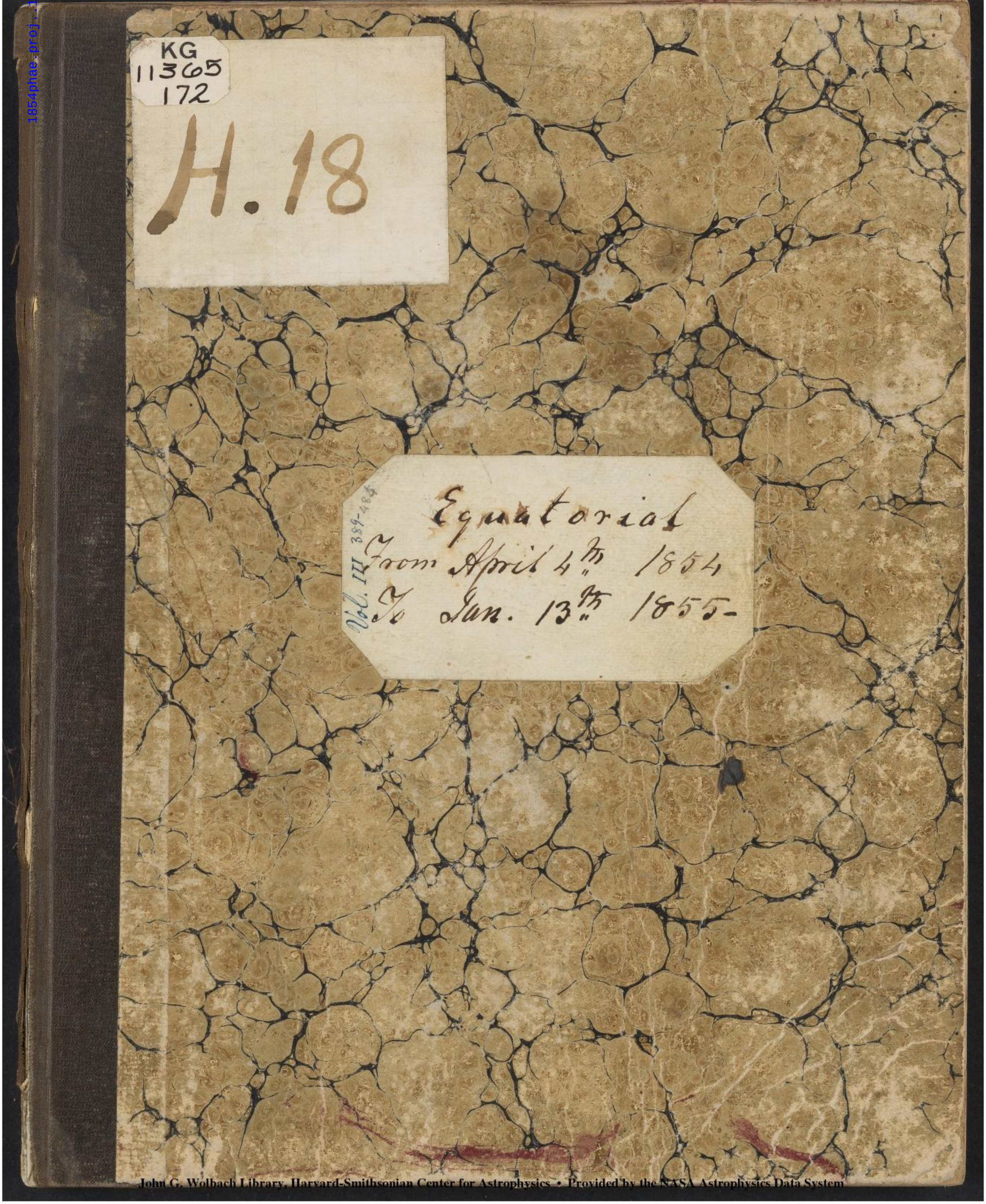
KG
11365
172

H.18



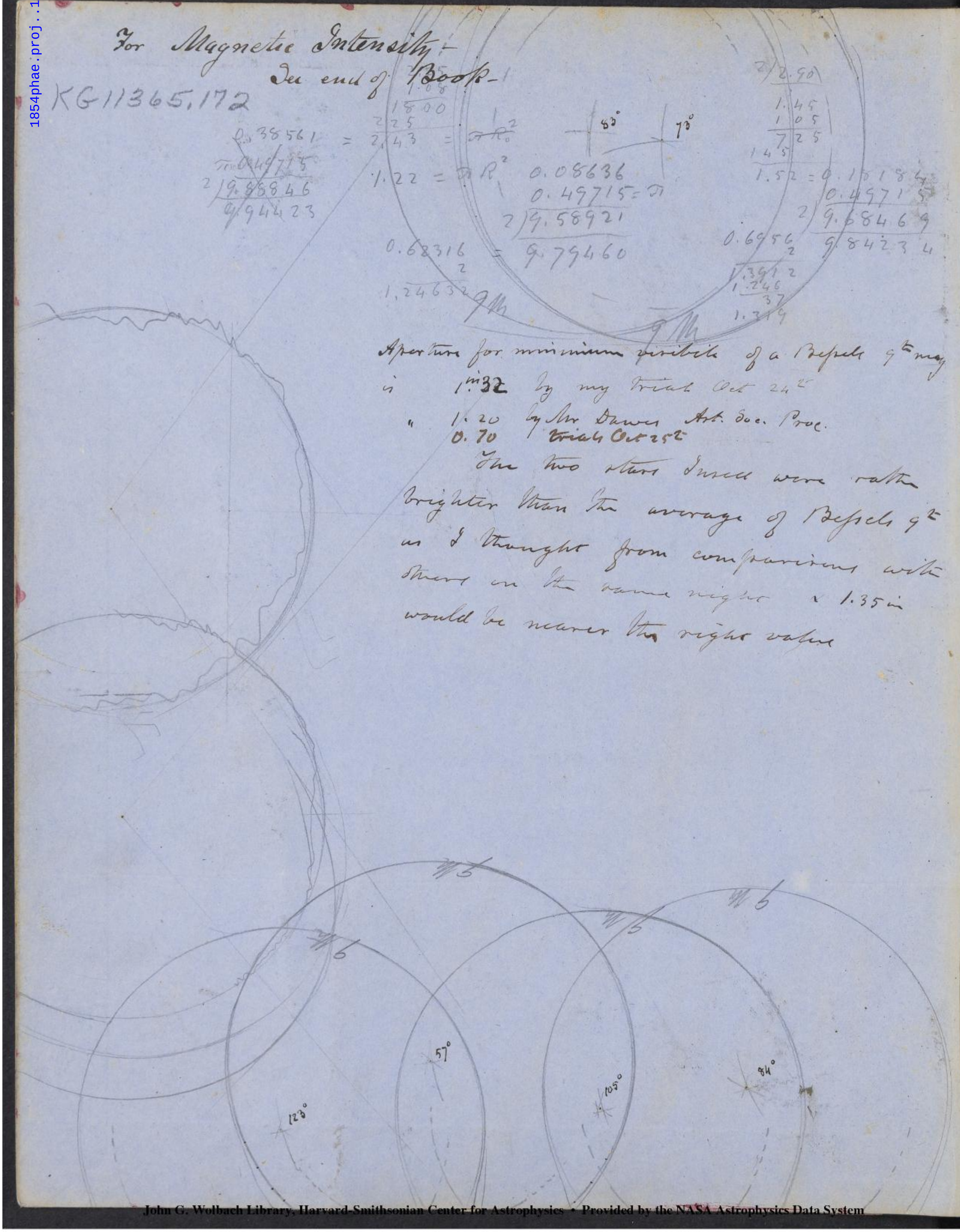
Equatorial

From April 4th 1854
To Jan. 13th 1855-

Vol. III 389-484

For Magnetic Intensity:–
See end of Book–

KG11365.172



1.08
1800
225
~~0.38561~~ = 2.43 = πR₀²
~~π 0.49715~~
~~2)9.88846~~
~~9.94423~~

1.22 = πR²
0.08636
0.49715 = π
2)9.58921
9.79460

0.68316
2
1.24632

2)2.90
1.45
1.05
725
145
1.52 = 0.18184
0.49715
2)9.68469
9.84234

0.6956
2
1.3912
1.246
37
1.319

Aperture for minimum visibile of a Bessels 9th mag
is 1in.32 by my trial Oct 24th
" 1.20 by Mr Dawes Ast. Soc. Proc.
0.70 " trials Oct 25th

The two stars I used were rather brighter than the average of Bessels 9th as I thought from comparisons with others on the same night & 1.35in would be nearer the right value

Double star seen by Mr Clarke

AR $18^{h}..19^{m}$ Dec -2° < 6th mag.

dist $< 0''.5$

In the n f quadrant is a * 11th d AR = 6^{s} dist $2'..15''$

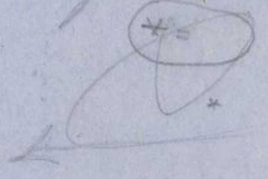
Another is 95 Ceti

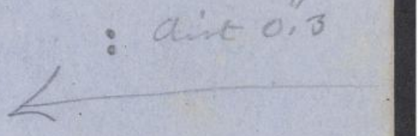
Sept 4th 1854

Obs'd above star vision disturbed

I think it is double as in diagram

Dec is $-1^{\circ}..50'$





KG 11365.172

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1854 Comet

April 4 P.M.

Ele 7..22..00 7..22..00
236 7..19..54.6 7.6
7..21 52.4
7..19..54.6
1..57.8

(236) ∂ 7..50..26.1 Hw 5..16.34 16..09..00
1..58.5
7 52 24.6
5..16 34
2..35 50.6

∂ 7..54..50.2 5..20..57 16..09..10
1 58.5
7..56 48.7
5..20 57
2..35..51

*a a is in Zone 337 d 394 73..08..43.7
b is in Zone 394 16 51..16 3

Comet south ~~Star~~ * fol. star a & b

xa 31..23,4 6..37
xa 8..31..27.4

xb 8 32..52.3 7..20 3,40.9
xb 32..56.4 3..41.0 0.35

☄ 8.35..4.3 6.02
☄ 8..35..8.4

xa 8..35..43.2 6..53
xa ..35..47.3

3..43.0
xb 8..37..11.8 7..35 3..43.0 0..47
xb 8..37 16.1
7.9 82
3..41.97 00..41

☄ 8..39..26.2 6.06
☄ 8..39..30.3

29..09.2
8..37..17 3
1..57.8
8..39..15.1
0..50..40.72
7..48..34.38
1..16.77
7..47..17.61 M.S.T.

0..49..53.98
46.74
0..50 40.72

☄ 8..42..44.8 H vv 6..08..17 Dec +16..09..04
1..58.5
8..44 43.3
6.. 8 17
2..36..26
Cor ☄ Æ −37.8
2..35 48.2

Cor −3 44
☄ δ = 16..05..20

double star 8..49..53.4 H vv 6..10..05 +16..55..00
π Arcturus 1 58.5
8..51 51.9
6 10 05
2..41..46.9
Æ 2..41..09.1
Cor −37.8

δ 16 51 16
Cor −3..44

☄ δ
3..41.97 = dα 0′..41″ = dδ
cor. for ref. −.00 cor for ref 00
3..41.97 = dα 0..41 = dδ

April 4 P.M.

a 2 = 30
30 = 7..30
28 7..0.0
37..37..0

+3.361 1.30220
sin a 9.78560
tang δ 9.45654
cos a 9.89879

Bessel's Zon 394 t 2..31..20.53 δ+ 15..59..46.5
k −52.32 d − 1..33.0
k' $\frac{\delta - D}{100}$ 0.00 d' $\frac{\delta - D}{100}$ 0.0
2..30..28.21 15..58..13.5
1..35.81 + 7..39.4
1854.0 2..32..04.02 16..05..52.9

+15.884
−.042
15.842
29 −0.306
142578
31684
459,418

p + 3.502 0.54434
p' + 15.884 1.20099

.003
14
−.042

3.504
+ .003
3.507
29
29736
6608
95,856

+0.0145
.0001
29
+.0029

Bessel's Zon 337 t 2..30..09.92 δ+15..59..17.2
k + 18.16 d − 1..8.0
k' $\frac{\delta - D}{100}$ 00 d' $\frac{\delta - D}{100}$ 0.0
2..30..28.08 15..58..09.2
1..35.81 + 7..39.4
1854.0 2..32..03.89 16..05..48.6
4.02 5..52.9
7.91 101.5

46.059
3.502
15) 49.561

Mean 2..32..03.95 16..05..50.7
dα dδx+3..41.97 dδ dδx−0..41
d R 2..3~~5..51.7~~0 d δ+16..05..09.7 at 7..47..17.61 Camb. M.T.
d 2..35..45.92

15)49.561(3.304
45
45
45
61

1854 – April 7th P.M.

236 is 0m. 01s.7 fast of sid. time.

h m s — h m s

236 ☾ 9..44..31.8 H West – 6..33..14 +13..13..~~00~~ 08

~~1..58.2~~ ref +50 Ref –10′

~~9..46..30.0~~ 6..34..04 13..03..08

~~1..02..30.3~~ 9..46..30 –2..24

~~8..43..29.7~~ 3..12..26 ℞ Dec 13..00..44

~~1..25.8~~ cor –5

MST ~~8..42 03.9~~ ℞ R 3..12..21

13.5
405
135
391.5
6..31

*6m 9..48..41.2 H W 6..37..53 +13..30..12

1..58.2 ref +50 ref –10′

9..50..39.4 6. 38..43 13..20..12

H 6..38..43. 9..48..41.2 *δ 13..17..48

3..11..56.4 1.7 –2..24

*α 3..11..51.8 9..48..39.5 + ~~13..11..57.4~~

cor –4.6 6..38..43 *δ 13..18..31.1

3..09..56.5 13..20..12

*α 3..09..48.82 1..40.9

7.68

3)29
9.67

350
54
1320
1650
178

Weisse 306? 9h..10h?

3..10..15.14 +13°..11′..17″
~~2..59.2~~ +6..31
~~3..13 73.3~~ +13..17..48
1..36.7
α 3..11..51.8

h m s
9..44..31.8 1..01..43.64
1.7 46.74
9..44..30.1 1..02..30.38
1..2..30.38
8..41..59.72
1..25.51
MST 8..40..34.21

If ~~the~~ Star is Weisse 206 — Star is 168 Weisse.

~~April 7 – 8h..42m..04s MST~~ ~~℞ R 3h..12m..21s Dec.+13°..00′..44″~~

6..33..14 13..13..08
ref. +..50 Ref. –10
6..34..04 13..03..08
9..44..30.1 –1..41
3..10..26.1 ℞ δ 13..01..27
–7.68
℞ R 3..10..18.42

h m s
MST Camb. 8..40..34.21 ℞ R 3..10..18.42
℞ δ +13°..01′..27″

13.3 3/39

399 97 = 1^m 37

133

385.7 6′ 26″

* ℞ $3^h\,11^m\,56^s$

δ 13° 20′

1. 01. 43.6

46.7

1. 02. 30 3

Diel 9..

+0.015

0001

27

+.0027

1.18.64

71

1

3..08..13.12

1..35.70

*α 3..09..48.82

+3.300

+006

3.308

29

29700

6600

95.700

$\overset{\circ\quad\prime\quad\prime\prime}{+13..11..57.4}$

+6..33.7

δ* +13..18..31.1

+13.66

−.05

+13.61

29

12149

2722

393.69

6..33.69

− 0.360

.0036

84

144

36

−.0504

April 11

Star 7-8 mag. = a = comp. Comet south fol star a

' "
xa 9.. 15 .. 6.1 8.. 12
x .. 15 .. 9.9

☄ 9.. 20.. 55.1 ' " 3.08
☄ 9.. 20.. 59.2
9 3
9.. 20.. 54. 6
1
9.. 20.. 53.6
1.. 18.. 16.6
8.. 02.. 37.0
1 19.06
8.. 01.. 17.94 M.S.T.

1.17.29.86
46.74
1.18.16.60

m s
5.49.0 ' "
5.49.3 5.04

Weisse 772

h m s
3.. 39.. 00.26
+1.. 34.13
1854.0 3.. 40.. 34.39

+9.. 06.. 00.2
+5.. 35.82
1854 +9.. 11.. 36.02

s
+3.245 .012
+ 001 0001
3.246 14
29 .0014
29214
6492
94134
"
11.58 .398
00 .0048
11.58 14
29 0160
10422 0040
2316 .00560
33582

Lal. 3 37 38.62 2 obs.
2 55.23 3.245 11.58
3 40 33.85 .000 .00
3.245 11.58
54 54
80 58 49.2 12.98 46.32
10 25.3 162.25 579
80 48 23.9 2. 55.23 625.32
9 11 36.1

h m s
× 3.. 40.. 34.39
+ 5.. 49.15
☄a 3.. 46.. 23.54

+9.. 11.. 36.02
5.. 04
☄ + 9.. 06.. 32.02

comet h m s
(236) 9.. 21.. 53.2
~~5 34 54~~
~~3.. 46.. 59~~
9.. 21.. 53
5.. 35.. 09
3. 46. 54
5.. 49
3.. 41.. 04

H West 5.. 34.. 54
ref. + 15
5.. 35.. 09

° "
Dec+9.. 11
ref 3
9.. 08
5
9.. 13

another star same mag south fol a 15'?

x a 9h 15m 57.0

x a ″ 17″ 18.5 ± 10^{s}

April 12 Comet

Star of comp. 7 mag. Comet north prec. star

E.C. 9.. 46.. 00
236 9.. 45.. 52.7

☄ 9.. 32.. 19.2 7.. 26
☄ 9.. 32.. 23.2

m s ′ ″
4.. 14.0 4.. 35
4.. 14.2 2.. 51

× 9.. 36.. 33.2
× 9.. 36.. 37.4

h m s
☄ 9.. 32.. 19.2
☄ 32.. 23.2

42.4
9.. 32.. 21.2
8

9.. 32.. 20.4 1.. 21.. 26.41
1.. 22.. 13.15 46.74
8.. 10.. 07.25 1.. 22.. 13.15

1.. 20.29
8.. 08.. 46.96 M. S. Time

☄ (236) 9.. 38.. 57.2 H West 5.. 43.. 13 Dec + 8.. 14.. 30
5.. 43.. 29 +16
3.. 55.. 28 29
4.. 14
3.. 59.. 42

Weisse Hora III No. 1179

x Æ	3..59..04.84	+3.232	0.414
	+ 1..33.76	+ ·001	·00414 14
1854.0 α	4..00..38.60	+3.233	1656 414
		29	·05796
		29097	
		6466	
		93.757	

	° ′ ″	
	+7..58..20.9	+10.10
		− ·06
	+ 4..51.2	+10.04
δ	+ 8..03..12.1	29
		9036
		2008
		291.16

No. 1170

h m s	
3..58..44.49	+3.229
+ 1..33.67	+ ·001
4..00..18.16	+3.230
	29
	29070
	6460
	93.670

° ′ ″	
+7..49..38.6	+10.13
+ 4..52.6	−.04
+7..54..31.2	+10.09
	29
	9081
	2018
	292.61

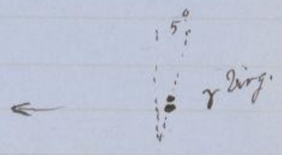
1854

April 18 γ Virginis G. P. B. observes and C. W. T. records
Companion s. fol.

Position 5°..47' Dist. $48^{r}22$ Zero $48^{r}65$ Zero of Pos. 269°..12'

Zero 269..12
48
~~Angle of Pos.~~ 6..35
180 00
Pos. angle 173..25

48.65
43
09
4".21



1854
June 2 P.M.

Im. of star of 8th mag. 6' north

Ch. (236) 12^{h}.. 57^{m}.. 11^{s}.8 – obs. W.C.B. Gt. Eq.

E.C. 13..02..00
236 13..01..46.6

Im. Chron. (236) Star of 8 mag 14^{h}.. 40^{m}.. 47^{s}.3 – obs. Dr. Hamel Gt. Eq.

Im B.A.C. 3579 Chron. (236) 14..50..45.1 – obs. Dr. Hamel Gt. Eq.

.236. + 19ˢ5

16. 15. 59
8 45 32

7. 30. 27 *. b. R. + 59° 4' * b. Decl — by instrument
24 Lyncis 7 30 38 59 3
7 6 2. + 60 19
7 6 13 Comet. ap. R. + 60 18 Decl. ☄
7 9 42 *a. ap R + 60 ~~17~~

*a. is Argelander 9^3 (p 209) 120.

7ʰ 8ᵐ 55ˢ70 60° 11' 5"6
− 30.68 + 4.7
+ .17 − 1.0
7 8 24.99 60 11 9.3 1842.0 46.06

sin α 9.98035
cos α 9.46851 n
tan δ 0.24181
log 20"055 0.30222
1.52438 33.45
0.67073 n −4.69
79.51
.8 12
63.61 −56.8

Also 96 (p.206) 58

7 8 55.58 60 11 0.9
− 30.37 + 5.1
− .19 + 1.3
7 8 25.02 60 11 7.3
+1 3.61 − 56.2
7 9 28.61 ~~60 10 12.1~~ Mean R. 1854.0

1842.0 7.. 08.. 25.01 60.. 11.. 07.3
Prec +1.. 3.61 − 1 10.6
1854.0 7.. 09 28 62 +60.. 9 56.7
Cor to App. Eq. − 1.48 +6.9
7.. 09.. 27.. 14 60.. 10 03.6
ƒ − * − 3.. 36.35 + 7.. 10.5
ƒ App α 7.. 5.. 50.79 App δ 60.. 17.. 14.1

1854 June 27th Van Arsdale's Second Comet Obs. G.P.B.

Comet n. p. star of 7th magnitude, Time M.Y.

Zero of Position 87° 14'

Reading of Scale of Dec	h	m	236 1st	236 2nd	* Scale	236		1st	2nd	Dec
7' 45"	15	58	23.8 s	31.4 s	0' 30"	26h	2m	2.0 s	9.8 s	~~38.4~~
7 59	16	3	29.7?	37.8	0 53		7	4.2	12.1	

15.. 58.. 23.8
16.. 02.. 20
3 38 2

Comet 236 How 13

236 =	16h	9m	15s
HW =	9	2	53
	16..	9	28
Ap. R. A.	7..	6	35

Dec N 330° 19'

~~9.2.53.~~

~~6~~ 5th

Star 5/6th

	h.	5th/6
	16	16	18.7
H	8..	45	32

329 4

8 45 32 W.

Revised

1854 June 27th P.M. $9^h\,37^m\,47^s.2$ M S T

Comet precedes * 7th mag. Arg. Zone 93 No 120

Δα ☄-* = − ~~[illegible]~~ $3^m\,36^s.35$
Δδ " " = + $7'\,10''.5$

Cor to Ap. Eq.

* of Comp 1854.0 R = $7^h\,09^m\,28^s.62$ $-1^s.48$
Dec = $60°\,09'\,56''.7$ $+6''.9$

Apparent R of ☄ = $7^h\,05^m\,50^s.79$
Dec " = $60°\,17'\,14''.1$

1854. June 27. Reduction to App. Equinox.

α $7^h\ 9^m\ 28^s61$
α $107^\circ 22'$
$\alpha + G$ ~~180~~ 60 49
$\alpha + H$ ~~301~~ 281 56
$\sin(\alpha + G)$ 9. ~~8790~~ 9.9410 .6881
$\cos(\alpha + G)$ ~~9.8153 n~~ 9705 n
$\sin(\alpha + H)$ ~~9.1471 n~~
$\cos(\alpha + H)$ ~~9.9957 n~~ 3155

δ 60 10 12.1
$\sin\delta$ 9.9383
$\tan\delta$ 0.2415
$\sec\delta$ 0.3033
$\log i$ 9.9294
$\log g$ 0.7642
$\log h$ 1.3096

f $+9''16$
g $+5,81$ G $313^\circ 27'$
h $+20.40$ H $174\ 34$
i $+0.85$

f $+9.16$ 8.84
$g \sin(G+\alpha) \tan\delta$ + ~~7.67~~ −40.12
$h \sin(H+\alpha) \sec\delta$ ~~−5.75~~
~~+11.08~~ −22.12
~~0.74~~ 5 − 1.48
7 9 ~~29.35~~ 27.13

$i \cos\delta$ $+0.42$
$g \cos(G+\alpha)$ $+3.88$
$h \cos(H+\alpha) \sin\delta$ ~~+19.52~~ 3.61
~~+14.14~~ 6.91
$60^\circ\ 10'$ ~~26''2~~ 19.0

3 38.2
38.4
34.5
3 34.3
4) 145.4
3 36.35
50.78
$7^h\ 5^m$ ~~53^s00~~

7' 15''
7 6
2) 14 21
7 10.5
29.5
$60^\circ\ 17'$ ~~36''~~

15 58 27.6

16 3 33.7
2) 32 2 1.3
16 1 0.6
− 19.5
~~16 0 41 Sid. Time~~
~~6 21 51.5~~
~~9 38 49.5~~
~~− 34.8~~
~~9 34 15~~

$16^h..01^m..00^s.6$
13.0
16..01..13.6
6 21..51.5
9..39 22.1
1 34.9
9..37 47.2

~~June 27. 1854. $9^h\ 34^m\ 15^s$ M.T.~~ ~~R.A. $7^h\ 5^m\ 53^s00$~~ 50.78 ~~Dec. $60^\circ\ 17'\ 36''$~~ 29.5 ~~Apparent Equinox.~~

~~The comet is visible to the naked eye, and has a tail of about 2½ degrees.~~

~~[illegible]~~

Van Arsdale's Comet,

Pers

II 1854 June 28. Obs. G.P.B.

4 29.
1.
~~4.3~~
16.0

Star, 8/9th (Arg. 96.87)

Time [illegible]

~~15~~

Comet. Scale		1st wire		2d	Star. Scale	1st wire	2d
4' 29"	16	15	8s.3	16s.0	4 29"	21m 19s.5	27s.4
5 32		22	37.4	45.4	5 47	28 43.2	50.9
		37	53.4	53.7			
	16	18	57				

~~Come~~

Comet
236 = 16 29 35.3
9 94 10

Dec. Cir. B.
+ 329° 38'

6.. 11.2
11.4
5.8
5.5
33 8
8 45

App't place of star
R 7h 31m 15s.70
+ 6 8.48
~~7 3 23.86~~
7.. 25 06.82

Dec + 59° 37' 35".47
~~A~~ - 7.5
59 37 ~~42.9~~
~~27.9~~ 28.2

~~236 25 45.4~~
~~[illegible] 26 40.~~
235 clow 13.14
16 18 57
16 19 10
6 25 48
9 53 22
8 58 31.5
52 51.3
21.9
9 51 45
51

June 28 9h 52m ~~45s~~ 7h ~~37m~~ ~~23s.86~~
23s.86
+ 59° ~~37'~~ ~~42".9~~

Revised

1854 June 28th 9h 51m 45s M S T Camb
Comet precedes ✱ 8th 9th Arg Zone 96 No 87

			Mean Eq 1854.0	Cor to ap. Eq
Δα	☄ − ✱ = − 6m 08s.48	✱ of Comp α	7h 31m 16s.65	− 1s.35
Δδ	" = − 0′ 07″.5	δ	59° 37′ 27″.9	+ 7″.8

Apparent R of ☄ = 7h 25m 06s.82
" Dec = 59° 37′ 28″.2

Comet — Star

R. 1	R. 2	Dec.
−6 11.2	11.4	
5.8	5.5	

4) 33.9
48.48

	7 30 45.27		59° 38′ 52″.1	
R	− 30.56	d	+ 6.9	
$k' \frac{\delta - D}{100}$	− .14	$d' \frac{\delta - D}{100}$	+ 0.9	
1842.0	7 30 14.57		59 38 59.9	
	+ 1 2.15		− 1 32.3	
1854.0	7 31 16.72		59 37 27.6	

sin α	9.9654
cos α	9.5839 n
tan δ	0.2325
31″.63 −	1.5001

46.06
77.69
.8
62.152

−7.69   0.8861 n
12
92.28

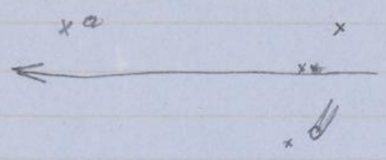
For June 28. 1854.

sin α	9.9646 = −a′	a	9.8847 n	0.4988	31.54
cos α	9.5886 n	b	9.2607	c 1.8899	77.60
sin δ	9.9359	d	9.8206 n	log tan δ 9.3413	+ .2194
tan δ	0.2320	b′	9.5245 n	9.9005 n	− .7452
sec δ	0.2961	c′	0.8908 n	a′ 9.7603 n	− .5758

Aa	0.2355 n	− 1.72	− 1.70	Aa′	0.1111 n	− 1.29
Bb	1.5676 n	− 36.95	− 37.06		0.8314	+ 6.78
Cc	1.1967	+ 15.73	+ 15.72		0.1976 n	− 1.58
Dd	0.4470	+ 2.80	+ 2.77		0.5910	+ 3.90
		− 20.14				+ 7.81
		1.34	− 1s.35			7.77

410

July 1, 1854 C. W. T. observes T. H. S. records



Revised

1854 July 1st 9h.. 45m.. 51s M S T

Comet follows * 9–10m = Arg. Zone 83 – 44

Mean Eq 1854.0 Cor to ap. Eq

Δα ☄ − * = + 6m.. 38s.23 ~~* of Comp α 8h.. 06m.. 26s.40~~

Δδ ☄ " = + 4'.. 16".0 ~~δ + 56°.. 44'.. 10".0~~

* α 8h.. 07m.. 23s.92 − 1s.03

App. AR of Comet 8h.. 14m.. 01s.12 δ 56°.. 42'.. 03".4 + 8".8

Dec " 56°.. 46'.. 28".2

* AR 8h 7m 22s.99 Dec + 56° 42' 11".7 16 24 50.8
+ 6 38,23 + 4 16,0 13.
☄ AR (App't) 8 14 1,22 ☄ Dec. 56 46 .27,7 16 25 3.8
6 37 37.17
Sid Time 9 .47 26.
− 28.47
− 7.70
− .07
36.24

8.. 07.. 22.89 56.. 42.. 12.2
6.. 38 23 +4 16 0
8 14 01 .12 56 46 28 2

July 1. M. T. 9h ~~44~~m 50s
45 51

July 1.

Comet s. p. star of the 12/13.

~~Star.~~ ~~Comet~~

~~Co~~

~~Star~~ ~~Comet~~

~~2.00~~ ~~8.15~~

Comet n f. star 9/10. (Misty)

St. ~~Comet~~ Comet

1. 80" ~~12.4 20.~~

16 10 12.4 20.1 6 20" 4 36 16 16 45.9 53.7 6 33.5 33.6

1 43 18 4.2 11.5 6 00 17 16 24 42.4 49.7 38.2 38.2

2 13 26 10.0 17.4 6 8 3 55 16 32 52.8 0.5 42.8 43.1

4 16" 16 24 50.8 6m 38s.23

Star 16 37 22

M.A 8 79 48 W. 56°. 44' arg. 83.44.

8h 6m 38s.36 56° 44' 3".2 ~~f.s.ω~~

− 11.80 + 5.7 ~~f.o.ω~~

− .16 + 1.1 ~~f.t.δ~~

tota 8 6 26.40 56 44 10.0 tota (1842.0)

prec + 0.. 57.52 − 2 6.6

8.. 7 23.92 56.. 42 03.4

Log. sin ω. 9.9291 Log a 9.9832 ω Log a' 9.6741 n −.4722

Log. cos ω 9.7224 ω b 0.1899 b' 9.6447 ω

Log. sin δ 9.9223 c 1.8574 − 72".02 c' 1.0246 n

Log. cos δ 9.7392 d 9.9055 ω d' 9.9291 n

2.1038 ω

Log. tan δ 0.1831 Prec. 2.9366 + 864".2 2.8 0.1749 n + 127.00

Aω − 0.4840 ω − 3.05 0.9485 − 1.50

Bb − 1.4937 ω − 31.17 0.3545 n + 9.88

C) c − 1.1873 + 15.39 0.5593 − 2.26

Dd − 0.5357 + 3.43 + 2.62

15".4 = −1.03s + 848.8 − 118".76

+ 8".7 56s.59

412

July 3d 1854

G. P. B. observes

Comet north fol. star b ~~= 11 mag~~. star b = 11 mag

' "

x 2,,16 1.3 Δα

Δδ 16,,2,,8.1 11.9

3,,11 12.0

𝒮 5,,27 13.2

16,,2,,20.1

x 1,,26 3.8.7

16,,03,,45.8

3,,05 13.1

13.0

𝒮 4,,31 51.8

16 03,,58.8

x 1,,46 19.2

16 05,,26.2

2,,59

14.0

14.1

𝒮 4,,45 33.2

16 05,,40.3

16 2 13.2 + 11.9 + 3 11

20.1 12.0

3 51.8 13.1 3 5

58.8 13.0

5 33.2 14.0 2 59

40.3 + 14.1

16 3 56.23 + 13.12 + 3 5.0

16 3 56

− ~~22~~ 14.6

16 4 18

6 45 31

9 18 47

−1 32

9 17 ~~15~~ M.T.

8

b 8 39 41 +54 25
c 8 35 23 +54 29
c 8 42 51 +54 19

July 3, 1854 Comet

Star b with star a   Star a = 9/10 mag. reddish

Star b south fol. star a   b star of comparison

a 7..25   7.4
16..10..14.2
48
3..49
17.8
17.9
b 3.36   25.2
16 14..32.1

Star b & star c   star c 9/10 mag.–white – b north prec. ✱ c

1854 July 3rd.. 9h.. 17m..08s M.S.T.

b 8..16   51.8
16..15..58.7

Comet follows ✱ 11th mag

$\Delta\alpha$ = ☄ − ✱ = + 0m.. 13s.12
$\Delta\delta$ " = + 3′.. 05″.0

c 2..31   1.8
16..19..08.8

Approx α of star 8h.. 35m.. 40s
Dec + 54°.. 29′

Chron. 236 comp. star b 16h..21m..10s.8 H. West 7..41..42 Dec. + 54°. 25

416

7447

July 27th 1854

BAC 3650

α 10h .. 33m .. 16s
δ 28° .. 21'

R 10h .. 32m .. 16s
D 28° .. 17'

10 .. 32 .. 15.95
1 3.86
10 33 19.81

28 .. 17 .. 11.4
8 15.0
28 .. 25 26.4

16 .. 39 .. 10
EC 16 41
1 .. 22
16 39 38
236 -28

cotg φ	0.0397								
sin φ	9.8287								
cos z	9.2627 n		+ 1.0262	log. Aa	-9.8726	-0.746	log. Aa'	-0.3371	-2"17
tg. z	0.7299 n		-1.2258	log. Bb	-9.6784	-0.477	log. Bb'	-0.8689	-7.39
tg ψ	9.3024 n	168° 39'	+ 9.4834	log. Cc	+ 0.0072	+1.017	log. Cc'	+ 0.3528	+ 5.66
cos ψ	9.9914 n		-0.6788	log. Dd	-9.2012	+0.180	log. Dd'	-0.2522	-1.79
sin ψ	9. ~~7914~~ 2938					-0.050			
						-0.366			-5.79
sin(ψ+δ)	9.4643 n	196 56			10 32 15.65			61 42 54.4	
sin(ψ+δ')	9.4676 n	197 4						61 42 48.6	
	9.8373 n								
cos z	9.3016	78° 27'							
cos z'	9.3049	78 21.5							
		78 24,							
log k	1.7221								
sin(δ'-δ)	6.4637								
	9.1009								
Δδ	0.1690	+ 1"5							
tg z sin ψ	0.0237 n								
cos δ cos δ'	9.8890								
cos(ψ+δ+δ')	9.8468 n								
Δα	0.1505	+ 0.89							

Revised

1854 July 27th 8h .. 52m .. 52s M S T

Comet follows B.A.C 3650

		Mean Eq 1854.0	Cor to Ap. Eq	Ref
*	α	10 .. 32 .. ~~12.97~~ 16.01	-0s.05	
	δ	28° .. 17' .. 05".6	+15".8	

Comet App α + 10h .. 33m .. 19s.81
" δ + 28° .. 25' .. 26".4

$\Delta\alpha$ Comet - * = +1m .. 03s.86 Corrected for Ref.
$\Delta\delta$ " = +8' .. 15".0 "

Comet nf. Star of 6th 7th

[illegible]. [illegible] Zeit bemerkten.

~~Zero 87°~~ 20' – 86° 20' Zero of Edge of Scale

Star

0' 12" 7h 8m 32s.1 8' 45"

−0' 26"	17h 8m 40s.6	~~9 13~~ 7' 53"	9m 43s.8
0 11	10 18.9	8 30	11 22.5
0 16	11 56.1	8 35	12 59.8
−0 5	13 33.5	8 05	~~18~~ 14 37.3
−0 23	15 12.1	7 40	16 16.0
−0 09	16 59.4	7 52	—
−0 03	18 33.9	7 55	19 37.9

	σ−∗ (a)	δ
17 9 43.8	+ 1m 3s.2	+ 8' 19"
11 22.5	3.6	19
12 59.8	3.7	19
14 37.3	3.8	10
16 16.0	3.9	3
18 (4)		8 1
19 37.9	+1 4.0	7 58
17. 14. 00	1 3.77	+ 8 13.5
	Ref + .09	Ref + 1.5
	1 3.86	8 15.0
	10 32 15.66	28 17 11.4

17 14 28
10 32 16
6 42 12 = 100° 33'

δ 28° 17'

δ' 28° 25'

17. 14. 28
8 20 8
8 54 20
1 28
8h 52m 52s m.s.t.

R. of Comet. 10h 33m 19s.51 28° 25' 26".4 Dec. of Comet.

1854 July 28th Comet follows ~~[illegible]~~ ~~[illegible]~~ * 10th 11th mag.

July 28th $8^h .43^m .01^s$ M.S.T.

$\Delta\alpha$ ☌ − * = $+1^m .11^s .49$
$\Delta\delta$ " = $-7' .43''.8$

Revised

~~Mean Eq. 1854.0~~ Cor to Ap. Eq.

* α ~~10^h~~ ~~35^m~~ ~~00^s~~ 39
δ ~~27°~~ ~~05'~~ ~~29''~~ 2

* of Comp Approx α ~~$10^h .40^m .19$~~ $10^h .33^m .57^s$
δ + ~~27°.04'~~ +27°.47'

colog. ϕ	0.0397	
sin ϕ	9.8287	
cos τ	9.1555n	
tg τ	0.8400n	
tg ψ	9.1952n	− 8° 54'.5
cos ψ	9.9947	
sin ψ	9.1899n	
sin $(\psi+\delta)$	9.5069	+ 18 44.5
sin $(\psi+\delta')$	9.5099	+ 18 52.5
	9.8240	
cos z	9.3409	77° 20'
cos z'	9.3439	77° 15'
		77 17.5
log k	1.7280	
sin $(\delta'-\delta)$	7.3508n	
	9.0788 n	
$\Delta\delta$	0.0620 n	− 1' 15''
tg. τ sin ϕ	9.9299	
sin δ cos δ'	9.8941	
cos $(\psi+\delta+\delta')$	9.8607	46° 31'.5
	0.0253n	
$\Delta\alpha$	~~9.963~~	− 0.s07

July 28th

BAC 3666 –

☄ R 10..35..05   * 5-6   10..34..57
Dec 27°..35′   27°..06′

Zero 86° 10′ ℌ Lf. Star 10/11.

	*		☄
9′ 30″	17ʰ 2ᵐ 48ˢ 0″	1′ 58″	17 3 58.7
8 56	4 43.0	1 16	5 54.3
8 31	6 49.5	0 48	8 1.4
8 59	8 54.4	1 12	10 6.2
9 11	11 4.7	1 20	12 16.8
			38 137 4
			17.. 8.. 03.5

327
65.5

17	3 58.7	+ 1 10.7	− 7′ 32″
	5 54.3	11.3	7 40
	8 1.4	11.9	7 43
	10 6.2	11.8	7 47
	12 16.8	+1 12.1	7 51
17	8 2.9	+1 11.56	− 7′ 42″6
		− .07	− 1.2
	☄ − ✱	+ 1 11.49	− 7 43.8

R. Comet	10ʰ 35ᵐ 9ˢ	δ + 27° 39′
Star.	10 33 57	+ 27 47
	6. 32. 54	98° 13′.5

17 8 20.5
8 24 5.5

8 44 26
− 1 26

8 ~~42 59~~
43..01

G. P. B. Observed. MS and CWT, Recorded.

Slide reading Star of Comparison, no. prec. stat ~~[illegible]~~

St. Comp.

3' 09" at 1. 17h 17m 19.8 1' 49" 17 23 45.2

[illegible] 2. 17 23.8 17 23 49.5

~~+ 6 2~~ − 6m 25s.55 + 6' 20"

27 47

27 41

$\star - a$ + 1m 11s.56 − 7' 42".6

$\star - b$ − 6 25.55 + 6 20.

− 5 13.99 − 1 22.6

+ .01 + 0.1

− 5m 13s.98 − 1' 22".5

$\star$ app. pl. 10 40 19 + 27° 34'

cotg. φ 0.0397

sin φ 9.8287

tan z 9.2747n 100° 51'

tg z 0.7175n

tg φ 9.3144n − 11 39

cos φ 9.9910

sin φ 9.3054n

sin(φ+δ) 9.4425 + 16 5

9.8377

cos z 9.2802 79° 0'5

log k 1.7180

sin δ'−δ 7.2654

8.9834

Δδ 0.0984 + 1.3

tg z sin φ 0.0229

cos δ cos δ' 9.8940

cos(φ+δ+δ') 9.8583

0.0856 + 0.08

July 31st 1854

EC 17..32..00
236 17..39 54.8

h m s
10..33..20 28°..25'
4 days 6 49 2..58
AR 10..40..09 Dec +25. 27

17..19..27
20 02
20 45
22 43
23 30
6 26
1 17

Comet n. f. Star of 10.11 mag

× 19,,9.0 Δα 4..00 Δδ
18.2 1,,48
19..27.2 5..48

44.8 3,,29
17.5 1,,44
20 2.3 20,,05,,13
~~20,, 2.3~~

20,, 27.8 3,22
17.9 1,,48
45.7 5,,10

25.8 2,,35
17.4 1,,40
17,, 23,,43.2 4..15

13.2 3,,38 1,,39
17 23,,30.1 16.9 5,,17

17 21 17 + 17.58 +1' 43"8
30

17 21 47
8 35 54
8 45 53
-1 26
8 44 27

1854 July 31st $8^h.44^m.27^s$ M S T

Comet follows a ✱ of 10^{th} 11^{th} -

$\Delta\alpha$ ☄ − ✱ = $+0^m.17^s.58$
$\Delta\delta$ " = $+1'.43''.8$

Comet

Aug 9th 1854

BAC 3691 6th α 10^{h}.. 52

δ +19°.. 47

10^{h}.. 38^{m}.. 25

+19°.. 40'

0 10 19 27.57

42.4

Comet-Observations (These have been revised)

Date	Camb. m.t.	☄ − * R.	Dec	No. Comp	*
June 27	9 ~~34~~ 37 ~~15~~ 47	−3m 36s35	+7' 10"5	2	(a)
28	9 5~~2~~1 45	∓6 8.48	∓0 7.5	2	(b)
July 1	9 4~~8~~5 5~~0~~1	+6 38.23	+4 16.0	3	(c)
3	9 17 ~~XX~~ 8	+0 13.12	+3 05.0	3	(d)
27	8 52 52	+1 3.~~XX~~86	+8 ~~XX~~ 15.0	7	(g)
28	8 42 59	+1 11.56	−7 42.6	5	(h)
31	8 44 27	+ 17.58	+1 43.8	6	(j)

Comets Apparent places. R.

		R.	Dec
June 27	9 3~~4~~7 ~~15~~ 47	7h 5m 50s79	+60° 17' ~~24"5~~ 14".1
28	9 5~~2~~1 45	7 ~~27 23.86~~ 25 06.82	+59 37 ~~42.7~~ 28".2
July 1	9 4~~8~~5 5~~0~~1	8 14 1.~~xx~~12	+56 46 ~~2x.x~~ 28.2
27	8 52 52	10 33 19.~~5x~~81	+28 25 26.4

Stars Mean Places. 1854.0

Mag.		R.	Dec	
7	(a)	7h 9m 28s62	+60° ~~10' 13"1~~ 9' 56".7	Arg. 93.120 −96 −58
~~7/10~~	~~(a)~~	~~28.13~~	~~11.1~~	~~— 96.58~~
8/9	(b)	7 31 16.~~7~~65	59 37 27.~~5~~9	— 96.87
9/10	(c)	8 7 ~~24.01~~ 23.92	56 42 3.~~0~~4	— 83.44
6/7	(g)	10 32 16.~~02~~01	+28 17 5.6	B.Ac. 3650.

Mag. Stars Approximate Places for 1854.0

	Mag.	R.	Dec
(d)	9/10	8h 35m 39s	+54° 29'
(f)	9/10	8 43 7	54 19
(i)	7/8	10 40 19	+27 34
(j)	10/11	10 39 55	+25 29

Stars Compared with other Stars

	Diff. of Apparent	R.	Dec	Comp.
July 3	(e) = d	+4m 17s85	−3' 49"0	1
"	(e) = f	−3 10.05	+5 45.0	1
July 28	(h) = i	−6 25.55	−6 20.0	1

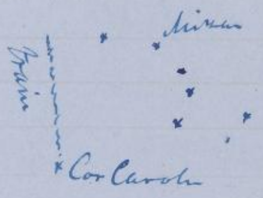
1854phae.proj..172S

Wednesday evg Aug 30th 1854

Meteor seen by Dr A. Gray. at 7h PM in the N.W. evg twilight

Commenced at an altitude ~~equal to~~ 1° less than that of the star at the ~~tip~~ of the tail of the Great Bear & & at the left of it = dist of that star to left of Mizar & descended to alt & az of Cor Caroli - those stars having their alts & azimuths = to those which they have at 9h.10m PM Aug 30th

Train was 5° long & lasted 5m 8m by Mr Clarke. it remained unmoved but was not straight but rather zigzag



NB that the Meteor was not seen ~~among in the~~ among the stars as given in the diagram but was seen at 7 PM at the alt & azimuth N.W above given corresponding to the places occupied by those stars at 9h.10m PM.

		Dr Gray		Mr Clarke Camb-port (Good St)
Beg	alt 30°	az N	55° W	alt 12° az N 59° W
End	" 16	"	" 51 "	

Mean of both supposing Mr Clarke's correct for middle point middle of train left by meteor will be Mean alt beg 19° az beg N 61° W
end 5° " end " 57 W N of W & in Vt where it was heard to explode.

At Hanover seen by Mr Albert Young (Son of Prof. Young) At 7h.30m by estimation, without watch. Meteor descended towards W.N.W & exploded in az S 47° W (or 37°) - True meridian alt 25°. (See Prof. Young's letter of Nov 28th 1854)

At Bellows Falls - N.H. - Went from az 2° N of Arcturus - alt higher by 2° or 3° than Arct - (az was estimated at 10° S of W.) disappeared behind hill or woods - At Newfane Vt. (or Fayetteville) 12 miles NW of Brattleboro - Seen in West - Report heard 3m to 5m? after - The report was heard by many - From alt 60° to horizon (or trees or hills)

See next page

Wednesday evg A

Meteor se
to N. W. evg twiligh

Commenced at
the star at the ~~diff~~ c
& at the left of it = dil
descended to alt & a
having their alts &
they have at 9h. 10m

Train
remained unmov
but rather zigzag

N B that the Mete
~~among in the~~ am
as given in the dia
seen at 7 PM att
above given corresp
occupied by those stars at 9h. 10m P.M.

Dr Gray — Mr Clarke Camb-port (Good Ob)

Beg alt 30° az N 55° W } alt 12° az N 59° W
End 16 " 51 "

Mean of both supposing Mr C's obs correct for middle point middle of train left by meteor will be Mean alt beg 19° az beg N 61° W
end 5° " end " 57 W N of W & in Vt where
it was heard to explode.

At Hanover seen by Mr Albert Young (Son of Prof. Young) At 7h 30m by estimation, without watch. Meteor descended towards W. N. W & exploded in az S 47° W - True meridian alt 25° (See Prof. Young's letter of Nov 28th 1854)

At Bellows Falls N.H. - went from az 2° N of Arcturus alt higher by 2° or 3° than Arct - (az was estimated at 10° S of W.) disappeared behind hill or woods - At Newfane Vt. (or Fayetteville) 12 miles NW of Brattleboro - Seen in West - Report heard 3m to 5m ? after - The report was heard ~~by~~ many - From alt 60° to horizon (or trees or hill)

See next page

Meteor of 25 August.*

at Starting.
distance from Nantucket East 120 m.
from Union S. 20 E 210 m.
alt. 50 m.
at explosion
distance from Nantucket N. 40 E. 330 m.
from Union N 20 E 170 m.

path of meteor 270 miles long - N. 20 E

* a rough approximation

Above was computed by Sidney Coolidge as one of his first exercises after his connection with the Observatory in 1854

He fell at the battle of Chickamauga - while in command of the 16th Regulars - of which only 23 men & 5 officers came out of action -

Aug 25th

Meteor seen in Union Me by Mr Sibley 7h 30 P.M.
Lat 44° N
Long 8° E of Wash

0.7 of alt of Jupiter & same azimuth with it
The az was a few degrees E of S.
alt of met about 15°
az. S 20 E

Passed round to N of East & was then a little lower - disappeared in haze behind a mountain.

Nantucket - 1st

1854 Aug 25th 7h 23m P.M. Brilliant Meteor - Originating at a point due East (true meridian) alt 30° - moved very slowly towards north & exploded at an altitude of 20° bearing N 40° E. W. M. Nant. Inquirer - Aug 28th
Moved very slowly occupying several seconds say 4 or 5

St Johns N.B. Same date & corresponding time bright Meteor in S. W - moving from right to left & rising.

Meteor of Aug - 30th Seen at Bellows Falls NH - 7 PM
alt = Arcturus + 3° = 41°
az = " + 2° = N 96° W at Starting.

Meteor of Aug 30th Bellows Falls 82m from Camb. Dartmouth college 105m from Camb

Starting point { Camb. hor. dist = 98m alt of meteor 34m
B. F. " 22m " 19m
by Calculation

explosion { Camb. hor. dist = 105m alt of m = 9m
Dartm. " 53m " 24m
by calculation and projection

Mean of all obs alt at Beg in miles = 26
End " 16

It fell at an angle of 45°
Length of path $= \sqrt{10^2+10^2} = 14.1$ miles

Passed over the town of Manchester Vt & fell near Dorset Vt - over Green Mts -

430

Sept 20th

Van Arsdale's Comet of Sept 1854.

(1854)

S

Comet comp. with star a. ~~11th~~

Comet s.f. fobly star. a of 11th.

h m s ~~Comet~~ - Star

Chro. 236) 21 31 3 − 21r.38

32 58 20.94 85° 58' Pos. Cir.

~~20~~

Star ☄ Δα = ☄ − *

21 35 13.5 21 36 2.4 +0m.. 48s.9

37.4 26.0 48.6

21 36 45.3 37 34.7 49.4

21 37 9.6 21 37 59.0 49.4

Mean 21.. 37.. 00.5 +0.. 49.07

~~20~~. 21 41 3 − 17.92

21 43 1 − 17.29

21.. 37.. 01.2 19.38

21.. 37.. 01

236 Slow 30

21.. 37.. 31

11.. 56.. 59

9 40 .. 32

1 35

M.S.T. 9.. 38 57

~~Zero~~ 48.66

48.69

48.66

Zero 48.67

19.38

29 29

585

287.05

☄ − * Δδ = − 4'.. 47.0

Place of Star (c)

176 - 39 Argelander

Not the star compared with the Comet

9.. 56.. 00.64 67.. 35.. 32.0

− 16.86 +46.9

− .19 + 0.6

9.. 55.. 43.59 +67.. 36.. 19.5

123 transfer. + 56.96 −3.. 26.1

9.. 56.. 40.55 +67.. 32.. 53.4

Cor to ap. Eq + 0.03 − 9.7

17
12
34
17
204
3

Ap. R A. * c = 9.. 56.. 40.58 δ 67.. 32.. 43.7

Daily mo in AR + 10m
in Dec − 69'

1854) Sept 20th. – Determination of comparison-star   f of 8/9th s. f. follg ~~star~~ 9.

Star a of comparison, north following star ~~[illegible]~~

~~2' 37" 21h 52m 21.4 32.3~~

(c) 8.9 2' 36" 21h 54' 37.4 47.4
(b) 9.10 8 7 22 1 3.8 13.9
(a) 11. ~~8.9~~ 7 00 22 3 24.2 34.8   8.. 46.8   8.. 47.4
☄ 0 55 22 4 22.7 33.7 not very neat.

Δα = ✱a − ✱c = + 8m.. 47s.10
Δδ = " = + 4'.. 24".0

Comet. Approx
☄ [23h Read] 22 5 45
Hour Angle 11 59 35
Cir. Read 247° 34'

Apparent AR & Dec of ✱c = Arg. 176 – 39
AR 9h.. 56m.. 40s.58   Dec 67°.. 32'.. 43".7
a – c + 8.. 47.10   a – c + 4.. 24.0
✱a AR 10.. 05.. 27.68   Dec 67.. 37.. 07.7
☄ – ✱ + 0.. 49.07   ☄ – ✱ – 4.. 47.0
☄ AR 10 06 . 16.75   ☄ Dec 67.. 32 . 20.7

By Circles deduced to time of Micr obs ☄ AR 10h.. 06m.. 25s
Dec 67°.. 33'

Sept 20th.. 9h.. 38m.. 57 M S T

Comet compared with a ✱ of 11th mag = a

Star a   Δα = ☄ − ✱ = + 0m.. 49s.07   ✱a − ✱c = + 8m.. 47s.10 Δα
Δδ = " = − 4'.. 47".0   " + 4'.. 24".0 Δδ

Ap. Eq ☄ AR 10h.. 06m.. 16s.75   Compared with ✱ a
Dec + 67°.. 32'.. 20".7

The star of comp. was obtained from ~~Arg.~~ comparison with a star of 8.9th = Arg 176 – 39 = ✱c
Mean Eq 1854.0
Star c   α 9h.. 56m.. 40s.55
δ 67°.. 32'.. 53".4

434

(1854)

Sept 22.

Zero 61r.12
61,,15
61,,15
Mean 61.14

Van Arsdale's Comet 1854 III

Comet n.f. star of 11th mag.

	Star	Comet	Comet ☄ − ✱ = Δα	Diff. Dec.
Zero =	— —	— — —	—	~~61r.14~~
	21 42 22.8	21 43 49.4	+ 1,, 26.6	—
	34.4	44 1.4	1,, 27.0	
			21 51 7	r. 26,53
			21 53 38	27,,13
			21,, 52,, 22.5	26.83
				Zero 61,, 14
				34.31
	21 59 25.4	22 0 58.8	1,, 33.4	686
				336.2 = 5′,, 36″.2
	21 59 37.2	22 1 10.5	1,, 33.3	ref +1.0
			☄ − ✱	Δδ + 5,, 37.2

Mean 21,, 52,, 30. +1,, 30.07 =
− 7.5 cor − 05
21,, 52,, 22.5 +1,, 30.02 = Δα = ☄ − ✱
236 slow 29.5
21,, 52 ,, 52.0
12 4 52
9 48 ,, 00
1 ,, 36
M.S.T. 9,, 46 ,, 24

Determination of Comparison Star

Star b n. f. a of 7th

	Dec	a		b	δ
a	2' 53"	22 4 40.9	b 6' 12"	22 7 29.5	2 48.6
b	6 12				
	3.. 19	22 4 50.5		22 7 39.0	2 48.5
	ref + 0.6 b − a		+ 3' 19"		+ 2m 48.55
	3.. 19.6				

Star a is Arg. 104-58

Approx. place of Comet

236 — 22 9 4 } 11 45 12 }

217.9

N.P.D. 24° 48'

	10h.. 20m.. 37s.54	65°.. 3'.. 37".5
	−1.. 14.55	+16.5
	−.12	+ 5
	10.. 19.. 22.87	65.. 03.. 54.5
prec	+ 51.44	−3.. 37.9
1854.0	10.. 20.. 14.31	65.. 00.. 16.6
Cor to ap. Eq. =	−.01	−9.3
Ap. R	10.. 20.. 14.30	65.. 00.. 07.3
b − a	+ 2.. 48.55	+ 3.. 19.6
Ap. R ⋆ b	10.. 23.. 02.85	65°.. 03'.. 26".9
☄ − ⋆ b	+ 1.. 30.02	+ 5.. 37.2
Ap. R of ☄	= 10.. 24.. 32.87	65.. 09.. 04.1

18.16
12
3632
1816
217.92 = 3.. 37

4 25
12
850
425
51. "

Comet compared with a star of the 11th mag = b which was afterwards determined from a

Sept 22nd 9h.. 46m.. 24s M.S.T.

Δα ☄ − ⋆b = +1m.. 30s.02
Δδ " = +5'.. 37".2
App. R ☄ = 10h.. 24m.. 32s.87
Dec = +65°.. 09'.. 04".1

Mean Eq 1854.0 Star a (not the star of Comp) Arg 104-58
α 10h.. 20m.. 14s.31
δ 65.. 00.. 16.6

436 Sept 23 1854 Van Arsdale's Comet

8) 78 / 72 / 61 / 56/4 (9.76

Comet comp. with star of 9th {AR. 10 31.1 ? / Dec +63 55 ?}

Comet S. F. Star.

Dec Star.	Dec ☄	AR Star	AR ☄	Δα ☄ − *	Δδ ☄ − *
6' 35"	5' 27" ~~22~~	$22^h 26^m 14^s.2$	$22^h 27^m 42^s.8$	$+1^m 28^s.6$	−1' 8"
		24.0	52.5	1 28.5	
Star.	☄	Star.	Comet.		
5' 46	4' 27"	$22^h 28^m 45^s.5$	$22^h 30^m 15^s.0$	$+1^m 29^s.5$	−1' 19"
		54.5	23.5	1 29.0	89 22.2
Star.	Comet.				
7' 12"	5' 45"	$22^h 31^m 42^s.3$ ~~57.?~~ 51.3	$22^h 33^m 12^s.2$	$+1^m 29^s.9$	−1' 27"
			21.4	30.1	
6' 47"	5' 12"	$22^h 34^m 59^s.7$	$22^h 36^m 30^s.8$	$+1^m 31^s.1$	−1' 35"
		35 9.0	40.4	31.4	

22 31 54.7
236 Slow − 30.6
22.. 32 .. 25.3
12 8 48.3
10 .23 .37 0
−1 .42.0
M.S.T. 10.. 21 ..55 0

+1.. 29.76 −1'.. 22".2
ref .00 −.3
+1.. 29.76 −1.. 22.5

Star a of comparison, compared with star b. R $10^h 32^m 7$ Dec $+63° 48'$ } ?

9^{th} 8.9^{th}

Star a	Star b	Star a		Star b		
9' 22"	2' 02"	$22^h 38^m$	3.3 ~~12~~ 12,5	~~$22^h 39^m$~~	$39^s.25$ 48,5	∓ $1^m 36''2$ 36,0	+ 7' 20"

Star a is Argelander 104. (p. 226) No. 71.
" b " " " " No. 75.

4.2
82
41
49 2

18.56
12
3712
1 ~~856~~
222.7 2
3.42.7

Star a.

	10..31..28.43		63..58..46.0
k	−1..14.62		+ 17.5
	+.11		− 0.4
1842.0	10..30..13.92		63..59..03.1
prec.	+49.34		−3..42.5
	10..31..03.26		+63..55..20.6
cor. Ap Eq	−.02		−9.1
Ap. R	10..31..03.24	Dec	+63..55..11.5
☄−*	+1..29.76		−1..22.5
Ap. R	10..32..33.00	Ap Dec	+63..53..49.0

Sept 23^{rd} $10^h..21^m..55^s.0$ MS T

Comet compared with * b = 9^{th} Arg. 104 ~~[illegible]~~ 71

Mean Equinox

$\Delta\alpha$ .. ☄−* = $+1^m..29^s.76$ 1854.0 * α = $10^h..31^m..03^s.26$
$\Delta\delta$ " = $-1'..22''.5$ " " δ = $63°..55'..20''.6$

Apparent Eq

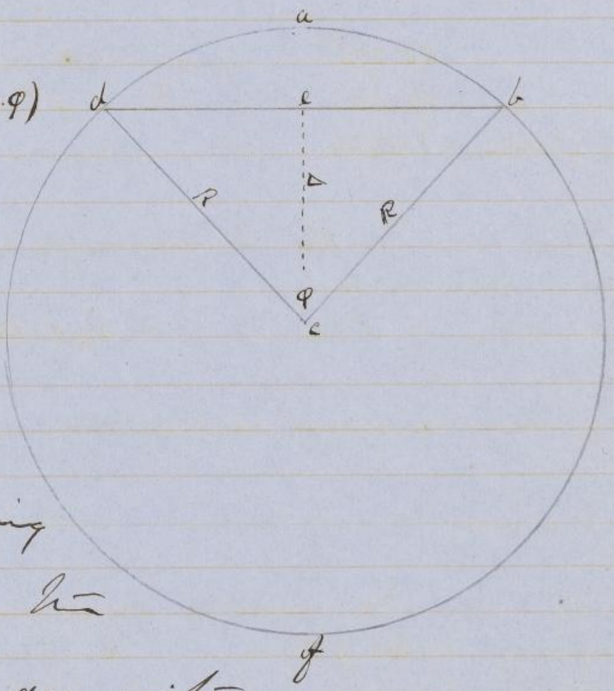
Comet, R $10^h..32^m..33^s.00$
Dec $+63°..53'..49''.0$

Experiments for determining the apertures through which stars between the 9th & 13th magnitudes of the scale adopted in the Zone observations are appear of equal brightness.

Through the finder of the Great Refractor a star of Bessels 9th appears just visible – I propose to draw over the shutter over the object glass until a star of Bessels 9th mag. appears in the Great Telescope of the same brilliancy as in the finder. The effective apertures will then be equal & knowing the aperture of the finder = we shall have the versed sine of the arc of the exposed surface of the great object-glass. When a star of less magnitude transits the shutter is to be moved off the object-glass and adjusted so that it is of the same brilliancy as the 9th mag. was & the amount by which the shutter has been raised can be measured from the revolution of the wheel which carries the chain The distance so measured will give the area of the object glass required to make it visible as the 9th mag was with an area equal to that of the finder - & from these we find the proportion of light of the two stars -

Let A_0 = the area of the object glass $fbad$ $= \pi R^2$
A_n = " of the exposed surface $abcd$ - the surface $debf$ being supposed to be covered
The angle φ is expressed in degrees

$$A_n = \frac{\varphi}{360} A_0 - \frac{1}{2} R^2 \sin\varphi = R^2\left(\frac{\varphi}{360}\pi - \frac{1}{2}\sin\varphi\right)$$



$$A_n = R^2\left(\frac{\pi}{360}\varphi - \frac{1}{2}\sin\varphi\right)$$

Let $\Delta = ec = R\cos\frac{1}{2}\varphi$

Let A_9, φ_9 and Δ_9 represent the above quantities for rendering a 9th mag. star as bright in the Great telescope as in its finder with its full aperture $= \frac{1}{4}(3.\overset{in}{0})^2\pi = \frac{1}{4}(28.27) = 7.07$ square inches

$$A_9 = 7.07 = \frac{1}{4}\frac{(\overset{in}{14.97})^2\pi}{360}\varphi_9 - \frac{1}{4}\frac{\overline{14.97}^2}{2}\sin\varphi_9 = \overset{0.4889\,\varphi_9 \;-\; 28.01 \sin\varphi_9}{\cancel{1.9555\,\varphi_9} - \cancel{112.05 \sin}\,\varphi_9}$$

~~$\varphi_9 = 41° 50'$~~ $\varphi_9 = 67° 21'$ $\Delta_9 = \overset{in}{6.233}$ $A_9 = 7.07$ square inches $R = \frac{1}{2}(\overset{in}{14.97})$
(tested) by graphic projection

$$ae = R - \Delta_9 = \overset{in}{1.252} = \overset{in}{7.485} - \overset{in}{6.233}$$

The relative brightness of a star of the nth magnitude compared with a star of the 9th mag. will be

$$i = \frac{A_9}{A_n} = \frac{\cancel{7.07}}{\cancel{R^2}\left(\frac{\pi}{360}\cancel{\varphi - \frac{1}{2}\sin\varphi}\right)} = \frac{7.07}{R^2}\;\frac{1}{\frac{\pi}{360}\varphi_n - \frac{1}{2}\sin\varphi_n}$$

$$i = \frac{7.07}{R^2}\cdot\frac{360}{\pi}\;\frac{1}{\varphi_n - \frac{180}{\pi}\sin\varphi_n} =$$

442

$R = 7.485 \quad 0.87419$

$\quad\quad 2$

$R^2 \quad 1.74838$

$\pi \quad 0.49715$

$\quad 2.24553$

$180 \quad 2.25527$

$\log \frac{180}{\pi} = 1.75812$

$= 57.295$

$7.07 = 0.84942$

$360 = 2.55630$

3.40572

$= 2.24553$

$\frac{7.07}{R^2} \cdot \frac{360}{\pi} \log = 1.16019$

$= 14.46$

Test-

Let $\varphi_n = \varphi_9 = 67^{\circ}.21'$ sin - - - - - - 9.96514

$= 1.72326$

52.876

$\varphi_n = 67.350$

$\varphi_n - \frac{180}{\pi} \sin\varphi_n = 14.474$

For a 9th mag star $i' = \frac{14.46}{14.47} = 1.0$

For the brilliancy $= i_n$ of a star taking a Bessels 9th for a standard

~~$i_n' = 14.46$~~ $\quad i_n' = \dfrac{14.46}{\varphi_n - 57.30 \sin.\varphi_n}$

φ_n being expressed in degrees-

$$\cos \tfrac{1}{2}\varphi_n = \frac{\Delta_n}{R} = \frac{\Delta_n}{7.485}$$

We need a sufficient number of comparisons between stars of Bessels 9th mag- & those of lower magnitudes- For which purpose we are to collect observed values of $\Delta_9 - \Delta_n$ in inches - or the distance in inches through which the shutter must be raised from the point where the 9th mag stars- disappear- or become of a certain standard faintness- to the point where an nth magnitude star is equally faint-

If the comparisons are made by closing the aperture until the star is at its minimum visibil we have for the area of the effective aperture for a Bessels 9th mag By experiment $\frac{\pi}{4}(1^{in}.35)^2 = 1^{in}.43$

28
14
112
28
392 = +6′..32

28
3
84 = 1..24

21..00..28
1 24
21.. 1 52
20 55
0..52

Δα +7

0.49715
4 0.60206
9.89509
0.26066
1.43 = 0.15575

1.35 = 0.13033
0 26066

To find versed sine of corresponding aperture of great object glass

$1.43 = 0.489\,\varphi - 28.01 \sin\varphi$ $\varphi = 39^\circ$

$\frac{1}{2}\varphi = 19^\circ..30'$ cos = 9.97435
R 0.87419
7.056 = 0.84854
R 7.485
0.439 = $R - \Delta_9$ for extinction of light. (tertia)

The versed sine of the aperture of the Great Refractor requisite to show a Bessels 9th mag. at the min. visibile = $0\overset{\text{in}}{.}43$ & the area of the surface is $1\overset{\text{in}}{.}43$.

Oct. 24th 1854 G.P.B.

Comparisons of Stars of different magnitudes with Stars of Beſsels 9th mag. The standard Stars have been selected from Weiſse & each has been twice observed by Beſsel.

Set II

Comparisons with Weiſse H XXI. Nos 16-18 and 20 by reducing the aperture until the stars all appear of a brightneſs equal to that of a 9th mag star in the finder with aperture = 3in

Values of $A_9 - A_n$ Dec + 15°

$A_9 - A_{10} = 0^{in}.6$	$A_9 - A_{11\text{-}12} = 2^{in}.7$	$A_9 - A_{12} = 3^{in}.7$	$A_9 - A_{13} = 4^{in}.3$
		" = 2.3	" = 3.0

Weiſse H-XXI- No 856- Dec + 10°

$A_9 - A_{10\text{-}11} = 1^{in}.6$	$A_9 - A_{11} = 1^{in}.3$	$A_9 - A_{12} = 2^{in}.1$	$A_9 - A_{13} = 5.3$
" = 1.7	" = 1.8	" = 2.8	" = 4.4
		" = 3.0	" = 4.1
		" = 5.8	

It was thought that more consistent results would be obtained by comparing the apertures for the *minimum visibile* of each star. The following comparisons were made in this way

Set II

Comparisons of apertures for minimum visibility of stars – :Bessels 9m seen with 1in $\frac{1}{3}$ aperture of finder. Standard is Weisse H-XXIII - Nos 869 & 874
Dec = 0°

$\Delta'_9-\Delta'_{10} = 0^{m}.3$

$\Delta'_9-\Delta'_{11} = 0^{m}.5$
" $= 1.1$

$\Delta'_9-\Delta'_{11-12} = 1.1$
" $= 1.6$

$\Delta'_9-\Delta'_{12} = 1^{m}.3$
1.6

$\Delta'_9-\Delta'_{12-13} = 1^{m}.6$
" $= 2.4$

$\Delta'_9-\Delta'_{13} = 1.6$
" $= 2.4$
" $= 2.7$

Weisse H. XXIII - Nos 982-987 - Dec = -10°

$\Delta'_9-\Delta'_{10} = 0.5$
" $= 0.4$

$\Delta'_9-\Delta'_{11} = 0.6$
" $= 0.9$

$\Delta_9-\Delta_{11-12} = 1.3$

$\Delta_9-\Delta_{12} = 1.8$
" $= 1.8$
" $= 1.6$
" $= 0.7$
" $= 1.7$

$\Delta'_9-\Delta'_{12-13} = 1.a$

$\Delta'_9-\Delta'_{13} = 1.5$
1.7
3.0

Mean Results for Sets I & II -

Set I

$\Delta_9-\Delta_{10} = 0.60$ w = 1

$\Delta_9-\Delta_{10-11} = 1.65$ " 2
$\Delta_9-\Delta_{11} = 1.55$ = 2
$\Delta_9-\Delta_{11-12} = 2.70$ " 1
} Mean $\Delta_9-\Delta_{11} = 1.86$ w = 4

$\Delta_9-\Delta_{12} = 3.28$ " 6

$\Delta_9-\Delta_{13} = 4.22$ " 5

Set II.

$\Delta'_9-\Delta'_{10} = 0.40$ w = 3

$\Delta'_9-\Delta'_{11} = 0.77$ w = 4

$\Delta'_9-\Delta'_{11-12} = 1.33$ " = 3
$\Delta'_9-\Delta'_{12} = 1.50$ " = 7
$\Delta'_9-\Delta'_{12-13} = 1.67$ " = 3
} $\Delta_9-\Delta_{12} = 1.50$ w = 13

$\Delta'_9-\Delta'_{13} = 2.15$ " = 6

Magnitudes of Zone stars

For Set I we have $A_9 = 6^m.23$ consequently

$A_{10} = 5^m.63$ w = 1

$A_{11} = 4.37$ " = 4

$A_{12} = 2.95$ " = 6

$A_{13} = 2.01$ " = 5

For Set II ... $A'_9 = 7^m.06$

$A'_{10} = 6.66$ w = 3

$A'_{11} = 6.29$ " = 4

$A'_{12} = 5.56$ " = 13

$A'_{13} = 4.91$ " = 6

5.63	= 0.7505	6.66	0.8235
4.37	= .6405	6.29	.7986
2.95	= .4698	5.56	.7451
2.01	= .3032	4.91	.6911
log R	0.87419		= 0.87419
$\frac{1}{2}\varphi$ 41°..12′	9.8763	27..09	9.9493
54..16	9.7663	32..50	9.9244
66..48	9.5956	42..02	9.8709
74..26	9.4290	49..00	9.8169

φ = 82..24	~~sin~~ 28.01 sin φ = 27.7	54..18	28.01 sin φ =	22.7
108..32	26.5	65..40		25.5
133..36	20.3	84..04		27.9
148 52	14.4	98..00		27.7
	$\varphi \times 0.4889$ = 40.39			26.5
	= 53.06			32.1
	= 65.32			41.1
	= 72.77			47.9

$A_9 = 7.07$	A_{10}	12.7	w = 1	$A'_9 = 1.43$	A'_{10}	3.8	w = 3
	A_{11}	26.6	4		A'_{11}	6.6	4
	A_{12}	45.0	6		A'_{12}	13.2	13
	A_{13}	58.4	5		A'_{13}	20.2	6

The 13th mag.s observed were probably only faint 12th mags as were most of the 13ths registered in zone obs.

The difficulty with Set b is that the standard of brilliancy to which the stars were reduced - was not easily comparable. partly on account of the difference in the power & extent of field of the Great Telescope and of the finder -

Set bb affords more reliable results for comparing 10th 11th & 12th magnitudes together but the area which limits the visibility of a 9th mag- is so small that the ratio of its light to that of the fainter stars is not to be trusted in these experiments.

I propose a new set of experiments viz-

1st To select 10th & 11th mag. stars in the great telescope. & compare them with Bessels 9th in the finder This will give a reliable scale from the 9th to the 11th

2nd Select a screen glass which will just allow a 13th mag. to be visible with the full aperture of the great telescope Then shut off the light sufficiently to obscure the 9th mag. stars & we shall then be able to form a new set of comparisons in which - the standard star will disappear at a more favourable aperture.

Oct 25th 1854 G.P.B & C.W.T.

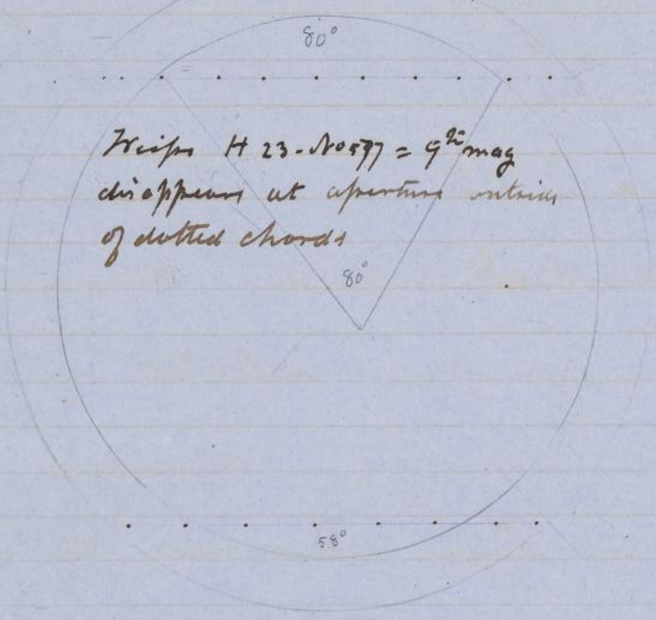
Observations of apertures of finder through which stars of 9th & fainter magnitudes selected in the Great Telescope are at their minimum visibile

The stars of 9th mag. selected were all twice observed by Bessel in his Zones & appeared of his average ninth mag. by our previous experience. The air was clear & fine.

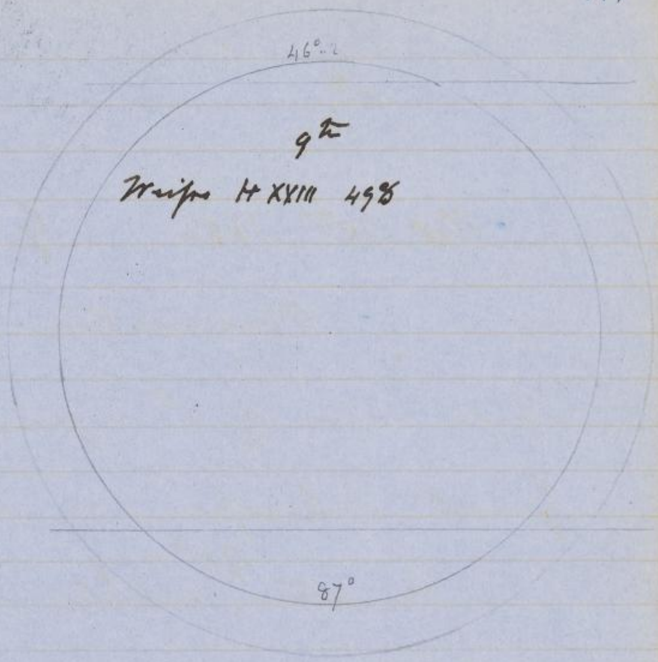
Experiments were made with very bright stars to see if the whole aperture of the finder was effective a 2nd mag star disappears when the versed sine of the effective segment of apperture is less than $0^{\text{in}}.01$ - The total aperture is $3^{\text{in}}.02$ & the effective I shall call $3^{\text{in}}.01$ The outside of brass setting of object glass with reference to which observations of apertures were made is of the diameter $3^{\text{in}}.59$.

NB In the following the figures denoting the magnitudes are placed in the covered portion of the aperture included between the chords.
The inner circle is that of the effective aperture of the finder when wholly exposed.

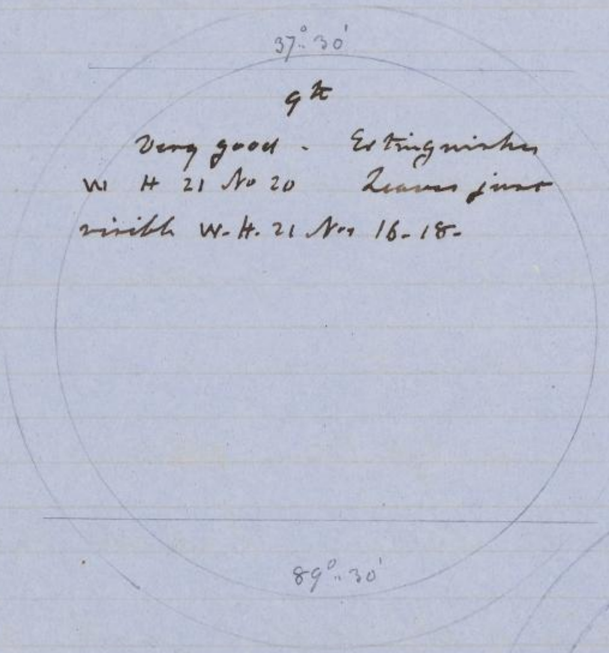
outside of dotting



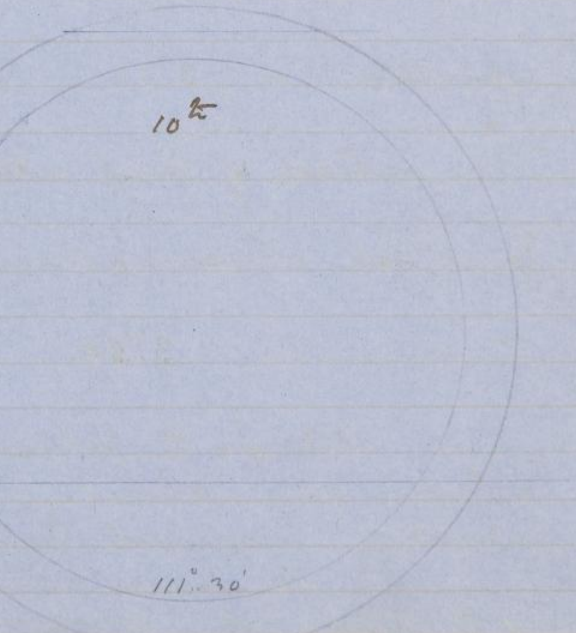
Weisse H 23 - No 597 = 9th mag
disappears at aperture outside
of dotted chords



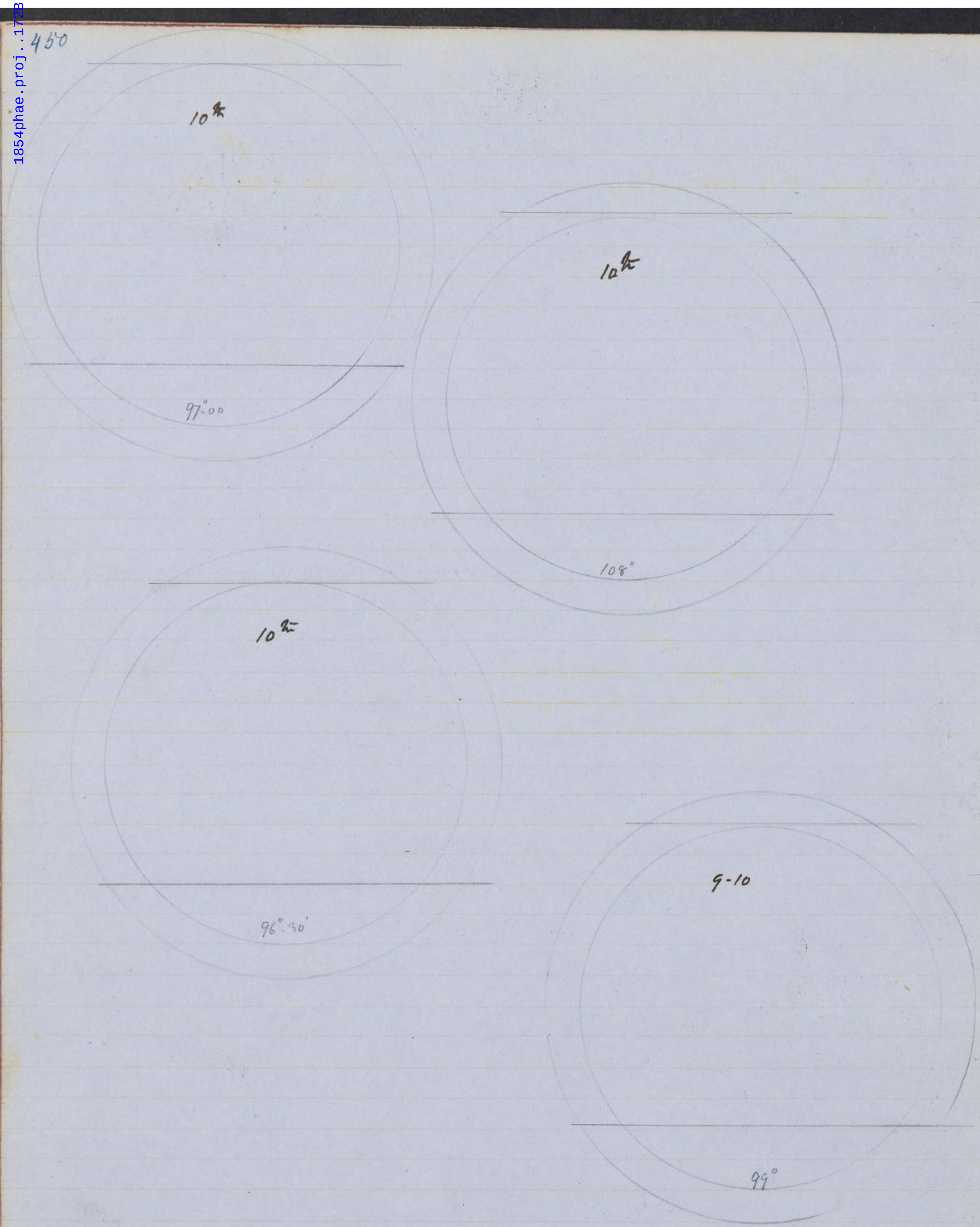
9th
Weisse H XXIII 498

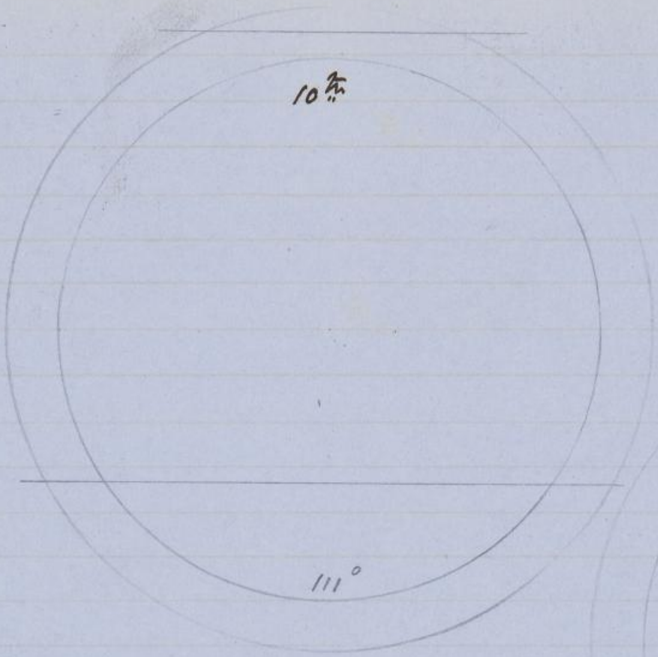


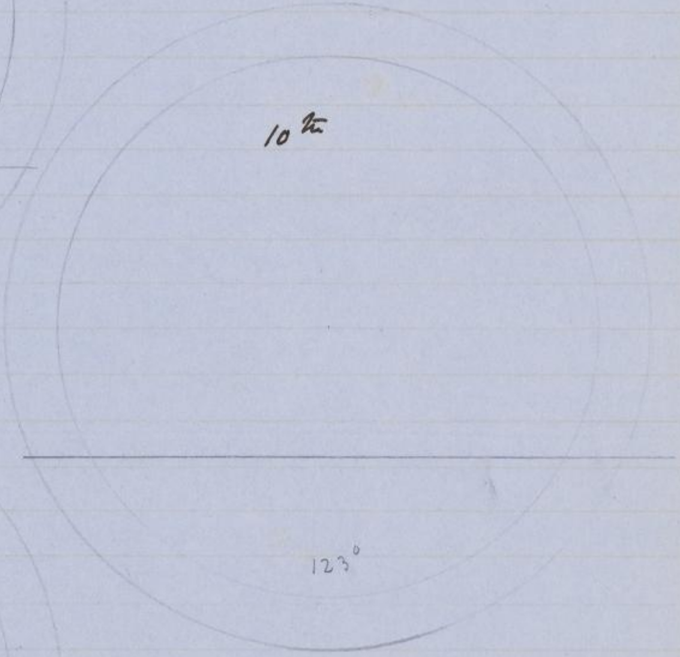
9th
Very good - Extinguishes
W. H 21 No 20 Leaves just
visible W. H. 21 Nos 16-18.

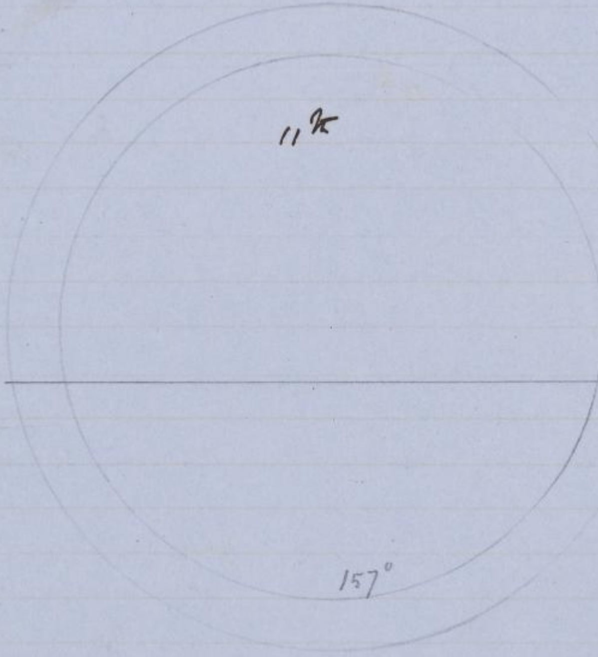


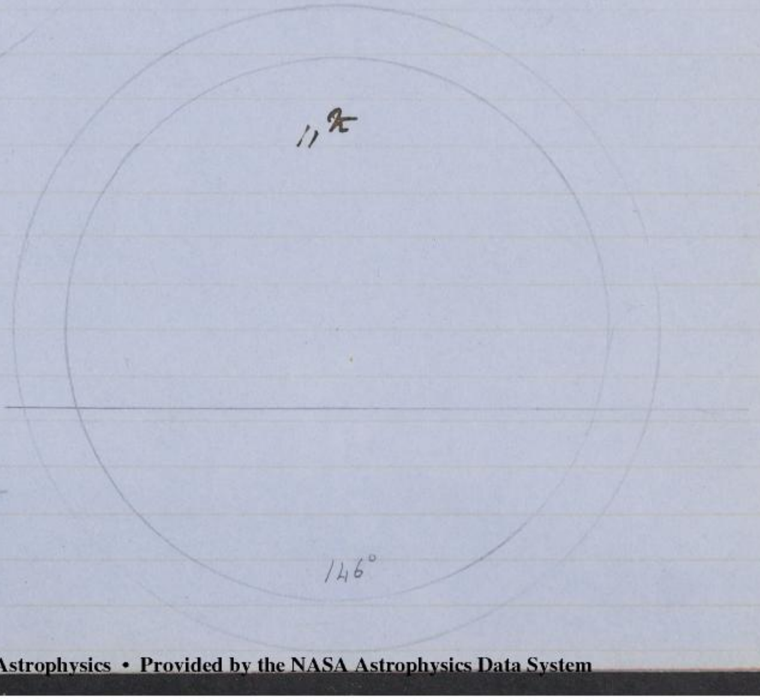
10th

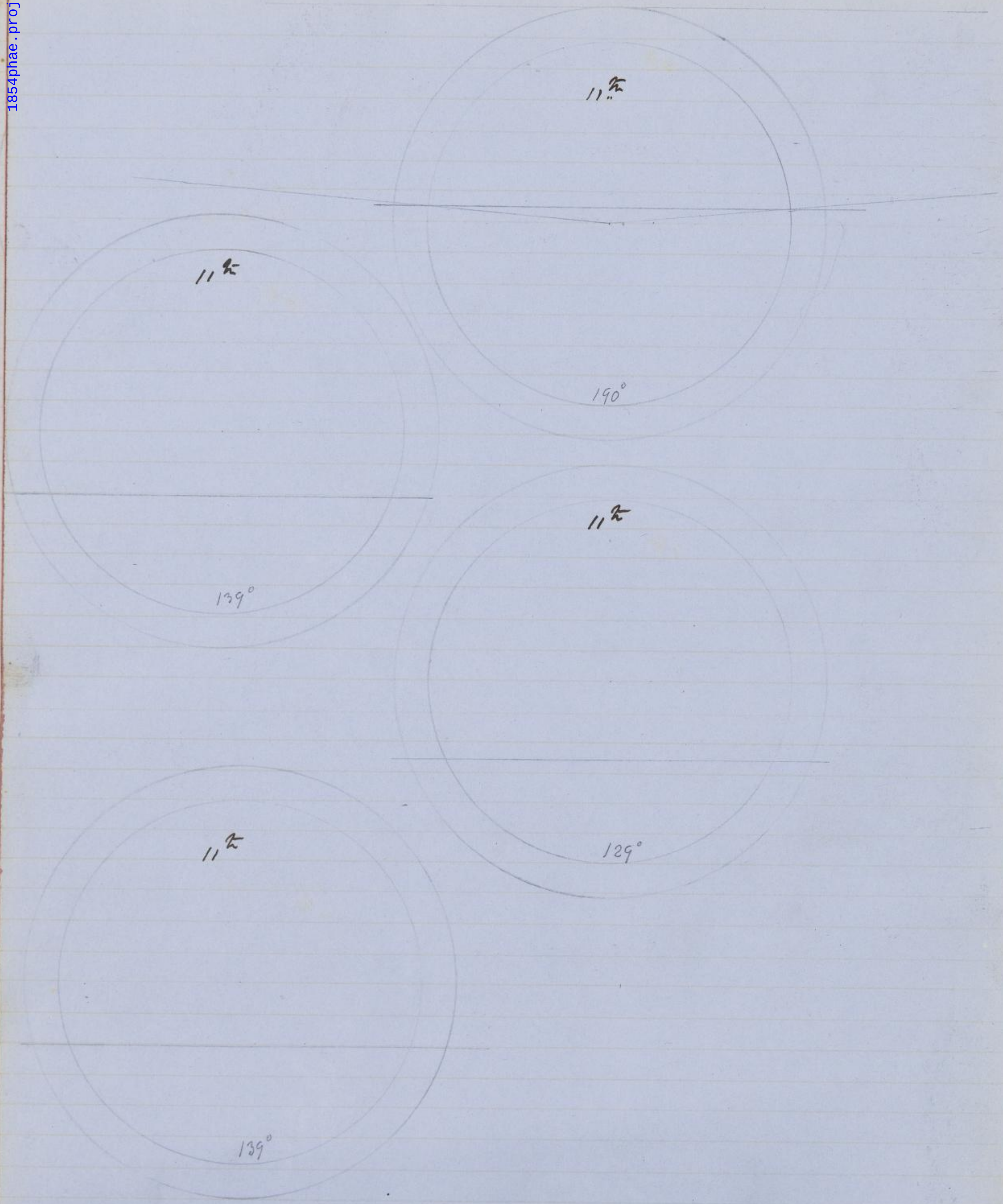

10^h
97°00
10^h
108°
10^h
96°30'
9-10
99°


10h
111°

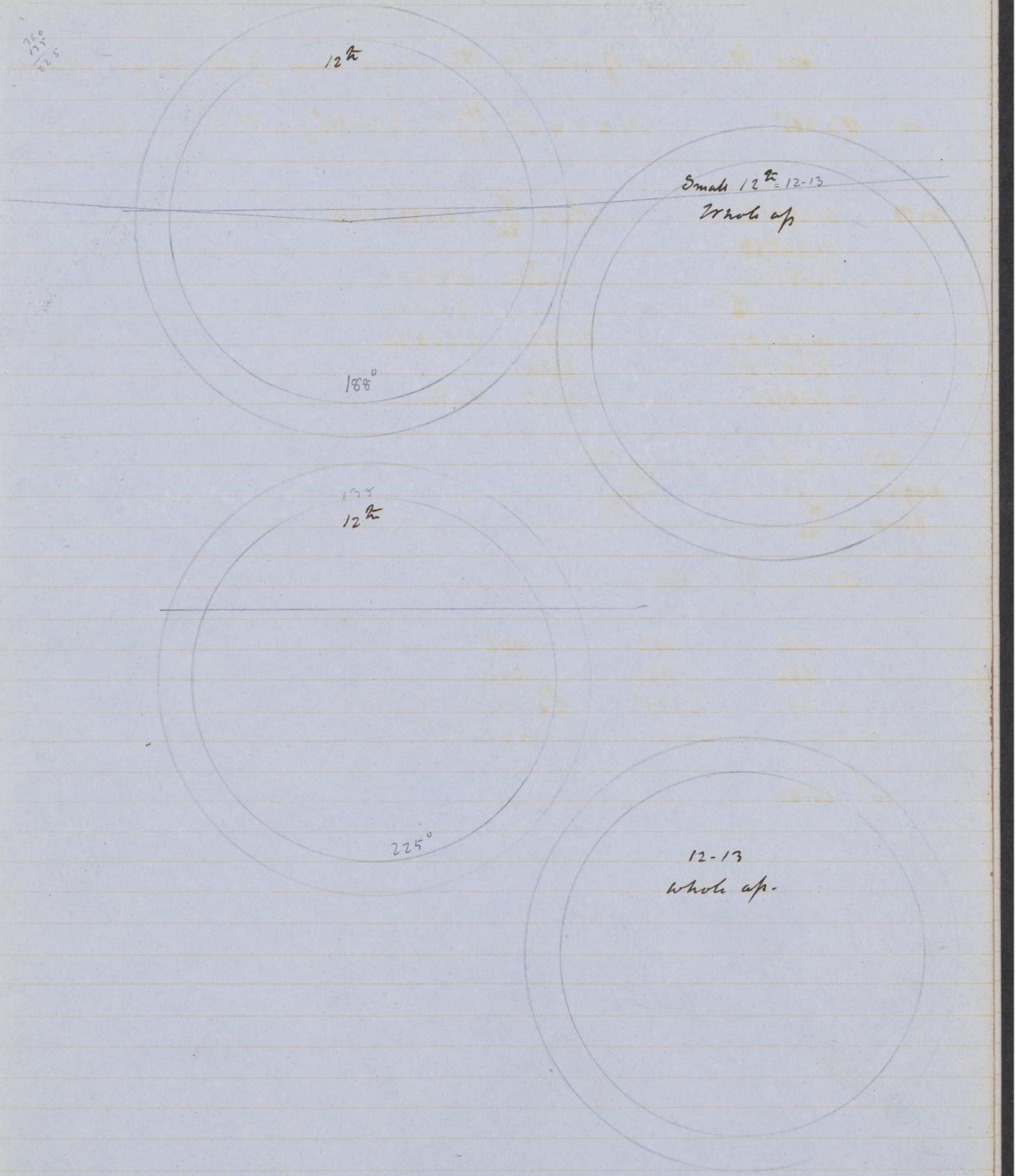

10h
123°


11h
157°


11h
146°


11h
190°
11h
139°
11h
129°
11h
139°

360
135
225



Let the unit of area be the whole area of the finder object-glass

or $\varphi_n = 360°$ $A_n = 1 = R^2\left(\frac{360}{360}\pi - \frac{1}{2}\sin 360°\right) = \pi R^2$ $R = \frac{1}{\sqrt{\pi}}$

$\log \pi$ 0.49715 $A_n = \frac{\varphi}{360°} - 0.1591 \sin\varphi$ whole area = 1

0.24858

$\log R$ 9.75142 $124°$ sin 9.91857

" R^2 9.50285 9.20182

2 0.30103 0.1319 9.12039

$\log \frac{R^2}{2}$ 9.20182 3444

= 0.15915 0.2685 Tertia

36° 9.76922 $36)124(344$

0.0935 = 8.97104 108

6000 = $\frac{\varphi}{360}$ 160

0.0065 144

16

$\varphi = 124$ $\frac{\varphi}{360} = 0.3444$

.026 .013 .008

066 083 090

$9^{th} = 0.092$ $9^{th} = 0.096$ $9^{th} = 0.098$ of whole area of finder

w = 1 w = 1 w = 2

10^{th} 0.162

Proportions of whole area of object glass of finder $= \frac{1}{4}(3.1415 \times 3.\overset{in}{01}{}^{2})$ through which stars of the magnitudes given at the head of each column are barely visible

	9th	wt	10th	11th	12th	12.13
						1.00
	0.092	1	0.162	0.374	0.541	1.00
	096	1	.112	.317	0.737	
	098	2	.110	282		
			.149	545		
			.160	235	(0.709 w=2)	From 12-13 ... $0.709 = 1.00\frac{1}{\sqrt{2}}$
			.208	282		
Mean	0.096	w=4	0.150	0.339	0.673	

Oct 27 Seven new Weisse stars employed making in all 12

9th
0.073
.051
~~.208~~ reject
.025
.138
.075
.106
.091
.061
.077
.208
.142
.057
.044
.121

15) 1.477 (0.098 = Mean
135 . 0.091 w = 14
127

Set I on p 446 gives $\frac{A_{11}}{A_{12}} = \frac{26.6}{45.0} = 0.591$ w = 4

" II " " $= \frac{6.6}{13.2} = \underline{0.500}$ " = 4

Mean $\frac{A_{11}}{A_{12}} = 0.545$ w = 8 By G. Ref

Page 455 A $\frac{A_{11}}{A_{12}} = \frac{339}{673} = \underline{0.537}$ w = 4 By Fnd

Final Mean $\frac{A_{11}}{A_{12}} = \underline{\underline{0.542}}$ w = 12

page 446 $\frac{A_{10}}{A_{11}} = \frac{12.7}{26.6} = 0.477$ w = 1

" " $= \frac{3.8}{6.6} = \underline{0.576}$ w = 3

Mean $\frac{A_{10}}{A_{11}} = 0.551$ w = 4 by G. Ref

page 455 $\frac{0.150}{0.339}$ = " $= \underline{0.443}$ w = 6 by Finder

Final Mean $\frac{A_{10}}{A_{11}} = \underline{\underline{0.486}}$

$\frac{A_9}{A_{10}} = \frac{93}{150} = \underline{\underline{0.620}}$

Final Results

$\frac{A_9}{A_9} = 1.000$ = The aſsumed standard of brightneſs = Beſsels 9th mag.

$\frac{A_9}{A_{10}} = 0.620$ = Ratio of Light of our tenth mag to Beſsels 9th mag

$\frac{A_9}{A_{11}} = 0.301$ = " eleventh " "

$\frac{A_9}{A_{12}} = 0.163$ = " twelfth " "

Area in inches of the effective aperture of the finder $= \frac{1}{4}\pi\, 3.01^2$

Area through which a 9th mag star is visible $= 0.093 \cdot \frac{1}{4}\pi\, 3.01^2$

Comparison of Sir J. Herschel's magnitudes in units & decimals

H	= Harvard Zones	Dif
8.7	8.3	+0.4
9.5	7.5	+2.0
9	9	0.0
9.5	10	−0.5
9.7	10	−0.3
10.5	13	−2.5
12.7	12	+0.7
9	11	−2.0
9	11	−2.0
		−3.9
	Mean =	−0.4

These comprise all the stars common to our Zones & all his double star & nebula Catalogues.

By comparing the distribution of 10th & 11th mag. stars of Sir J. H's sweeps at Cape of Good Hope with those in our zones I find that our 11th agrees almost precisely with his 10th

1854 – Octr 27 – Occultation of 58 & 60 Sagittarii.

E.C. Slow of sid. time.

oct. 26 W.C.B. β Lyræ – $8^{s}.42$ at $18^{h}.44^{m}$

" – α Aquilæ – 8.46 " 19..43

Oct. 27 – T.H.S. ζ Aquilæ – 8.11 " 18..58

δ. " – 8.10 " 19..18

c Sagittarii – 8.18 " 19.53

Observed Immersion 58 Sagitt: E.C – $22^{h}..15^{m}..15^{s}.9$ – W.C.B. with Christophe

" — " — " – " – " – 22..15..15.2. T.H.S. with 4f. Fraunhofer

" — " — " – " – " – 22..15..14.3 P.S.C. with 9r. Equatorial

" — " — " – " – " – 22..15..14.3. G.P.B. Equa. Finder

C.W.T. recorded for G.P.B and P.S.C.

R.F.B. recorded for Tr. H. Safford

Observed Immersion of 60 Sagitt: E.C. 23..49..20.1. T.H.S. 5ft. Equatorial

" — " — " – " – " – 23..48..19.7 – P.S.C. with 8ft. Equatorial

C.W.T. marked for P.S.C.

R.F.B. marked for T.H.S.

1854

- P.S.C. used. No 312 -

58 Sagitt Time by 312 — Im — 14..09..11.5

W.C.B used No 236. — 58 Sagitt. Im 22..15..26.5 — 7

- 3.5

22..15.23.0

EC - 22..22..0
236 - 22..22..7.1

EC - 23..42..0.0
236 - 23..42..7.2

J.H.S. used No 424 - J.H.S compared
EC - 22..21..10.0 — 424 — 22..21..19.8
30.0 — " 29.7 qu 39.7.
50.0 — " — 49.7
EC - 23..54..50.0 — " — 22.54 .49.9

JHS - obs - Imm. 60 Sagitt by 424. 11..49..20.0

EC - 22..37..0
312 - 15..31..57.5

EC - 22..41..0
312 - 15..35..57.5

EC - 23..59..0.0
312 - 16..53..57.5

1854 Nov. 9. Obs. for Personal Equation. By Electric Method—

WCB (leads) G.P.B.

Read off by WCB.	Read off by P.S.C.			
58.7	58.6	2.9	2.8	4.2
10.9	10.9	15.2	15.15	4.3
30.5	30.5	34.7	34.7	4.2
45.7	45.75	49.9	49.9	4.2
59.0	59.0	3.1	3.1	4.1
12.7	12.7	16.9	16.8	4.2
29.1	29.1	33.2	33.15	4.1
44.6	44.5	46.6	46.5	4.0
56.2	56.1	0.2	0.15	4.0
11.7	11.7	15.8	15.75	4.1
27.2	27.2	31.2	31.25	4.0
45.2	45.1	49.2	49.1	4.0
				4.12

G.P.B leads — WCB.

19.3	19.25	22.9	22.9	3.6
31.1	31.1	34.9	34.9	3.8
43.2	43.2	47.0	47.0	3.8
53.9	53.9	57.7	57.6	3.8
3.9	3.9	7.8	7.75	3.9
17.1	17.05	20.9	20.8	3.8
29.2	29.27	33.0	33.0	3.8
42.0	41.95	45.9	45.9	3.9
8.4	8.35	12.3	12.27	3.9
33.9	33.9	37.7	37.55	3.8
				19
				3.81

WCB (leads) ~~[illegible]~~ GPB.

22.4	22.4	26.4	26.3	4.0
34.7	34.6	38.8	37.75	4.1
46.9	46.85	51.0	51.05	4.1
0.3	0.25	4.5	4.5	4.2
13.7	13.7	17.8	17.8	4.1
~~27.0~~	27.0		30.9	4.10

Nov. 9. Pers. Eq. cont.

WB (leads). GPB* ~~[illegible]~~

30.0 – 30.05 34.2 – 34.2 4.2
41.6 – 41.6 45.7 – 45.7 4.1
55.9 55.9 0.0 .00.0 4.1
9.4 – 9.5 13.3 – 13.3 3.9
22.7 22.65 26.7 – 26.65 4.0
35.4 35.4 39.5 – 39.5 4.1
49.7 – 49.65 53.7 – 53.75 4.0
2.1 – 2.1 6.0 – 5.95 3.9
15.3 – 15.35 19.3 – 19.25 4.0
26.0 – 26.0 30.2 – 30.15 4.2
40.3 – 40.3 44.3 – 44.25 4.0
55.5 – 55.45 59.6 – 59.6 4.1
4.05

GPB* ~~[illegible]~~ (leads). WB.

21.0 – 20.95 24.6 – 24.45 3.6
38.8 – 38.75 42.6 42.45 3.8
54.9 – 54.85 58.8 – 58.6 3.9
7.9 – 8.0 11.8 – 11.75 3.9
23.0 – 23.0 26.9 – 26.85 3.9
34.0 – 33.95 37.9 – 37.9 3.9
48.2 48.2 52.0 – 52.05 3.8

1854 Nov. 9 Pers. Eq. cont.

WCB	JMS	
28.4-28.45	32.3-32.2	3.9
47.9-47.95	51.8-51.77	3.9
3.8-3.80	7.8-7.75	4.0
20.0-20.05	23.5-23.05	3.5
36.6-36.6	40.5-40.45	3.9
52.3-52.3	56.3-56.25	4.0
5.5-5.45	9.6-9.6	4.1
20.9-20.9	24.9-24.8	4.0
33.6-33.6	37.8-37.8	4.2
48.0-48.0	52.1-52.1	4.1
3.0-3.0	6.9-6.85	3.9
15.4-15.3	19.3-19.2	3.9
		3.99 }
		or 3.95 }

JMS	WCB	
52.4-52.4	56.2-56.2	3.8
9.8-9.8	13.8-13.8	4.0
27.3-27.3	31.3-31.25	4.0
38.2-38.2	42.2-42.25	4.0
54.4-54.4	58.3-58.2	3.9
8.9-8.9	12.9-12.95	4.0
21.4-21.35	25.3-25.4	3.9
32.6-32.5	36.7-36.6	4.1
47.3-47.3	51.3-51.3	4.0
57.4-57.45	1.5-1.55	4.1
12.9-12.85	16.9-16.9	4.0
29.7-29.65	33.8-33.8	4.1
43.4-43.4	47.6-47.5	4.2
		4.01

1854 Nov. 9. Res. Eq. cont.

WCB	RC.	
2.1 – 2.1	6.0 – 6.0	3.9
15.0 – 15.05	19.0 – 18.95	4.0
27.6 – 27.55	31.2 – 31.25	3.6
40.8 – 40.7	45.0 – 44.95	4.2
55.7 – 55.75	59.9 – 59.9	4.2
8.1 – 8.1	11.9 – 11.85	3.8
24.0 – 24.05	28.0 – 28.0	4.0
38.8 – 38.70	42.8 – 42.8	4.0
52.0 – 51.95	56.0 – 56.0	4.0
6.9 – 6.95	11.0 – 11.0	4.1
19.4 – 19.3	23.6 – 23.5	4.2
36.9 – 36.9	40.6 – 40.5	3.7
		3.98
50.45	54.1	

RC.	WCB.	
35.9 – 35.9	40.0 – 40.0	4.1
6.1 – 6.1	10.0 – 9.95	3.9
19.4 – 19.4	23.5 – 23.45	4.1
33.2 – 33.15	37.2 – 37.1	4.0
53.8 – 53.80	57.8 – 57.75	4.0
8.3 – 8.3	12.1 – 12.1	3.8
23.7 – 23.6	27.2 – 27.2	3.5
38.5 – 38.45	42.8 – 42.8	4.3
57.1 – 57.15	1.1 – 1.1	4.0
14.0 – 14.0	17.9 – 17.9	3.9
30.6 – 30.5	34.6 – 34.5	4.0
~~4~~31.5 31.45	35.8 – 35.75	4.3
		3.99

1854 Nov 9. Ker. Eq. Coud.

WCB.	RCl.	
14.0 14.05	17.7-17.7	3.7
28.8-28.75	32.5-32.55	3.7
42.0-41.95	45.7-45.6	3.7
57.8-57.8	55.5-55.45	3.7
5.8-5.85	9.8-9.85	4.0
20.6-20.6	24.6-24.55	4.0
31.9-31.9	35.7-35.7	3.8
47.0-47.00	50.9-50.9	3.9
1.5-1.5	5.4-5.4	3.9
13.0-13.05	16.8 16.8	3.8
25.7--25.65	29.6-29.6	3.9
41.2-41.2	44.9-44.9	3.7
		3.82

RCl.	WCB.	
44.7-44.65	48.5-48.5	3.8
59.6-59.6	3.6-3.6	4.0
16.9-16.95	20.8-20.7	3.9
33.3-33.35	37.3-37.3	4.0
53.1-53.1	57.2-57.2	4.1
9.0-8.95	13.0-13.0	4.0
25.6-25.6	29.3-29.35	3.7
39.1-39.1	43.0-43.0	3.9
53.7-53.6	57.5-57.45	3.8
6.9-6.9	10.8-10.75	3.9
21.1-21.15	25.1-25.1	4.0
34.3-34.30	38.2-38.2	3.9
51.9-51.95	55.6-55.5	3.7
		3.90

GPB.		THS.		
36.4	36.4	40.1	40.1	3.7
49.0	49.0	52.8	52.75	3.8
1.7	1.7	5.3	5.25	3.6
15.1	15.1	18.9	18.9	3.8
28.9	28.9	32.8	32.85	3.9
39.7	39.75	43.3	43.2	3.6
57.1	57.1	54.5	54.5	3.4
7.3	7.25	11.1	11.1	3.8
21.3	21.35	25.0	25.0	3.7
34.8	34.75	38.5	38.45	3.7
46.9	46.9	50.6	50.65	3.7
0.2	0.15	3.9	3.95	3.7
				3.70

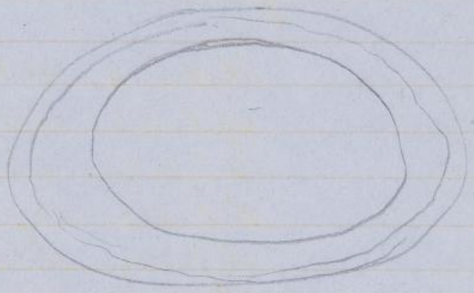
MS.		GPB.		
48.7	48.65	52.8	52.8	4.1
59.0	59.0	3.1	3.15	4.1
28.1	28.05	32.2	32.15	4.1
40.2	40.15	44.3	44.3	4.1
52.2	52.25	56.3	56.3	4.1
4.0	4.00	8.2	8.2	4.2
14.3	14.35	18.5	18.45	4.2
25.0	25.0	29.3	29.3	4.3
39.9	39.95	44.1	44.1	4.2
51.7	51.70	55.8	55.8	4.1
4.1	4.1	8.3	8.3	4.2
14.9	14.95	19.0	19.0	4.1
				4.15

1854 Nov 23

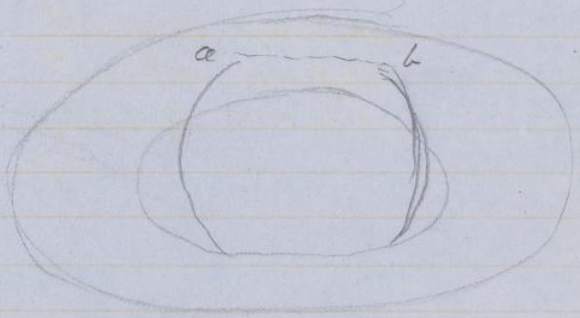
Saw Saturn at 8 P.M.

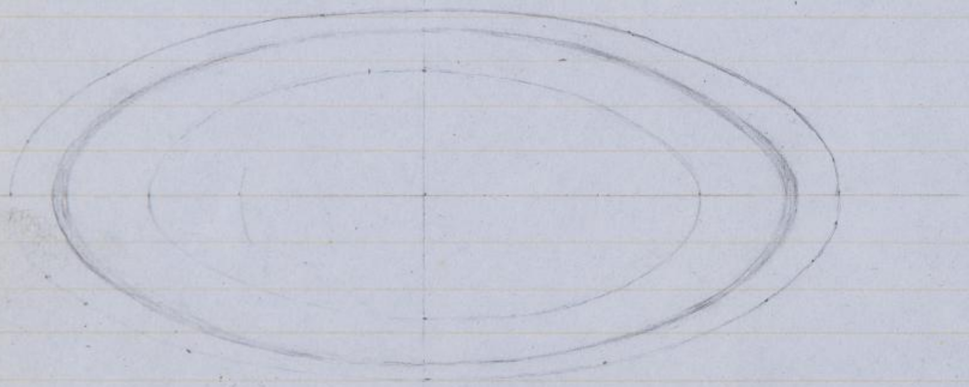
The upper (ap) edge of ball projected on the ring appeared truncated at ab Clouded suddenly & prevented further obs-

G.P.B



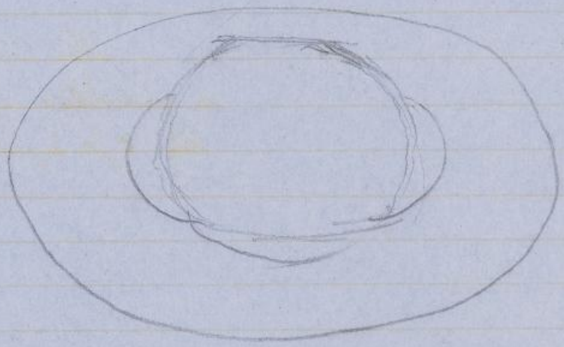
46.2
20.4
25.8

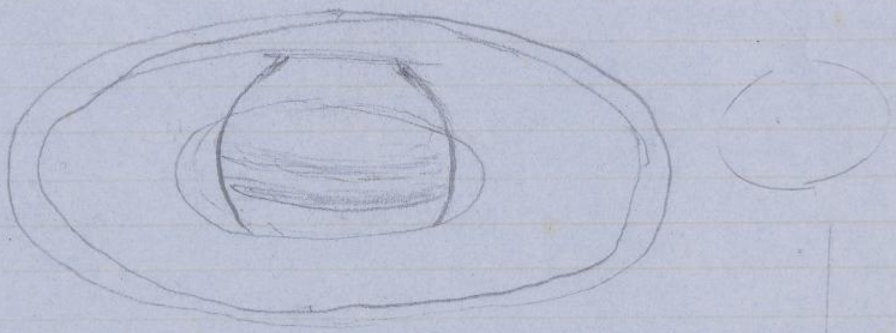


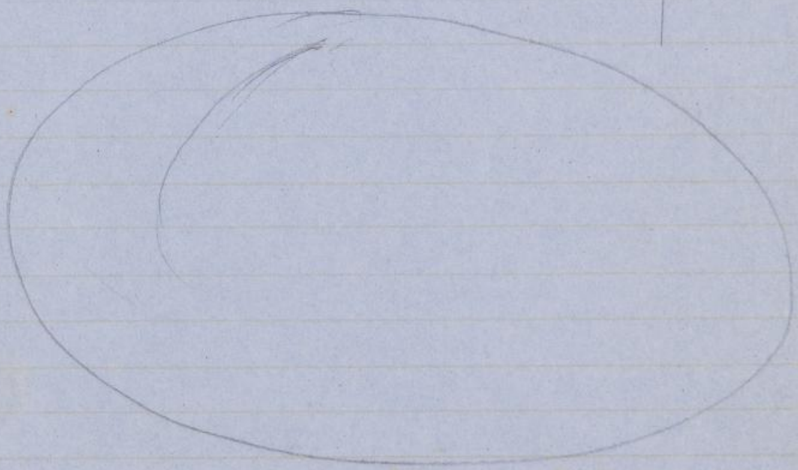


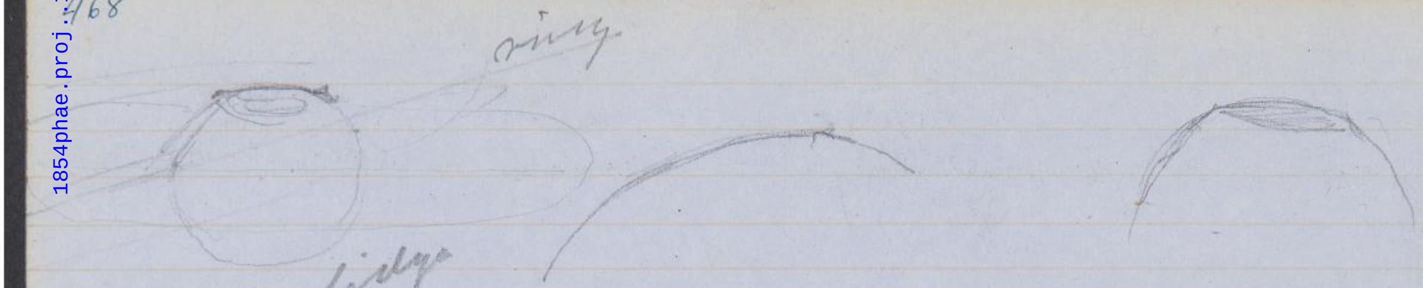
Nov 23rd 9.20 P.M.

Saturn finely defined



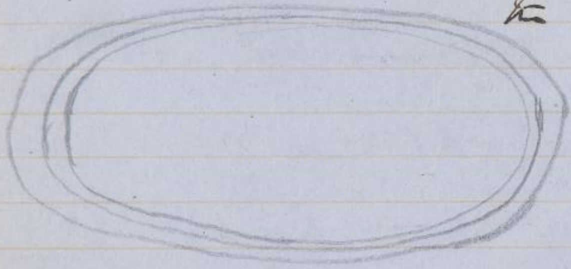




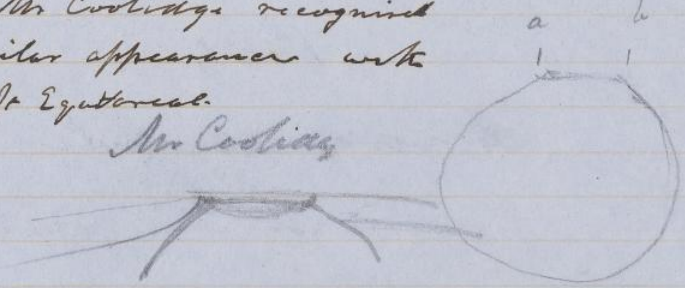


Mr Coolidge

Mr Coolidge recognised a similar appearance with the 5 ft Equatoreal.

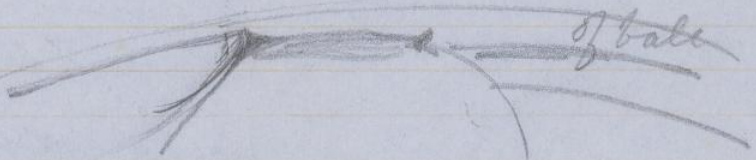


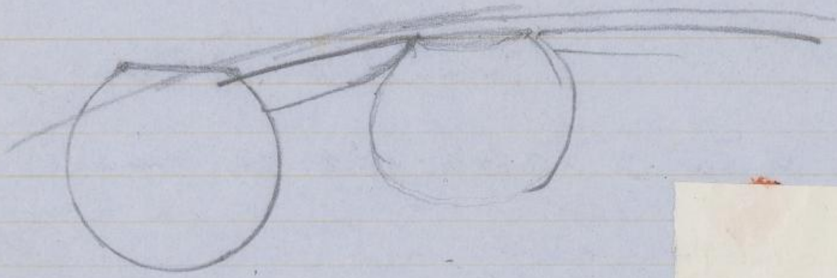
Mr Coolidge



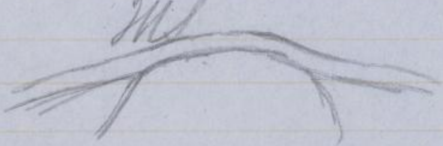
GPB

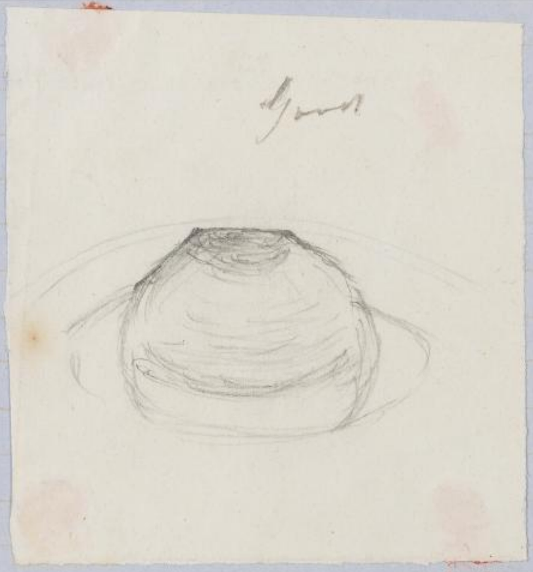
a to b = 2/5 of diameter of ball





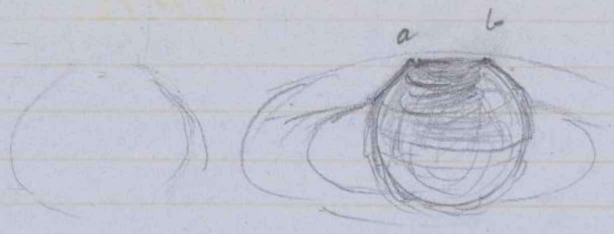
JM





N.B. That in case of refraction the Sun's rays will be refracted & therefor the shadow curtailed by very nearly as much as it would be enlarged as seen from Earth. The curvature of the ring (out of plane) will not (refract the shadow- which

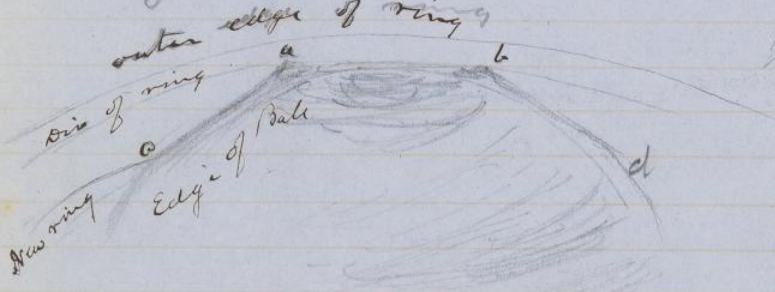
N.B. a & b are not black



Division of Ring
comes exactly to a & b

Nov 23 1854 9 to 10 P.M.

A very singular apparent distortion of the Southern pole of Saturn or of the ring near it causing the ball of



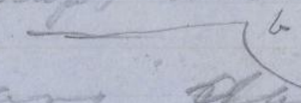
the planet to present the outline shown in the drawing

from a to b quite flat. from a to c straight & even almost concave towards ring near a a to c is dark like a penumbra a more decided than b, b to d less straight than a to b a & b darkish & may be parts of the shadow of ball on ring but they are decided corners the whole edge of ball from c a b to d runs more dusky than the rest

cannot be seen [illegible] S pole quite dark [illegible]

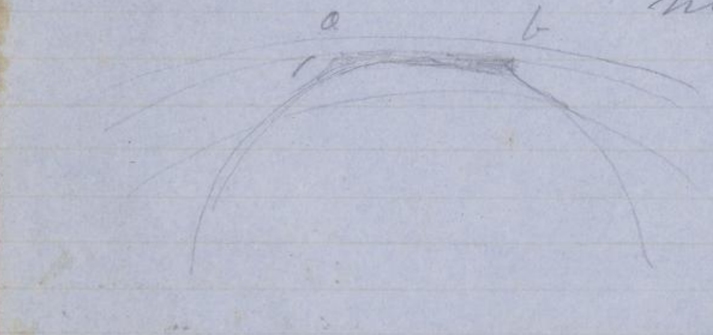
½ 1854 Saturn G.P.B.

Dec 9th 8 P.M.
Looked at Saturn with 140 & 400 - good definition The distortion of the S polar region very evident - perhaps - the shading on the ring is less dark than on Nov 23 - But it seems more evident on the following side than it did then - If any thing I should say that the corner of the following side (b) is now the most prominent & perhaps concave turning away from the ball



The polar regions are darker than the equatorial - Or than any other part of the ball

Transparency of dark ring is quite apparent -



nearly straight from a to b but a little convex

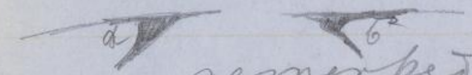
Clouded up -
Cleared again at 9 P.M
when Mr Coolidge saw the planet under - much better definition.

Saturn

Dec 9th 9 P.M. Mr. J. Coolidge

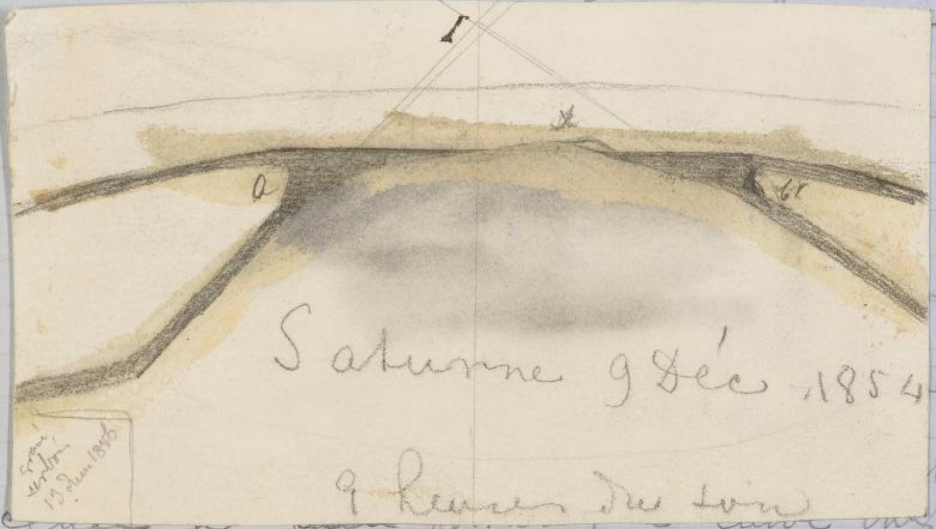
Saw Saturn exceedingly well defined with power of 400.

The general appearance of the distortion the same as on 23d November. The "horns" on both sides evidently concave as



Towards the apparent pole remarked a new appearance of the body of the planet

x is a blunt point extending beyond the division of the 2 rings, of the same color as the belt round South pole — perhaps in sketch not quite far enough to the right



Saturne 9 Déc 1854

9 heures du soir

13 Dec 1854

~~[illegible] Know [illegible] than~~

~~[illegible] the division of the~~

~~[illegible] ing seemed to b~~

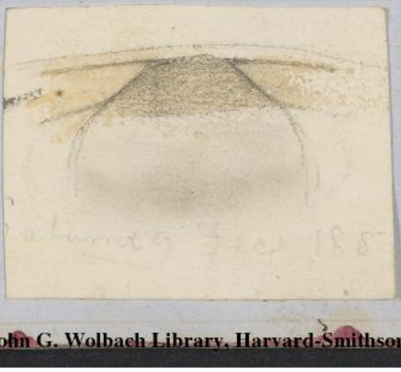
~~[illegible] on the~~

~~[illegible] base of the excres-~~ ex cres-

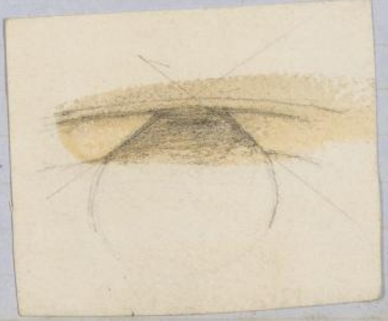
~~cence [illegible]~~

~~Mr Richard Bond however did not~~ EE ~~at any time see it. It may therefore be an optical illusion~~

The belt round pole darker than equatorial belt.



Saturne 9 Déc 185

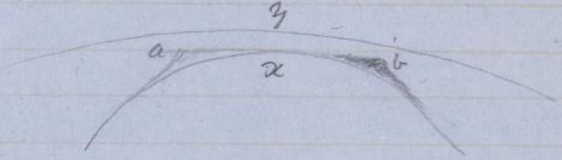


N.B. —
R. F. B saw the upper edge of distortion straight — but saw also the elevation at a as in EE — but did not think he saw the dark division

1854 Dec 26th G. P. B

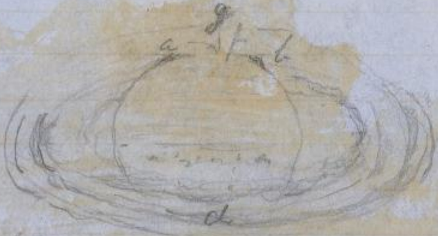
Saw Saturn under good definition

The outline of the shading a b is still as distinct as ever but b is decidedly ← darker than a and at times approaches to black.



The distance x y is not quite so much as 1/2 of the breadth of outer ring

Dec 26th - 7h 6 P.M.
Haze but steady -



The outer Ring is divided
c on both sides about 2/5 of the
breadth from the outside
Power 400 and 700? 384

Micrometer Eye-pieces -

The broad bright ring is shaded near its inner edge, The "obscure" ring is lightest where the body of the Planet is seen thro it - b, is much stronger and blacker than a, - a, projects very little - at intervals I think I see the projection f, which Mr Coolidge discribes - almost to certainty - the black right line of the shadow is not continuous from a, to b, but is interrupted at, f, where there seems to be an elongation, or protuberance of the body of the Planet - the outer ring is a shade darker from f to g, than it is in other parts - but nothing approaching in intensity to a and b. - The principal belt of Saturn is spotted, or in masses

1854
Dec 14/15.

R T P Cal. time

EC – 10 .. 47 . 0 EC –
236 10 .. 48 . 13.5 236 –

Im – 16 .. 53 .. 30 . S 15.39
Em 17 .. 03 .. 33.

obs. W C B., Christopher

Immersion 82 Virginis, 236 – 10 .. 31 .. 12.3 – 5 Exact.
W C B – Emersion ? some seconds " 10 . 40 . 05 . – Doubtful

Both on dark limb. The Emersion was accidentally lost by both P. S. C and W. C. B. the above time of Emersion is merely an estimate when the star was certainly seen.

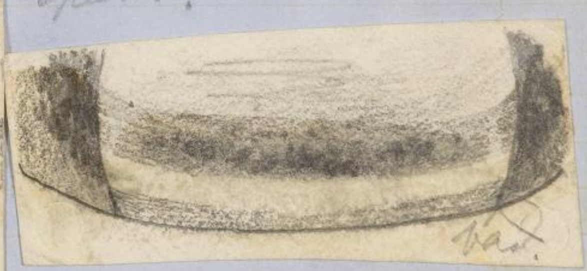
10 . 47 . 0
5 . 1
10 . 46 . 54 . 9
10 .. 48 . 13 . 5
1 . 18 . 6

Saturn.

Dec 26th 1854 7 to 9 – very steady – hazy

Observed Saturn with powers 141, 316 & 401. Had it not been for the haze would have been able to use higher powers yet. The outer ring is divided the (?) division being in the outer half. This ring seemed rather darker than before. Saw the [illegible] though not as well as on the ninth. It seems rather flatter than before. The left hand horn diminishing in darkness and visibility the right hand one to the contrary increasing every way. It is as black as the space between the ring and the body of the planet and twice as broad as the division of the ring and seemed now and then to be curved outwards [illegible]

The equatorial belt seemed confused with the spots.

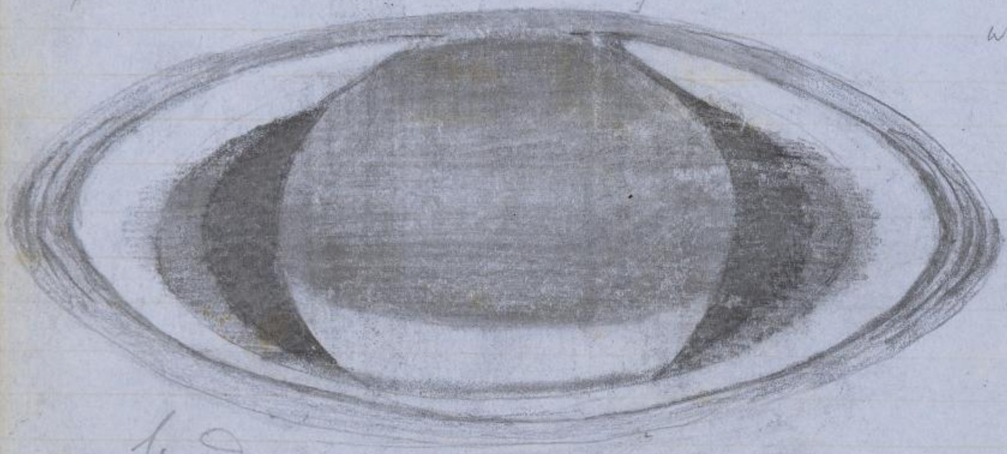


The limb of the planet seen through the inner ring seems to undergo a very small refraction

On the outer ring extending from horn to horn is a shadow of the colour and relative ~~size~~ and proportions proportions of the ~~equatorial eye~~ (the telescope) Did not see inner ring as well as expected.

Dec 27th 1854 Saturn

I saw Saturn with power of 401 very well defined. The right hand horn longer than ever. Outer ring divided ~~vaty~~ by 2 or 3 divisions which extend all over it in the inner half as well. As the outer one protuberance distinctly seen (protuberance of ball on ring above s pole)



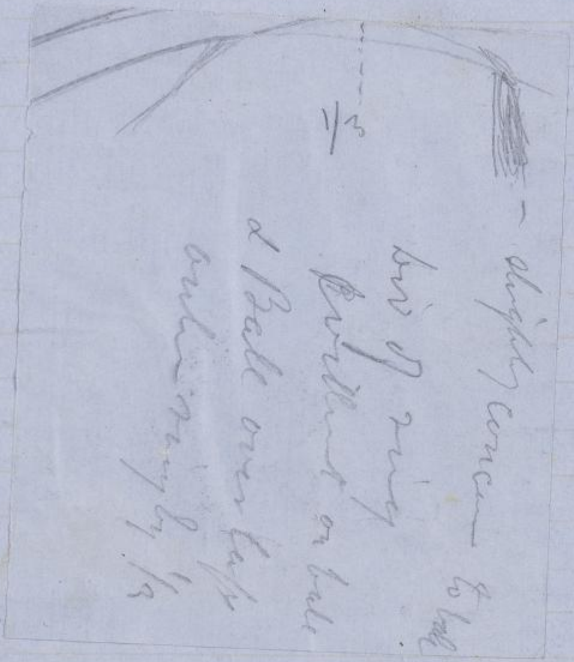
the spots on the equatorial band had disappeared.

bed

1855

Jan 1st 185~~4~~5

Saw Saturn pretty well. The right hand corner of shadow by much the most distinct — although the other is distinctly seen & not much different in outline from what it was a month ago —



Occultation of 139 Tauri by the moon

1st January 1855

C. W. T. observer

The time of immersion was
3h. 14m. 54s. 8-9 by Electric Clock not corrected for rate

9th January Observed Saturn with ~~400~~ 361 &
~~800~~ 401 The inner half of bright ring is divided into
to 3 or 4 fine divisions. Saw them very distinctly. The
outer ring is divided as before. The protuberance
is on the left hand side of the centre. It was
very well defined. The upper half of the division
between the two rings near the south pole of the planet ~~is much less~~ distinct
and more narrow than the lower.

The right hand shadow is very dark and
broad (see drawing) The left hand one has nearly vanished

The equatorial diameter seemed the greatest to right
Before the one ~~that~~ is inclined to it by about 20°
appeared so

The equatorial band is very faint
nearly of the same shade as the remainder of the body
~~So~~ (the south pole band also)

(When printed ~~text~~ differs from original ~~sketch~~ drawing)

55.0 52..37
3 1.2
1.5

24.7
45.8
17.1

Jan 12 1855

Star in Lalande$^{\circ a}$ compared with Weisse 658 = b 1852.0 AR $0^h\,37^m\,32^s.8$

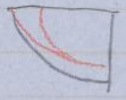
Scale-reading 236

a $6..09$

Dif AR $31^s.5$

b $0..08$

a N of b $6..01''$



$7..21$
$1..19$
$6..02$

See End of this Book —

Jan 13 1855

Saturn

Very bad seeing — The shadow on the right hand side does not appear to be altered but observation too indifferent to be relied on.

Finis

Finis

Saturn
Venus
~~parallax of solar system~~

To compare the following Star in Declination with Weisse H-0h- 658

	1853.0			
By Lalande	$AR\ 0^h..37^m..32^s.85$	$Dec\ +1^\circ..00'..53.''1$		in 1795
Weisse	33.18		32.0	.. 1825
Santini	32.92		22.8	.. 1840
Camb. Transit obs				1855

Weisse 658 is $6'..19.''8$ (in 1825) South } above ✶
$0^m..30^s.99$ following }

If there is proper motion the dif Dec will be $6'..00''$

xb $6'..09''$
0..08
7..21 xa 1..59..48.8

1855 Jan 12th

xb 1..19 2..00..20.3
31.5

NB - To reobserve the following Stars

✶ $3^h..16^m..03^s$ in Dec
4..18..23 AR & Dec
4..

Col. Sabine in a letter under date Feb. 1854 – States the intensity at Falmouth to be 1.374 .... By which the intensities given below are to be multiplied ... in order to give the true values –

Comparison of Observations made with Fox Magnetic and Intensity Instrument, at Cambridge Observatory in 1850 Lieut Whipple, and 1854 Assistant of Lieut W.

Observations for Intensity with

Weights					Deflectors				
Needle	Angle of Deflection in		Intensity in		Needle	Angle of Deflection in		Intensity in	
	1850	1854	1850	1854		1850	1854	1850	1854
	° ′ ″	° ′ ″				° ′ ″	° ′ ″		
A	29 56 05	30 23 10	1.2917	1.2743	A	16 42 50	16 01 25	1.3014	1.3559
A	36 48 30	37 20 15	1.2917	1.2760	A	18 15 55	17 36 35	1.3014	1.3482
B	29 55 15	30 28 05	1.2917	1.2707	A	34 05 40	33 07 50	1.3014	1.3347
					A	30 47 10	29 22 25	1.3014	1.3578
					B	17 09 50	16 28 45	1.3014	1.3539
					B	18 04 50	17 27 20	1.3014	1.3465

Mean Intensity for 1854	1.2737	1.3495
" " " 1850	1.2917	1.3014
Change in Intensity	– .018	+ .0481

Remarks –

The Intensities (1.2917) and (1.3014) are means of results obtained from observations made in 1844 – Not having the angles of deflection for 1844 or the results from the observations of 1850 – they have been assumed as the intensities for 1850 in order to estimate the change in Intensity during the four succeeding years –

No Corrections have been made in either case for Temperature –

Declination determined in

Needle	1850	1854
A	9° 41′ 25″	9° 47′ 30″
B	9° 30′ 45″	9° 45″ 20″
C	9° 30′ 15″	

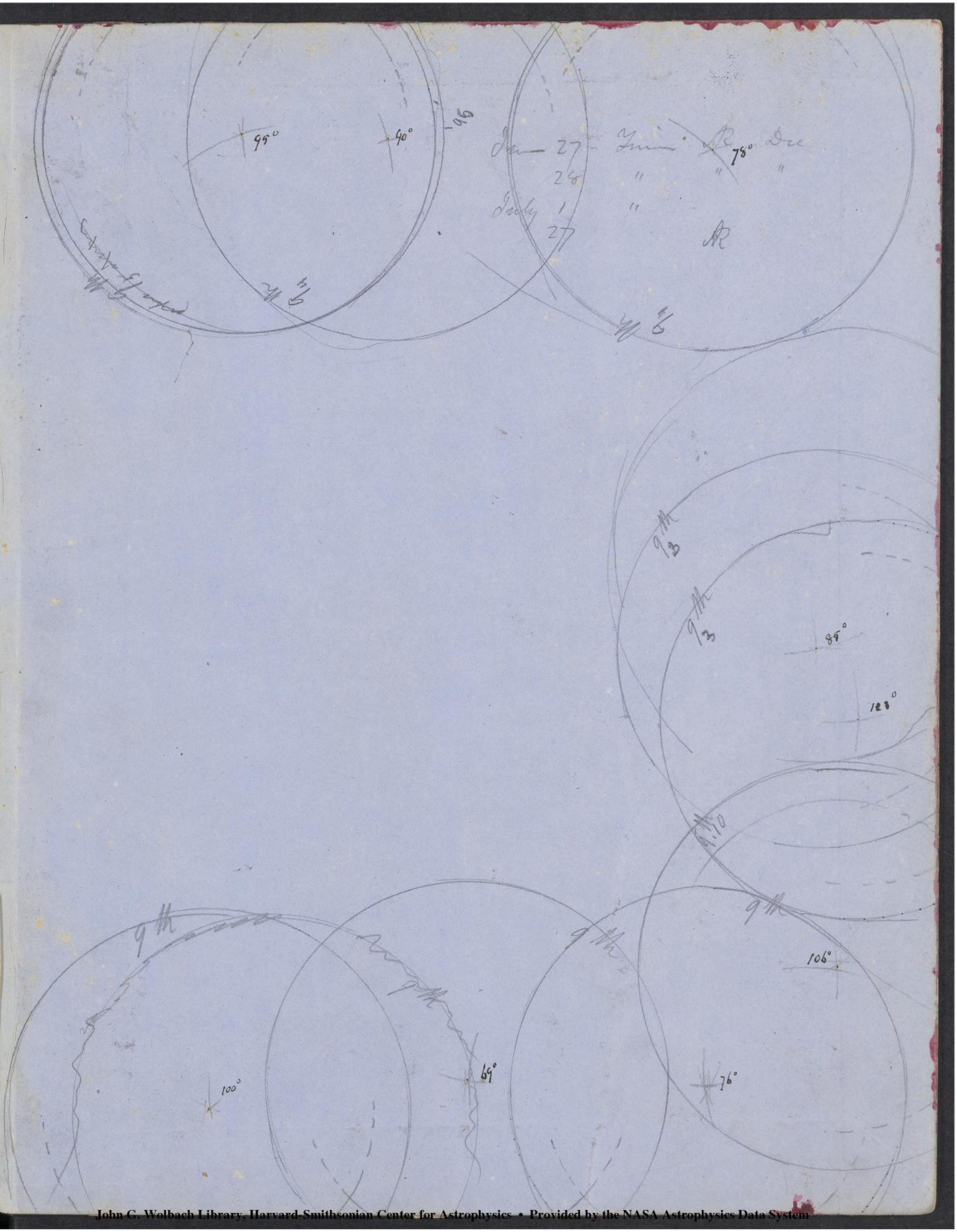
Needle C, being out of order was not used during the observations made in 1854....

Inclination determined in

	1850	1854
A	74° 20′ 54″	74° 24′ 33″
B	74° 23′ 55″	74° 21′ 49″
C	74° 33′ 50″	

Capt Lefroy

Total intensity at Cambridge in 1842 = 1.777 =



Jan 27 Time AR Dec
28 " " "
July 1 "
27 AR