142	+0.010	+0.002	-0.152	-0.146	+0.006	
	-0.010	-0.008	+0.002	+0.003	-0.007	-0.002	+0.005	
6	-0.155	-0.152	+0.003	+0.001	-0.154	-0.153	+0.001	
	-0.008	-0.004	+0.004	+0.002	-0.006	-0.005	+0.001	
7	-0.159	-0.160	-0.001	0	-0.159	-0.159	0	
	-0.010	-0.009	+0.001	0	-0.010	-0.010	0	
8	-0.168	-0.170	-0.002	-0.001	-0.169	-0.169	0	
	+0.170	+0.168	-0.002	-0.001	+0.169	+0.169	0	
9								
10								

Cor.

4th Abney

Span Span Diff Span

Cor.

Span Span Diff Span

0	-0.093	-0.093	0				
+0.001	-0.093	-0.093	0				
-0.001	-0.049	-0.050	-0.001	-0.001	-0.050	-0.050	
+0.001	-0.143	-0.142	+0.001	0	-0.143	-0.143	
0	+0.005 ⁴	+0.004	~~-0.001~~	0	+0.005 ⁴	+0.005 ⁶	
+0.001	-0.139	-0.138	+0.001	0	-0.138 ⁹	-0.138 ⁹	
~~-0.001~~	-0.012 ⁰⁹	-0.012 ⁰⁹	~~-0.001~~	0	-0.011 ⁰⁹	-0.011 ⁰⁰⁴	
+0.001	-0.152 ⁴⁸	-0.149 ⁷	+0.002 ¹	+0.002 ¹	-0.149 ⁷	-0.149 ⁸	
+0.002	-0.005 ⁷	-0.005 ⁶	+0.002 ¹	+0.001 ²	-0.005 ⁶	-0.005 ⁷	
0	-0.154	-0.154	0	0	-0.154	-0.154	
0	-0.006	-0.005	+0.001	+0.001	-0.005	-0.005	
					-0.159	-0.159	

	Measured	Adjusted	Discrepancy
0	0	0	0
	-0.037	-0.042 ⁴	-0.005 ⁷
1		-0.042 ⁴	X
	-0.038	-0.051 ⁴⁹	-0.013 ¹
2	-0.102	-0.093	+0.009
	-0.039	-0.050	-0.011
3	-0.156	-0.143	+0.013
	+0.002	+0.005 ⁴	+0.003 ²
4	-0.142	-0.138 ⁹	+0.004 ³
	-0.005	-0.004 ⁰⁴	-0.006 ³
5	-0.160	-0.149 ⁷	+0.011 ³
	-0.026	-0.005 ⁷	+0.021 ¹⁹
6	-0.157	-0.154	+0.003
	-0.019	-0.005	+0.014
7	-0.157	-0.159	-0.002
	-0.015	-0.010	+0.005
8	-0.162	-0.169	-0.007
	+0.037	+0.032 ³	-0.005
9		-0.137	X
	+0.140	+0.137 ⁶	-0.003
10	0	0	0

Adjusted Line Logs.

0	0	0				
1	- .044	8.64345	5.1471	- 0.000014	- 0.000014	
2	- .093	8.96848	5.4922	-	31	- 0.000017
3	- .143	9.15534	5.6590	-	46	15
4	- .139	9.14301	5.6467	-	44	+ 02
5	- .147	9.16732	5.6710	-	47	- 03
6	- .154	9.18752	5.6912	-	49	- 02
7	- .159	9.20140	5.7051	-	51	- 02
8	- .169	9.22789	5.7316	-	54	- 03
9	- .137	9.13672	5.6404	-	44	+ 10
10	0				0	+ 44

-0.000014
 -0.000017
 -0.000016
 -0.000030
 $+0.000016$
see below.

-0.000003
 0.000050
 -0.000001
 -0.000004
see next base

These figures may be considered as an adjustment of those on page 114 for the purpose of more strictly fulfilling arithmetic conditions between space & line. But the process of adjustment is acknowledged to be not rigid, and in any case we may assume an elasticity of one in the last place. Comparing the two pages, we see that there is no reason for changing 30 (line 2) on page 114 to 31 (~~page~~ on page 131, since it makes the difference not so accordant with facts. ∴ Rector 30 There is no other such evident case. Still it may pay to study line 6 + 7 considering line 5 + 8 figures.

5	- .147 (adjust)		Lift Line	In Spur	Dicer	Gear	- .147
		- .026 - .013 - .010		- .147		+ .002 + .003 + .001	- .010
6	- .157 (measur)			- .160	- .003	- .001	- .158
		- .019 - .006 - .000				+ .014 + .006 + .003	- .004
7	- .157 (measur)			- .168	- .009	- .003	- .160
		- .015 - .003 - .012				+ .009 + .003	- .006
8	- .167 (adjust)			- .169		- .005 - .001	- .169
	(<u>.147</u>)	.038 .060					

bar $2\frac{1}{2}$ W.

5	-.147	-.012	-.011	-.147	0	0	-.147	-.011
6	-.158			-.159	-.001	0	-.158	
		-.004	-.003		+.002	+.001		-.003
7	-.160			-.163	-.003	-.001	-.161	
		-.006	-.009		-.003	-.001		
8	-.169			-.169			-.169	-.007 day -.008

page 138 this page Mean day

5	-.147	-.147 (assume)	-.147			
6	-.154	-.158	-.156	9.1931	5.6968	-0.000050
7	-.159	-.161	-.160	9.2041	5.7078	- 51
8	-.169	-.169 (assume)	-.169			

Letters then substitute 50 (line 6) for 49 of previous page.

Results

Rutherford Millimeter plate

The figures and remarks on the opposite page were copied upon a half sheet of letter paper, sealed in an envelope and handed to Prof. W. S. Rogers, May

Harvard College Observatory

Cambridge May 1879

Received of J. Raper Colman, a sealed envelope purporting to contain Results of measurements of Rutherford Millimeter Plate marked $\frac{68}{360}$ rev.

Rutherford Millimeter Plate

133

Measurements in the direction of the ^{marked} ⁶⁸ rev ³⁶⁰ throw.
~~Corrections~~ Corrections expressed in Centimeters.

Sheet

Results of measurements made
 in May 1879

Number of Line	Correction to Line.	Correction to Space.
0	0.000000	
		-0.000014
1	-0.000014	
		-0.000016
2	-0.000030	
		-0.000016
3	-0.000046	
		+0.000002
4	-0.000044	
		-0.000003
5	-0.000047	
		-0.000003 ³
6	-0.000050	
		-0.000001
7	-0.000051	
		-0.000003
8	-0.000054	
		+0.000010
9	-0.000044	
		+0.000044
10	0.000000	

Comparison of Results of Morley, Rogers & Edmunds. Space.

Rogers May 1878	Morley 1878	Rogers Gel. + Dec 1878	Rogers Apr. + May 1879	Edmunds May 1879	Mean of { Map. Accordant } Period	
-36	-08	-36	-16	-14		
-14	-11	-11	-19	-06	-14.2	4.8
-06	-10	-18	-27	-16	-12.5*	6.5
-03	-02	-03	+11	+02	-01.5†	3.5
-07	-02	-03	-02	-03	-03.4	3.6
-27	-06	-22	-04	-03		
+01	-01	+02	-01	-01	00.0	2.0
+08	-01	+04	+01	-03	+01.8	6.2
+34	+05	+32	+13	+10		
+51	+35	+54	+42	+44	+47.7‡	6.3

* -27 (Rogers) rejected. † +11 (Edmunds) rejected. ‡ +35 (Morley) rejected.

Lines omitted ^{in mean} are those which strongly suggest change in plate. These correspond to the large differences between Rogers '78 and R.E. '79. But notice that for all these cases and in general Morley agrees better with the '79 measurements than with Rogers 1878.

Study of 3rd Space - J. R. E.

Space Determination	{	-0.010
		-0.016
		-0.016
		-0.008
		-0.012.5
From Line Determination		-0.017
Adjusted value		-0.016

Note. In adjusting, the adjacent space measures affected the position of the line in a manner not easily explained here, but with the effect of carrying the

adjusted value away from the mean of 12 and 17.

Mean Roxne May 1878 + Oct-Dec 1878	Diff Roxne May 1878 + Oct-Dec 1878	Diff Roxne May 1878 + Oct-Dec 1878	Diff Roxne 1879 + Edmunds	Diff Edmunds Space & Line	Mean 1878	Mean 1879	Diff 78+79	Diff Roxne 78+79 + Oct-Dec 79
-36	0	28	2	No data	-27	-15	12	21
-12	3	1	3	" 5	-12	-17	5	5
-12	12	2	11	4 5	~~-12~~			
-03	0	1	9	4 4	~~-03~~	~~-03~~		
-05	4	3	1	10 4	-04	-02	2	3
-25	5	19	1	6 10	-18	-03	15	22
+02	1	1	0	3 6	+01	-01	2	3
+06	4	5	4	3	+04	-01	5	7
+33	2	28	3	No data	+24	+11	13	22
+52	3	17	2	"	+47	+43	4	09

Mean of Roxne 1878 Roxne 1879 Edmunds 1879	Residuals Roxne 1878
-12.7	+4.7
-15.3	+4.3
-17.9	+7.7
+03.7	-5.7
-02.3	+0.3
-04.3	-1.7
-01.0	0.0
-01.0	0.0
+09.3	-4.3
+40.3	-5.3

8' from ~~center~~ corner. Rock I. 173, 5

+18 steps.

Location of carb by number 217, 34

R 17, 146

Parents represent.

Asia. I.M.

+2 +3 80.0 0.7 0.5

+2 +3 79.6 0.8 0.8
~~Σ 2.4~~

+1 +2 79. 20 00

$+4 + 5 \quad 81.5 \quad 1.0 \quad 3.6$

+1 +2 79.1 0.3 1.6

-1 0 76.6 0.4 1.7

$$-2-1 \mid 75.5 \quad 11 \quad 0.8$$

-3 -2 74.6 1.2 1.4

-3 -2 75.2 0.7 2.1

~ 76.0 0.3 0.2

+21 77.7' 85 12.7
.. 0.85 12.7

20.21.22 Profile from Ant's Head

24 " " Sampling

46.47 Dist. pers. visit at Wambok.

Mr. 4. ^{221.} July 23, 1882

Level. 686

8.4 10.2

no	time	Diff
5.39	65	26
38	65	27
39	65	26
		79

7 38

39.6	65.5	
39.2	67.4	
39.8	67.2	
186	00.1	81.5

7 41 level 6860 9.2 7.3

Tues. 18 Misty Steam King in afternoon.

Wed. 19

Thurs. 20 King's Room.

Fri. 21

Sat. 22 Carl's Head.

Sun. 23

Mon. 24 Steam King

Tues. 25 Ward Room

Wed. 26

Thurs. 27

Fri. 28 Home

	July 23, 530		III, 175.		Diff.
Level.	328.0	7.00	328.0	6.12	
W. Gate Stem King	328.0	4.91	328.8	7.05	1.26
Cairn top. Bury Hill	330.2	4.48	330.9	5.70	1.22
Iron top.	330.4	4.47	330.4	5.83	1.36
E Gate	335.2	4.70	335.0	5.91	1.19
dist. 92	341.8	5.56	338.5	6.69	1.13
93	342.7	5.58	341.2	6.71	1.13
Level	342.7	7.03	346.5	6.37	
Ho? - mt	349.1	5.38	349.0	6.65	1.27
dist. mt. 2 ft. B. H.	351.2	5.35			
Long 2	352.2	4.89	352.0	6.20	1.31
Long 1 grain lines	356.1	3.89	355.9	5.17	1.28
Phaenon top lines	1.3	4.27	1.4	5.55	1.28
dist. top lines	2.3	4.42	2.4	5.65	1.23
" " "	3.6	4.48	3.5	5.72	1.24
Level	2.4	7.03			
Phaenon 25	6.6	2.74	6.6	4.01	1.27
	10.2	3.99	10.3	5.21	1.22
grain lines	19.6	4.07	19.8	5.28	1.21
grain lines	21.0	4.01	20.9	5.20	1.19
64	27.2	3.27	27.2	4.52	1.25
	30.6	3.61	30.5	4.83	1.22
grain lines	34.3	3.79	34.4	5.01	1.22
Level	34.3	7.06	34.4	7.07	

44

6 07

July 23 1882

level	7.010	8.2	9.0	-0.8 Head right
	555.2	581.2		-1.5 Screw at eye back
	55.3	81.6		Σ_v
	55.3	82.2		700.5
	65.9	45.0	79.1	555.3
	555.3	581.7		+ 145.2

level 7.010 7.8 9.3

rotated. head left Screw back

level	7.01.0	8.5	8.8	700.9 Σ_p
	558.0			558.0
	557.9			+ 142.9
	558.2			

misread, telescope head left seen forward

level	7.17.0	7.3	9.7	718.5 Σ ①
	715.8			715.8
	15.6			~~10.3~~
	16.0			+ 2.7

head right Σ back forward.

level	7.18.0	8.0	9.3	718.7 ①
	739.2			738.8
	38.9			+ 20.1
	38.2			

6 22

head right seen back.

702.0 8.4 8.8

677.3 702.2

77.1 3.3

77.3 2.8

31.7 8.08.3

76.6

6 27

July 23, 1882
6 57 hnd 702.0 7.8 9.6

75.1 00.8

75.4 00.8

75.8 01.2

273 02.8

75.5

702.0 9.2 8.0 9.6

7 17 hnd 702.0 7.6 10.0

75.6 00.2

76.2 1.1

75.6 0.7

27.4 02.0

74.6

7 20 hnd 700.0 8.6 9.0

hnd 700.0 8.8 7.7

75.6 0.4

76.0 0.7

75.9 1.6

27.5 2.7

75.2

hnd 700.0 8.9 8.7

7 30 hnd 700.0 8.6 9.0

75.0 00.2

74.9 00.2

74.8 00.3

24.7 00.7

76.0

8.5 9.1

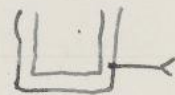
July 25, 1882

3 51

Separate of Cont.		Riatta Humboldt	
Top Madras		309.6	16.81 16.77
level	7.2 9.3	308.2	7.20
	8.1 8.1	316.2	7.20
Cont		311.7	12.60
		311.7	12.59
Adams		314.1	18.13
S. Adams?		315.2	17.94
Adams		314.1	18.16
Madras		309.6	16.79
Cont		311.6	12.60
level	7.0, 8.5	315.0	7.20
	7.0 9.0	308.0	7.20

4 03

Seven found had right.
 Station Riatta Humboldt a headrail, unthru
 Rhine metal.



level	-2.1	16.5	308.2	7.20	133.7	+1.7	18.3	7.13
"	00	16.2	316.2	"	141.0	-3.8	18.2	7.05
"	-1.5	15.5	315.0	"	130.0	-5.6	18.4	7.05
"	-2.0	16.0	308.0	"				
Top Madras	2		309.6	16.78	136.0	2	16.62	16
" Adams	2		314.1	18.14	140.6	2	17.96	18
" S. Adams	1		315.2	17.94				
" Cont	3		311.7	12.60	138.2	3	12.46	14

3
5-
5-
16
18
14

1897phae.proj..462E