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KG
11365
12

A.12

Value of Level division

Transit Circle

From January 15, 1852

To June 28th, 1852.

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KG-11365.12

Ill. E. A 1st wire

A to D	41.s100
B " D	27.455
C	13.720
E	13.769
F	27.455
G	41.276
E	

Value of div of level of Transit Circle Sea June 28th

From Astron. Exped 1849-1851-

Ill East.

A to mean of 7 wires	= ~~41.142~~	+ 41.142	−41.142	$= i_1$
B "	= ~~27.447~~	+ 27.474	+27.474	$= i_2$
C "	= ~~13.762~~	+ 13.758	−13.758	$= i_3$
D "	= ~~0.042~~	+ 0.126	−0.045	$= i_4$
E "	= ~~13.727~~	− 13.726	+13.726	$= i_5$
F "	= ~~27.413~~	−	+27.431	$= i_6$
G "	= ~~41.234~~	−	+41.263	$= i_7$

Ill W

By 5 complete passages of Polaris made between May & Aug 1854 7 H.S. wires for dist of D

To Mean of 7 wires $i \quad i_4 = -0.^s049$

1854 Aug & Sept By 29 passages of Equatorial stars 7 H.S. wires $i_4 = -0.^s034$

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For reduction of imperfect transits of Moon

1st Correct the mean of observed wires just as for a star – That is supposing A C & F to be the observed wires M the mean of all 7 wires & B D E & G the unobserved wires

For a star $M = \frac{A+C+F}{3} + \frac{(A-M)+(C-M)+(F-M)+(G-M)}{3} \sec\delta$

$A - M = i_1 \quad B - M = i_2$ $\qquad M = \frac{A+C+F}{3} + \frac{i_1+i_3+i_6+i_7}{3} \sec\delta$

For the Moon Let $p = \frac{3600+I}{3600} \times \frac{\sin(\alpha \text{ geocent } ZD)}{\sin(\alpha \text{ appt } ZD)}$

Compute M as for a star – Then call it M'

$M = M' + \frac{i_1+i_3+i_6+i_7}{3} \sec\delta\,(p-1)$

The following table contains values of $\frac{p-1}{17}$ for the arguments α and δ = α's declination –

α's geocent. $ZD = z - \delta$ $\qquad \sin(\alpha \text{ appt } ZD) = \sin(z-\delta) + \rho\sin(z-\delta)$ $\qquad \sin(\alpha \text{ appt } ZD) = \sin(z-\delta) + \cos(z-\delta)\rho\sin 1''$

$\frac{\sin(\alpha \text{ geocent } ZD)}{\sin(\alpha \text{ appt } ZD)} = \frac{\sin(z-\delta)}{\sin(z-\delta)+\cos(z-\delta)\rho\sin(z-\delta)} = \frac{1}{1+\rho\cos(z-\delta)\sin 1''} = 1 - 0.0167\cos(z-\delta)$

$\rho\sin 1'' = 3429''\sin 1'' = 0.0167$

$p = \frac{3600+I}{3600}\left(1 - 0.0167\cos(z-\delta)\right)$

$M' = \frac{A+C+F}{3} - \frac{i_1+i_3+i_6}{3} \sec\delta$ for a star

For Moon $M = M' - \frac{i_1+i_3+i_6}{3}\sec\delta\,(p-1)$

or $M = \frac{A+C+F}{3} - \frac{i_1+i_3+i_6}{3}\,p\sec\delta$

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Values of R-1

Values of log. p

	I = 100	110	120	130	140	150	160
δ = 30°	0.0047.2	0.0059,1	0.0070.9	0.0082.6	0.0094.0	0.0105.6	0.0117,3
26°	.0048,5	.0060,4	.0072.2	.0083.9	.0095.3	.0106.9	.0118.6
22°	.0050.1	.0062.0	.0073.8	.0085.5	.0096.9	.0108.5	.0120.2
18°	.0052,1	.0064.0	.0075.4	.0087,5	.0098.9	.0110.5	.0122,2
14°	.0054,3	.0066.2	.0078.0	.0089.7	.0101.1	.0112.7	.0124,4
10°	.0056,9	.0068.8	.0080.6	.0092,3	.0103.7	.0115.3	.0127.0
6°	.0059,8	.0071.7	.0083,5	.0095,2	.0106.6	.0118,2	.0129,9
2°	.0063,0	.0074.9	.0086,7	.0098,4	.0109.8	.0121.4	.0133,1
− 2°	.0066,5	.0078.4	.0090,2	.0101.9	.0113.3	.0124,9	.0136,6
− 6°	.0070,1	.0082.0	.0093.8	.0105,5	.0116.9	.0128,5	.0140.2
− 10°	.0074.1	.0086,0	.0097,8	.0109,5	.0120.9	.0132,5	.0144,2
− 14°	.0078,3	.0090.2	.0102.0	.0113.7	.0125,1	.0136,7	.0148,4
− 18°	.0082.6	.0094,5	.0106.3	.0118.0	.0129,4	.0141,0	.0152,7
− 22°	.0087,6	.0099,5	.0111.3	.0123.0	.0134.4	.0146.0	.0157.7
− 26°	.0091.8	.0103,7	.0115.5	.0127.2	.0138,6	.0150,2	.0161,9
− 30°	0.0096,6	0.0108,5	0.0120,3	0.0132.0	0.0143,4	0.0155,0	0.0166,7

R is Change of Cr R in 1h of Long.

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Inst. Errors of Transit Circle from Jan. 14, 1852 to

1852	Illumination West		
	Coll.	Azim.	Level
Jan. 22.	+0.140	−0.400	−0.156
" 27	+0.104	−0.316	−0.070
Feb. 2	+0.120	−0.314	−0.088
" 11	+0.078	−0.207	−0.027
" 16	+0.097	−0.302	−0.127
	Illumination East		
" 16	−0.219	−0.303	−0.127

		Coll.	Azim	Lev.
Jan.	14	+0.138	−0.379	−0.140
"	15	+ .138	− .381	− .142
"	16	+ .138	− .383	− .144
"	17	+ .139	− .386	− .146
"	18	+ .139	− .388	− .148
"	19	+ .139	− .392	− .150
"	20	+ .140	− .395	− .152
"	21	+ .140	− .397	− .154
"	22	+0.140	−0.400	−0.156
"	23	+ .133	− .384	− .138
"	24	+ .126	− .367	− .121
"	25	+ .119	− .350	− .104
"	26	+ .112	− .333	− .087
"	27	+0.104	−0.316	−0.070
"	28	+ .107	− .316	− .073
"	29	+ .110	− .316	− .077
"	30	+ .113	− .315	− .080
"	31	+ .115	− .315	− .083
Feb.	1	+ .118	− .315	− .085
	2	+0.120	−0.314	−0.088

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1852

Jan. 16/17 Gm

Ill Work (293)

17 Pers.

202 α Arietis

1202 δ Ophiuchi	Antares	
48.0	28.1	7. 59.0
6 02.0	43.4	8 14.0
6' 15.8		8 29.0
6 29.5	0 14.0	8 43.5
6 43.5	0 29.5	8 58.0
6 57.0	0 44.8	9 13.4
16.. 07 .. 10.7	16 21 00.0	1 .. 59 .. 28.0
206.5	190.3	244.9
	66	66
2)206.5	5)70.3	2)304.9
29.5	14.06	43.56
−2	−2	−2
16.06.27.50	16.20.12.06	1 .. 58 .. 41.56
16.06.39.91	16.20.18.45	1 .. 58 .. 49.59
6.41	6.39	8.03

16.06.27.50 Mean red.

1.58.41.56

MJC 5.49.00

194 12.46.24.7

Jan. 15/16 Gm

MJC. 21.11.00

202 16.51.18.3

Jan. 16/17

MJC. 20.28.00

202 16.12.04.5

6.4

16.12.10.90

19.41.07.46

20.31.03.44

3.21.68

20.27.41.76

20.28.00

18.24

16

+2.24 of Bertin

19.40-20.72

46.74

19.41.0746

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Ill West

Jan. 19 Pm

202			
a Aquilæ		β Cygni	
38.5		41.4	
53.5		57.4	
8 08.3		6 18.0	
8 23.3		6 28.8	
8 38.0		6 44.4	
8 53.0		6 59.4	
1 59 08.0		5 17 15.5	
222.6		259.9	
66		66	
2)162.6		2)199.9	
23.23		28.56	
−2		−2	
1 58 21.23		5 16 26.56	
1 58 49.58		5 16 56.58	
28.35		80.02	

19/20 Am.

202			
β Libræ		α Coronæ Borealis	
48.3		05.7	
02.1		21.3	
16.0		36.5	
8 29.9		7 51.8	
8 44.0		8 07.3	
8 57.6		8 22.5	
15 09 11.5		15 28 38.0	
208.4		183.1	
66		180	
2)209.4		2)369.1	
29.91		51.87	
−2		−2	
15 08 27.91		15 27 49.87	
15 09 01.59		15 28 28.98	
33.68		34.11	

19 Pm

M.Z.C. 9 27 00
202 5 20 41.7

19/20 Am

M.Z.C. 19 29 00
202 15 24 16.3
34
15 24 50.5
19 32 57.13
19 31 53.37
3 11 99
19 28 41.38
19 29 0
18.62
2.68 first of B

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Ill West

Jan. 20 Pm.

202
α Persei

8 07.5
8 25.5
8 49.4
9 10.4
9 31.7
9 52.5
9 14 13.5
193.5
120.
73.5
10.50
-2
3 13 08.50
3 13 46.53
38.03

Jan. 21/22

202
β Geminii

16.5
5 30.8
5 45.5
6 00.0
6 14.5
6 29.0
15 56
119.8
120
.2
59.8
-2
15 55 57.8
15 56 48.66
50 88

202
δ Ophiuchi

03.9
5 17.8
5 31.5
5 45.4
5 58.9
6 12.8
16 06 26.5
196.8
120
76)316.8
45.25
-2
16 05 43.25
16 06 34.05
50 60

22 Pm

2
202
10 Ceti

03.0
5 17.4
5 31.0
5 45.0
5 59.0
6 13.0
1 16 26.4
195.3
120
76)315.3
45.04
-2
1 15 43.04

21/22
M.T.G. 20 20 00
202 16 23 00.5
50.8
16 23 51.3
20 00 50.24
20 23 01.06
3 20 36
20 19 40.70
20 20 00
19 30
16
3 30

20 00 03.50
46.36
20 00 50 24

5
first of Bootis 3.30

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Jan. 23 Sm. Ill West

Polaris U.C. Ext Therm +17°

Zero + post mire

Mire
.950
934
940

00 37,, 30.3 G
8,, 20.0 a trace ½ div
04.5
48.0
40-33.0
41-15.8
42-02.5
42-45.7
43-30.4
44-15.0
45,,01.4
45-44.5
00,,46,,31.6-F
7,, 15.0
57,, 59.5
58,, 44.5
9,, 26.0
50,, 11.0
50,, 57.5
51,, 46.0
52,, 26.0
53,, 10.9
3,, 54.0
54, 39.3
55,, 23.7-E
0 07.2
56,, 52.0
57,, 38.4
58,, 21.5
59,, 03.8
9,, 49.3
1,, 00,, 30.0
1,, 18.8
02,, 03.7
02,, 51.5
3,, 32.2
1,, 04,, 20.0-D
1,, 04,, 56.3
5,, 46.2
6,, 29.0
7,, 13.0
7,, 54.0
8,, 40.5
09,, 28.0
10,, 13.4
0 54.5
11,, 41.0
12,, 22.5
1,, 13,, 11.5-C
13,, 56.0
40.2
15,, 25.0
04.5
16,, 48.5
17,, 34.4
16.0
19,, 05.6
9,, 48.5
20,, 30.5
21,, 13.5
22,, 05.0-B
22,, 46,
3,, 30.0
15.4
1,, 25,, 00.4
25,, 44.0
6,, 31.4
12.5
27,, 57.5
28,, 40.4
9,, 31.5
30,, 14.0
1,, 31,, 03.4 A

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Jan. 23 Pm
202
γ Eridani
9 " 25.5
9 " 84.4
9 " 53.4
0 " 07.8
0 " 22.0
0 36.0
3 " 50 " 50.0
234.1
60
7)54.1
7.73
-2
3 " 50 " 05.73
3 " 51 " 07.38
1 " 01.65

Ill. West
23/24 Am.
202
α Herculis
6 " 04.9
6 " 19.0
6 " 33.5
6 " 47.5
7 " 01.8
7 " 16.0
17 " 07 " 30.0
152.5
60
7)332.5
47.50
-2
17 " 06 " 45.50
17 " 07 52.30
1 " 06.80

24 Pm.
202
η Lyrae
48.5
7 " 03.4
7 " 19.0
7 33.6
7 48.5
8 04.0
3 " 38 " 18.5
175.5
60
7)235.5
33.64
-2
3 " 37 " 31.64
3 " 38 " 41.38
1 " 09.74

Jan 26/27 Am
M.T.G. 19. 36 " 00
202 15. 38 " 00.3
1 " 26 19
15 " 59 " 26.49
20 " 20 " 35.00
19 " 38 " 51.49
3 " 13.13
19 " 35 " 38.34
19 " 36. 00
2166
16
5.16 feet of Boston

20 " 19 " 46.28
48.74
20 " 20 " 35.02

Jan. 24 Pm.
M.T.G. 7. 30 " 00
202 3 " 42 " 24.8
1 " 09.74
3 " 43 " 34 54
20 " 12 " 39.91
7 " 30 " 54.63
1.13.87
7 " 29.40.76
7 " 30 " 00
19 24 6
16
9.24

20 " 11 " 53.17
46.74
20 " 12 " 39.91

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Sea West

Jan. 26/09 Am

ave
β Scorpii

4h 40.9
4. 56.0
5h 10.2
5. 24.5
5. 39.3
5 53.5
15h 56m 08.2
232.6
60
2)172.6
24.66
−2
15h 55m 22.66
15. 56. 48.85
1m 26.19

Jan. 27 Pm

E.C. α Cassiopeiæ	E.C. β Ceti	E.C. 20 Ceti	E.C. θ' Ceti
+56° 7m 04.55	−19° 36.10	−2° 55.40	−9° 03.75
28.85	50.35	9.20	19.55
7 53.15	8 04.85	1m 22.83	2m 33.60
8 17.60	8 19.35	1m 36.83	2m 47.40
8 42.00	8 34.00	1 50.40	3 01.45
9 06.40	8 48.40	2 4.12	3 15.40
00h 29m 30.45	00h 33m 03.40	00h 42m 17.75	1h 13m 29.20
183.00	196.45	193.17	182.75
60	60	190.45 60	180
7)123.00	7)136.45	5)193.17 256.45	7)382.75
00h 28m 17.57	00h 32m 19.49	00h 41m 36.62 31.64	1h 12m 47.54
cal +.18	cal +.11	cal +10	cal +.10
a2 +.14	a2 −.30	a2 −.23	a2 −.26
lev. −.13	lev. −03	lev. −.64	lev −.05
00h 28m 17.76	00h 32m 19.27	00h 41m 36.45	1h 12m 47.33
00h 32m 06.67	00h 36m 08.02	3m 49.26	1h 16m 36.46
3m 48.91	3m 48.75	00h 45m 25.71	1h 3m 49.13
		00h 45m 25.42	1h 16 36.48
		.29	

Rate of 202 from 26th to 29th = 5.s0
29 to 26 = 6.5
Mean rate 5.75
in 10h 2.s4
1m 26.2
1m 23.8

3.48.91
75
166
3.48.83

Jan. 26 Pm

NZC. 9m 30.00
202 5m 5s 03.3
1m 22.27 1m 23.8 = cor 1.5
5m 51m 45.57
20h 20m 33.02
9m 31m 12.55
1m 33.58
9m 29m 38.97
9m 30m 00
21.03 − 1.s5
16
5.03
−1.5
3.5

20h 19m 46.28
46.74
20h 20m 33.02

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(29 Pm) rel. +.104
ax. −.916
lev. −.070

Jan 27 Pm

EC Moon I		E.C. o Piscium		E.C. a Arietis	
−2°	39.00	+8	03.15	+23°	15.30
	53.38		17.40		30.60
	07.40		31.00		45.30
α	21.50		3,,45.00	5	00.80
δ	35.65		3 59.00	5	15.00
ε	49.50		4 12.96	5	30.00
1,,	19,,03.60	1,,	34,,26.65	1,,	55,,45.10
	64.55		145.26		181.5
	60		120		180
	3)64.55		7)315.26		7) 1.5
	21.85		45.04		00.21
1,,	18,,21.52	1,,	38,,45.04	1,,	55,,
cel	+.10	cel	+.10	cel	+.11
ax.	−.23	ax	−.19	ax	−.11
lev.	−.06	lev	−.06	lev.	−.08
1,,	18,,21.53	1,,	33,,44.89	1,,	55,,00.13
	3,,49.34		3,,49.37	1,,	58,,49.43
1,,	22,,10.87	1,,	37,,34.26		3,,49.32

Ill West

29 Pm

202 Zauri	
	5,,06.0
	5,,20.5
	5,,34.8
	5,,49.0
	6 03.4
	6 17.6
4,,	26,,32.0
	163.3
	160
	7)343.3
	49.04
	−2
4,,	25,,47.04
4,,	27,,25.86
1,,	38.82

29/30 Am.

NZC	20,,58,,00
202	19,,81,,49.8
	1,,42.4
	17,,33,,32.28
	20,,32,,22.69
	27,,01,,09.59
	3,,26.61
20	57,,42.98
	20,,58
	17.02
	16
	1.02

29 Pm

NZC	7,,59,,00
202	4,,30,,43.7
	1,,38.82
	4,,32,,22.52
	20,,32,,22.69
	7,,59,,59.83
	1,,18.64
	7,,58,,41.19
	7,,59,,00
	18.81
	16
	2.81 fol B

20,,81,,35.73
46.54
20,,32,,22.69

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1852
Jan. 29 Pm.

Ill West (300)

evl +.094
cr −.212
lev −.053

E.C. δ Ceti		E.C. α Arietis		E.C. ξ² Ceti		E.C. 845 B.A.C.		E.C. Moon I		EC δ Arietis	
	59.46		8.95		39.25		18.15		16.98		30.00
−9°	13.20	+23°	23.95	+8	53.30	+9	32.15	+11	31.40	+14°	44.72
	27.00		38.80 ✓		07.00		46.05		45.50		59.25
2	40.80	4	53.70	6	21.00	8	59.95	0	00.00	9	13.75
2	54.65	5	08.65	6	34.75 ✓	8	14.00	1	14.40	9	28.15
3	08.60	5	23.45	6	48.60	8	27.70	1	28.65	9	42.70
1,, 13,,	22.45	1,, 55,,	38.00	2,, 17,,	02.40	2,, 33,,	41.75	2,, 51,,	42.80	2,, 59,,	57.40
	226.16		195.50		208.30		239.75		175.73		225.97
	60		180		60		180		180		180
7	286.16	7	375.50	7	148.30	7	419.75	7	355.73	7	405.97
1,, 12,,	40.88	1,, 54,,	53.64	2,, 16,,	21.18	2,, 32,,	59.96	2,, 50,,	59.96	2,, 59,,	13.71
cal	+.10	cal	+.11	cal	+.10	cal	+.10	cal	+.10	cal	+.11
cr	−.17	cr	−.08	cr	−.12	cr	−.12	cr	−.12	cr	−.09
lev	−.03	lev	−.05	lev	−.04	lev	−.04	lev	−.04	lev	−.05
1,, 12,,	40.78	1,, 54,,	53.62	2,, 16,,	21.12	2,, 32,,	59.90	2,, 50,,	59.90	2,, 59,,	13.66
1,,	16.36.44	1,, 58,	49.43		3,, 55.91		3,, 55.94		3,, 55.98		3,, 55.99
3,,	55.66	3,,	55.81	2,, 20,	17.03	2,, 36,	55.84	2,, 54,	55.88	3,, 03,	09.67
				2,, 20	17.02	2,, 36,	56.14			3,, 03,	09.83
					.01		.30				.16

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1852phae.proj ... 12T

Jan. 29

E.C.
α Persei

+49	46.85	
	8.09	
	29.15	
	50.30	
	11.50	
	32.50	
3,, 10,,	53.55	
	150.80	231.94
		120
7)	150.80	351.94
3,, 09,,	50.28	
cor.	+.15	
arr.	−.04	
lev.	−.07	
3,, 09,,	50.24	
3,, 13,,	46.33	
	3..36.09	

α E.C.
17 Januari

	23.80
	39.00
	54.00
2	08.95
2	24.00
2	39.10
3,, 32,,	53.45
	242.30
	180
7)	62.30
	8.90
	−6
3,, 32,,	08.90

Feb 2nd Pm.

202
α Andromedæ

	00.3
α	15.9
α	31.4
8	47.0
ζ	02.5
ζ	18.0
23,, 59,,	33.5
	148.6
	160
7)	328.6
	46.94
	−2
23,, 58,,	44.94
00,, 00,,	43.15
1,,	58.21

February 2nd Pm

	M.E.C.	3,, 21,, 20
	202	00,, 07,, 45.0
		1,, 58.21
20,, 47,,	22.17	00.09,, 43.21
	46.84	20,, 48,, 08.91
20,, 48,,	08.91	3,, 21,, 34.30
		33.02
		3,, 21,, 01.28
		3,, 21,, 20.0
		18.72
		16
		272

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1852phae.proj...12T

	M. Sun	Clock fast of Boston
	M.S.	M.B.
Jan.	16	2.24
	19	2.68
	21	3.30
	24 Sun	3.24
Rate	26 Sun	3.50
	26	5.66
	29 Sun	2.81
	29	1.62
Feb	2 Sun.	2.72
	4	2.90
	5	2.58
	6	2.18
	9	3.43
	11	2.13
	12	1.68
	13 Sun	1.87
	15 Sun	1.36
	16	1.18

of Boston

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Feb. 8 Pm

202
α Andromedæ
53.0
8,08.7
8,24.5
8,39.7
8,55.5
9 11.0
23,59,26.7
249.1
60
7)279.1
39.87
−2
23,58,37.87
00,00,43.14
2,05.27

207
β Pegasi
05.3
19.5
33.6
47.8
02.0
16.3
00,07,30.5

Feb. 4/5 Am

202
β Aquilæ
11.9
25.8
39.7
53.5
07.5
21.4
19,36 35.3

202
α Aquilæ
19,32.4
19,46.3
0 00.2
0 14.2
0 28.0
0 42.0
19 40,35.7
218.8
120
7)98.8
14.11
−2
19,40,12.11
19,43,31.79
3,19.68

EE 18,02.00

207

Feb 3 Pm

MJ 6 3,,19,,20
207 00,,12,,49.5

Feb. 4/5 Am

M.J.C. 22.54,,00
202 19,,50 ,,09.1
3,,19.68
19,,53,,28.78
20,,56,,02.02
22,,57,,26.76
3,,45,66
22,,53,41,10
22 54.
18.90
1C
2.90 of Boston

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1852phae.proj...12T

Feb. 5 Pm.

202
γ Ceti
45.5-
59.5-
2,,13.2
2,,27.0-
2,,40.8
2,,54.5-
2,,33,,13.4
253.9
60
7)193.9
27.7
-2
2,,32,,25.7
2,,35,,87.35-
3,,11.65-

5/6 Am Ill. West

207
γ Draconis
49.6
2,,12.0
2,,34.0 +5°.30'
2,,56.1-
3 18.0
3 40.0
17,,54,,02.0
211.7
180
7)391.7
55.96
-2
17,,52,,53.96
17,,55,,08.46
14.50
αz +.06
lw -.08
col +.14
-14.38

αz -0.25
lw -0.05
col +0.09

Feb. 5/6 Am.

U.C. 20,,53,,00
207 17,,55,,51.3
14.50
17,,56,,05.80
20,,59,,58.58
20,,56,,07.22
3,,25,,8
20,,42,,41.42
20,,53,,00
18.58
16
2.58 foot of Bute

20,,59,,11.74
46.84
20,,59,,58.58

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Feb 6 d/ 1852

By 207

25 42.0
26 05.8
26 28.0
26 50.8
27 13.3
27 35.7
17 27 58.3

+ 52.24

Barometric

2339
120
3539
2 50.56
17 26 48.56
17 27 03 88

207. Slow 15.32
ux +.07
lw -.08
cul +14
15.14

ℰ 17 25 00
207 17 29 11.2
15.3
17 29 26 5

21 03 08.39
46.75
21 03 55.14

4 26.5

M℘ 20 25 00 — 20 26 00
207 17 31 42.7 — 17 32 43.0
15.32 15.32

17 32 27.68
21 03 55.14
20 28 32.54
3 21.27
20 25 11.27
20 26 00.00
48.73
2X corr. 207 30.54
18 19
16.00
M℘ fast +2.07
of Boston.

17 32 43.00
15.32
17 32 58.32
21 03 55.14
20 29 03.18
3 21.36
20 25 41.82
20 26 00.00
18.18
16.00
M℘ fast of Boston +2.18

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1852phae.proj...12T

Feb 8d/gt 1852

γ Draconis G.R.B. same wires on 5d/6t

	56.1	40.0	02.0
8d/9	53.8	37.8	00.0
	2.3	2.2	2.0

Mean 2.17

Error 5d/6t 14.50

207 Slow 8d/9t −16.67

207 — 53.8

37.8

17 54.. 00.0

16.03.16.3
16.7
16.03.33.0
17.54.00.0
4.33.0

EC 17.54.00.0
207 16.03.16.3

M.S.C 20.53.00.0
207 18.07.39.1

coincidence 20h 52m 45s

M.C 20.55.00
207 18.09.39.4

Feb. 9 Sm.
202
H Gem.
19.0
34.0
+22.35 48.9
03.5
18.4
33.5
6.13.48.9

2054
2609
4454
63.63
6 13.. 03.63 − 2.00
az − .09
lw − .04
col + .04
6.. 13 01 59
6.. 14 .00.64
59 05

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1852phae.proj... 12T

307 Gl. West

Feb. 9 Pm.
202
α Arietis
7 07.4
7 22.4
7 37.3 az -0.23
7 52.0 — lev +0.04
8 07.0 col +0.08
8 21.8
1..58..36.6
184.5
180
7)364.5
52.07
-2
1..57..50.07
1..58..49.25
59.18
az -13
lev -03
col +09
59.25

Feb. 9/10 Am.
207
γ Draconis
1..47.0
2..09.4
2..31.5
2..53.6
3..15.6
3..37.5
17..53..59.5
253.1
180
7)373.1
53.3
-2
17..52..51.30
17..53..49.28
15.98 slow

17..52..51.30
17..53..8.60
17 30 - 0.13 = 17.17
15.98
1 32

10. Pm.
207
μ Gem.
00.4
clouds
30.3
6..13..46.0
clouds

2..01..34.8
59.2
2..02 34.0
1..58.00
4..34.0

EC. 1..58..00
202 2..01..34.8
0..59.2
2 34.0
21..14..58.06
46.74
21..15..44.80

2..01..34.8
59.18
2..02 33.98
1..58.00
4.33.90

Feb. 9 Pm
11.36 4..48..30
202 2..03..44.5
59.18
2..04..43.68
21..15..44.80
4..48..58.88
47.34
4..48..11.54
4..48..30..
18.46
16
2.46 fast of Boston

Feb. 9/10 Am.
11.36 20..41..00
207 17..59..39.2
15.98 17.30 1.32
17..59..49.18
21..15..44.80
20..44..04.38
3.23.81
20..40..40.57 41.89
20.41
19.43 18.11
16 16.00
3.43 2.11

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1852phae.proj. . . 12T

Feb. 11/12 Am

207 α Aquilae

34.8
48.9
+8°.28' 3.. 02.6
3.. 16.5
3.. 30.4
3.. 44.3
19.. 43.. 58.0
235.5
120
7)115.5
16.50
−2
19.. 43.. 14.50
19.. 43.. 31.91
17.41

az −.13
lev −.03
col +.09
−17.48

12 Pm.

202 ε Orionis

−1°.18'
55.8
−0°.24' 09.9
23.2
37.1
51.2
04.6
5.. 24.. 18.2
2010
2600
37.14
5.. 23.. 35.14
az −.15
lev −.03
col +.09
5.. 23.. 35.05
5.. 24.. 26.91
−51.86

202 ε Orionis

11.0
az −0.23 25.0
lev −0.04 38.0
col +0.09 52.8
8 06.5
8 20.2
5.. 28.. 33.7
18.2
16
7)368.2
52.60
−2
5.. 27 50.60
5.. 28.. 42.34
51.74
az −.15
lev −.03
col +.09
−51.83

12/13 Am.

207 δ Draconis

+51° 46.1
08.4
30.5
32.6
3 14.5
3 36.5
17.. 53.. 58.2
246.8
120
7)366.8
52.40
−2
17.. 52.. 50.40
17.. 58.08.71
−18.31 +0.13 = 18.18
col +.13
az +.05
lev −.05
18.44 −18.18

Feb. 11/12 Am.

11.7.6. 22.. 23 .. 20
207 .. 19.. 50 .. 03.0
17.41 17.48
19.. 50 .. 20.41 21.22.52.17
21.. 23.. 37.91 46.74
22.. 26.. 42.50 21 23 37.91
3.. 40.69
22.. 23.. 01.87
22.. 23 20
18.13 14.06
16
2.13

Feb. 12 Pm.

11.7.6. 8.. 06.. 00
202 5.. 33.. 44.7
51.74
5.. 34.36.44
21.. 27.. 34.46
8.07.01.98
1.. 19.75
8.. 05.. 42.19
8.06.00
17.81
16
1.81

12/13 Am.

11.7.6. 20.. 35.00
207 18.. 05 21.3
18.31
18.. 05.. 39.61
21.. 27.. 34.46
20.. 38.. 05.15
3.. 22.87
20 34.. 42.32
20.. 35
17.68
16
1.68

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1852phae.proj...12T

1852

(309)

corl. +.078
az. — .207
lev. — .027

13 Pm.
207
Sirius
38.6
−16° 53.0
07.0
8 21.7—
8 35.8
6.. 38.. 50.0
6.. 8 Clouds
167.5
60
5)107.5
21.5
−2
6.. 38.. 19.50
6.. 38.. 38.11
−18.61 − 0.12
corl. + .08
az. — .14
lev. — .01
18.46
−18.73

14 Pm.
194
γ Ceti
+3° 38.4
52.3 3.9
06.1 3.8
6 20.0 3.9
6 33.7 3.7
6 47.5 3.8
2.. 37.01.2 3.7
199.2
6
7)139.2
19.88
−2
2.. 36.. 17.88
2.. 35.. 37.21
40.67
corl. + .08
az. — .13
lev. — .03
40.59

Stewart
194
α Ceti
+3° 33.3
47.0 3.7
00.7 3.7
5 15.5 3.8
5 28.2 3.7
5 42.0 3.8
2.. 55.. 55.9 3.93
222.6
120
7)102.6
14.61
−2
2.. 53.. 12.51
2 54.. 32 04
40.47
corl. + .08
az. — .03
lev. — .03
40.39

194
α Persei
+49° 3.. 25.0
3.. 46.1
4 07.0
4.. 28.3—
4.. 49.5—
5.. 10.4
3.. 15.. 81.5—
197.8
ow
7)197.8
28.26
−2
3.. 14.. 26.26
3.. 13.. 46.93
40.33
corl. + .11
az. + .04
lev. — .05
40.43

EC. 6.. 26.. 00
194 6.. 26.. 20.4
20.4
40.47
EC fast 19.77

M.T.C. of Camb. m.s.t.
Feb. 14 − 5h — fast − 17.74
13.. 9 — " 17.67

13 Pm
MZ. 6. 9.. 11.. 00
207 6.. 43 25.0
18.61
21.. 30.. 44.28 E.. 43.. 43.61
46.74 21.. 31.. 31.02
21.. 31.. 31.02
9.. 12.. 12.59
1.. 30.46
9.. 10.. 42.13
9.. 11.. 00
17.87 17.67 By corrected Transits.
16.
1.87 fast of R

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1852phae.proj. . . 12T

Feb 14 8m Feb 15th Phil 1851

207

Grains 48.5

36.5 4.5
51.5 20.0
05.5 35.6
19.8 51.2
34.0 6.8
48.5 - 5 " 18 " 22.4

6 " 40 " 03.0

1890
60
2490

5 " 1 35.57
2

5 " 17 " 33.57
5 " 16 " 56.16

37.31

EC. 5 " 21
194. 5 " 21 " 18.7
37.31
5 " 22 41.39
EC fast +18.61

Corr
MSC 7 " 42 " 27
194 5 " 23 27.0
37.31
5 " 22 " 49.69
21 " 39 " 24.13
7 " 43 " 25.56
1 " 15.42
7 " 42 " 09.64
7 " 42 " 27.00
17.36
60
MSC +1.36 of Boston
Feb 15th at 7h 42 P.M.

EC 5 " 22
194 5 " 22 " 18.7

MSC 7 " 44 " 00
194 5 " 25 00.3

21 " 38 " 37.39
46.74
21 " 39 24.13

From the 14th P.M. to 16th A.M. EC was exposed to a temperature of about between 25° & 30° Rate in this interval losing -1°.2
Rate at temp of 50 -2.4

EC gains 1°.2 by a reduction of temperature = 23°

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1952phae.proj... 12T

Feb. 16 Pm Transit-Circle reversed & Ill East at 3h Pm. cal. —.22
16 Pm 16/17 Am. arg. —.30
194 194 lev. —.11

α Persei		Lirius		α Lyrae	
	20.0	8	32.0		36.9
+49°	41.0	8	46.5	+38°	54.5
	01.8	9	00.8	bad seeing	8.12.3
4	23.0	9	15.0		2.30.0
4	44.0	9	29.4		2.47.1
5	05.1	9	43.5		3.04.8
3.15.26.4		6.39.58.0		18.33.23.0	
161.3				208.6	
av				av	
7)161.3				7)208.6	
23.04				29.80	
−2				−2	
3.14.21.04				18.32.27.80	
3.13.45.86				cal −.28	
.35.18				arg −.03	
cal. −.33				lev −.14	
arg. +.06				18.32.27.35	
lev. −.17				16.21.54.12	
34.74				33.23	

Feb. 16/17 Am.
M.S.G. 20.49.50
194 −18.36.52
33.23
18.36.18.77
21.43.20.68
20.52.58.09
3.25.27
20.49.32.82
20.49.50
17.18
16
1.18 fast of Boston

21.42.33.94
46.74
21.43.20.68

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1852phae.proj. . . 12T

(312)

Feb. 17 P.m. Ill. East 18 P.m.

194 194 194

γ Ceti	α Ceti	γ Ceti	ε Ceti	α Orionis
			22.8	00.0
			36.8	13.8
			50.4	7,, 28.0
			58 04.0	7,, 41.5
		23.0	0 17.8	7 55.5
		37.0	0 31.5	8 09.2
+3° 5,, 31.0	+3° 25.8	2,, 36,, 50.8	2,, 58 45.3	5,, 48, 23.0
3,, 44.8	39.4		208.6	171.0
5,, 58.5	53.0		180	120
6 12.2	5,, 06.8		7)28.6	2)291.0
C 26.0	5,, 20.6		04.08	41.57
C 39.7	5,, 34.3		−2	−2
2,, 36,, 53.5	2,, 55,, 48.2		2,, 55,, 02.08	5,, 47 39.57
265.7	228.1		2,, 54,, 31.58	5,, 47,, 09.65
180	180		30.10	29.92
7)85.7	2)48.1		cor − 21	
12.24	06.87		cor − 19	
−2	−2		cor − 06	
2,, 36,, 10.24	2,, 55,, 04.87		29.62	
2,, 35,, 37.17	2,, 54,, 31.99			
33.07	32.88			
cor. − .21	cor. − .21			
cor. − .19	cor. − .19			
cor. − .08	cor. − .08			
32.59	32.40			

17 P.m.

M.J.C. 5,, 13,, 00
194 3,, 01,, 23.9
32.5
3,, 00,, 51.4
21,, 47,, 17.23
5,, 13,, 34.17
51.37
5,, 12,, 42.80
5,, 13,, 00
17.20
16
1.20 fast of Boston

21,, 46,, 30.49
46.74
21,47,17.23

18 P.m.

M.J.C. 4,, 51,, 00
194 2,, 43,, 14.45
30.10
2,, 42,, 44.35
21,, 51,, 13.79
4,, 51,, 30.56
47.75
4,, 50,, 42.81
4,, 51
17.19
16
1.19 fast of Boston

21,, 50,, 27.05
46.74
21,51,13.79

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1952phae.proj - 12T

1852 Ill East-

Feb. 18/19 Am.

19		
194		
α Aquilæ		
24.4		
34.3		
48.3		
4 02.1		
4 16.0		
4 29.8		
19..44..43.9		

(313) Ill. East.

19 Pm		
194		194
α Ceti		α Ceti
—		20.0
5..39.4		33.6
5..52.8		47.4
6..06.5		5..01.0
6 20.4		5 14.8
6 34.1		5 28.5
2..36..48.0		2..55..42.4
153.2		187.7
120		180
5) 33.2		2) 7.7
6.64		01.1
-2		-2
2..36..04.64		2..54..59.10
2..35..37.14		2..54..31.97
27.50		27.13

extremely faint

faint

19/20 Am

194
β Lyræ
4..12.4
4..28.8
4..45.0
5..01.3
5..18.0
5..34.3
18..45..57.0
189.6
180
7) 9.8
1.40
-2
18..45..59.40
18..44..36.49
23.91

The observed R of γ Ceti is too small compared with Naut. Almanac R, by about two tenths of a second of time

18/19 Am.

M.T.G. 21..56..00

194 19..51..00.9

19 Pm.

M.T.G. 5..04..00

194 3..00..10.45

19/20 Am.

M.T.G. 21..02..00

194 19..00..44.7

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1852phae.proj. . . 12T

Ill. East (3.14)

February 20 Pm

194 α Ceti

20.5
37.7
5.48.4
6.02.5
6 16.2
6.30.0
2.36.43.6
195.9
180
2)15.9
2.27
-2
2.36..00.27
2..85..37.12
23.15

20/21 Am

194 α Lyrae +39°

1.24.0
1 41.8
1 55.5
2..17.0
2..34.5
2..52.3
18..33..09.9
239.0
12
2)119.0
17.0
-2
18 32..15.0
18..31..54.24
20.7.6
cd — .07
az — .02
lev — .03
20.64

22/23 Am

194 α Cygni +45°

40.9
6..00.2
6..19.4
6..38.9
6..58.3
7..17.5
20..37..37.0
212.2
60
7)272.2
38.88
-2
20..36..36.88
20..36..21.24
15.64
cd — .89
az + .02
lev — .09
15.88

23/24 Am

194 α Cygni

cd — .13
az — .26
lev — .07

39.2
58.6
6 17.9
6 37.2
6 56.5
7 clouds
20 37..35.6
186.4
60
3)186.4
37.28
-2
20..36..35.28
20..36..21.26
14.02
cd — .19
az + .01
lev — .09
13.75

20 Pm

M.T. 4..42..00
194 2..41..59.3

20/21 Am.

M.T. 20..40..00
194 18..42..34.8
20.64
18..42..14.16
21..59..06.89
20..43..07.27
3..29.66
20..39..43.61
20..40
16,39
16.
0.39

21..58..20.13
46.74
21..59..06.89

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1952phae.proj...12T

Ill Ends (315)

Feb 25 8m

194	194	194	194	194
Moons Limb	α Ceti	α Persei	η Tauri	γ¹ Eridani
44.5	04.3	56.0	09.5	38.1
58.9	18.0	17.1	24.4	52.4
6 13.0	31.9	38.0	39.3	1..06.6
6 27.3	4 45.5	3 59.1	8..54.5	1..20.7
6 41.5	4 59.4	4 20.3	9 09.4	1..34.9
6 55.8	5 13.1	4 41.5	9 24.5	1..49.0
2..37..10.0	2..55..27.0	3..15..02.6	3..39..39.4	3..52..03.0
251.0	199.2	234.6	201.0	204.7
60	120	160	160	60
7)191.0	7)319.2	7)414.6	7)381.0	7)144.7
27.28	45.60	59.23	54.43	20.67
−2	−2	−2	−2	−2
2..36..25.28	2..54..43.60	3..13..57.23	3..38..52.43	3..51..18.67

Moon's Limb unreliable

unreliable

23/24 Sm.

M.J.C. 22..27..25
194 20..42..01.
42.01.0 13.75−
20..41..47.25
22..10..56.56
22.30..50.69
3..41.3
22 27.09.39
22.27..25
15.61
16
.39 slow y Boston

22..10..09.82
46.74
22..10..56.56

25 8m
M.J.C. 5..36..00
194 3..55..41.0

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(316)

Feb. 25/26 Am

194		
	α Lyrae	
	14.5	
	32.0	
	49.4	
2	07.2	
2	24.9	
2	42.5	
18	33 00.0	
	170.5	
	120	
2)	50.5	
	07.21	
	-2	
18	32 05.21	
18	31 54.12	
	11.09	

26/27 AM

194	
	α Lyrae
	12.9
	30.4
	48.0
	clouds
2	23.0
2	40.5
18	32 58.5
	213.3
	180
6)	33.3
	05.55
	-2
18	32 03.55
18	31 54.39
	9.16

Feb. 27 Om

194		
	α Lyrae	
	56.4	
	10.4	
	24.3	
2	38.2	
2	52.4	
3	06.5	
3	53 20.5	
	208.7	
	60	
7)	268.7	
	38.39	
	-2	
3	52 36.39	

Ike East —

194		
	Moon's Limb	
	01.3	
	16.0	
	30.8	
4	45.5	
4	00.1	
5	14.8	
4	15 29.5	
	138.0	
	180	
7)	318.0	
	45.43	
	-2	
4	14 43.43	

194		
	ε Lyrae	
	24.8	
	39.0	
	53.8	
0	08.0	
0	22.5	
0	37.3	
4	20 51.8	
	237.2	
	180	
2)	57.2	
	8.17	
	-2	
4	20 06.17	

M.S.G. 20 14 00
194 18 36 04.55
11.09
22 16 02.92 18 35 53.46
46.74 22 16 49.66
22 18 49.66 20 17 03.80
3 19 44
20 13 44 36
20 14 —
15.64
16
36 plow of b

24/27 Am
M.S.G. 20 19 00
194 18 45.005
27 Om
E.C. 3 45 00
194 3 45 19.3

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27 Pm.

194

	E.C.	E.C.	
	a Ursæ	a Ceti	a Persei
	52.5	39.40	2.31.05
	06.8	52.55	2.52.08
	21.0	6.75	3.13.10
7	35.3	4 20.60	3.34.35
7	49.7	4 34.30	3.55.00
8	04.0	4 48.10	4.16.30
4.28.	18.0	2.55.01.90	3.14.37.45
	187.3	203.00	239.33
	60	60	00
7)	247.3	7) 148.00	7) 239.33
	35.33	20.43	34.19
	-2	-0	-0
4.27.	33.33	2.54.20.43	3.13.34.19

The Spring Gov. was surrounded by a great many Visitors during the observation

Spring Gov. out of order

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Ill. East (318) The atmosphere is very much disturbed tonight – Stars extremely unsteady

March 2nd

E.C. 51 Gem.	E.C. 8 Gem.	E.C. α^2 Gem.	E.C. α Canis Min.	E.C. β Gem.
51.50	14.70	02.45	34.60	~~40.88~~
05.70	29.20	16.85	48.35	~~26.45~~
20.15	44.25	34.00	02.10	41.95
4 34.90	0 59.00	4 51.35	1 15.80	57.50
4 48.80	1 13.95	5 7.50	1 29.70	13.00
5 03.25	1 29.00	5 24.00	1 43.40	29.00
7 05 17.60	7 11 43.80	7 25 40.20	7 31 57.45	7 36 44.50
181.90	283.90	178.35	231.40	~~223.28~~
60	180	180	120	180
7)241.90	7)413.90	7)358.35	7)111.40	7 / 403.28
34.94	59.13	51.19	15.91	35 57.61
– 0	– 0	– 0	– 0	
7.04.34.94	7.10.59.13	7.24.51.19	7.31.15.91	

9/3 Am

M.T.G. 21.09.10
194.19.54.50
4.16
19.54.54.16
22.42.28.98
21.12.25.14
3.28.45
21.08.56.73
21.09.10
13.27
2.73

22.41.42.24
46.74
22.42.28.98

For Comparison of Spring Governors made March 1st Dec after March 30th —

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The moon was ab. with Chron. 194
Spring Gov. stopped - spring broke
March 2

Ill. East (319)

194	E.C.	E.C.	E.C.
Nwon's Limb	δ Caneri	ε Hydra	α Caneri
24.5	15.45	57.40	24.15
39.4	29.70	11.40	38.25
54.5	44.40	25.15	9 52.00
7.. 09.9	5 „ 58.80	38 „ 39.25	0 06.20
7 25.4	6 „ 13.25	8 53.00	0 20.50
7 40.0	6 „ 27.90	9 06.80	0 34.60
8 „ 07 „ 55.2	8 „ 36 „ 42.90	8 „ 39 „ 20.70	8 „ 50 „ 48.55
248.9	231.80	213.70	224.25
180	180	66	180
7) 68.9	7) 411.80	7) 273.70	7) 44.25
09.84	8 „ 35 „ 58.83	8 „ 38 „ 39.10	8 „ 50 „ 06.32
-2			
8 „ 07 „ 07.84			

very unsteady

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(320) 5a, East

March 2/3 Am.

194 a Aquilae

Comparative

	03.0
	16.8
	30.7
	44.5
	58.4
19.44.	12.3

194 a Cygni

+45°	21.5
	5 40.5
	6 00.5
	6 19.5
	6 39.0
	6 58.5
20 37.	18.0
	197.5
	60
7)	137.5
	19.64
	−2
20.36.	17.64
20.36.	21.43
	3.79
	col −.33
	ar2 +.02
	lev. −.06
	4.16

3 Pm

194 a Hydra

8	12.0
8	25.8
8	39.5
8	53.5
9.	7.6
9.	21.0
8. 39.	35.0
	194.4
	180
7)	374.4
	53.48
	−2
8. 38.	51.48

3/4 Am

194 a Aquilae

+8	46.4
	000
	14.0
3	27.8
3	41.6
3	55.5
19.44.	09.4
	194.8
	00
7)	194.8
	27.83
	−2
19.43.	25.83
19.43.	32.37
	6.54
	col −.23
	ar2 −.22
	lev. −.04
	7.03

col −.23
ar2 −.33
lev −.04

194 a Cygni

	18.9
	38.0
	57.4
6	17.0
6	36.0
6	55.4
20.37.	15.0
	237.7
	120
8)	117.7
	16.81
	−2

22.9
10.5
47) 33.4 (0.9
423
11

7.55.
10.8
7.54.45.2
7.54.55.7
+10.5

+10.8
14.0
47) 24.8 (0.5
235
13

March 3/4 Am

1936. 21.02.30	
194 19.52.03.0	
	7.03
19.52.	10.03
22.46.	25.53
21.05.44.	50
	3.27.36
21.02.	17.14
21.02.	90
	12.86
	16
	3.14

22.45.38.79
46.74
22.46.25.53

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March 9 Pm

194 Sirius		194 δ Gem.		194 a^2 Gem.	194 β Gem.	
−16°	38.0		15.8	cloud	+28°	12.0
	52.3	+22°	30.5	"		27.4
	06.5		45.5	36.0		43.0
8	21.0	1	00.2	52.4	5	56.5
8	35.0	1	15.0	7.. 2 5.. 08.5	6	14.5
8	49.5	1	30.0	cloud	6	30.0
6.. 39..	04.0	7.. 11..	44.8	clouds	7.. 36..	45.5
	206.3		181.8			230.9
	60		180			180
7)	146.3	7)	1.8		7)	410.9
	20.90		1 00.26			58.70
	−2		−2			−2
6.. 36..	18.90	7.. 10	58.26		7.. 35..	56.70
cul.	−.23	cul	−.24		cul	−.26
ar	−.31	ar	−.13		ar	−.10
lev	−.02	lev	−.02		lev	−.02
6.. 38..	18.34	7.. 10..	57.87		7.. 35..	56.32
6.. 38..	37.70	7.. 11..	16.99		7.. 36..	15.44
	1936		1912			19.12

3 Am −4.16
11 Am −22.22
8) 18.06 2.26

194 losing 2.26

March 9 Pm

U.S.C.	7.. 37.. 00	1908.. 06.. 20	
194	6.. 47.. 50.1	194 7.. 17.. 15	
	19.12		
23.. 09.. 18.11	6.. 48.. 09.22		
4674	23.. 10.. 04.85		
23.. 10 04.85	7.. 38.. 04.37		
	1.. 15.04		
	7.. 36.. 49.33		
	7.. 37		
	10.67		
	16		

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Ill Ext. (322)

March 10 Pm.

194

δ Gem.	α² Gem.
	02.5
29.0	+25 18.5
43.9	34.6
58.5	4.. 51.0
13.5	5.. 07.0
28.3	5.. 23.3
7.. 11.. 43.5	7.. 25.. 39.5
	176.4
	180
	2)356.4
	50.91
	−2
	7.. 24.. 48.91
	ϑ cal −.25
	az. −.12
	lev. −.04
	7.. 24.. 48.50
	7.. 25.. 09.19
	20.69

10/11 Pm.

194

α Cygni	
	04.0
+45	23.0
	42.4
	£.. 01.8
	£ 21.0
	£ 40.4
20.. 36.. 59.8	
	192.4
	180
	2)12.4
	1.77
	−2
20.. 35.. 59.77	
	cal − .33
	az + .02
	lev. −.06
	20.. 36.. 59.40
	20.. 36.. 21.62
	22.22

10 Pm

	cin.		10/11 Pm
M.S.C.	8.. 15.. 25	M.S.C.	21.. 23.. 10
194 -	7.. 30 17.0	194	20.. 40 .. 10

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1852phae.proj ..12T

All East (323)

March 15 Bm

194 α Canis Min.		194 β Gem.	
			59,5
+6°	37.0	+28° 5	14.9
	51.0	5	30.5
	04.4	5	46.4
1	18.0	6	02.0
1	31.9	6	17.4
7	31 45.8	7	36 33.0
	142,3		203,7
	120		120
5)	22.3	7)	323.7
	04.46	7	35 46.24
	-2		-2
7	31 02.46	7	35 44.24
cal	-.23	cal	-.26
az	-.22	az	-.10
lev	-.04	lev	-.06
7	31 01,97	7	35 43.82
7	31 33.19	7	36 15.34
	31.22		31.52

15/16 Am.

E.C. α Cygni		E.C. β Aquarii	
			32.30
+45°		-6	46.08
	81.80		00.00
5	51.05	3	13.80
6	10.30	3	27.60
6	29.70	3	41.40
20	36 49.40	21	23 55.10
	99.15		216,28
	66		120
9)	153,15	9)	96.28
20	35 51.05	21	23 13.75
cal.	-.33	cal.	-.23
az.	+.03	az.	-.27
lev.	+.07	lev.	-.03
20	35 50,82	21	23 13.22
20	36 21.76	21	23 44.98
	31.08		31.16

March 15/16 Am

M.R. 21 04 25
194 20 40 57.0
325
20 41 29.5
23 32 57.43 — 29 33 44.67
46.74 — 21 07 45.78
3 44.17 — 3 27.68
21 04 18.03
21 04 25
06.95
16
9.1 slow

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1852phae.proj. . . 12T

Ill. East (324)

March 18/19 Am. 19/20 Am

cd – .100
az – .765
lev – .039

194 α Cygni

45.9
05.0
24.4
3. 44.0
6 03.0
6 22.5
20 36. 41.8
146.6
120
2) 906
43.80
– 2
20. 35. 41.80
cd – .14
az + .01
lev – .05
20. 35. 41.62
36. 21.83
40.21

194 α Cygni

4. 42.8
5. 02.0
5. 21.5
5 41.0
6. 00.3
6. 19.4
20. 36. 38.9
165.9
120.
7) 285.9
20. 35. 40.84
– 2
20. 35. 38.84

22 Pm
194 α Aurigæ

56.3
4. 15.9
4 35.5
4 55.4
5 15.0
5 34.9
5. 05. 54.5
287.5
120
7) 887.5
55.36
– 2
5. 04. 53.36
6. 05. 44.77
51.41

March 18/19 Am.
M.D.C. 20. 54. 20
194 20. 42. 34.0
40.21
20. 43. 14.21
23. 44. 47.08
46.74
23. 45. 33.82
23. 45. 33.82
20. 57. 40.39
3. 26. 03
20. 54. 14.36
54. 20
5.64
16
10.36

March 19/20 Am.
M.D.C. 20. 53. 55
194 20. 46. 03.0

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1052phae.proj.: 12T

Ill. East (325)

March 25 Sm.

E C Moon's 1st limb	E.C. a Tauri	E.C. a Tauri	E.C. a Aurigæ	E C β Orionis
04.20	00.40	03.45	06.95	~~4.76~~ G
19.00	14.35	17.80	26.65	6.. 18.50 F
33.45	28.80	32.05	46.50	6.. 32.70 E
48.20	0 43.00	6 46.40	5.. 06.00	6.. 46.20 D
6.. 02.95	0 57.25	7 00.80	3 25.95	7.. 00.20 C
6.. 17.60	1 11.35	7 15.00	5 45.20	7.. 14.10 B
3.. 56.. 32.35	4.. 11.. 25.60	4.. 27.. 29.40	5.. 06 05.45	5.. 07.. 28.05 A
157.75	180.75	145.90	162.70	144.55
180	120	160	120	180
7)337.75	7)300.75	7)324.90	7)42.70	7)324.55
48.25	42.96	46.41	6.10	5 6 46.36
− 0	− 0	− 6	− 0	
3.. 55.. 48.25	4.. 10.. 42.96	4.. 26.. 46.41	5.. 05.. 06.10	
	4.. 11.. 21.55	4.. 27.. 24.95		
	− 38.59	− 38.54		
		17		
		37		
		48		
		41		

E C losing

March 22 Sm

M 2 C	5.. 10.. 00
154	5.. 11.. 15.5
	51.4
00.. 00.. 33.29	5.. 12.. 06.9
46.74	0.. 01.. 20.09
00.. 01.. 20 03	5.. 10.. 46.87
	0.. 30.90
	5.. 09.. 55.97
	5.. 10.. 00
	1.. 04.03
	16

11.97 slow of B

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(326) Ill. East

March 25 Pm. | March 26 Pm

E.C. β Tauri

30.00
45.75
6.. 01.30
6.. 17.00 –
6.. 32.60
6.. 48.40
5.. 17.. 03.95
192.00
60
7) 119.00
17.00

E.C. γ Tauri

58.30
13.40
27.70
0.. 41.85
0.. 56.00
1 10.25
4.. 11 24.70
233.20
60
7) 293.20
4.. 10 .. 41.88
4.. 11.21.53
+39.65
17
39.48

E.C. α² Tauri

02.40
+16° 16.80
31.00
6 45.25
6 59.60
7.. 14.00
4.. 27.. 28.40
197.45
120
7) 317.45
4.. 26.45.35
col – .04
ax – .12
lev. – .01
4.. 26.45.18
4.. 27.24.57
39.79

E.C. Moon's 1st limb

Limb not distinct

47.15
02.25
7.. 17.10
7.. 32.10
7 47.20
8 01.80
4.. 48.. 17.05
164.65
60
7) 284.65
4.. 47.32 09

E.C. α Aurigæ

East-west wire too low

05.85
25.40
45.40
5.00
24.95
5.. 05.. 44.25
04.60

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March 26 Pm.

E.C. β Orionis	E.C. β Tauri	E.C. δ Orionis	E.C. ε Orionis
~~3.55~~	29.00	~~5.26~~	20.80
~~17.40~~	44.50	18.95	− 1° 34.40
31.20	00.20	32.75	48.20
46.05	6.. 15.85	46.25	6.. 02.00
59.05	6.. 31.40	00.20	8.. 15.65
12.95	6 46.90	13.95	8.29.25
5.. 07.. 27.00	5.. 17.. 02.80	5.. 24.. 27.85	5.. 28.. 43.25
196.20	170.65	~~145.1~~	193.55
120	60	180	180
7) 316.20	7) 110.65	7) 325.1	7) 13.55
5 6 45.17	5.. 16.. 15.80	5 2 46.44	5.. 28.01.93
			cor. — .04
			ox. — .16
			lev. — 00
			5.. 28.01.73
			5.. 28.. 41.63
			39.90

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March 28/29 Am.

194
a Cygni

—
—
—

5 16.8
5 36.0
5 55.4
20 36 15.0

March 31/32 Am.

194
a Cygni
11.4
30.8
50.0
5 09.4
5 28.8
5 48.0
20 36 07.4
185.8
120
7) 65.8
09.40
−2
20 35 07.40
20 36 22.28
1 14.88

28/29 Am

M.J.C. 20 14 30
194 20 41 41.5
1 07.34
20 42 48.84
00 24 59.35
20 17 49.49
3 19.50
20 14 29.99
20 14 30
.01

00 24 12.61
46.74
0 0245 9.35

29/30 Am.

M.J.C. 20 45 25
194 21 16 36.5

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March 31/32 Am.
M.Z.b. 19.. 40.. 30
194 20.. 19.. 20.5
1.. 14.89
20.. 20.. 35.33
00.. 36.. 49.01
19.. 43.. 46.32
3.. 13.99
19.. 40.. 32.33
19.. 40.. 30
2.39
16
18.39 slow of B.

00.. 36.. 02.27
46.74
36 49 01

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March 1st 1852 — Comparison of Spring Governors

The following observations were for trying how nearly the two instruments will record the same phenomenon. Both were on one circuit & dots were made with a break circuit Key & recorded simultaneously on both cylinders.

The exhibition Spring Governor has not been cleaned since it was at the Great Exhibition & is very dirty so that it performs certainly below its average work.

No denoting the observation	(A) Time by EC recorded on New Spr. Gov. Reading I —	II.	III	(B) Time by EC recorded on Exhib. Spr. Gov. I	II	A-B	Diff. of Readings- I—II A	I-III. B
2	3h 26m 6.30	.26	.30	3h 26m 06.30	30	0.00	0.04	0.00
3	10.20	.20	.17	10.24	25	−.04	.08	.04
4	14.40	.32	.32	14.35	.36	+.05	.08	01
5	18.40	.35	.37	18.37	37	+.03	.05	00
6	22.35	.30	.28	22.32	30	+.03	.05	02
7	26.30	.25	.28	26.30	28	.00	.05	02
8	30.30	.30		30.30	.30	.00	00	00
9	3m 26m 44.15	.13		44.10	.10	+.05	02	00
10	28m 18.70	.63		18.63	.60	+.05	07	03
11	21.60	.58		21.60	.60	.00	02	00
12	27.45	.40		27.40	.38	+.05	.05	02
13	30.28	.25		30.32	.34	−.04	03	02
14	34.30	.30		34.27	.28	+.03	00	01
15	37.28	.25		37.30	.30	−.02	03	00
16	41.60	.50		41.55	.50	+.05	10	05
17	50.25	.20		50.30	.30	−.05	05	00
18	53.60	.57		53.60	.60	00	03	00
19	28m 56.50	.43		56.50	.50	00	07	03
20	29m 00.30	.30		00.30	.25	00	00	05
21	4.85	.85		04.86	.80	−.01	00	06
22	9.05	.02		09.00	.00	+.05	03	00
23	12.67	.60		12.60	.60	+.07	07	00
24	19.80	.75		19.80	.80	00	05	00
25	23.32	.30		23.32	.30	00	02	02
26	26.75	.72		26.78	.75	− 03	03	03
27	3m 29m 31.00	.00		31.00	.00	.00	00	00

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March 1st Comp of Spring Governors continued

No for obs	A		B		A-B	I-II, A	I-III, B	No for obs	A		B		A-B	I-II, A	I-III, B
	Remarks														
	h m s														
28	3 29 35.64	.60	35.62	.58	+.02	0.04	0.04	63	3 33 18.54	.55	18.52	.50	+.02	0.01	0.02
29	39.40	.40	39.35	.30	+.05	00	05	64	21.15	.15	21.10	.10	+.05	00	00
30	47.95	.95	48.00	.00	−.05	00	00	65	36.35	.35	36.30	.30	+.05	00	00
31	51.50	.50	51.50	.47	.00	00	03	66	46.15	.15	46.15	.15	.00	00	00
32	54.70	.70	54.70	.68	.00	00	02	67	50.80	.80	50.73	.65	+.07	00	.08
33	29 58.30	.25	58.27	.25	+.03	05	02	68	54.85	.90	54.90	.86	−.05	05	04
34	30 00.10	.10	00.10	.10	.00	00	00	69	33 58.80	.80	58.85	.88	−.05	00	03
35	05.75	.78	05.70	.67	+.05	03	03	70	34 03.85	.90	03.90	.90	−.04	05	00
36	08.54	.50	08.54	.50	.00	04	04	71	08.77	.78	08.74	.70	+.03	01	04
37	11.10	.10	11.05	.05	+.05	00	00	72	13.90	.85	13.90	.86	.00	05	04
38	13.75	.70	13.80	.75	−.05	05	05	73	18.86	.88	19.00	.98	−.14	02	02
39	16.50	.50	16.50	.50	.00	00	00	74	24.68	.70	24.78	.75	−.10	02	03
40	18.90	.90	18.90	.85	.00	00	05	75	36.50	.55	36.50	.50	.00	05	00
41	24.35	.30	24.30	.30	+.05	05	00	76	42.05	.05	41.98	.90	+.07	00	08
42	30.55	.57	30.50	.50	+.05	02	00	77	49.70	.80	49.64	.60	+.06	00	04
43	33.70	.73	33.70	.70	.00	03	00	78	34 55.70	.70	55.67	.64	+.03	00	03
44	36.30	.30	36.30	.30	.00	00	00	79	35 00.75	.80	00.75	.73	.00	05	02
45	40.80	.80	40.90	.85	−.10	00	05	80	07.10	.10	07.10	.10	.00	00	00
46	45.20	.20	45.20	.20	.00	00	00	81	11.80	.80	11.80	.85	.00	00	05
47	56.15	.14	56.15	.15	.00	01	00	82	16.10	.10	16.10	.12	.00	00	02
48	30 59.47	.48	59.48	.45	−.01	01	03	83	35 19.85	.85	19.78	.80	+.07	00	02
49	31 03.62	.60	03.60	.58	−.02	02	02	84	3 37 37.30	.30	37.30	.28	.00	00	02
50	7.84	.85	07.90	.85	−.06	01	05	85	40.60	.60	40.60	.65	.00	00	05
51	11.73	.73	11.70	.67	+.03	00	03	86	42.80	.84	42.80	.84	.00	04	04
52	15.75	.70	15.75	.70	.00	05	05	87	47.30	.28	47.28	.26	+.02	02	02
53	18.00	.00	17.98	.98	+.02	00	00	88	37 52.80	.85	52.88	.90	−.08	05	02
54	25.20	.18	25.15	.15	+.05	02	00	89	38 00.50	.50	00.52	.50	−.02	00	02
55	28.05	.05	28.00	.00	+.05	00	00	90	6.90	.90	06.98	.95	−.08	00	03
56	31.75	.73	31.70	.70	+.05	02	00	91	15.10	.10	15.05	.05	+.05	00	00
57	35.72	.70	35.70	.68	+.02	02	02	92	19.45	.48	19.48	.44	−.03	03	.04
58	44.15	.15	44.10	.10	+.05	00	00	93	26.20	.18	26.20	.16	.00	02	04
59	54.72	.72	54.72	.75	.00	00	−05	94	30.85	.85	30.83	.75	+.02	00	08
60	32 58.60	.60	58.65	.68	−.05	00	−03	95	36.50	.52	36.50	.50	.00	02	00
61	33 05.18	.15	05.20	.18	−.02	03	02	96	41.25	.25	41.21	.23	+.04	00	02
62	12.23	.20	12.25	.25	−.02	03	00	97	3 39 45.90	.95	46.00	.98	−.10	05	00

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March 1st Comp. of Spring Governours continued

No. for obs.	A		B		A−B			No. for obs.	A		B		A−B		
98	3h 39m 50.80	.85	3h 39m 50.75	.70	+.05	0.05	0.05	134	3h 43m 08.30	.30	3h 43m 08.30	.30	.00	0.00	0.00
99	54.94	.95	54.90	.90	+.04	01	00	135	12.74	.77	12.70	.66	+.04	03	04
100	39m 58.95	.95	59.00	.00	−.05	00	00	136	17.75	.73	17.75	.70	.00	02	05
101	40m 7.70	.73	07.70	.70	.00	03	00	137	23.65	.62	23.60	.65	+.05	03	05
102	11.44	.43	11.50	.50	−.06	01	00	138	29.80	.80	29.77	.80	+.03	00	03
103	18.75	.78	18.84	.82	−.09	03	02	139	32.25	.20	32.20	.20	+.05	05	00
104	24.90	.90	24.98	.00	−.08	00	02	140	38.86	.83	38.76	.75	+.10	03	01
105	30.70	.70	30.77	.78	−.07	00	04	141	45.60	.60	45.50	.55	+.10	00	05
106	35.86	.87	35.85	.90	+.01	01	05	142	50.80	.80	50.80	.84	.00	00	04
107	40.85	.85	40.81	.80	+.04	00	01	143	56.80	.80	56.75	.78	+.05	00	03
108	45.67	.70	45.75	.70	−.08	03	05	144	44m 05.65	.65	05.60	.63	+.05	00	03
109	47.30	.30	47.30	.30	.00	00	00	145	10.40	.40	10.40	.40	.00	00	00
110	49.65	.65	49.70	.60	−.05	00	10	146	15.60	.60	15.60	.60	00	00	00
111	53.28	.30	53.3	.30	−.02	02	00	147	25.35	.35	25.40	.35	−.05	00	05
112	40m 57.80	.80	57.90	.90	−.10	00	00	148	29.10	.10	29.08	.01	+.02	00	07
113	41m 02.05	.10	02.05	.08	.00	05	03	149	36.40	.40	36.43	.40	−.03	00	03
114	14.20	.20	14.20	.20	.00	00	00	150	40.50	.50	40.50	.50	00	00	00
115	24.90	.80	25.00	.00	−.10	10	00	151	44.92	.90	44.90	.90	+.02	02	00
116	30.75	.74	30.85	.85	−.10	01	00	152	49.34	.35	49.35	.30	−.01	01	05
117	39.30	.30	39.30	.30	.00	00	00	153	52.70	.70	52.73	.75	−.03	00	02
118	42.25	.28	42.28	.30	−.03	03	02	154	44m 56.80	.80	56.80	.80	.00	00	00
119	45.40	.40	45.45	.40	−.05	00	05	155	45m 1.50	.55	1.56	.60	−.06	05	04
120	48.55	.60	48.54	.50	+.01	05	04	156	3m 48m 08m 24	.26	8.30	.30	−.06	02	00
121	54.85	.90	54.80	.80	+.05	05	00	157	27.20	.20	27.26	.23	−.06	00	03
122	41m 58.80	.80	58.80	.80	−.00	00	00	158	36.53	.50	36.50	.50	+.03	03	00
123	42m 02 70	.70	02.75	78	−.05	00	02	159	49.50	.50	49.50	.50	.00	00	00
124	06.50	.50	06.50	.53	.00	00	05	160	48.58.75	.73	58.80	.78	−.05	02	02
125	09.25	.25	09.23	.23	+.02	00	00	161	49m 04.15	.10	4.10	.10	+.05	05	00
126	17.05	.05	17.05	.05	.00	00	00	162	19.48	.48	19.48	.48	.00	00	00
127	21.85	.90	21.85	.82	.00	05	03	163	25.35	.35	25.33	.35	+.02	00	02
128	25.60	.60	25.65	.63	−.05	00	02	164	31.35	.40	31.45	33	−.10	05	02
129	28.90	.93	29.00	.00	−.10	03	00	165	37.50	.53	37.46	.48	+.04	03	02
130	32.70	.74	32.64	.60	+.06	04	04	166	47.40	.35	47.40	.40	.00	05	00
131	36.95	.95	37.00	.00	−.05	00	00	167	49m 56.50	50	56.45	.45	+.05	00	00
132	42m 40.33	35	40.30	.30	+.03	02	00	168	50m 04.50	50	4.46	.40	+.04	00	06
133	43m 00.85	.85	00.85	.83	0.00	0.00	0.02	169	3m 50m 13.45	50	13.48	.50	−.03	05	02

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March 1st Comp. of Spring Governors continued

No. of obs.	A	2nd Reading	B	2nd Reading	A−B		I–II	I–II
170	3h 50m 26.60	.60	3h 50m 26.55	.60	+.05		0.00	0.05
171		30.30	.30	30.30	.25	.00	00	05
172		34.40	.40	34.40	.30	.00	00	10
173		42.05	.05	42.00	.00	+.05	00	00
174		50.70	.70	50.65	.70	+.05	00	05
175		53.20	.20	53.25	.28	−.05	00	03
176	51m 16.00	.00	15.97	.00	+.03		00	03
177		22.78	.80	22.78	.75	.00	02	03
178		30.75	.75	30.66	.72	+.09	00	06
179		38.30	.25	38.33	.30	−.03	05	03
180		43.40	.40	43.43	.47	−.03	00	04
181		47.40	.40	47.40	.40	.00	00	00
182		53.37	.38	53.30	.35	−.07	01	05
183	51m 55.80	.80	55.80	.70	−.00		00	10
184		4.68	.70	04.74	.75	−.06	02	01
185	3h 52m 21.25	.25	21.20	.25	+.05		0.00	0.05
186							383	408 = Total Sums
							183	184 = no of comps

Sum of positive values of A−B = +2.98
" negative " = −3.11
Diff −0.13

} Number of trials = n = 184

with a prob. error of $0.033 \times \sqrt{184} = 0.44$

Probable amount by which A gives an observation earlier than B is less than $\frac{-0.13 - 0.44}{184}$ or less than 0.003

Most probable constant difference of A & B 0.000

by single observation

Probable error of the difference of R.A. of two stars, of which one is read off from A & the other from B including sum of error of armature time & of the motion of the cylinder & the error of reading off of both sheets is

$$0.845 \cdot \frac{2.98 + 3.11}{184} = 0.033 = \text{prob. error of sum of two records}$$

The probable error of A, I suppose to be about $\frac{2}{3}$ of that of B. = 0.667 of this

$$\text{Prob. error of A} = 0.033 \sqrt{\frac{2^2+3^2}{2^2+3^2}} = 0.033 \sqrt{\frac{4}{13}} = 0.018$$

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We conclude from these comparisons that the two records made by the two Spring Governors are perfectly identical their probable constant difference being less than $0^s.003$. Their observed difference being only $\frac{0^s.13}{184.00} = 0^s.0007$

2nd ly That with the New Spring Governor (A.) the whole of the errors entailed by errors of reading off the record, by want of uniformity in the motion of the cylinder, by uncertainty in the time required for the armature to obey the signal give a probable error of $0^s.018$ to a single observation. The same for (B) is $0^s.027$

To find the error arising from reading off the record we have by the columns I - II, for (A) Probable error of a single reading off $= \frac{0.845}{\sqrt{2}} \cdot \frac{3^s.24}{183} = \frac{0^s.015}{\sqrt{2}} = 0.011$ And for (B) $\frac{0.845}{\sqrt{2}} \frac{4^s.09}{183} = \frac{0^s.019}{\sqrt{2}}$

Putting e for the probable error resulting from irregularity of uniform motion in the cylinder, from uncertainty in the response of the armature & other sources excluding that of reading off then

for (A) $0^s.018 = \sqrt{e^2 + (0.015)^2}$ $e = 0^s.010$ By 184 observations

for (B) $0.027 = \sqrt{e'^2 + (0.019)^2}$ $e' = 0.019$ "

The probable error for B is larger than there is any reason to apprehend in the ordinary conditions of the instrument.

By the results given in the succeeding four pages the probable error of a single observation from all sources including error of observing is $= 0.037$ while the error of observing alone is $= 0.032$

Therefor the mode of recording by the apparatus now in use only increases the probable error of a single observation by

$0^s.005$.

Which is moreover an error accidental in its nature so as to be eliminated by repeating observations.

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April 1st 1852 Observations with the Spring Governor for determining the Personal Equation in using the Electro Magnetic method of Observing – Between G.P.B & C.W.P. –

Made upon δ Orionis Dec. S. 0°.24' with Great Equatorial –
Dist. of Microm. wires = 60ᵛ.045 – 50ᵛ.045 = 10ᵛ.000 – Zero of position 282°.10' being the value since last daguerreotyping operations – Images good – air clear & calm
Double signal G.P.B. leads – Single signal W. C W.P. leads –

For personal Equation between the same Observers see obs in ~~Transit Bo~~ Equatorial Book March 16th 1852 for the ordinary mode of observing by the eye and ear. C.W.P – G.P.B = +0ˢ.050 See also Eq Book Dec 1853.

Obs. by Electro-Magnetic-Circuit –

E.C. (a)

	G.P.B leads	C W P.	Dif.	dif. from mean
EC	6ʰ 26ᵐ 27.37	6ʰ 26ᵐ 33.95	6.58	0.04
	46.30	28ᵐ 52.94	6.64	.02
	29ᵐ 03.18	9ᵐ 09.65	6.67	.05
	22.48	9ᵐ 29.05	6.57	.05
	41.44	47.97	6.53	.09
	00.53 .57	07.25 .27	6.72	6.7.10
	43.68	50.57	6.69	.07
	31ᵐ 03.38	31ᵐ 09.95	6.57	.05
			499	0.47 = ε
			6.621	Mean

(a')

	C.W.P. leads	G.P.B.	Dif	
EC.	6ʰ 31ᵐ 27.95	6ʰ 31ᵐ 34.56	6.61	0.11
	46.87	31ᵐ 53.30	6.43	.07
	32.03.38	32.09.80	6.42	.08
	32.20.30	32.26.80	6.50	.00
	2.35.37	2.41.80	6.43	.07
	2.53.30	2.59.73	6.43	.07
	33.14.53	3.21.04	6.51	.01
	3.29.98	3.36.37	6.39	.11
	33.45.90	33.52.50	6.60	.10
	34.03.52	34.10.23	6.71	.21
			503	ε = .183
			6.503	Mean

Time of passage over 1st wire by G.P.B. $= t_1 \pm \varepsilon_1$
" 2nd " C.W.P $= t_2 \pm \varepsilon_2$

$$\text{Dif.} = (t_2 - t_1) \pm \sqrt{\varepsilon_1^2 + \varepsilon_2^2} = (t_2 - t_1) \pm \varepsilon\sqrt{2}$$

$$0.674\sqrt{\frac{\Sigma(\text{Dif. from mean}(t_2 - t_1))}{n-1}} = \varepsilon\sqrt{2} = 0.84\,\frac{\Sigma(\text{Dif.})}{n-1}$$

ε includes (pr. er of observer in giving signal for instant of passage of [image of star
(prob. amt. of sudden atmospheric changes on the image of star.
(pr. er of recording ap. in registering signal)
(" of reading of sheet by scale)

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(b) G.P.B. leads	G.W.S.	Dif. from mean		(b') G.W.S. leads	G.P.B.	Dif.	Dif. from Mean
E.G. 6h 35m 15.72	6h 35m 22.27	6.55	0.04	6h 39m 14.88	6h 39m 21.48	6.60	.07
35 31.95	38.44	6.49	.10	9 30.86	9 37.27	6.41	.12
35 42.38	5 38.86	6.48	.11	9 48.28	9 54.75	6.47	.06
35 29.85	36 30.74	6.59	.01	40 09.68	40 16.33	6.65	.12
35 39.95	46.47	6.52	.07	40 26.43	40 31.92	6.49	.04
35 56.24	37 02.85	6.61	.02	40 41.87	40 48.45	6.58	.06
7 17.30	7 24.18	6.68	.10	40 58.90	41 05.53	6.58	.05
7 33.57	7 40.28	6.71	.12	41 19.68	41 26.23	6.55	.02
7 50.40	7 57.05	6.65	.06	41 34.90	41 41.42	6.52	.01
8 11.34	8 17.95	6.61	.02	41 55.25	42 01.64	6.39	04
8 28.65	8 35.28	6.63	.04	42 09.80	2 16.15	6.53	02
38 44.26	8 50.78	6.52	.07	42 26.18	42 31.64	6.46	0.61 = Σ
		704	0.76 = Σ			6.526	Mean
		6.587	Mean				

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(c) G. P. B. leads	C. W. T.	Dif.	Dif. from Mean	C. W. T. leads	(c') G. P. B.	Dif.	Dif. from Mean
E.C. 6h 46m 28.65s	6h 46m 35.30	6.65	0.06	6h 52m 26.68	6h 52m 33.20	6.52	0.00
6 51.53	58.18	6.65	.06	2m 57.50	2m 53.95	6.45	.07
7 13.70	20.28	6.58	.01	3m 10.65	3m 17.20	6.55	.03
7m 31.44	37.90	6.46	.13	3m 26.30	3m 31.82	6.52	.00
7m 50.35	56.87	6.52	.07	3m 45.60	3m 52.10	6.50	.02
8m 06.58	13.20	6.62	.03	4 03.24	4m 09.77	6.53	.04
8m 25.20	31.70	6.50	.09	4 19.05	4m 25.60	6.55	.03
8m 43.90	50.63	6.73	.14	54 38.63	4m 45.05	6.52	.00
9m 02.72	09.27	6.55	.04	4 57.58	5m 04.14	6.46	.06
9m 25.30	31.84	6.54	.05	5 13.34	5m 19.90	6.56	.04
49m 45.24	51.78	6.54	.05	5m 32.05	5m 38.64	6.59	.07
50m 08.65	15.35	6.70	.11	5m 49.15	5m 55.68	6.53	.01
50m 28.68	35.24	6.56	.03	04.85	6m 11.48	6.63	.11
50m 53.18	59.80	6.62	.03	23.90	30.28	6.38	.14
		822	0.90 = Σ	40.04	46.58	6.54	.04
		6.587	Mean			786	0.66 = Σ
						6.524	Mean

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April 1st

(d)

G. P. B. leads	C. W. T.	Dif.	Dif. from Mean	C. W. T. leads
Exh. E.C. ~~1h 49m 50.84~~	~~11h 49m 58.00~~	~~7.16~~		12h 00m 01.48
50.07.76	14.63	6.87	0s.03	0 15.00
26.74	33.80	7.06	.16	0 32.68
42.58	49.64	6.76	.14	1 06.90
51 57.65	52 04.50	6.85	.05	1 25.95
2 13.74	2 20.55	6.81	09	1 42.30
31.51	2 38.40	6.89	.01	2 00.85
50.00	2 56.90	6.90	00	2 26.20
53 06.43	13.30	6.87	.03	2 42.30
20.20	26.94	6.74	.16	2 58.20
37.50	.40	6.90	00	3 17.70
53 54.30	54 01.20	6.90	.00	3 34.85
4 11.38	18.40	7.02	.12	3 53.20
4 27.60	34.50	6.90	00	4 08.95
4 42.05	49.00	6.95	05	4 25.06
4 59.45	55 06.50	7.05	.15	4 42.80
5 16.20	5 23.04	6.84	.06	4 03.00
5 32.80	5 39.73	6.93	03	16.90
5 50.20	5 57.00	6.80	10	31.40
6 24.37	6 31.22	6.85	.05	48.70
11 56 44.76	11 56 51.78	7.02	12	
27.20	28.00	6.80	10	
38.48	.40	6.92	02	
56.58	03.63	7.05	.15	
11.40	18.40	7.00	10	
27.80	34.68	6.88	.02	

25) 172.56 ~~Mg~~ = Σ = 1.73

6.902

6.834

.068

(d')

G. P. B.	Dif.	Dif. from Mean
12h 00m 08.35s	6.87	0s.04
24.85	6.85	02
89.30	6.70	13
13.73	6.83	.00
32.80	6.85	.02
49.00	6.70	13
07.72	6.87	.04
32.95	6.75	.08
49.05	6.75	.08
05.60	6.90	.07
24.65	6.95	.12
41.66	6.81	.02
00.20	7.00	.07
15.84	6.89	.06
32.00	6.94	.11
49.70	6.90	.07
09.90	6.90	.07
23.70	6.80	.03
38.20	6.80	03
55.53	6.83	.00

13664 Σ = 1.19

6.834

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Reduction of preceding Obs

Sums of Dif. from Mean | No of Obs

Σ = 0.47	8
.83	10
.76	12
.61	11
.40	14
.66	15
1.73	25
1.19	20
7.15	115 Obs

Prob. error of each = $\sqrt{(\text{prob. error CWS})^2 + (\text{prob. error GPB})^2}$

Put prob. error CWT = prob. error GPB. Then

Prob. error of a single observation = $\frac{\text{prob. error single dif}}{\sqrt{2}}$

Let x = error of observing - That is the error committed in not touching the break circuit rightly

Prob. error of single obs. = $\sqrt{x^2 + (\text{prob. error from mode of registry})^2}$

By deductions of a few pages back & the result of the three last pages

$$0^s.037 = \sqrt{x^2 + (0^s.018)^2} \qquad x = 0^s.032$$

7.15 = 0.85431
115 = 2.06070
8.79361
0.84535 9.92704
0.058 = 8.72065

Therefor -

The probable error of giving the signal alone is $0^s.032$ - & all other sources only increase the probable error of observing by $0^s.005$

Prob. error of a single dif. between CWS and G.P.B. = $0^s.053$ = probable error of an observed dif. of R of two stars by a single Obs.

8.72065
$\sqrt{2}$ 0.15051
$0^s.037$ = 8.57014 By 115 Obs.

Prob. error of a single observation including all the sources of error known

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Reduction for personal Equation

G P B leads — Star δ Orionis — C.W.T. leads

Int. of wires by set (a) = 6ˢ.62 by 8 obs.
(b) .59 12
(c) .54 14
19.80 34
Weight Correction −.01
19.79
6.597
6.515
2 | 0.082
0.041 by 35 obs

Int. of wires by set (a') = 6ˢ.50 by 10 obs
(b') = .53 11
(c') = .52 15
5 36
6.515

Star.

Int. of wires of wires by set (d) = 6.902 25 obs
6.834
2 | 0.068
0.034 by 23 obs
0.041 " 35 "
Mean by weight 0ˢ.038
Prob. error 0.005

Int. of wires by set (d') = 6.834 by 20 obs

C.W.T. gives signal later than G.P.B.
Probable error = $\frac{0^s.037}{\sqrt{58}}$ = 0ˢ.005

By the old method of observing by the eye and ear C.W.T. observed later than G.P.B by 0ˢ.05 (See Eye Book March 16th 1852)

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Ill. East (342).

April 1st Sm.

194	194	194	194	194	194
γ Leonis	Moon's 1st limb	χ Leonis	δ Leonis	δ Hydræ at Bset.	ϵ Leonis
51.0	40.4	27.9	16.5	01.0	17.0
06.0	54.5	41.8	31.0	15.0	31.0
0 20.5	09.0	55.5	45.8	29.0	45.0
0 35.0	9 23.4	6 09.5	5 00.5	0 43.3	4 59.0
0 49.5	9 38.0	6 28.2	5 15.0	0 57.5	5 13.1
1 04.5	9 52.5	6 37.0	5 30.0	1 11.5	5 27.0
10 11 19.0	10 40 07.0	10 56 51.0	11 05 45.0	11 11 25.8	11 15 41.3
185.5	224.8	245.9	183.8	183.1	233.4
60	60	180	180	120	180
7)245.5	7)164.8	7)65.9	9.8	7)303.1	7)413.4
35.07	23.54	09.41	0.54	43.3	59.06
−2	−2	−2	−2	−2	−2
10 10 33.07	10 39 21.54	10 56 09.41	11 04 58.54	11 10 41.30	11 14 57.06

April 1/2 Sm.

M.T.G 19 43 00

194 20 25 45.5

1 17.37

26 27 02.87 00 39 58.82

00 40 45.56 46.74

19 46 17.31 00 40 45.56

3 14 34

19 43 02.97

19 43 00

297

16

18.97

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April 1/2 Am.

194	
α Cygni	
4.. 09.0	
4.. 28.2	
4.. 47.5	
5.. 06.9	
5.. 26.3	
5.. 45.5	
20.. 36.. 04.8	
168.2	
120	
2) 48.2	
6.89	
−2	
20.. 35.. 04.89	
20.. 36.. 22.25	
1.. 17.37	

2/3 Am.

194	
γ Cygni	
19.7	
35.0	
30.8	
21.. 06.. 07.0	

194	
β Aquarii	
1.. 45.4	
1.. 54.4	
2.. 13.3	
2.. 27.0	
2.. 40.8	
2.. 54.6	
21.. 23.. 06.4	
248.9	
60	
2) 188.9	
26.98	
−2	
21.. 22.. 24.98	
21.. 23.. 44.82	
1.. 19.84	

April 7 Pm

E.C.	
δ Draconis	
7.. 09.00	
7.. 22.95	
7.. 36.80	
7 50.65	
8 4.45	
8 18.40	
5.. 08.. 32.45	
174.70	
180	
354.70	
5.. 07.. 50.67	
5.. 07.. 24.64	
26.03	

194	
ε Orionis	
56.0	
7.. 12.9	
7 26.5	
7 40.35	
5.. 27.. 54.00	
5.. 27.. 10.9	
5.. 26.. 41.44	
1.. 30 54	

April 2/3 Am.

M.T. G.	20.. 25.. 40	
194	21.. 12.. 27.0	
	1.. 19.84	
	21.. 13.. 46.84	00.. 45.. 56.37
	00.. 44.. 42.11	46.74
	20.. 29.. 04.73	00.. 44.. 42.11
	3.. 21.. 35	
	20.. 25.. 43.38	
	20.. 25.. 46	
	3.38	
	16	
	19.38	

M.T. G.	19.. 45.. 00	1.. 11.. 31.24
194	20.. 59.. 01.8	46.74
	1.. 36.57	1.. 12 17.98
	2100 38.33	
	1.. 12.. 17.98	
	19.. 48.. 20.35	
	3.. 14.67	
	19.. 45.. 05.68	
	19.. 45.. 00	
	5.68	
	16	
	21.68	

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April 9/10 10 Pm.

194 194
ζ Cygni α Leonis
06.5
20.5
35.0
21.. 05.. 03.0 mid 5.. 49.4
6.. 03.7
6.. 18.0
4.. 22.. 32.3
165.7
160
7)345.7
49.39
−2
4.. 25.. 47.39
4.. 27.. 24.74
1.. 37.35

15.03
−2
21.. 05.. 01.0
21.. 06.. 37.53
1.. 36.53

April 13 Pm. Ill. East

194 194
α Hydra α Leonis
−8° 55.4 +13 05.0
9.0 19.0
8.. 23.0 8.. 33.1
8.. 36.5 8.. 47.0
8.. 50.5 9.. 01.0
9.. 04.3 9.. 15.0
9.. 19.. 18.4 9.. 59.. 29.3
197.1 149.4
60 160
7)257.1 7)309.4
36.73 47.06
−2 −2
34.73
cul. − .14 9.. 58.45.06
ar. − .16 cul − .14
lev. − .04 ar − .11
9.. 18.34.39 lev − .05
9.. 20.. 19.10 9.. 58.44.76
1.. 44.71 10.. 00.. 29.57
1.4481

21.98

10 Pm

M.J.C. 3.. 16.. 15
194 4.. 31.. 30.5
1.. 37.35
1.. 13.. 27.80 4.. 33.07.85
46.74 1.. 16.. 14.54
1.. 16.. 14.54 3.. 16.. 53.31
32.39
9.. 16.. 20.98
3.. 16.. 15
5.98
16

April 13 Pm.

M.J.C. 7.. 59.. 20 1.. 27.. 17.46
194 9.. 27.. 06.0 46.74
1.. 44.81 1.. 28 04.20
9.. 28.. 50.91
1.. 28.. 04.20
8.. 00.. 46.71
1.. 18.77
7.. 59.. 27.94
7.. 59.. 20
7.94 + 16 = 23.94

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1852phae.proj:...12T

Ill East

April 13/14 Am.

194

α Andromeda

+28°

11.9

27.5 5.6

8.43.0 5.5

8.58.5 5.5

9.14.0 5.5

9.29.8 5.8

23.5 9.45.4 5.6

230.1

160

7)410.1

58.58

−2

23.58.56.58

00. cul −.28

az −.08

lev −.12

23.58.56.10

00.00.43.23

1.47.13

April 16 Pm

194

α Canis Min.

+6° 01.0

15.0

9.28.8

9.42.5

9.56.4

0.10.0

7.30.24.0

7)297.7

42.53

−2

7.29.40.53

7. cul −.24

az −.17

lev −.08

7.29.40.04

7.31.32.66

1.52.62

194

β Gem.

+28° —

53.0 5.5

08.5 5.4

4 24.4 5.4

4 40.6 5.4

4 55.4

7.35.11.8

181.3

60

5)121.3

24.26

−2

7.34.22.26

cul −.28

az −.08

lev −.12

7.34.21.78

7.36.14.74

1.52.96

194

12 Com. Venat.

+39° —

—

—

16.0

33.5

50.9

12.48.09.4

16

−2

12.47.14.0

cul −00.32

az −.02

lev −.13

12.47.13 53

12.49.07.07

1.53.54

April 13/14 Am.

M.T.G 22.36.45

194 00.06.53.5

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1852phae.proj...12T

April 16/17 Am.

194

α Aquarii

−1°

36.5
50.4
8 03.9
8 18.0
8 31.6
8 45.4
21 58 59.0
244.8
120
7)124.8
17.83
−2
21 57 15.83
col −.24
ar −.19
lev −.07
21 58 15.33
21 58 09.94
1 54.61

17 Pm.

194

α Hydrae

−8°

44.0
57.5
8 11.5
8 25.4
8 39.3
8 53.0
9 18 07.0
237.7
60
7)177.7
25.38
−2
9 17 23.38
col −.24
ar −.22
lev −.06
9 18 22.86
9 20 19.04
1 56.18

194

12 Can. Ven.

+39°

18.5
37.5
55.4
8 13.0
8 30.4
8 48.5
12 48 06.0
209.3
120
2)89.3
12.76
−2
12 46 10.76
col −.32
ar −.02
lev −.13
12 47 10.29
12 49 07.07
2 56.78

April 22 Pm.

194

α Leonis

+12°

41.0
55.0
8 08.9
8 23.0
8 37.0
8 51.2
9 59 05.4
221.5
60
7)161.5
23.07
−2
9 58 21.07
col −.24
ar −.15
lev −.09
9 58 20.63
10 00 29.46
2 08.83

16/17 Am

M.J.L.

194

1 39 07.12
46.74
53.86

20 29 25
22 10 55.5
1 54.61
22 12 50.11
1 39 53.86
20 32 56.25
3 21.96
20 29 34.29
29 25.00
9.27 +16

25,27

April 22 Pm.

M.J.L.

194

2 02 46.44
46.74
2 03 33.18

8 09 20
10 12 10.5
2 08.83
10 14 25.33
2 03 33.18
8 10 52.15
1 2041
8 09 31.74
8 09 20
11.74

slow of Bank 27.74

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1852phae.proj...12T

April 24 Pm.

194
ε Hydra
04.0
17.9
31.5
6 45.4
6 59.3
7 13.0
8 37 27.0
198.1
120
7)318.1
45.44
−2
8 36 43.44

Ill. East

April 27 Pm.

194
α Orionis
clouds
47.5
4 51.4
5 05.3
5 19.1
5 45 33.0
194.2
60
3)154.2
51.40
−2
5 44 49.40
8 47 08.58
2 19 18

194
α Gem.
18.5
34.5
51.0
7 28 07.5
clouds

36.9
14
22.5
44
22)21.1(1.9
198
12

April 22/23 Sun
N.Y.C. 194

19 57.00
22 01 52.0
2 12 10.09
22 04 02.03
2 09 33.18
20 00 28.85
3 16.66
19 57 12.19
19 57
12.19
16

April 27 Pm
Ill. C 194

3 30 30
5 52 15.5
2 19.4
5 54 34.9
2 23 15.95
3 31 18.95
34.61
3 30 44.34
3 30 30
14.34 + 16 30.34

2 22 29.21
46.74
2 23 15.95

28.19

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1852phae.proj. . .12T

(34.8)

Ill East

April 27 Sun.

E.C.	E.C.	E.C.	E.C.	E.C.	E.C.
8 Caneri	ε Hydrae	α Canesa	Moon's Ilimb	α Hydrae	ε Leonis
41.50	23.50	50.20	51.80	46.50	50.45
55.95	+7° 37.25	4.10	6.80	−8° 00.30	+24° 5.60
10.40	51.10	18.15	21.70	14.25	20.80
6. 25.05	9.. 05.00	32.20	6.. 36.28	0 27.90	7.. 35.80
6 39.40	9.. 18.90	0 46.50	6.. 51.30	0 41.90	7.. 50.85
6.. 54.00	9.. 32.60	1 00.40	7.. 06.18	0 55.80	8 5.93
8.. 37.. 08.. 55	8.. 39.. 46.55	8.. 51.. 14.70	9.. 17.. 21.00	9.. 21.. 09.75	9.. 38.. 21.00
234.85	214.90	166.25	196.06	196.40	190.43
60	180	60	60	60	60
7)174.85	7)34.90	7)226.25	7)255.06	7)196.40	7)250.43
24.98	39.04.98	8.. 50.. 32.32	9.. 16.. 36.43	9.. 20.. 28.06	9.. 37.. 35.77
	col. −.17			col −.17	col. −.18
	az. − .10			az. −.12	az. − .07
	lev. − .08			lev −.06	lev. − .11
	8.. 39.. 04.63			9.. 20.. 27.71	9.. 37.. 35.41
	8.. 38.. 55.98			9.. 20.. 18.91	9.. 37.. 26.71
	8.65			8.80	8.70

27th PM Circuit put on EC & left over night.

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(349)

1

Ill. East

April 27

E.C.
r Lewis

42.30
56.60
10.60
0 24.63
0 39.20
0 53.15
9.. 51.. 07.40
233.88
60
7)173.88
9.. 50.. 24.84

E.C.
η Lewis

42.0
56.15
10.90
9.. 25.00
9.. 39.40
9. 54.10
10.. 00.. 08.40
235.95
60
7)175.95
9.. 59.. 25.13

EC
a Lewis

56.71
10.76
24.83
38.83
53.00
7.00
10.01.. 21.30
212.43
60
7)272.43
10 0 38.92

April 27/28 Am

E.C.
γ Pegasi

+14° 3.10
17.10
31.05
5 45.40 —
5.. 59.50
6 13.70
00.. 06.. 28.10
197.95
120
7)317.95
05.. 45.42
col — .17
az — .08
lev — .09
00.. 05.. 45.08
5.. 35.99
9.09

EC has been going all night with circuit on.

Since 8h Sid.

EC −0.1

76
09
.34
2

EC +.68

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Ill. East

April 28 Pm.

	E C	E.C.	E C	E.C.	E.C.	E.C.
	ε Leonis.	ε Leonis	η Leonis	α Leonis	γ Leonis	Moon's I limb
+24°	17.95 A	8.55	8.30	22 85 A	40,40	33.05
	31.95 B	22.83	22.50	+13 36.85 B	55.10	47.95
	46.95 C	36.80	37.00	50.92 C	9.80	2.25
	6„ 2.10 D	6„51.00	7„ 51.60	9„ 4.98 D	a 24.45	3„ 16.83
	6„ 17.15 E	9 5.10	8 6.00	9„19.10 E	o 39.60	3„ 37.40
	6„ 32.15 F	9 19.20	8 20.20	9 33.10 F	o 53.80	3„ 46.37
	9„ 36„47.45 G	9„49„33.20	9„ 38„34.70	9„ 59„47.50 G	10„ 11„08.60	10. 14„ 01.00
	195.70	176.68	180 30	215.30	231.15	178.85
	180	180	180	180	60	60
	7)15.70	7)356.68	7)360.30	7) 35.30	7)171.15	7)118.85
	9„ 36„02„24	9„48„50.95	9„ 57„ 51.47	9„ 59„05.04	10„ 10.24.45	16.98
	cal. -.18			cal -.17		
	ar. -.07			wr -.08		
	lev. -.11			lev -.09		
	9„ 36„01.88			9„ 59„04.70		
	9„ 37„ 26.69			10. 00„29.39		
	1 24 81			1„ 24.69		

EC was stopped & pallets adjusted & cleaned

& a New Trial of Rate of EC. With circuit on. was commenced

28 Pm.

E.C. was stopped and pallets fixed by R.F.S at 7½ sid. time

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Ill East

April 28 Am.
E.C.
ρ Leonis

+10°	55.15
	9.20
	23.00
3	36.90
3	50.88
4	4.80
10 24	19.00
	193.93
	60
	7)253.93
10 23	36.99
	cul. −.17
	az. −.09
	lev. −.09
10 23	36.64

April 28/29 Am.
E.C.
α Andromedæ

	32.40
+28°	48.00
	3.40
	19.10
	34.90
	50.40
0 00	06.20
	194.40
	60
	7)134.40
23 59	19.20
	cul. −.19
	az. −.05
	lev. −.12
23 59	18.84
00 00	43.54
	1 24.70
	1 24.69
	0.01

E.C.
γ Pegasi

3	29.10
+14° 3	43.50
3	57.00
4	11.60
4	25.60
4	39.80
00 04	54.30
	260.80
	180
	7)80.80
00 04	11.54
	cul. −.17
	az. −.08
	lev. −.09
00 04	11.20
00 05	36.00
1	24.80

circuit has been on since 27th 8h but the clock was adjusted previous to the 8h obs. of the 28th

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See two next pages

April 30 Pm.

194	194	194	194	194
δ Leonis	δ Hydra et Crateris	ι Leonis	ξ Virginis	β Leonis
06.0	50.4	06.4	54.0	23.9
20.9	4.5	20.4	48.5	38.0
35.0	9„ 18.5	3„ 34.5	01.5	52.3
3 50.0	9„ 32.8	3„ 48.5	5„ 15.5	9 6.5
4 04.4	9„ 47.0	4„ 02.5	3„ 29.4	9 21.0
4 19.5	0 01.0	4„ 16.5	5„ 43.5	9 35.0
11„ 04„ 34.3	11„ 10„ 15.2	11„ 14„ 30.4	11„ 35„ 57.4	11„ 39„ 49.4
169.5	169.4	159.2	228.8	226.1
180	60	180	120	180
7) 349.5	7) 229.4	7) 339.2	2) 108.8	7) 46.1
49.93	32.77	48.46	15.54	6.58
−2	−2	−2	−2	−2
11„ 03 47.93	11„ 09„ 30.77	11„ 13„ 46.46	11„ 35„ 13.54	11„ 39„ 04.58

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1852phae.proj...12T

194	194	194	194
Moons I limb	17 Virginis	B Corvi	12 Com. Ven.
10.5	15.0	29.0	~~49.54~~
24.8	29.0	44.0	7.0
6. 39.0	42.7	58.5	24.5
6. 53.0	9 56.5	13.5	42.5
7. 07.0	0 10.4	28.5	00.0
7. 21.3	0 24.2	43.5	17.4
12. 07. 35.4	12. 10. 38.0	12. 24. 58.4	12. 47. 3518
192.0	215.8	295.4	176.6
180	180	180	120
7)371.0	7)395.8 54	195.4	7)296.6
53.0	56.74	13.63	12 46 42.37
-2	-2	12. 24. 11.63	- 2
12. 06. 51.0	12. 09. 54.74 54 Σ instr.	- 60	12 46 40.37
		12. 24 11.03	
		12. 26. 38. 20	
		2. 27. 17	

2. 34. 18.87
46.75
05.62

April 30 8pm.
M.T.G. 10 „ 21 „ 15
194 12 „ 55. 52
2 „ 27.2
12 „ 58 „ 19.2
2 „ 35 „ 05.62
10 23.13.58
1 42.1
10 „ 21 „ 31.48
10 „ 21 „ 15.0
16.5

CC for the last 48 hours has had the battery on constantly

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(35.42)

Ill. East

Circuit has been on 48 hours

April 29 Pm.

Shut read off on 30th

E.C.	E.C.	E.C.	E.C.	E.C.	E.C.
	ρ Leonis	δ Leonis	Morris Clark	ε Leonis	ξ Virgini
+13 22.95			5.3	6.73	34.00
87.20	+10 55.20	+21 6.0	19.2	21.00	48.00
51.15	9.10	9 " 21.0	0 33.85	35.00	2.00
9 5.35	23.30	4 " 35.6	0 48.00	49.00	6 16.00
9 19.45	3 " 36.98	4 " 50.6	1 2.50	3.00	6 29.80
9 33.60	3 51.25	5 " 05.1	1 16.70	16.80	6 43.70
9 " 59 " 47.55	4 5.00	5 19.8	11 " 11 " 31.30	11 " 15 " 31.00	11 " 36 " 57.60
217.25	10 " 24 " 19.15	11 " 05 " 34.7		162 226.53	231.10
180	19.98	192.8	156.85	180	180
7) 37.25	60	180	180	7) 342.53	7) 111.10
9 " 59 " 05.32	7) 259.98	7) 352.8	336.65	11 " 14 48.93	11 " 36 " 15.87
col. −16	10 " 23 " 37.14	11 " 04 " 50.40	11 " 10 " 48.12		
ar. −.04	col −16	ar −.18			
lev. −.09	ar −.09	col −.06			
9 " 59 " 04.99	lev −.09	lev −.10			
10 " 00 " 29.37	10 " 23 37 80	11 " 04 " 50.06			
1 " 24.38		11 " 06 " 14.45			
		1 " 24.39			

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(353)

Circuit has been on 62 hours

29 Pm
E.C.
B Leonis

24.20
38.50
52.80
0„ 6.95
0„ 21.15
0 35.50
11„40„49.80
228.90
180
7)48.90
11„40„06.98

April 29/30 Am.
E.C.
a Pegasi

16.00
+14 30.20
5„44 30
6„ 58.50
6„ 12.80
6„ 26.80
22„ 56 41.00
229.60
180
7)409.60
22 55„ 58.51
cor. −.16
az. −.08
lev. −.09
22„55„58.18
22„57„22.66
1„24.48

E.C.
a Cassiopeae

29.24 A
+55 58.10 B
0 17.85 C
0 42.20 D
1„ 6.80 E
1„31.00 H
00„31„55.50 G
235.69
60
7)295.95
00 30„42.28
cor. +.28
az. +.06
lev. −.17
00„30„41.89
00„32„06.40
1„24.51

May 2/3 Am.
194
a Pegasi

+14° 11.0
25.0
4„39.1
4„53.3
5„07.5
5„21.7
22„55„36.0
193.6
180
7)373.6
22„54„53.37 − 5/2
cor. −.18
az. −.08
lev. −.09
22„54„53.02
22„57„22.74
2„29.72
+ 2/2
2„31.72

194
a Andromedae

+28° 27.5
43.0
58.9
8„14.1
8 30.0
8 45.4
23„56„01.3
220.2
120
7)100.2
14.31
− 2/2
23„58„12.31
cor. −.16
az. −.04
lev. −.12
23„58„11.99
00„00„43.64
2„31.65
2„31.72
2.31.68
2.27.17
5)4.51
.90 2/2
−1.8

Circuit taken off.
May 1st AM

2L 29h. Pegs. − 1„24.39
30. Am 1„24.49
1/2
−0.20

May 2/3 Am.
M.S.C. 19„52„30
194 22„36„31.0
2„31.72
2 39„02.72
2„42„58.72
19„56„04.00
3„15.96
19 52„48.04
19„52„30
18.04
1/2

2„42„11.98
46.74
2„42„58.72

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Ill. East

May 3 Pm. 194 δ Leonis

+21°	59.5
	14.5
	29.2
	43.5
3,,	58.5
4,,	13.5
11,, 04,,	28.0
	246.7
	60
7)	306.7
11,, 03,,	43.81
	−2
11,, 03,,	41.81
col.	−.14
az.	−.05
lev.	−.10
11,, 03,,	41.52
11,, 06,,	14.43
2,,	32.91

15.0
14.7
14.3
15.0
15.0
14.5

194 β Leonis

+15°	17.8
	32.0
	46.0
9,,	00.3
9,,	14.5
9,,	29.0
11,, 39,,	43.4
	183.0
	180
7)	03.0
11,, 59,,	00.43
	−2
11,, 58,,	58.43
col.	−.14
az.	−.06
lev.	−.09
11,, 58,,	58.14
11,, 41,,	31.11
2,,	32.97

fair reading

May 3/4 Am. 194 α Aquarii

	57.3
−1°	11.0
	24.5
5,,	38.4
5,,	52.1
6,,	06.6
21,, 56,,	19.8
	2091
	60
7)	269.1
	38.44
	−2
21,, 55,,	36.44
col.	−.14
az.	−.08
lev.	−.07
21,, 55,,	36.15
21,, 58,,	10.39
2,,	34.24

May 3/4 Pm. 194 ε Canis Maj.

	27.5
−29°	43.4
	59.0
0,,	14.5
0	30.4
0,,	46.1
6,, 51,,	02.0
	222.9
	120
7)	102.9
	14.70
	−2
6,, 50,,	12.70
col.	−.16
az.	−.17
lev.	−.07
6,, 50,,	12.40
6,, 52,,	47.74
2,,	35.34

every minute

194 β Geminorum

	54.5
+28°	10.0
	25.8
	41.3
	57.0
	12.5
7,, 34,,	28.3
	229.4
	60
7)	249.4
	41.34
	−2
7,, 33,,	39.34
col.	−.16
az.	−.03
lev.	−.22
7,, 33,,	38.93
7,, 36,,	14.48
2,,	35.55

May 3/4 Am.

M.T. ℓ. 19,, 13,, 00

194 22,, 00 ,,	48.8
2,,	34.24
22,, 03 ,,	23.04
2,, 46,,	55.28
19,, 16,,	27.76
3,,	9.46
19,, 13 ,,	18.30
19,, 13	
	18.30
	16
	34.30 slow of Boston

2,, 46,, 08.54
46.74
2,, 46 55.28

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Trial of E.C. for Rate with circuit on.

Circuit put on April 27th PM

			sid. time h m		s	daily rate		
24	1852 – April	27th	9..12	fast	8.72	+0.64	by 8 stars	
	"		0..05	"	9.09		1	"

April 28 7h..00 clock stopped and pallets adjusted and cleaned

28	9..47	slow	1m..24.72	+0.06	15h	Circuit on	2
29th Sid. = 28 Ast.	0..02	"	1..24.75	+0.74	From 28th to 29th evening	by EC gained +0.34	2
29	10..32	"	1..24.38	−0.24	29h Ast to 30th Ast	" +0.25	2
29	23..46	"	1..24.50				2

Circuit taken off May 1st Am.

Circuit off

			sid. time h m		m s	daily rate	
May 2nd	23..30	slow	1..24.48	−0.11	From the 2 2/3 to 3 1/4 morning	by Rate +0.34	
3	11..9	"	1..24.54	+0.88			
3	22..58	"	1..24.14		From the 3rd PM to 4th PM		−0.15
4	6..11	"	1..24.67				
4	22..58	"	1..24.97				

The result of the above trial is not conclusive on account of the circumstances that the pallets were cleaned (& the clock stopped) just previous to the commencement of the series. So that there was no previous rate to compare with the subsequent

It goes to show a tendency of the clocks to gain 0.3 daily with the circuit on.

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May 4/5 Am.

E.C. a Pegasi	E.C. a Andromedæ
15.85	32.10
29.90	47.90
44.00	3.35
5 58.20	9 19.00
6 12.30	9 34.70
6 26.40	9 50.20
22„ 56„ 40.80	00„ 00„ 05.55
227.45	193.25
180	60
7)407.45	7)133.25
22„ 55„ 58.24	23„ 59„ 19.03
Eaur −36	−35
22„ 55„ 57.88	23„ 59„ 18.68
22„ 57„ 22.78	24 0 42.70
1„ 24.93	1„ 25.02

May 5/6 Am.

E.C. a Pegasi	E.C. a Andromedæ
15.90	32.00
29.80	47.40
43.90	9„ 03.10
5„ 57.90	9„ 18.40
6„ 12.10	9„ 34.05
6„ 26.00	9 49.80
22„ 56„ 40.30	00, 00„ 05.30
225.50	190.05
180	60
7)405.50	7)130.05
22„ 55„ 57.93	23„ 59„ 18.58

194 a Pegasi
03.0
+14° 17.0
31.3
4 45.5
4 59.6
5 13.7
22„ 53„ 28.0
198.1
120
7)318.1
45.44
−2
22„ 54„ 43.44
22„ 57„ 22.82
2„ 39.38
αl − .14
αz − .06
lev − 18
2„ 39.76

5/6 Am

	20„ 06„ 45
37	23„ 02„ 32.0
	2„ 39.76
36.10	23„ 05„ 11.76
1.5	2„ 54„ 48.39
37.5	20„ 10„ 23.37
36.08	3„ 14.25
34.30	20„ 07„ 05.08
2/1.78 | .89	20„ 06„ 45
18	20.08
18	16
	36.08 sbw of B

36.08 / 9 / 36.48

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1852phae.proj... 12T

May 10 Pm
154
a Hydræ
—
06.3
−8° 20.0
7" 38.9
9 47.9
9 01.5
9.. 18.. ~~15.5~~
109.6
60
5)169.6
9.. 17.. 33.92 −5/2
cal −.14
acc −.10
lw −13
9.. 17.. 33.55
9.. 20.. 18.71
2.. 45.16
+25
47

May 11 Pm
154
12 eun. Venat.
26.8
44.4
—
6.. 19.5
6 ~~37.5~~
6 55.0
12.. 47.. 13.0
~~8.2~~
1587
60
5)1947
29.74
−2
12.. 46.. 17.74
12.. 49.. 6.95
2.. 49.20

May 10 Pm
11.96
154
6.. 08.. 25
9.. 21.. 32.5
2.. 48.16
9.. 24.. 18.66
9.. 14.. 31.17
6.. 09 48.49
1.. 00.58
6.. 08.. 47.91
6.. 08.. 25
22.91
16

3.. 13.. 44.43
46.74
9.. 14.. 31.17

2.8
3.0
0.6

38.8
7.8
40 6

May 17. 03m. 86 — 43.01
of Boötes

38.91 slow of Boötes

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1852phae.proj...12T

May 14th AM 1852

A trial to see whether the micrometer wire of the Transit Circle or the fixed wires was more accurate in error in opposite directions.

The mean of two settings of the at a point halfway between two of them the mean of two sensibly in

			Middle setting		Left & Right	
		Mean	Mean	dif	Mean settings	dif
middle	2.947	.963	2.955			
Left & right	.829	022	926			
	947	936	943			
	828	050	934			
	960	973	966			
	885	065	975			
	009	982	995			
	059	912	986			
			965	.002	936	.018
	959	946	952			
	021	900	960			
	965	965	965			
	898	974	936			
			376	76	376	120
			2.963	.013	2.952	.020

Probable error of Middle setting = 0.011
" Left & Right " = 0.017
.006

It is possible that at a smaller distance the result would have been not the same.

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1852phae.proj:...12T

1852

(361)

17 Pm

194
α Leon
42.6
56.0
4.. 10.5
4. 24.5
4 39.0
4 53.4
4.. 25.. 07.5
232.9
60
7)172.9
24.7
-2
4.. 24.. 22.70
cul —.14
ar —.00
lev —.19
4.. 24.. 22.32
4.. 27.. 24.63
3.. 02.37

17/18 Am
194
α Pegasi
+14° 39.4
53.3
4. 7.4
4.. 21.5
4.. 35.6
4.. 50.0
22.. 55.. 04.3
211.8
60
7)151.8
21.68
-2
2 2.. 54.. 19.68
cul — .14
ar — .07
lev — .18
22.. 54.. 19.29
22.. 57.. 23.17
-3.. 03.88

18 Pm
194
α Hydrae
−8° 34.4
48.3
2.0
2.. 16.0
2 28.8
2 43.5
9.. 22.. 58.5
231.5
120
7)111.5
15.9
-2
9.. 22.. 13.98
cul — .24
ar — .00
lev — .08
9.. 22.. 13.61
9.. 20.. 18.61
1.. 55.00

194
ε Leonis
+24° 38.4
53.5
8.5
9.. 23.5
9.. 38.8
9.. 54.0
9.. 40.. 09.0
225.7
60
7)165.7
23.67
-2
9.. 39.. 21.67
cul — .26
ar — .00
lev — .14
9.. 39.. 21.27
9.. 37.. 26.39
1.. 54.88

194
α Leonis
+13° 44.0
58.3
12.0
2.. 26.3
2.. 40.4
2.. 54.5
10.. 03.. 08.5
244.0
60
7)184.0
10 02.. 26.28
-2
10.. 02.. 24.28
cul —.24
ar —.00
lev —.12
10.. 02.. 23.92
10.. 00.. 29.13
1.. 54.79

18 9.. 15 Pm 194 set forward 5 minutes

May 17. Pm.
M.T.G. 6.. 11.. 00
194 9.. 51.. 33.8
3.. 02.71
9.. 54.. 36.51
3.. 42 7.06
6.. 12.. 29.45
1.. 1.02
6.. 11.. 28.43
6.. 11
28.43
16

3.. 41.. 20.32
46.74
3.. 42 07 06

421.44 slow of Berlin

17/18 Am

M.T.G. 19.. 26 15
194 23.. 6.. 58.5
3.. 3.88
23.. 12.. 02.38
3.. 42.. 7.06
19.. 29.. 55.32
3.. 11.66
19.. 26.. 43.66
19.. 26.. 15
28.66

28.66
16
44.66

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1852phae.proj...12T

Ill East

May 19 Pm.

194	194	194		194	194
α Hydrae	ε Leonis	α Leonis		α Andromeda	γ Pegasi
31.8	35.9	41.5		50.5	49.0
45.5	51.0	55.5	+28°	6.3	01.0
59.5	6.0	9.8		21.5	9„ 15.4
2 13.2	9 21.0	2„ 23.8		2 39.3 —	9 29.5
2 27.3	9 36.3	2„ 37.5		2 53.0	9 43.9
2 41.1	39 51.0	2„ 52.0		3 8.5	9 58.1
9„ 22 55.0	9„ 40„ 06.3	10„ 03„ 06.0		00„ 03„ 24.0	00„ 08„ 12.4
273.4	297.5	296.5		201.1	297.3
180	60	60		60	60
7)93.4	7)147.5	7)166.5		7)261.1	7)207.3
13.34	21.07	23.78		37.30	29.61
−2	−2	−2		−2	−2
9„ 22„ 11.34	9 39„ 19.07	10„ 02„ 21.78		00„ 02„ 35.30	00„ 07„ 27.61
				cul −4,28	cul − .24
				ar .00	ar .00
				lev − .16	lev − .12
				00„ 02„ 34.86	00„ 07„ 27.25
				0„ 44.11	01„ 05„ 36.53
				1„ 50.75	1„ 50.72

18 Pm.

M 26 5„ 39„ 05
194 9„ 28„ 28.5
1„ 54.9

3„45„16.87
46.74
3„46 03.61

9„ 26„ 33.6
3„ 46„ 3.61
5„ 40„ 29.99
55.78
5„ 39„ 34.21
5„ 38„ 05
29.21
16
45.21

slow of Burton

19 Pm.

M 26 5„ 9„ 40
194 9„ 2„ 53.5

46.52
44.66
21.86
9

19/20 Am.

M 26 20„ 17„ 40
194 00„ 13„ 21.5
1„ 50.7

3„49„ 13„ 43
46.74
3„ 50 00.17

00„ 11„ 30.6
3„ 50„ 00 17
20„ 21„ 30,63
3„ 20.11
20 18„ 00.62
17 40
30.52
16
46.52

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1952phae.proj...12T

(363)

20 Pm
194
a Hydrae
29.3
43.0
56.8
+13° 2.5
8 16.5
8 30.4
2 44.7
10 02 59.0
49.4
16.47
−2
10 02 14.47
10 00 29.08
1 45.39
cul. − .23
ar. − 00
lu. − 12
1 45 04

22 Pm
194
a Leonis
A
B
C
D
E
F
G

Ill Exst
Morning Planet

24 Pm
194
21.0
34.8
1 48.8
2 02.5
2 16.5
2 30.0
9 22 44.0
197.6
180
7)17.6
2.51
−2
9 22 00.51
cul − .24
ar. − 00
lu. − 08
9 22 00.17
9 20 18.50
1 41.67

194
a Leonis
30.5
44.5
58.5
+13° 2 12.7
2 27.0
2 41.0
10 02 55.0
269.2
180
7)89.2
12.74
−2
10 02 10.74
cul − .25
ar − .00
lu − .12
10 02 10.37
10 00 29.03
1 41.34

−8° Morning Planet

May 24 Pm
M.S.T. 5 15 10
194 9 28 00
1 41.5
9 26 18.5
4 09 42.95
5 16 33.55
01 51.84
5 15 43.69
5 15 10
33.69
16
49.69

4 08 56.21
46.74
4.09 42.95

49.69
45.21
4.48

49,69
45.21
4.48

.7

.7

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1852phae.proj...12T

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25" Pm

Pl East

194 α Hydrae	194 ε Leonis	194 Moon's I limb	194 α Leonis	194 ρ Leonis	194 δ Leonis
~~18.3~~	23.5"	33.5"	1„ 28.0	00.3	11.0
~~32.3~~	~~37.5~~"	48.4	1„ 42.0	14.5"	25.8
~~41.1~~	52.4	2.9	1„ 56.0	28.3	7„ 40.4
0.0	9„ 7.4	7„ 17.5"	2„ 10.1	6„ 42.0"	7„ 55.4
13.8	9„ 22.5	7„ 32.0	2„ 24.3	6 56.0	8„ 10.0
28.0	9„ 37.5"	7„ 47.0	2„ 38.4	7„ 10.0	8„ 25.0
9„ 22„ 41.5"	9„ 39„ 52.7	9„ 58„ 01.5"	10„ 02„ 52.5"	10„ 27„ 24.0	11„ 08„ 39.5"
180.0	233.5"	182.8	254.3	175.1	207.1
180	180	60	180	120	180
7) 0.0	7) 53.5"	7) 122.8	7) 71.3	7) 295.1	7) 387.1
9 22 0.00	7.64	17 54	10.19	42.16	55.30
	−2	−2	−2	−2	−2
	9„ 39„ 07.64	9„ 57„ 15.54	10„ 02„ 08.19	10„ 26„ 40.16	11„ 07„ 53.30

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1852phae.proj...12T

25ˆ Pm.

194
δ Hydr et Crat
55.5
9.8
−14 24.0
3,, 38.0
3 52.3
4 06.4
11,, 14,, 20.5
206.5
60
7)266.5
38.07
−2
11,, 13,, 36.07
cal. − .15
arc − .63
lev − .02
11,, 13,, 35.87
11,, 11,, 57.01
1,, 38.86

26 Pm

194
α Leonis
25.8
+13° 39.8
53.9
2 8.0
2 22.0
2 36.0
10,, 02,, 50.0
235.5
60
7)55.5
7.93
−2
10,, 02,, 05.93
cal. −.15
arc +.01
lev −.03
10,, 02,, 05.74
10,, 00,, 29.05
1,, 36.69

194
Moonʼs Limb
45.0
59.4
14.0
9 28.0
9 42.3
9 57.0
10 54,, 11.4
2856.1
6
7)196.1
28.01
−2
10,, 53,, 26.01

194
σ Leonis
08.9
23.5ˆ
38.0
7 53.0
8 08.0
8 22.5ˆ
11,, 08,, 37.3
191.2
60
7)371.2
53.03
−2
11,, 07 51.03

194
δ Hydr et Crat.
53.4
07.5ˆ
3,, 21.5ˆ
3,, 35.8
3 50.0
4 04.0
11,, 14,, 16.4
190.6
60
7)250.6
35.80
−2
11,, 13,, 33.80

194

May 26
11,, 30 6 5,, 49,, 40
194 10,, 10,, 25.0
1,, 36.69
10,, 08,, 48.31
4,, 16,, 49,, 93
46.74
4,, 17,, 36.07
4,, 17,, 36.07
5,, 51,, 12.24
57.53
5,, 50,, 14.71
49 40
94.71
16
50.71

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1852phae.proj...12T

Ill East

May 28 Pm

194	194	194	194	194
β Leonis	o Virginis	c Virginis	Moon's I limb	s Virginis
2 22.5	33.5	43.5	8.4	3.0
2 36.7	47.4	57.4	22.5	17.0
2 51.0	9 01.0	11.4	36.5	30.8
3 5.2	9 15.0	4 25.0	3 50.7	49 44.1
3 19.5	9 29.0	4 39.0	4 4.8	9 58.0
3 33.8	9 43.0	4 52.6	4 18.9	0 11.5
11 43 48.0	11 59 57.0	12 15 06.5	12 44 33.0	12 50 25.1
216.7	225.9	235.4	173.8	184.5
180	120	60	180	120
36.7	105.9	175.4	353.8	304.5
11 43 05.24	11 59 15.13	25.06	50.54	44.21
−2	−2	−2	−2	−2
11 43 03.24	11 59 13.13	12 14 23.06	12 43 48.54	12 49 42.21
				−2
				12 49 42.01
				12 48 09.76
				1 32.25

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Ill Cont

194 α Virginis	May 30/31 Am 194 α Andromedae	194 γ Pegasi	194 α Arietis	May 31 Pm E.C. α corona Borealis	E.C.
18.0	26.5	23.3	33.5	25.8	—
31.5	+28° 42.3	+14° 37.3	+23 48.5	+27 40.4	—
45.4	57.7	6 51.5	03.0	7 56.4	35.2
8 59.4	2 13.3	7 5.8	0 18.0	8 12.1	49.8
9 13.5	2 29.0	7 20.0	0 33.0	8 27.7	3.4
9 27.5	2 44.5	7 34.0	0 48.6	8 43.0	17.2
13 19 41.5	00 03 00.0	00 07 48.4	2 01 03.0	15 28 58.4	15 09 31.8
236.8	218.3	220.3	187.0	263.8	
180	120	160	60	160	
7)416.8	7)98.3	7)40.3	7)127.0	7)83.8	
59.54	13.33	5.76	18.14	13 28 11.97	
-1	-2	-2	-2	evl — .22	
13 18 57.54	00 02 11.33	00 07 03.76	2 00 16.14	arb + .01	
	evl. −.23	evl. −.21	evl −.21	lev. — .05	
	arc. +.01	arc. +.02	arc +.01	15 28 11.70	
	lev. −.09	lev. −.07	lev −.08	15 28 26.82	
	00 02 11.02	00 07 03.40	2 00 15.85	15.12	
	00 00 44.46	00 05 36.85	1 58 49.45		
	1 26.56	1 26.55	1 26.40		

51
56
7)151
50

26 Aug. 1.36.69
31 Aug. 1.26.50
4)10.19 / 1.13
2.26

May 30/31 Am

M.G. 20 09 10
194 0 41 59.0
1 26.56
00 40 26.50
4 33 22.30
20 07 04.20
3 9 17.74
20 03 46.46
20 03 10
36.46
16
52.46 Slow of Boston

4 32 35.56
46.74
4 33 22.30

5 0.71
28 3 2.46
4) .75 / 0.46

30/31 Am
M.G.C. 21 13 40
194 1 52 34.5
1 26.40
1 51 08.10
4 33 22.30
21 17 45.80
3 29.33
21 14 16.47
21 13 40
36.47
16
52.47 Slow of Boston
12

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1852phae.proj...12T

June 4 Pm.

194
β Libræ
43.0
57.0
9„ 11.0
9„ 25.0 –
9„ 38.7
9„ 52.5
15„ 10„ 06.5
233.7
60
7)193.7
24.81
–2
15.09„22.81

4/5 Am

194
α Cassiopeæ
14.6
+58 39.0
3.4
3„27.6
3„52.2
4.16.5
00„34„41.0
194.3
60
7)194.3
27.76
–2
00„33.25.76
cal. –.36
az –.00
lev –.11
00„33„25.29
00.32.~~8.88~~
1„~~18.75~~
1.17.51

194
α Arietis
24.5
89.4
54.4
0 9.0
0 24.0
0 39.0
2„00„54.0
244.3
60
7)64.3
9.18
–2
2„00„07.18

5 Pm.

194
α Leonis
05.4
19.5
33.5
1.47.4
2 1.4
2„15.8
10„02„30.0
153.0
60
7)333.0
47.57
–2
10„01„45.57

194
δ Leonis
48.4
3.0
17.8
7 32.5
7 47.3
8 2.0
11„04„17.0
168.0
60
7)228.0
32.57
–2
11„07„30.57

194
δ Hyd. et β
33.0
47.0
1.4
3„15.5
3„29.5
3„43.5
11„13„58.0
~~227.9~~
60
107.9
15.41
–2
11„13„13.41

June 4/5 Am

20„00„50
00„59„07.0
1„17.51
00 57„49.49
4„53„05.06
20„04„44.47
3„17.36
20 01„27.05
20„00„50
97.05
16
5305

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1952phae.proj...12T

June 6/7 Am.

194		194	
α Andromeda		γ Pegasi	
	13,0		
+ 28°	28.4	+ 14°	23.5
/	44.0		37.9
/	59.5	6	52.0
2	15.0	7	6.0
2	30.7	7	20.3
00 02	46.5	00 07	34.5
	237.1		139.7
	180		120
7)	417.1	5)	259.7
	59.58		51.94
	−2		−2
	00 01 57.58		00 06 49.94
	cal. − 0,23		cal. − ,21
	az. + .00		az. + 00
	lev. −.08		lev. − 07
	00 01 57.27		00 06 49.66
	00 44.70		5 37.07
	1 12.57		1 12.59

June 9 Pm.

194	
α Leonis	
1	25.4
1	39.5
1	53.5
2	07.9
22 02	22.0

9 Pm.

circuit on gon

E.C.		E.C.		E.C.	
δ Leonis		δ Hydræ et Crateris		β Leonis	
	10.18		54.93		28.60
	25.00		9.00		42.70
	39.74		22.98		56.97
5	54.50	1	37.18	1	11.00
6	09.20	1	51.40	1	26.50
6	23.90	2	5.60	1	39.75
11 06	38.78	11 12	20.00	11 41	54.00
	201.30		201.09		256.52
	180		180		180
7)	381.30	7)	201.09	7)	78.52
11 05	54.47	11	37.29	11	11.22

June 6/7 Am.

M.J.C.	19 17 00	
194	00 22 58.65	5 00 11.46
	1 12.65	46.74
	00 21 46.10	5 00 58.20
	5 00 58.20	
	19 20 47.90	
	3 10.17	
	19 17 37.73	
	19 17 00	
	37.73	
	16	
	53.73	

June 9/10 Am.

M.J.C.	20 50 20	5 12 01.1
194	2 8 18.0	46.74
	1 07.50	5 12 47.87
	2 07 10.50	
	5 12 47.87	
	20 54 22.63	
	3 25.50	
	2 0 50 57.13	
	20 50 20	
	37.13	
	16.00	
	53.13	

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1852phae.proj...12T

Ill. Eq. 1 (370)

June 9 9 Pm.
E.C.
1 Ursae Maj.

31.55
55.05
18.68
5 42.50
6 6.20
6 29.75
11 46 53.60
237.33
60
7)297.33
11 45 42.55

9/10 Am.
E.C.
a Aquilae

+23° 00.15
15.00
8 30.00
8 44.85
8 59.70
9 59 14.80
149.70
60
5)149.70
2 58 29.94
col. −.22
ar. +.00
lev. −.07
2 58 29.65
1 58 49.72
20.07

E.C.
a Persei

22.80
+49° 43.85
4.73
3 25.75
3 47.00
4 8.00
3 14 29.44
181.57
60
3)181.57
3 13 25.94
col. −.30
ar. −.00
lev. −.10
3 13 25.54
3 13 45.48
19.94

10 Pm
E.C.
δ Leonis

9.85
39.35
5 53.95
6 8.95
6 23.54
11 06 38.30
149.40
120
5)269
53.88

E.C.
δ Hydrae et Corvi

54.40
4.68
22.85
1 36.98
1 51.20
2 5.27
11 12 19.50
198.88
60
3)258.68
11 11 36.98

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1952phae.proj...12T

Ill. East (3/1)

10 Pm.
E.C.
β Leonis

28.08
42.35
56.65
1 10.83
1 25.25
1 39.30
11..41..53.68
256.14
180
7) 76.14
10.88

10/11 Am.
E.C.
α Arietis

45.35
00.00
8..14.95
8..29.70
8..44.80
8 59.50
1..55..14.53
208.83
00
7) 208.83
1..58..29.83

E.C.
α Persei

22.24
43.28
3. 4.50
3..25.70
3..46.80
4.. 7.65
3..14..28.90
178.97
00
7) 178.97
25.59

11 Pm.
E.C.
δ Leonis

24.30
39.00
4..53.90
6 8.68
6 23.40
11..06..38.10
149.28
120
5) 269.28
53.85

E.C.
δ Hydrae et Crateris

54.25
8.47
1..22.57
1..36.63
1..50.92
2 5.00
11..12..19.37
197.21
60
7) 257.21
36.74

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1852phae.proj...12T

(372)

June 11 Pom.

E.C. β Leonis

28.00
42.30
56.45
1 10.68
1 24.55
1 39.00
11 41 53.50
254.88
180
7) 74.88
10.69

E.C. γ Ursae Majoris

some instrumental 31.42
54.70
17.98
41.75
5.47
29.18
11 46 53.00
233.50
60
7) 293.50
41.93

11/12 Am.

E.C. α Arietis

45.00
+23° 59.55
14.72
8 29.70
8 44.60
8 59.58
1 59 14.48
267.83
60
7) 207.83
1 58 29.69
col. − .21
az. + .60
lev. − .00
1 58 29.48
1 58 49.81
20 33

E.C. α Persei

22.28
+49° 43.22
4.40
13 25.44
13 46.78
14 7.85
3 14 28.93
178.90
60
7) 178.50
3 13 25.56
col. − 32
az. − .00
lev − .00
3 13 25.24
3 13 45.55
20.31

12 Pom

E.C. β Leonis

9.70
24.38
39.18
5 53.90
6 8.60
6 23.40
11 06 38.10
197.26
180
7) 377.26
53.89

E.C. γ Ursae Maj.

54.25
8.38
22.70
1 36.85
1 50.88
2 4.97
11 12 19.20
197.23
60
7) 257.23
36.74

June 11/12 Am.

N.C. 6 20 43 55
194 2 09 41.0
1 03.15
5 19 54.20
46.74
5 20 40.98
2 08 37.81
5 20 40.98
20 47 56.83
3 24.44
20 44 32.39
20 43 55.
37.39
16

June 13/14 Am.

N.C. 20 34 40
194 2 08 14.0
38.78
2 07 15.22
5 28 34.10
20 38 41.12
3 22.92
20 35 18.20
20 34 40
38.20
54.2
16

5 27 47.36
46.74
5 28 34.10

Bernh. Sinn

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1952phae.proj...12T

Ill. East (373)

June 13/14 Am	E.C. α Arietis	E.C. α Persei
	00.30	—
	15.00	—
	~~30.27~~	19.48
8	44.95	3 40.44
9	lost	4 1.84
9	14.64	4 22.93
1.. 59..	~~29.60~~	3.. 14.. ~~44.00~~
	104.54	61.76
	180	60
	5)224.54	3)121.76
1.. 58..	44.91	3.. 13.. 40.58
cl	− .21	− .32
ref.	+ .00	− .00
lev.	− .00	− .00
	1.. 58.. 44.70	3.. 13.. 40.26
	1.. 58.. 49.85	3.. 13.. 45.62
	5.15	5.36

E.C. ones down to 13, and Dsel before this dawn. faint

June 15 Pm. 194	June 16 Pm. 194
β Leonis	β Leonis
46.8	44.9
00.3	59.0
2.. 14.6	13.2
2.. 29.0 −	2 27.5
2.. 43.3	2 41.7
2.. 57.5	2 56.0
11.. 43.. 11.8	11.. 43.. 10.3
202.8	252.6
60	60
7)202.8	7)192.6
28.97	27.51
−2	−2
11.. 42.. 26.97	11.. 42.. 25.51

June 15 Pm.
W.C. 6.. 07.. 25
194 11.. 46.. 27.0

16/17 hm.

	h	m	s	
W.C.	20..	46..	45.	5.. 39. 37.03
194	2..	32..	5.5	46.79
			54.02	5.. 40.. 23.77
	2..	31..	11.48	
	5..	40..	23.77	
	20..	50..	47.71	
		3..	24.90	
	20..	47..	22.81	
	20..	46..	45	
			37.81	
			16	

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1852phae.proj . . 12T

Circuit - put on E.C. at this transit — Ill. East (374)

June 16/17 Am. | 17/18 Am. | 19 Pm.

E.C. ε Arietis	E.C. α Arietis	E.C. η Tauri	E.C. δ Leonis	E.C. δ Hydrae et Cent.	E.C. β Leonis
58.40	57.65			6.40	40.05
+23° 13.35	12.55	3.00	36.48	20.55	54.27
28.20	27.30	18.00	51.24	34.70	8.48
8 43.10	8 42.15	8 32.95	26.00	2 48.85	1 22.77
8 58.00	8 57.20	8 48.00	20.85	3 2.85	1 37.00
9 12.75	9 12.12	9 —	35.40	3 17.00	1 51.20
1 59 27.75	1 59 26.95	3 39 18.00	11 07 50.24	11 13 31.25	11 42 03.45
241.55	235.92	98.95		167.60	219.22
60	60	60		180	60
7) 301.55	7) 295.92	7) 98.95		7) 341.60	7) 159.22
1 58 43.08	1 58 42.27	3 38 32.98		11 12 48.80	11 41 22.74
cub. −.23	1 58 59.00	3 38 40.88			
aq. +.06	7.73	7.90			
lev. − 00					
1 58 42.85					
1 58 49.93					
7.08					

18/19 Am

M26. 19 54 30

194 1 47 32.5

16 7.08

13 5.15

3 / 1.93

−0.61 EC losing daily circuit off before true

5-55 23.26

46.74

5 56 10.00

20/21 Am.

M26. 20 03 30

194 2 04 24

47.43

2 03 36.57

5 56 10.00

20 07 26.57

3 17.80

20 04 08.77

20 03 30

38.77

16

54.77

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June 20/21 Am

194 Cassiopea		194 α Arietis		E.C. α Persei		E.C. δ Leonis		E.C. δ Hydræ circ.		E.C. β Leonis	
+56°	45.3			+49°	34.15		20.88				39.00
	9.5		10.0		55.20		35.57				53.23
2	34.0		24.0		16.30		50.20			1	7.50
2	58.5	1	39.8		37.10	5	5.00		47.86	1	21.80
3	22.5		54.5	3	58.25	5	19.86		2.00	1	36.00
00	33.47.0		9.5	4	19.10	5	34.50		16.20	1	50.23
00	34 11.9	2	00 24.5	3	14 41.00	11 05	49.30	11 11	30.38	11	42 04.50
	224.7				261.10		215.31			2	12.26
	100				60		180				60
7)	408.7			7)	261.10	7)	35.31			7)	152.26
	58.38			3	13 37.30	11	05 05.04			11	41 21.75
	— 2			3	col. — .32						
00	32 56.38				ref. + .10						
	col. — .38				lev. — .00						
	ax. —			3	13 36.98						
	lev. —			3	13 45.85						
00	32 56.00				19.87						
00	32 8.52										
	47.46										

June 20/21 Am Circuit has been broken for the last 24 hours. Put on new 8 Cell

June 22/23 Am. Grove's battery which has hitherto been used as a local line for the observatory, was this morning exchanged for Smee's. Three cups of Smee's is found to be equivalent in strength to one of Grove's in its best condition

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1852phae.proj...12T

(376)

June 22/23 Am.

E.C. α Arietis

56.0
11.0
8.26.0
8.40.7
8.55.4
9.10.3
1.55 25.1
224.5
60
7)224.5
1.58.40.64

E.C. α Persei

2 33.25
2 54.35
3 15.48
3 36.55
3 57.56
4 18.88
3.14 40.00
256.97
60
7)256.17
3.13.36.59
−3 for col
3.13.36.27
3.13.45.92
EC slow −9.65 −9.60

−2.21
−19 corr of R
6)240
−0.40 EC losing daily with circuit on

6.07.12.94
46.74
6.07.59.68
105 85
7.8.09.53
9.85
7.7.59.68

1.58.40.64
−23
1.58.40.41
1.58.50.12
−9.71

June 22/23 Am.
M.J.D. 21.14.50
194 3.23.46.5

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1852phae.proj:...12T

$a = +0.138$
$b = +0.058$
$c = -0.198$

Rate $-0^{s}.53$ (379)

$t_0 = 11^h$

June 23 Pm.

E.C. δ Leonis	E.C. δ Hydræ et Crat	E.C. Morris 1 limb	E.C. β Leonis	E.C. ο Virginis
N 21°.20	S 13°.59	N 5°.37	N 16°.54	N 19°.33
$t_0 = 11.00$				
20,20	4.90	24.78	38.60	49.25
35.05	18,85	39.00	52.85	3,00
49.73	33.10	53.12	41 6.90	57 17.00
6, 4.43	11. 47,20	30, 7.33	21.20	30.52
19.25	1.48	21.70	35,45	44.93
33.95	15.50	35.85	49.70	58.80
11..06..48,80	11, 12, 29.85	11, 30, 50.28	11..42..04.00	11, 58, 12.80
21 41	15088	23206	20870	7)21,670
180	180	180	60	60
7)31,41	7)330,85	7)52,06	7)48,70	7)+50,70
11, 6, 4.49	11, 11, 47.27	11, 30, 07, 44	41, 21.24	57, 30.96
11..06..04.40	11..11..47.27	11..30..07.44	11..41..21.24	57-40.56
col = −.21	col = −.20	col = −.20	col = −.21	−9.60
az = +.05	az = +.12	az = +.08	az = +.06	9.60
lev = +.05	lev = +.04	lev = +.05	lev = +.03	6
11..06..04.29	11..11..47.22	11..30..07.37	11..41..21.12	30
r 00	00	00	+ 9.00 56	
-2_1 = + 9.56	+ 9.56	+9.56		
11..06 13 85.	11.. 11..56.78			
11..06 13 93	11.. 11..56.75			
+.08	−03			

11..57..30.96
col = −.20
az = +.08
lev = +.05
11..57..30.89
r 0.00
-2_1 + 9.56
11..57.40.45
11..57 40.56
+.11

At 12h did. The circuit which has been running since the 20/21 was broken & remained so except at short intervals like just now noticed.

11..30..16.93 11..41 30.68

11..41 30.64

−04

After this date the reductions are in the transit book

Previous to this date for reductions see two separate books A & B & Chron. Expell.

June 23/24 Am.

	11.. 21..25..00
194	B.. 37. 53.0
	42.55
6..07..12.54	B.. 37.. 10.45
46.74	6.. 7.. 59.68
6.07.59.68	24.. 29..10.77
	8. 31.20
	24..25..39.57
	25..00
	39.57
	16
	55.57

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June 23/24 Am.
E.C.
α Persei

	33.48
+49	54.83
	15.95
3	37.00
3	58.10
4	15.86
3	14 40.50
	258.74
	6
7)	258.74
3	13 36.96
col	−.26
ar	−.03
dec	+.07
3	13 36.74
3	13 45.96
	9.21

June 25/26 Am.
E.C.
α Persei

	33.75
	54.27
	15.60
3	36.88
3	57.90
4	16.95
3	14 40.10
	257.45
	6
2)	257.45
	36.78
col	−.26
	−.03
	+.07
3	13 36.56
3	13 46.04
	−9.48

E.C. has gained since 22/23 0.040 daily

June 25/26 Am.

M.C.	21 10 10
194	3 30 50.6
	38 50
3	30 50
6	15 52.99
21	14 46.99
	3 28.80
21	10 49.91
21	10 10
	59.91
	10
	55.91

6 15 06.05
46.74
6 15 52.79

21 54.77
26 55.91
4) 1 14 (0.23
2
.46
55.91
24 56.37

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June 25th P.M.

1st second Mark on sheet $11^h 53^m 00^s$ of EC
Last " 58 " 54

	G.P.B. 26d	C.W.P. 23rd	Diff
	11 " 56 " 48.95	49.25	-0.30
o Virginis G.P.B.	57 " 30.6	30.92	-0.32
	44.8	44.93	-0.13
	58.5	58.80	-0.30
	58 " 12.7	12.80	-0.10
		5)	-1.15
			-0.23
	Cor for per. Eq. CWP-GPB		+0.04
			-0.19 -0.19 +0.03 = -0.16
	Cor for app R of *		0.03

From June 23rd 12h 2d } EC lost daily 0.053 By transit
To 26 12 " } of o Virginis Circuit having been off

From 22/23 3h 2d } EC gained daily 0.040 circuit on the
To 25/26 3 " } first 4 hours
By a Bowser.

Rate of EC previous to the 6 days during which circuit was on was -0.60
subsequent " 0.00
Mean rate of EC circuit off -0.30
" circuit on -0.40

Reductions not rigorously made but as there is a previous & subsequent rate the trial is entitled to more weight than that two months since -

By previous trial in April EC appeared to gain with circuit on But the present trial gives a slightly ~~opposite~~ opposite effect

1st trial EC with circuit on gains daily on its daily Rate when the circuit is off by +0.30 Weight = 1
2nd trial EC loses by -0.10 " = 2
Mean by weight +0.05

EC gains with circuit on +0.05 above its rate circuit off

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1st Transit 1h 55m 00

June 27/28 1852

α Aquilæ G.P.B.

EC 1h 57m 55.15		
10.10	1h 58m 40.01	Rate of EC from 22/23 Aug
25.10	Σ cor ——— −0.20	−0.15 daily.
40.05	1h 58m 39.81	
54.90	D-B ——— +0.04 per eq	
9.90	1h 58m 39.85	
1h 59m 24.85	1h 58m 50.28	6h 26m 55.73
220.05	EC Slow −10.43	46.74
280.05		6h 27m 42.47
1h 58m 40.01		1h 00m 4.86
		7h 27m 52.33

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A	300″	= 303.2 d	1″	= 0.989 d
E		= 303.7		= 0.989
F		= 295.0		= 1.017
G		= 296.2		= 1.013

Ext 79 680 Attlee 80

						d	d
						× S.	
A	40.1		E	2.. 12.2		3.1	83.1
	40.1			12.2			
	39.1			12.7			
	39.7			12.4		64.1	64.3
		57.7					
		56.6					
		56.8 = 56″.2					
1	37.7		1	16.1		67.2	18.8
	37.3			16.4			
	37.3			16.7			
	37.4			16.4		58.5	
	39.7			12.4			
	57.7			56.0			
2	22.9	46.1	0	30.4		125.7	off reach
	23.9	46.3		30.1			
	23.7	46.2 = 45″.7		29.9			
	23.5			30.1			
	37.4			16.4			
	46.1			46.3			

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Observations made June 28th Noon & Pole for value of divisions of the level scale of the Transit Circle.

Att Ther 79					Level	Level
	dif		dif		× 5	dif	dif
F	40.0	4	~~9.2~~ 8.6	0.7	79.0	5.8
	.3			1.4		
	7			1.2		
	40.3			6.1		37.7 37.9
	33.8 = 34.4			32.7 = 33.1		
	74.3			33.7	41.3	43.7
	3.8			34.5		
	4.3			33.2		
	74.1			33.8		79.7
	71.4 = 72.3			72.4 = 73.3		
	145.4			106.3		
	5.2			6.3	If scale	123.4
	5.1			6.0		
	145.2			106.2		

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Value of Divisions of Level of Transit Circle.

Temperature = 80

Cross level end of Scale = E

~~Scale EE~~

From 3 to 67 64.1 = 56.2
67 126 58.5 = 46.9

3 to 67	64.1 = 56.2	1 div	= 0.88	
41 to 79	37.7 = 33.7		= 0.90	
67 to 126	58.5 = 46.9		= 0.78	0.79
70 to 127	56.5 = 44.9		= 0.80	by a new trial

Adopted value for a temp of 80° length of bubble = sum of E & W readings = 85
value of div of Scale E = 0".85
Probable error = 0".040
Scale EE in at X level end of level of division (not of obs probably) or of a mean of a large number in different parts of the scale

Scale EE

6 to 44	37.7 = 33.7	1 div	= 0.89
19 to 83	64.3 = 56.2		= .87
44 to 123	79.7 = 72.8		= .91

Adopted value for temp of 80 - length of bubble or sum of E & W readings = 85
value of div of Scale EE = 0".89
Prob. error 0".013
of a mean of a large number of divisions in different parts of the scale.

See two pages further on

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(387)

				× 5	
A	84.3	E	33.6	126.5	
	7		32.3		
	8		33.0		
	84.6		33.0		56.5
	45.4 = 44.9		45.6 = 45.1		
	34.3		78.8	70.1	
	35.2		8.3		
	35.2		8.7		
	35.2		78.1		

$x_0 - x$	$(x_0 - x)^2$
0.03	9
05	25
07	49
05	25
$n-1$	3) 108
	36

0.03	9
.05	25
.06	36
	2) 70
	35
$\sqrt{}$ =	0.06
	67
	0.0402

0.00	0
02	4
02	4
$n-1$	2) 8
$\sqrt{}$	4
	0.02
	67
	0.0134

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Value of Level of Transit Circle

By trials Oct 29 1849 Temperature 50

Sum of E & W readings 126 = Bubble

Scale L (× level end)

Readings

from 4 to 60	56.1 d = 59.9	1 div = 1.07	
60 to 121	61.6 = 59.9	1 div = 0.97	

Adopted value for temp = 50° bubble = 126

1 d. scale L = 1.02

Prob. error 0.047

Scale LL

Readings

from 6 to 67	61.7 = 59.9	1 div =	0.98
" 57 to 123	55.5 = 59.9	1 div =	1.08

Adopted value for temp = 50° Bubble = 126

1 d scale LL = 1.03

prob error 0.047

Combining the values for the two temperatures

b being the observed length of the bubble

For Scale L

1 div = 1.00 + 0.0041 (b − 121)

prob. error ~~of division~~ 0.04

For Scale LL

1 div = 1.00 + 0.0034 (b − 118)

prob. error = 0.03

Adopted Value of 1 div of Level of Transit Circle

1 div = 1.00 + 0.0037 (b − 120) for reducing

the mean of E & W readings by reversal.

b being the length of the bubble

Probable Error of division after eliminating the proper error of the Scales by reversal, = ~~0.04~~ 0.036

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1.2
0.2
0.9

Scale I

$(0.047)^5$ =

.040 =

0.044

Scale II

$(0.047)^2$ =

.013 =

0.030

The most probable value of the probable error of division from the two trials will be the mean of the two resulting probable errors after excluding the probable error resulting merely from accidental error of observation. in determining the value of the divisions To estimate this I suppose the probable error of the arc measured by the Circle on June 28th to be as follows

Arc by microscopes 3 readings each

A	E	Dif	Dif from mean	$(\ )^2$
57.7	56.0	1.7	0.8	64
46.1	46.3	0.2	0.1	1
44.9	45.1	0.2	0.1	1
F	G			
34.4	33.1	1.3	0.7	49
72.3	73.3	1.0	0.5	25
44			$n-1$	4)140
				35
			$\sqrt{}$	0.6
				0.67

Prob. error of an arc measured = 0.40

by a single Microscope (By the micrometer screw - not the division of circle) — Ditto mean of Two Mics = 0.28 = $\frac{0.40}{\sqrt{2}}$

Prob. error of place of bubble = 0.16

Prob. error of arc measured on scale = $0.16\sqrt{2}$ = 0.22

Probable error of a single determined difference between the scale & its value in arc = Error of Observation

~~$= \sqrt{(0.40)^2+(0.22)^2} = 0.45$~~

$= \sqrt{(0.28)^2+(0.22)^2} = 0.35$

$0.233 \times 0.674 = 0.157$

$n-1$

Prob. error of place of end of bubble by a single reading. in the ordinary mode of reading the level moving it at each reading = 0.157

Dif from mean taken indiscriminately from Level Book

	Squares		$\frac{\Sigma(\ )^2}{n-1}$	$\sqrt{\frac{\Sigma(\ )^2}{n-1}}$
0.3	9			
0.2	4	Σ = 17	8	.3
0.2	4			
0.0	0	2	1	.1
0.1	1			
0.1	1			
0.1	1	2	1	.1
0.1	1			
0.0	0			
0.5	25	33	16	.4
0.2	4			
0.2	4			
0.1	1	2	1	.1
0.0	0			
0.1	1			
0.3	9	43	22	5
0.3	9			
0.5	25			
0.3	9	14	7	3
0.2	4			
0.1	1			
0.2	4	13	7	2
0.3	9			
0.0	0			
0.0	0	2	1	1
0.1	1			
0.1	1			
0.3	9	13	7	3
0.2	4			
0.0	0			
0.2	4	17	8	3
0.3	9			
0.2	4			
0.0	0	4	2	
0.0	0			
0.2	4			

35 | 60 (0.17 × 0.85 = 0.144 = prob error

35
250

12 | 28 (.233
24
40

There were on the average about 50 divisions & the probable error of observation for the sum of their values by two microscopes & one reading of the bubble was as just shown

$= 0''.35$

Assuming the errors to be continuous The probable error of observation in determining one division $= 0''.007$

This is so small that the foregoing determinations of the prob. error of division are not sensibly larger than they would be if there were no error of observation - I divide $\frac{0.35}{50}$ rather than $\frac{0.35}{\sqrt{50}}$ because $0''.35$ is not the prob. error of the sum of 50 accidental errors quantities affected by equal positive & negative

By reversal we eliminate

1st Zero error of scales - Difference of lengths of its bearings &

2nd Unequal curvatures of tube at ends of bubble if the level error is small & the inequality of curvatures continuous over a large number of divisions - Reversal compensates also for a difference of the value of the divisions of the two scales. if small

3rd For any small inexactness in the adjustment of the cross level relative to the axis of the tube of the level proper. For if the axis of the cross level be brought to a horizontal position as is done in leveling - the axis of the level proper may be supposed to be elevated above this horizontal plane by a small angle $(90-\alpha)$ and its projection on the same plane to make a small angle α with ~~a prop~~ the axis of the cross level & being also small the correction of the resulting level error for cross East is $+\Delta$ for cross West $-\Delta$ & of the mean $(+\Delta - \Delta) = 0$ Correction for α is $+\frac{1}{2}\Delta\alpha^2$ α is insensible when α is small. (true error = obsd ± corr

For further discussion of Level error see next Transit Book

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