

KG
11365
111

C. 4

*Meridian Marks,
Azimuths,
 $r = 2.285$
Level, and Collimation of
The Transit Circle, 1856.
September to Feb 24 1859*

Sold by T. Groom & Co., Stationers, India Building, 82 State St., Boston.

G1365.111



The numbers in red ink have been corrected to the new constants. $C_1 = -1.363$, $C_2 = -1.417$

See Feb. 10, 1857.

$$\tau = 2.285$$

Ill. East -

Ill. west

$$A_1 = -0.732$$

$$A_2 = -0.732$$

$$C_1 = -1.363$$

$$C_2 = -1.417$$

to Feb. 16th 1857

New constants from July 1 1856, using the value of (mid-mean) P.E. = $+0.027 \pm 0.003$ as in Transit Book for Dec. 1856

1857 Oct. 10th Mr. Hall by 9 transits of Polaris finds for the intervals of wires

Ill E	A to B	3.588	A to C = 6.977
	B to C	3.389	B to C = 3.389
	C to D	3.401	D to C = 3.401
	D to E	3.587	E to C = 6.988

This system of wires has been used since Feb. 17th 1857.

Mid wire to mean < 0.005

Dec 27th 1856 The following numbers show
the condition of the constants for the marks

1856 Aug 1 st		St E.	St W	St E	St W
By Reversal	Coll =	+0.062	-0.092	02 =	
" Marks	" =	+0.131	---	---	---
	$\delta C_1 =$	-0.069			

Sept 10th

By Reversal	+0.106	-0.136	+	
Marks	+0.123	-0.119	+0.094	+0.118
	$\delta C_1 =$	-0.017	$\delta C_2 =$	-0.017

Dec 16th

Reversal	+0.079	-0.109	-0.381	
Marks	+0.024	-0.096	-0.381	-0.378
	$\delta C_1 =$	+0.055	$\delta C_2 =$	-0.013

The first trial Aug 1st is entitled to only $\frac{1}{2}$ the weight
of the others because but one mark was measured
after reversal. We shall thus have the mean value

$\delta C_1 = +0.001$, $\delta C_2 = -0.015$; & the mean of the
two, $= -0.008$ shows no sensible change of
constants since 1849.

1856. Sept. 10th Mr West

Reads

 Obj. South
 Level Q.P.B.
 E - W
 57.4 - 52.6 +
 50.6 - 52.1 +
 49.3 - 51.9 +
 + 44.3 - 54.8
 + 44.7 - 53.1
 + 44.7 - 52.2
 2850 167
 47.5 52.8
 47.5
 5.3
 2.65 = +0.17

South.	m.C.B.	North.	Zero	Zero
.935	0.991	.207	0.187	- .000 +0.18
.926	0.991	.185	0.991	- .010 .022
.933	0.940	.170	0.196	- .002 .020
.945	2.148	.562	0.448	12 .060
.931	0.448	.187		" 20
20	2.596	-4		
.951	4.700	.183		

$$2.173 \quad 1.298 - 1.417 = -0.119$$

$$418 \quad 0.850 - 0.732 = -0.122 + 0.118$$

$$2.591 \quad a_2 + .145$$

$$1.755 \quad b_2 + .210$$

$$1.290 - 1.390 = - .100 \quad c_2 - .100$$

$$677 - .732 = + .145 \quad a_2$$

S.W.

$$S.W. \quad \delta = 2.173 \quad A = 0.418$$

$$E = 2.04 \quad N = 0.663$$

$$a + 0.12$$

$$b + 0.21$$

$$c - 0.12$$

Reversed to Illumination East

Ther 76

Ther 76

South	North	Zero	m.C.B.	Level	Obj. South
.980	.979	.707	0.702	.990	E W Q.P.B.
.980	0.991	.690	0.991	.987	992 above
.978	1.012	.710	0.289	.690	
2385	2.312	2107	0.661	267	987
.979	0.661	.702		989	0.991 Mean Zero
+ 11	2.973	.298		.011	
.890	1.651	.287			
2.034	1.486 - 1.363 = + 0.123				
.663	0.826 - 0.732 = + 0.094				

$$2.697 \quad a_1 - .047$$

$$1.371 \quad b_1 + .250$$

$$1.348 - 1.390 = - .042 \quad c_1$$

$$685 - 0.732 = - .047 \quad a_1$$

S.W.

S

n

$$4.16 = +0.25$$

$$\text{mid. in East coll} + 0.094 \quad - 0.094$$

$$\text{red. to mean} + 0.27 \quad A - 0.27$$

$$\text{Dir. lat.} - .015 \quad - .015$$

$$c_1 + 0.106 \quad c_2 = - 0.082$$

$$\text{By marks} + 0.123 \quad - 0.119$$

$$\text{Obj} 0.017 \quad 0.017$$

$$2.148$$

$$2.312$$

$$0.164$$

$$0.213$$

$$0.213$$

$$2/0.377$$

$$3/0.188$$

$$0.094$$

0.448

0.661

0.213

0.213

0.213

0.213

0.213

0.213

0.213

0.213

0.213

0.213

856.

Sept ¹⁰/₁₁M = East

Ther 74.5

Level
E W

South		North		Zero.
981		.710	.290	990
1.000		.712	.288	1.000
988	0.989	.705	.295	1.000
2969	997	709	293	.997
989	1.008	227	291	
2.032	2.303	0.268		
		0.658		

$$\begin{array}{l}
 a - 0.49 \\
 b - +0.10 \\
 c - 0.12
 \end{array}
 \quad
 \begin{array}{l}
 a + 0.09 \\
 b - - \\
 c + 0.12
 \end{array}$$

$$\begin{array}{l}
 1.348 - 1.390 = -0.042 a_1 \\
 683 - 732 = -0.049 a_1
 \end{array}$$

2.303

0.658

2.961

1.645

$$1.480 - 1.363 = +0.117$$

$$0.823 - 0.732 = +0.091$$

1856. Sept 25th

W.C.B.

South

North

Idmington East
excellent definition

Zero -

.085

.670

997

.080

.665

1.000

.083

.663

1.000

.080

.670

.996

.087

.675

.993

15

343

4986

.083

.667

.997

Zero

.997

.997

0.914

0.330

2.088

1

0.754

2.842

1.334

1.421

 $1.363 + .058 = \text{etc}$ $66.7 - 0.732 - .065 = \text{etc}$ Ther 595
Level object South
East West G.P.B.

+ 55.8 ~ 70.2

126

+ 55.9 - 69.8

+ 56.0 - 69.7

59.3 - 66.2 +

58.8 - 66.3 +

58.8 - 66.5 +

446 4087

57.43 68.12

57.43

10.69

5.34 + 0.35

$$\begin{array}{l} a, -0.065 \\ b, +0.350 \\ c, +0.058 \end{array}$$

1856
Oct. 8/9 AM
M.C.B. J.C. East

South	North	Zero
.105	.620	.012
.110	.630	.010
<u>.107</u>	<u>.625</u>	<u>.010</u>
0.107	0.627	2.065
0.011	0.011	0.877
0.904	0.384	2.942
2.065	0.877	1.188

$$\begin{array}{l} a - 0.14 \\ b - \dots \\ c + 0.11 \end{array}$$

$$1.471 - 1.363 = +0.108$$

$$0.594 - 0.732 = -0.138$$

Oct. 30 - J.C. East

South	North	Zero
.121	.600	.015
.123	.610	.000
<u>.116</u>	<u>.605</u>	<u>.000</u>
60	15	.015
0.120	.605	.005
1.005	1.005	
<u>.885</u>	<u>.400</u>	
2.022		
<u>.914</u>		

$$2.936$$

$$1.108$$

$$1.468 - 1.363 + .105 \text{ Col}$$

$$554 - 0.732 - .178 \text{ az}$$

Fine evening, steady ocean

Therm Int 63 - 62

Level	W.C.B.
E	W
+ 60.5	- 68.8
+ 61.0	- 68.0
+ 60.8	- 68.0
60.5	- 67.5 +
60.0	- 67.5 +
59.0	- 67.5 +
361.8	473
60.3	67.9
	60.3

$$7.6$$

$$3.8 = +.27$$

$$\begin{array}{l} a - 0.178 \\ b + 0.270 \\ c + 0.105 \end{array}$$

Oct. 31/32

Ill East

MCRB

South

North westerly Zero

270

640

hume

017

1.721

255

627

020

2.607

272

625

020

0.835

0.266

.631

019

1.303 - 1.363 = -0.060

Σ 4.019

1.019

0.415 - 0.732 = -0.314

0.753

0.388

1.721

0.844

a - 0.31

b ---

c - 0.06

Nov. 4/5-

MCRB

South

North

Zero

130

.642

.995

0.139

0.665

Ill E.

.138

.670

.985

0.990

0.990

a - 0.13

.145

.677

.985

0.851

0.325

b ---

.132

.670

.990

1.944

0.742

c - 0.02

.150

.667

.997

0.742

1.343

- 1.363 = -0.020

195

7326

7452

0.601

- 0.732 = -0.131

.139

.665

990

5th Pk

South

North

Zero

.218

.622

.995

.225

.628

.992

.215

.613

1.000

.658

1863

2987

.219

.621

.996

.777

.375

1.775

0.856

2.631

.919

1.315

- 1.363 =

- .048

Col.

0.459

- 0.732 =

+ .273

W2

In Th 38.2 Level. Ex Th 37.5
Object South - E - W

71.0 - 76.6 +

70.3 - 77.1 +

69.5 - 77.3 +

+ 70.1 - 76.2

+ 70.9 - 75.2

+ 71.0 - 75.0

38 374

70.5 76.2

70.5

Ill E.

a, -0.273

b, +0.210

c, -0.048

- .05

5.7

2.85 = +

5

0.21

Nov 14th

Ill East

18

Level
East West

South	North	Level -	
.208	.540	.022	
.210	.525	.015	
<u>.203</u>	<u>.538</u>	<u>.022</u>	
21	103	59	
.207	.534	.020	
1.020	1.020		
<u>.813</u>	<u>.486</u>		
1.858			
<u>1.112</u>			
2.970			
<u>.746</u>			
1.485 - 1.363 = + 0.112			Col
373 - .732 = - 0.359			az

$$\begin{array}{r|l} a & -0.36 \\ b & - \\ c & +0.11 \end{array}$$

$$\begin{array}{r|l} a & +0.359 \\ b & +0.21 \\ c & +0.095 \end{array}$$

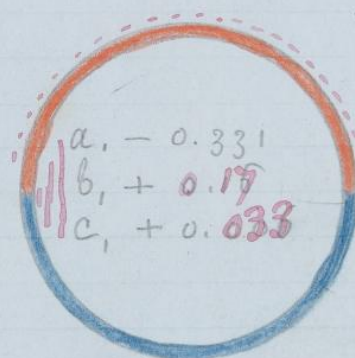
1856 Nov $\frac{15}{19}$ Ill East W.C.B.Exp Ther $-29\frac{3}{4}$ Int. Th 37°

Lence

East West

South	North	Zero
210	.580	015
230	.575	020
250	.590	010
690	1745	045
230	582	015
1.015	1.015	
0.785	0.433	
1.798	0.990	
0.990		

+ 81.0	85.0
+ 81.2	84.0
+ 81.6	83.5
80.4	85.3 +
79.6	86.0 +
79.3	86.0 +
4831	5098
80.52	84.97
	8052

4.45
 $2.22 + 0.17$ 

$$\begin{aligned}
 s &= 2.783 \\
 d &= 0.803 \\
 \frac{1}{2}s &= 1.396 - 1.363 = +0.033 \text{ all} \\
 \frac{1}{2}d &= 0.401 - 0.732 = -0.331 \text{ az}
 \end{aligned}$$

Ill East:

Exp Th 38.5
Int 43Nov-27
28

m c b

South	North	Zero
.202	.617	.010
.190	.568	.017
.192	.590	.010
584	1775	6,013
0.195	0.592	
1.013	1.013	
0.818	.421	
1.869		
0.962		
2.831		
0.907		

$$1.415 - 1.363 = + 0.052 \text{ col}$$

$$0.453 - .732 = - 0.279 \text{ az}$$

$$\begin{aligned} \alpha_2 &= -0.279 \\ \delta &= +0.190 \\ C &= +0.052 \end{aligned}$$

Level
East West

$$\begin{aligned} &+ 74.5 - 85.8 \\ &+ 76.2 - 83.0 \\ &+ 77.2 - 81.8 \\ &78.9 - 79.8 + \\ &79.5 - 80.0 + \\ &76.5 - 79.9 + \\ &40.8 - 10.3 \\ &76.8 \quad 81.7 \\ &76.8 \\ &49 \\ &2.5 = +0.19 \end{aligned}$$

Dec-12th Ill East m c b

South	North	Zero
.218	.555	.015
.207	.572	.025
.220	.565	.010
.45	.192	.50
.215	.564	1.017
1.017	1.017	
.802	.453	
1.832		
1.035		
2.867		

$$1.433 - 1.363 = + 0.070 \text{ col}$$

$$398 - .732 = - .334 \text{ az}$$

$$\begin{aligned} \alpha_1 &= -0.334 \\ \delta &= +0.150 \\ C &= +0.070 \end{aligned}$$

Exp Th 43.5
Level Int Th 44.0

East - West

$$\begin{aligned} &+ 765 - 830 \\ &+ 785 - 800 \\ &+ 768 - 795 \\ &773 - 810 + \\ &758 - 814 + \\ &757 - 818 + \\ &420 \quad 067 \\ &770 \quad 811 \\ &770 \\ &41 \\ &2.05 + 0.15 \end{aligned}$$

oil'd the clamp
moved much easier after

South North

.225 — 560

227 — 558

G.P.B.H.

Ill. East

Ex. Th 20.5
Ink 250Decr 16th object

South - North Zero

.260 — .571 .025

.262 — .577 .030

.268 — .573 .027

0.263 0.573 0.027

0.025 0.025

0.762 0.454

1.742 1.033

1.033

2.775

709

1.387 — 1.363 = +0.024

354 — 0.732 = - .378

~~a₁ - 0.378~~~~b₁ - 0.020~~~~c₁ + 0.003~~

M.E.

|| a -0.38

|| b -0.06

|| c +0.02

object North

E - W

+ 899 — .867

+ 80.0 — .853

+ 91.6 — .853

87.3 — .907 +

87.0 — .912 +

87.3 — .918 +

534.0 6531.0

890 885

885

.005

00.2 = - 0.02

Reversed the Transit Circle Decr. 16th

Reversed. Ill. West

South North

Zero

Sun, object South

E - W

.756 .395 .025

.745 .450 .023

.750 .483 .020

.776 .445 .68

.756 .473 .023

283 246

0.757 0.449

0.025 0.025

0.732 0.426

1.673 0.969

.969 0.399

2.642

.703

1.327 — 1.417 = -.096 cor

351 — 0.732 = -.381 or

1.286 0.399 = -.126 cor

352 — 0.732 = -.381 or

|| a -0.38

|| b - .06

|| c - .10

M.E. m = 1.033 s = 1.742

" W n = 0.969 s = 1.673

0.064 0.069

0.069

Mean 0.067 = col. mid wire

a₂ - 0.381b₂ - 0.090c₂ - 0.065

Dir. ab.

By Markers

Drif

M.E.

s

+0.067

+0.027

-0.015

+0.079

+0.024

0.055

M.W.

s

-0.067

-0.027

-0.015

-0.109

-0.096

0.013

KTC

Dec 25 9 Am

mer snobs. WCB

South WCB North

.770 — .400

.767 .375

.775 .420

212 1195

0.770 0.398

022 022

.748 .376

1.769

856

2.568

850

1.284 = - 1.417 = -.133 col.

425 = - 732 = -.307 az.

M. hust

tolerable swing-

Zero

.030

.020

.018

068

.022

Eg Ther +14 Int R 24

Level
East Mark

+ 96.8 - 902

+ 97.0 - 895

+ 97.6 - 890

92.8 - 924 +

96.8 - 925 +

912 924 +

7266 75460

94.43 91.0

91.0

343

1.71 = -0.141

 $a_2 - 0.307$ $b_2 - 0.141$ $c_2 - 0.133$ Dec 26th PM

South WCB North

.800 395

.787 415

.780 410

0.789 0.407

2 0.027 0.027

0.762 0.380

3 1.742 0.868

4 0.868

2.610

0.874

1.305 - 1.417 = -0.112 c

0.437 - 0.732 = -0.295 a

Zero

.027

.035

.020

027

 $a - 0.30$ $b -$ $c - 0.11$

Dec 27th Zero of Transit Micrometer
was altered to read 0.26

Dec 27th Ill West MCB

S	N	Zero
0.455	.670	0.237
955	.682	.237
963	.690	.232
0.958	0.681	0.235
Zero 0.235	0.235	
0.723	0.446	
1.652	1.336 - 1.417 = -0.081 c	
1.019	0.316 - 0.732 = -0.416 c	
2.671		
0.633		

a -0.42
b ----
c -0.08

Dec. 29th Examined marks & zero - no sensible change
has occurred since 27th

Results of Measures on the
Meridian Marks have been revised
up to Dec 27th 1856.

Ill West Dec 29th

a ----
b -0.10
c ----

Dec 29th
Level.

E	W
89.7	90.7 x
89.5	90.6 x
x 92.7	87.5
x 93.2	86.3
51	355 1
91.3	88.8
88.8	
2.5	

1.25 = -0.10

Dec 30. Lamp West.

$\alpha_2 - 0.42$

$b_2 - 0.10$

c - 0.08

Examined by α Andromedae, γ Pegasi,
 α Capricornae, β Ceti, Polaris, and θ Ceti - and found satisfactory.

857 Jan. 20⁺ 3 PM

South	North	Zero
.952	.660	.225
.952	.682	.235
<u>.940</u>	<u>.650</u>	<u>.240</u>
144	192	100
.948	.664	.233
<u>233</u>	<u>233</u>	
.715	.431	
1.633	.985	
985		
2.618		
648		
1.309 - 1.417	- .108	
324 - 0.732	- .408	

Feb. 10th 1857

Diaphragm removed
New Wires.

New Wires put in Feb. 16th 1857.

The web given by Miss Dix was used.

For the system of Wires used from 1857, Feb. 16 until
1860, Dec. we have mid-mean = -0.019, and the constants for the
Marks will be

Ill. East.	Ill. West
$A_1 = -0.732$	$A_2 = -0.732$
$C_1 = -1.409$	$C_2 = -1.371$

Micrometric Measures

Let on wire A at 100

Wire B 990
983

Wire B — 1.519 — 1.523 —

Wire C — 3.005

Wire D — 4.570

Wire E — 6.083

(Lamp West ?)

0.000

1.579

3.005

4.570

6.082

1.519

1.486

1.505

1.572

3.005

3.077

72

.036

2.285

36

13710

6655

1062260

Feb. 16. 4 PM

New wires
all west

Thurs. 24 52
Level

South

North

Zero.

.830

.495

.105

.870

.480

.110

.812

.470

.110

52

1245

25

0.817

.482

.108

108

.108

.709

.374

s 1.621

n .854

2.475

.767

1.237 - 6.417 = - .180 c₁

383 - .732 = - .349 - a₂

1.237

0.383

- 1.371

- 0.134

E W

760 - 752 +

762 - 740 +

763 - 730 +

+ 775 - 710

+ 755 - 715

+ 748 - 721

363 168

760 .728

760

.032 = - .24

a = - 0.349

b = - 0.240

c = - 0.134

Changed Collimation

Feb. 17th - 4 P.M.

Lamp West

South	North	Zero	Level
.950	472	.118	
.940	490	.108	
<u>.940</u>	<u>470</u>	<u>.115</u>	
130	232	341	
.943	477	114	
<u>114</u>	<u>114</u>		
829	.363		
1.895			
<u>830</u>			
2.725			
1.065			
1.362 -	1.377	-.009 α_2	$a = -0.199$
.533 -	732	-.199 α_2	$b = -0.240$
			$c = -0.009$

Feb. 25th P.M. Ill. West

Ext. Mer. 58

Level

E - W

South	North	Zero	
.948	.508	.122	77.2 - 67.3 +
.945	.510	.117	76.4 - 67.7 +
<u>.943</u>	<u>.508</u>	<u>.128</u>	+ 75.0 - 69.0 +
3/136	26	77	+ 74.8 - 68.4
.945	.509	.126	234 / 324
<u>-126</u>	126		759 681
.819	.393		681
1.872			78
898			039 = -0.29
2.770			
.974			
1.385 -	1.377 = -	0.032 coll.	$\alpha_2 = -0.245$
487	732 = -	.245 α_2	$b_2 = -0.290$
			$c_2 = +0.024$

March 9th L. P. L. Lamp West

Ther + 34

		Level		obj. south	
South.	North	Zero	East	West	
.880	606-	.120	+ 943	82.5	
.880	620	.157	+ 938	827	
.888	623	.160	910	852	+
8	49	.152	906	855	+
.883	618	189	98	159	
147	147	.147	924	839	
.736	.471		839		
1.682			085		
1.077			42 = - .35		
2.759					
605					
1.379 - 1.371 =	- 0.034 col.		$a_2 - .430$		
.302 - .732 =	0.430 W.		$b_2 - .350$		
			$c_2 + .008$		

March $\frac{13}{14}$

Steady & clear

Lamp West.

South	North	Zero
.890	.635	.160
.900	.635	.150
<u>.890</u>	<u>.640</u>	<u>.145</u>
26180	110	5
.887	.637	.152
152	152	
<u>.735</u>	<u>.485</u>	
1.679		
<u>1.109</u>		
2.788		
0.570		
1.344 - 1.371 = -		.023
280 - 0.732 = -		.452

$$a_1 = .452$$

$$b_1 = .350$$

$$c_1 = .023$$

April 4th 4 P.M. unsteady

South	North	Zero
.950	.657	.160
.900	.635	.157
<u>.923</u>	<u>.635</u>	<u>.160</u>
73	127	177
.924	.642	.159
<u>.159</u>	<u>.159</u>	
.765	.483	

Ex. Therm° 50

E	W
855	747 +
854	742 +
850	749 +
+ 848	748
+ 843	745
+ 853	740
3	31
850	745
745	
105	

$$052 = -0.40$$

$$S = 1.748$$

$$n = 1.105$$

$$S + n = 2.853$$

$$S - n = 0.643$$

$$1.426$$

$$0.321$$

$$1.371$$

$$0.732$$

$$a = -0.411$$

$$b = -0.400$$

$$c = +0.055$$

1857. April 18

South	North	Zero
.950	.575	.140
.955	.590	.155
<u>.960</u>	<u>.590</u>	<u>.155</u>
165	255	150
.955	585	.150
<u>150</u>	<u>750</u>	
.805	.435	

$$s = 1.839$$

$$n = 0.994$$

$$s + n = 2.833$$

$$1.416$$

$$1.371$$

$$s - n = 0.845$$

$$0.422$$

$$0.732$$

$$a = -0.310$$

$$b =$$

$$c = +0.045$$

Illumination west

April 23^d

W.C.B.

Rather indistinct, but tolerably steady

South	North	Zero
.955	.620	.170
.947	.620	.175
<u>.955</u>	<u>.620</u>	<u>.175</u>
7	0	10
.952	.620	.173
<u>.173</u>	<u>.173</u>	
.779	.447	
1.780		
<u>1.021</u>		
2.801		

$$.759$$

$$1.400 - 1.377 = -0.017 \text{ - col.}$$

$$0.379 - .732 = -0.353 \text{ - az}$$

$$a = -0.353$$

$$b = -0.460$$

$$c = +0.029$$

Level

Ther 42°

	E	W
+	870	- 775
+	880	- 765
+	880	- 760
	890	- 733 +
	875	- 738 +
	<u>860</u>	<u>- 745 +</u>
	455	316
	87.6	75.3
	75.3	
	123	

$$b.l = -0.46$$

For Marks on April 25th See Transit Book
 Collimation was probably affected by removal
 of one of spokes of Circle.

1857. May 8th

Illumination West.

Ther. Int 61.5
Level

Ext. 65.6

South North

Zero

E W

1.090

0.562

.143

71.6 - 60.5 +

087

.565

.160

70.8 - 60.2 +

.083.562.150

+

114

0260

9

153

+ 70.0 - 60.2

1.087

0.563

.151

+ 70.0 - 59.6

2.151

151

+

2,262

.936

.412

24 5

229

2.139

70.6 - 60.1

2.491

0.94260.1

3.081

105

1.197

.052 = 0.340

1.540 - 1.377 = -.123 col

a + .134

598 - .732 = + .134 az

b - .340

c + .169

May 18th

men

South North Zero

1.020

0.653

.160

1.052

.635

.170

1.045.640.170

137

128

220

1.044

.642

.170

-173-173

.871

.469

Ther. Int 45 - Exp 45

Level

E - W

$$S = 2,000$$

$$n = 1,073$$

$$S + n = 3,073$$

$$S - n = 0.927$$

$$a - 0.269$$

$$1.536$$

$$0.463$$

$$b$$

$$1.371$$

$$0.732$$

$$c + 0.165$$

Runs of Microscopes of the Transit Circle.

Pointer - 290°.

1857.	A	B	C	D	E	F	G	H	
Apr 23	225.00	115.00	205.0	295.00	65.0	155.0	245.0	335.0	Therm° 57.2
	+ 5.07	+ 5.80	+ 5.52	+ 5.35	- 5.95	- 5.60	+ 5.30	+ 5.20	
	+ 5.030	8.5	6.0	2.3	8.5	5.3	2.0	0.5	
	5.005	7.7	6.0	2.5	8.5	5.8	3.3	0.3	
	5.010	7.3	6.1	2.8	8.2	5.3	4.0	0.2	
	5.028	7.2	5.5	2.5	8.6	5.5	3.0	1.0	
	5.016	7.6	5.0	2.4	8.6	6.0	3.0	1.2	
	5.015	7.3	5.2	2.8	8.5	5.8	3.0	1.3	
	5.18	8.0	6.3	3.0	9.2	5.0	3.3	0.7	
	5.13	8.2	5.8	2.6	8.0	4.7	3.8	1.2	
	+ 5.20	+ 5.75	+ 5.8	+ 2.5	- 8.2	- 5.0	+ 2.0	+ 2.2	
	13	773	569	89					
	5.1	5.773	5.69	5.					
	+ 5.41	5.65	5.48	5.23	- 3.0	- 5.73	+ 2.5	+ 5.48	
	3.7	6.5	5.7	2.7	4.2	7.5	3.3	4.3	
	4.0	6.9	5.7	2.3	4.3	7.7	3.0	4.0	
	3.8	8.0	5.3	1.8	4.8	7.5	3.0	4.5	
	2.7	7.0	5.8	2.0	4.3	8.0	3.0	4.0	
	3.8	6.5	4.7	2.0	3.7	7.7	2.5	3.8	
	4.2	6.2	4.7	2.2	3.5	8.0	2.7	3.8	
	3.6	5.5	5.0	2.3	3.8	8.0	3.0	5.0	
	4.0	6.2	5.0	3.0	4.0	7.8	3.5	4.5	
	+ 3.3	6.2	+ 5.5	+ 2.5	- 4.0	- 8.0	+ 4.0	+ 4.0	

These may be rejected, as they were taken before the alterations made in the Circle May 25th - April?

Painter

A

290

25

250

57 - May 28th

Illumination west

Ther. Int 60° Ept 68°
Level 61-

South	North	Zero
1.120	0.532	0.140
115	548	150
<u>112</u>	<u>.523</u>	<u>.152</u>
47	103	142
1.116	0.534	0.147
<u>-147</u>	<u>-147</u>	
0.969	.387	
<u>2.215</u>		
0.884		
<u>3.099</u>		
<u>1.331</u>		
1.549	-1.377 = -0.132 cor	
.665	-0.732 = +0.067 az	

E	W
+64.8	-58.7
+65.0	-58.0
65.3	-57.0 +
<u>65.2</u>	<u>-56.9 +</u>
4/203	306
65.1	577
<u>57.7</u>	
74	
3.7 = -0.25	

a + 0.067
b - 0.250
c - 0.178

1857.
June 20th

Illumination West

Ther. Exp. - 75 Int. = 67.5
Level. G.P.B.

East - West

597 — .577 +

592 — .572 +

590 — .565 +

+ 580 — 564

+ 582 — 559.

+ 579 — 558

520 4395

58.7 5.66

5.66

2.1

1.05 = — .06

South	W.C.B.	North	Zero
1.140	.179		.154
1.143	.487		.157
1.125	.495		.158
1.137	.503		.157
1.133	.570		.153
178	04		29
1.139	501		156
- 156	- 156		
0.983	0.345		
2.246			
787			
3.036			
1.459			
1.518 - 1.377 =			+0.147 we
729 - .732 =			+0.003 ar

 $a_2 + 0.003$ $b_2 - .060$ $c_2 + .0147$

57 June $\frac{24}{25}$

Illumination West

Ther Ept Int
Level
East West

South	North	mem Zero
1.178	.570	.152
.182	.572	.153
<u>.160</u>	<u>.573</u>	<u>.157</u>
1.173	51.2	
<u>155</u>	<u>155</u>	
1.018	357	

$$S = 2,326$$

$$x = 0.816$$

$$S + x = 3,142$$

$$1.571$$

$$1.371$$

$$1.510$$

$$0.755$$

$$0.732$$

$$a + 0.023$$

$$b$$

$$c + 0.200$$

July 9/7

JUL - West.

Exp. Mer.

JUL - Mer 73

m e r s			Level	
South	North	Zero	E	W
1.150	.467	0.171	+ 540 -	- 542
137	.457	0.163	+ 532	- 547
138	.487	0.160	+ 532	- 543
125	205	194	532	- 534 +
1.142	.468	0.165	527	- 531 +
-165	165		522	- 532 +
.977	.303		6)185	6)229
2.212			531	53.8
0.693				531
2.905				60.7
1.519				00.3 = +0.02
1.452 -	1.377 =	- 0.035 cor	a +0.027	
0.759 -	0.732 =	- 0.027 cor	b +0.020	
			c +0.081	

July 7/85

Exp. No. 66

Lat. No. 67

W. L. W.

South	North	Zero
1.129	.532	.135
1.110	.540	.157
1.115	<u>.532</u>	.146
1.137		
<u>1.145</u>		
1.127	0.535	
<u>0.146</u>	<u>0.146</u>	
0.981	0.389	

$$J = 2.241$$

$$n = 0.889$$

$$s+n = 3.130$$

$$1.565$$

$$\underline{1.371}$$

$$s-n = 1.352$$

$$0.676$$

$$\underline{0.732}$$

$$a = -0.056$$

$$b$$

$$c = +0.094$$

$$\begin{array}{r} 2.6 \\ 2.262 \\ \hline 312 \end{array}$$

$$\begin{array}{r} 2.285 \\ 37 \\ \hline 322 \end{array}$$

1857

July 20^E
mer marks

West

Therm° 75°
Object South
Level

South	North	Zero
1.176	.425	.173
.162	.428	.168
<u>.170</u>	<u>.420</u>	<u>.160</u>
208	13	.1362
1.169	.424	.145
<u>1.153</u>	<u>153</u>	<u>.136</u>
1.086	.271	6/318
2.322	619	.153
<u>.619</u>		
2.941		
<u>1.493</u>		
1.498	1.377	+ 0.053 col
0.856	0.732	+ 0.074. 622

E	W
+ 48.8	46.0
+ 48.5	46.0
+ 48.0	46.2
25.0	48.5 +
44.5	49.0 +
<u>43.5</u>	<u>49.0</u> +
6/383	6/44.7
44.4	47.4
	<u>46.4</u>
	1.0
	0.5 = +0.03

$a = +0.124$

$b = +0.030$

$c = +0.099$

July 29^E

mer

Ex Therm 75°
Level

South	North	Zero
1.175	0.420	.147
.160	.410	.140
<u>.170</u>	<u>.412</u>	<u>.150</u>
1.168	0.414	
<u>0.146</u>	<u>0.146</u>	
1.022	0.268	

$s = 2.333$

$n = 0.612$

$s+n = 2.945$

1.472

1.371

$s-n = 1.721$

0.860

0.732

$a = +0.128$

$b =$

$c = +0.101$

157. Aug⁷/₈ 6 Am

West

South	North	m.c.B.	Zero
1.142 —	.460		.153
160 —	.450		.157
170 —	.450		.160
147 —	.435		.155
<u>155 —</u>	<u>.458</u>		<u>.160</u>
274	253		285
1.155	0.451		-0.157
<u>-157</u>	<u>.157</u>		
<u>0.998</u>	<u>0.294</u>		
2.280			
<u>.672</u>			
2.952			
<u>1.608</u>			
1.476 —	1.377 =	+	0.059 col
804 —	0.732 =	+	0.072 col

$\alpha + 0.072$
 $b + 0.120$
 $c + 0.005$

Ther 63

Level 10.40 Am

East	West	Ther 76
57.7 —	52.0 +	
50.0 —	55.0 +	
47.8 —	55.8 +	
+ 48.7 —	52.8	
+ 48.8 —	52.5	
+ 48.6 —	50.0	
<u>6/2956</u>	<u>6/201</u>	
49.3	53.3	
	49.3	
	4.	
	2.0 = + 0.12	

Aug⁺ 10/11 - 8 Am

W C 13

South

North

Zero

1 .150	0.435	0.170
.137	.430	.165
<u>.157</u>	<u>.435</u>	<u>.160</u>
144	10	195
1 .148	433	0.159
<u>159</u>	<u>-159</u>	
0.989	.274	
2.260		
<u>.626</u>		
2.886		
<u>1.634</u>		

$$1.443 - 1.377 = +0.026 \text{ wt}$$

$$.817 - 0.732 = +0.085 \text{ wt}$$

Therm^o 71°
Object South

Z

W

+ 52.0	— 530
52.2	— 530
46.8	— 580 +
<u>46.5</u>	<u>— 57.8 +</u>
4/197.5	4/21.8
49.4	55.4

49.4

6.0

$$3.0 = +0.19$$

$$a + 0.085$$

$$b + 0.190$$

$$c + 0.072$$

857- August ³⁰/₃₁

mer. marks

South — North — Zero —

1.147 0.457 .137

.150 .470 .137

.147 .466 .140

1.148 0.464

0.138 0.138

1.010 0.326

s = 2.287

n = 0.745

a = +0.039

b

c = +0.145

s+n = 3.032 s-n = 1.542

1.516 0.771

1.371 0.732

Level No. 1 is used in higher temperatures

Sept 1st The Level belonging to Lieut Joes New Transit here was secured to the telescope tube of our Transit Circle and the following readings were had - Therm° + 71.5

	limb of L.	Reading of level	
Reading microscope set on	136.42.5	N 47.5	S 45.5 mid
Read	9.8.327	" 80.0	" 14.0 mean of E & W
	72.0 295	" 13.0	" 81.0

136.45.0	47	47
.10.7	80.5	13
.10.8	80.5	12.5
.10.7	80.8	12.5

72.2	84	80
72.0	14	80.1
72.5	13.5	80.3

45.0	47.0	46.5	mid
45.5	47.0	46.7	
45.2	46.5	47.2	

note, the E & W index of the scale do not agree

Illumination West

Ex Ther-70

Sept-1st Am very unsteady -
South North WCB Zero

1.160	.490	.150
.143	.480	.175
.152	.494	.160
<u>155</u>	<u>268</u>	<u>185</u>
1.152	.489	.157
<u>-157</u>	<u>-157</u>	
.995	332	
2.273		
.1759		
3.032		
<u>1.514</u>		
1.516 - 1.377 =	+ 0.099 w	
757 - 0.732 =	+ 0.025 w	

E	W
+ 53.4	- 59.5
+ 54.5	- 57.3
+ 54.8	- 56.8
503	- 602 +
503	- 598 +
<u>497</u>	<u>600</u> +
130	3536
522	.585
	<u>522</u>
	667
	3.2 = + 0.03
	0.21

a = + 0.025

b = + 0.210

c = + 0.145

Sept-1st - Lieut Joes' Transit Level, tested by our Transit circle Ther 73°

	East side	West side
Reading Microscope A set on - 136°	43.0	44.5
	43.3	44.5
	43.0	44.5

9.8	10	80
70.5	80	9
70.3	81	9
11.7	10.5	80

43.2 45 - 45

For Run, Ther. 73.2 - 46.5

Correction for runs 0.4

44.5
42.1

45.2

45.2 = 5.02.1 = 1.00.4

42.8

21

By first group

By second group

Value of 1 division of the scale 1.1

1.2

Probably Level No 1

1857, Sept. 4th

marks

South - North

1.155 0.438
 .132 .437
.153 .443
 1.146 0.439
1.61 1.61
 .985 .278
 2.250 0.635

Illumination - West
 Clear and steady.

Zero

0.158
 .163
.163
 0.161

$S = 2.250$

$n = 0.635$

$S+n = 2.885$

$S-n = 1.615$

$\frac{1}{2}(S+n) = 1.442$

$\frac{1}{2}(S-n) = 0.807$

$col. = 1.442 - 1.377 = +.025$

$az = 0.807 - .732 = +.075$

Ther. 67

Level

E W

475 - 600 +
 470 - 602 +
 + 53.0 - 543
 + 53.0 - 54.5
 50.125 57.25

50.125

2/7.625

3.562 = 0.22

Sept. 5th

St. Ives' Transit Level No. 2 -

Leveled to the Lib. tube of Transit Circle

Therm° 77.3

North end

South end

A 136.00.26.6

32.5

30.0

Then set the level to read equal on each side

" 136 30.8

31.0

31.0

level

3.33

" 1.14.0

00.0

62.0

3.33

" 136 30.8

31.0

31.0

level

3.36

" 46.2

62.0

00.0

3.37

" 136 30.8

31.0

31.0

3.30

" - 3.5 (56.5)

41.0

20.8

3.30

" 23.2 33.

51.0

10.9

3.30

" 16.5

61.0

00.0

3.40

" 136 31.0

31.0

31.0

level

3.40

" 9.65.2

20.8

41.0

3.38

" 39.0

10.8

57.0

3.32

" 132.2

00.0

61.0

3.33

" 136 31.2

30.4

30.4

level

3.33

Atm

Pd

Ther 78.3
 82.0

34

26.0

26

52.3 - 18.3

21.0

31

$r = 4.57$

3.66

66.5 - 14.2

16.0

36

4.58.5

2.84

84.2 - 17.7

11.5

41.5

4.56.0

3.30

99.3 - 15.1

6.0

46.0

4.58.0

3.35

3.29

1857 Sept 22nd 4:30 PM - Ill. West
Observer: G. P. B.

Marks			Level	
S	N	Zero	E	W
1,040	0.583	0.143	+63.2	65.0
1,043	.596	.151	+63.3	65.0
<u>1,035</u>	<u>.580</u>	<u>.150</u>	56.8	71.4x
1,046	0.586	144	<u>56.4</u>	<u>71.0x</u>
0.148 =	0.148 =	0.148	59.97	68.1
0.898	0.438			<u>59.9</u>
2.052	n = 1.001			2) <u>18.2</u>
	s = <u>2.052</u>			4.1 = 0.28 ^s
S+n = 3.053				
s-n = <u>1.051</u>				
$\frac{1}{2}(s+n)$ 1.526				
$\frac{1}{2}(s-n)$ <u>0.525</u>				
Ill W col = 1.526 - 1.377 = +0.149 col			a = +0.207	
Ill W wr = 0.525 - 0.732 = -0.207 wr			b = +0.280	
			c = +0.155	

1857, Sept 23rd

P. M.

Illumination West
S. P. B. Observer.

South	North	Zero	W	E
1.650	0.572	0.156	x70.2	57.2
.055	.568	0.158	x70.1	57.2
<u>045</u>	<u>.572</u>		64.0	62.7x
1.050	0.571		<u>63.5</u>	<u>62.8x</u>
<i>2m</i> 0.157	<u>0.157</u>		27.8	
0.893	0.414		66.9	60.0
2.041	0.946		<u>60.0</u>	
<u>0.946</u>			6.9	
2.987			3.45	
<u>1.095</u>			0.23	
1.494 - 1.387 = +0.077 Col				
0.548 - 0.732 = -0.184 az				

$$a = -0.184$$

$$b = +0.230$$

$$c = +0.123$$

Transit Reversed to Ill. East

1857 Sept 23rd (Continued.)

Ill. East.

North.

0,738

,743

,742

0.741

Sum

0.157

0.416

South.

0,448

,438

,436

0.441

1.157

0.716

Zero

0.156

$$n = 0.951$$

$$s = 1.636$$

$$\underline{0.951}$$

$$s + n = 2.587$$

$$s - n = 0.685$$

$$\frac{1}{2}(s+n) = 1.293$$

$$\frac{1}{2}(s-n) = 0.342$$

$$1.293 - 1.409 = -0.116$$

$$0.342 - 0.732 = -0.390 \quad az$$

$$a^2 = -0.39$$

$$b^2 = +0.23$$

$$c = -0.07$$

$$a = -0.390$$

$$b = +0.230$$

$$c = -0.112$$

Sept 27/28. 1857. Illumination. East. This
 AS W.C.B.

South.	North.	Zero.	Level	East	West
1,320.	,890	,166			
,290	,900	,160		+ 580	610
,310	,890	,153		+ 575	605
,317	,904	,165		+ 575	605
,317	,892	,157		500	660 +
<u>6554</u>	<u>4476</u>	<u>801</u>		500	655 +
1,3108	,8952	,1602		495	660 +
,1602	,1602			3225	3795
1,1506	,7350			5375	6325
0.850	,2650				5375

$$S = 1.942 \quad n = .605$$

$$1.942$$

$$S + n = 2.547$$

$$S - n = 1.337$$

$$\frac{1}{2}(S+n) = 1.273 - 1.409 = -.136 \text{ col}$$

$$\frac{1}{2}(S-n) = 0.668 - 0.732 = -.064 \text{ az}$$

$$a = -.064$$

$$b = +0.310$$

$$c = -.036$$

Sept 28th

South	North	Zero
.305	.892	.134
.307	.895	.160 N
.312	.895	.145
<u>24</u>	<u>12</u>	.170 S
308	.894	<u>.150</u>
		<u>.259</u>
- 1.152	1.152	.152
0.844	0.258	
S 1.928	0.589	
n 0.589		

$$2.517$$

$$1.339$$

$$1.259 - 1.409 = -.150 \text{ c}$$

$$0.669 - 0.732 = -.063 \text{ a}$$

$$a = -.063$$

$$b =$$

$$c = -.0150$$

1857 Oct. 2.

Elimination East

Eq. Mer. 61

mer. Marks - steady and clear.

Level

South	North	Zero
.425	.810	.168
.430	.800	.165
.417	.803	.167
72	13	500
424	.804	.166
1,166	1,166	
742	.862	

East	West
567	732 +
565	735 - +
+625	662
+625	650
2382	2779
595	695
	595
	100

$$s = 1,696$$

$$n = 828$$

$$1,696$$

$$s + n = 2,524$$

$$s - n = .868$$

$$\frac{1}{2}(s + n) = 1,262$$

$$\frac{1}{2}(s - n) = .434$$

$$1,262 - 1,409 = -.101 \text{ col}$$

$$.434 - .732 = -.298 \text{ az}$$

$$a = -0.298$$

$$b = +0.340$$

$$c = -0.147$$

$$\text{mid-mean} = +0.02 \text{ sec.}$$

1857

Oct 8thIllumination East Ex Ther. 66
G. P. B. Observer.

North

825

840

830

95

832

168

336

 $n = 768$

South

417

360

410

87

396

168

772

 $s = 1764$

768

 $n+s = 2532$ $s-n = 996$ $\frac{1}{2}(s+n) = 1266$ $\frac{1}{2}(s-n) = 498$

Zero

167

168

170

505

168

Level

E

W

+602 — 66.0

+60.5 — 65.2

54.5 — 71.0 +

54.0 — 69.8 +

2292 2710

59.3 677

57.3

10.4

5.2

 $b = .34$

$$1266 - 1409 = -.143 = c$$

$$488 - 732 = -.244 = a$$

$$a = -.244$$

$$b = +.340$$

$$c = -.143$$

1857

Oct 12th

Ill. West. reversed.

N

South mark invisible. Zero

.582

7.15.8

.595

16.2

.57416.4

0.582

484

0.161

7613

0.423

Before reversing the North mark read

Ill. E. 0.73

Zero 0.16

0.43

Ill. E. Mid wire int. coll = 0.000

Red. to Mean 0.000

Dir. at -0.015

$C_1 = -0.015$

Ill. W. $C_2 = -0.015$

October 12 Reversed to

1857

Oct 13.thIll. West

E. Thr. 70.8

W.C. B. obs.

Level

N.

Good seeing -

S.

Z

.570	1.042	.150
.545	.053	.150
.580	.046	.152
.560	.050	.146
<u>.570</u>	<u>.050</u>	<u>.155</u>
325	241	3
.565	1.048	0.151
- 157	-157	
414	.897	

E	W
+530	- 580
+530	- 573
+535	- 550
500	- 665 +
487	- 650 +
<u>470</u>	<u>- 652</u> +
52	70
509	612
	<u>509</u>
	103
	5.15
	.32

$$n = 946 \quad S = 2.050$$

$$0.946$$

$$S + n = 2.996$$

$$S - n = 1.104$$

$$\frac{1}{2}(S + n) = 1.498$$

$$\frac{1}{2}(S - n) = 0.552$$

$$1.498 - 1.371 = +.127 \text{ col}$$

$$.552 - .732 = -.180 \text{ az}$$

$$a = -.180$$

$$b = +.320$$

$$c = +.127$$

1857, Oct $\frac{29}{30}$

Ill. West.

En. Ther. 38.3

good seeing.

A. H. observer.

South.

North

Zero

Level

W

E

953

601

.179

X 78.5

738

970

610

.166

X 82.0

71.2

968

601

.168

X 82.0

71.5

965

598

.167

X 81.8

71.9

962

598

.170

X 82.0

72.0

4818

3008

850

85.2

X 68.6

96.3

60.1

.170

85.5

X 68.8

170

17.0

85.1

X 68.9

79.4

43.1

85.0

X 69.0

85.0

X 69.0

s = 1,824

n = 985

832.1

704.7

985

704.7

s + n = 2,809

127.4

s - n = .839

63.7

 $\frac{1}{2}(s + n) = 1.404$

1,404 - 1,377 = + .033 col

 $\frac{1}{2}(s - n) = .419$

419 - 732 = - .313 az

a = -.313

b = +.380

c = +.033

5
 Note - 6th Am

Illumination West

Ther - 64

South m.c.B. steady North
 1.028 .650
 .040 .655
 .030 .643
1.033 649
 147 147
 .886 .502

Zero-
 .145
 .153
.143
 147

North
 Right hand mark

.922
 .902
.922
 46
.915
 170

Left hand mark

.395 .795
.395
 397
 .394
1.190
 .776 - .776

$$s = 2.025$$

$$n = 1.147$$

$$1.147$$

$$2.025$$

$$s - n = .878$$

$$s + n = 3.172$$

$$\frac{1}{2}(s - n) = .439$$

$$\frac{1}{2}(s + n) = 1.586$$

$$-.732$$

$$-1.377$$

$$a = -.293$$

$$c = +0.169$$

$$a = -0.293$$

$$b =$$

$$c = +0.215$$

1857, Nov $\frac{6}{7}$

Illumination West:

Ex. Ther. 54.5

South	North	Zero	unsteady.	A. H. W.	E.
1.050	.66.0	170		X 760	570
.04.5	.64.8	168		X 750	580
.04.4	.65.0	160		X 741	586
.04.8	.64.9	165		645	X 678
.04.1	.65.1	165		642	X 670
228	3058	828		630	X 688
.046	.612	166		4168	3772
166	166			89.5	62.9
880	448			62.9	

$$S = 2.011$$

$$n = 1.019$$

$$1.019$$

$$S+n = 3.030$$

$$S-n = 0.992$$

$$\frac{1}{2}(S+n) = 1.515$$

$$1.515 - 1.377 = +.098 \text{ col}$$

$$.996 - .732 = -.236 \text{ ar}$$

$$\frac{1}{2}(S-n) = 0.496$$

$$a = -.236$$

$$b = +.220$$

$$c = +.144$$

1857 Nov 11th Ill. 20.

Ex. G. 47.2

G. P. B. obs.

South	North	Zero
1.000	.633	.175
.016	.651	.172
.023	.650	.173
.039	.645	.173
1.013	.645	.173
.173		

Remainder 26 Ill East.

South	North	Zero
.528	.802	
.510	.800	
.518	.813	
.56	.15	
.518	.805	
.173	.173	
.654	.368	

Ill East

$$S = 1.494 \quad n = 0.841$$

$$n = 0.841 \quad S = 1.494$$

$$S - n = 0.653 \quad S + n = 2.335$$

$$\frac{1}{2}(S - n) = 0.326 \quad \frac{1}{2}(S + n) = 1.167$$

$$- .732 \quad - 1.409$$

$$a = -.406 \quad c = -.196$$

Ill West

$$S = 1.919 \quad n = 1.080$$

$$n = 1.080 \quad S = 1.919$$

$$S - n = 0.839 \quad (n + S) = 2.999$$

$$\frac{1}{2}(S - n) = 0.419 \quad \frac{1}{2}(n + S) = 1.499$$

$$- .732 \quad - 1.371$$

$$a = -.313 \quad c = +0.128$$

Level	
W	E
x 78.5	63.5
x 78.0	63.8
x 78.1	63.8
69.0	x 73.0
68.6	x 73.8
68.0	x 73.2
44.02	41.1
73.4	68.5
68.5	
2.45	b = +.17

Ill West

$$a = -0.313$$

$$b = +0.170$$

$$c = +0.128$$

Ill East

$$a = -0.406$$

$$b = +0.170$$

$$c = -0.242$$

Nov 17/18 1857.

Illumination East, Ex Ther 37.5

A 26.

Secul.

South	North	Zero	East,	West,
.573	.779	174	X 81.3	76.0
.560	.756	168	X 81.2	76.3
.569	.740	175	X 81.3	76.5
.570	.751	169	73.0	X 85.1
.571	.748	168	72.8	X 85.8
2843	3774	854	73.0	X 85.5
.569	.755	171	4626	4852
<u>1.171</u>	<u>1.171</u>		771	809
.602	.416			<u>771</u>

38

19

15

$$s = 1.376$$

$$n = .951$$

$$n = .951$$

$$s + n = 2.327$$

$$\frac{1}{2}(s+n) = 1.164$$

$$s - n = .425$$

$$\frac{1}{2}(s-n) = .213$$

$$a = -529$$

$$1.164 - 1.969 = -.199 \text{ or } b = +150$$

$$.213 - .732 = -.519 \text{ or } c = -245$$

For Dec 2nd 1857.

Ill. East.

Exther 43,4

South	North	Zero	E	All.
58.8	75.1	17.1		W
58.1	74.1	178	X 780	75.1
57.8	76.0	172	X 780	75.0
173.7	225.2	52.7	X 782	74.4
57.9	75.1	174	71.0	X 813
17.4	174		70.0	X 818
59.5	423		70.0	X 816
			445.2	469.2
			74.2	78.2
				74.2
				40
				2.0

$$\begin{aligned}
 s &= 1.395 & n &= 967 \\
 n &= 967 \\
 s+n &= 2.362 & \frac{1}{2}(s+n) &= 1.181 \\
 s-n &= .428 & \frac{1}{2}(s-n) &= 0.214
 \end{aligned}$$

$$b = +.15^2$$

$$\begin{aligned}
 1.181 - 1.409 &= -.228 \text{ cor} \\
 0.214 - .732 &= -.518 \text{ ar}
 \end{aligned}$$

$$\begin{aligned}
 a &= -.578 \\
 b &= +.150 \\
 c &= -.228
 \end{aligned}$$

Dec 19. 1857

Ill. East

Ex. Ther. 37.3

A. H.
West

South	North	Zero	East	Level.
55.7	76.2	17.8	73.8	X 83.8
56.9	76.8	17.4	72.4	X 84.0
57.5	76.8	17.1	72.7	X 83.0
57.5	76.9	17.5	X 79.0	74.8
<u>520</u>	<u>779</u>	<u>16.1</u>	X 79.2	<u>740</u>
5) 284.6	384.6	5) 85.9	X 79.5	<u>73.7</u>
56.9	76.9	17.2	4566	473.3
<u>1,172</u>	<u>1,172</u>		761	78.88
.603	.403			<u>7616</u>

$$s = 1.378$$

$$n = 0.921$$

$$s + n = 2.299$$

$$s - n = 0.457$$

$$n = 0.921$$

$$\frac{1}{2}(s + n) = 1.149$$

$$\frac{1}{2}(s - n) = 0.228$$

$$1.149 - 1.463 = -0.264 \text{ col}$$

$$0.228 - 0.732 = -0.504 \text{ az}$$

$$a = -0.504$$

$$b = +0.110$$

$$c = -0.260$$

$$1.393$$

$$b = +.11^s$$

Dec 19. 1857.

Reverend to Ill West.

South	North	Sum
96.8	75.9	17.8
97.0	74.3	16.8
<u>96.7</u>	<u>76.4</u>	<u>17.4</u>
96.8	75.5	
17.3	17.3	
79.5	58.2	

$$s = 1.826$$

$$n = 1.330$$

$$\frac{1}{2}(s+n) = 3.156 \quad \frac{1}{2}(s-n) = 0.496$$

$$1.578 \quad 0.248$$

$$\underline{1.371} \quad \underline{0.732}$$

$$e = +0.207 \quad a = -0.484$$

$$a = -0.484$$

$$b$$

$$e = +0.207$$

1857. Dec $\frac{22}{23}$

Ill. West.

Ex Ther 31.4

South	North	Zero.
948	848	179
949	839	177
<u>942</u>	<u>838</u>	<u>178</u>
945	841	178
<u>178</u>	<u>178</u>	
767	663	

$$s = \begin{array}{r} 1.753 \\ 1.515 \\ \hline \end{array}$$

$$s+n = 3.268$$

$$\begin{array}{r} \frac{1}{2}(s+n) = 1.634 \\ -1.377 \\ \hline +.263 \end{array}$$

$$n = \begin{array}{r} 1.515 \\ 1.753 \\ \hline \end{array}$$

$$s-n = .238$$

$$\begin{array}{r} \frac{1}{2}(s-n) = 0.119 \\ -.732 \\ \hline -.613 \end{array}$$

Level	A.H.
b.	W
79.0	x87.9
79.1	x87.9
78.9	x87.8
x86.2	79.5
x86.3	79.0
x86.2	78.7
4957	5008
82.6	83.5
	<u>82.6</u>

$$0.9$$

$$0.45$$

$$b = +.00^{\circ}$$

$$a = -.613$$

$$b = +.030$$

$$c = +.263$$

1858, Jan. 3/4

Ill West

Ex. Thur. 41.1

A. 96.

North	South	Zero	West	East
79.9	93.2	180	x 86.0	79.0
79.2	95.0	178	x 85.8	78.8
78.8	95.0	182	x 85.0	78.0
80.5	95.1	171	77.3	x 84.5
<u>78.6</u>	<u>94.5</u>	<u>178</u>	76.3	x 84.5
397.0	472.8	889	<u>76.4</u>	<u>x 84.3</u>
79.4	94.6	178	4868	4891
<u>178</u>	<u>178</u>		81.3	81.5
616	768			<u>81.3</u>

$$n = 1,408$$

$$s = 1.755$$

$$n = 1,408$$

$$s+n = 3,163$$

$$\frac{1}{2}(s+n) = 1.581$$

$$s-n = 0.347$$

$$\frac{1}{2}(s-n) = 0.173$$

$$1.581 - 1.377 = + 0.210 \text{ wt}$$

$$0.173 - 0.732 = - 0.559 \text{ wt}$$

$$a = -.559$$

$$b = -.007$$

$$c = +210$$

$$b = -.000$$

858.

Illumination West

Ep. Ther. 45°
W.C.B.

Jan 5th

South

North

Zero

0.945

0.745

0.167

.942

.740

.167

.953.743.168

.947

.746

.167

1.671.67

780

.579

$$s = 1.782$$

$$n = 1.323$$

$$1.323$$

$$1.782$$

$$s - n = 0.459$$

$$s + n = 3.105$$

$$\frac{1}{2}(s - n) = 0.229$$

$$\frac{1}{2}(s + n) = 1.552$$

$$-.723$$

$$1.371$$

$$a = -.494$$

$$c = +.186$$

$$a = -0.494$$

$$b =$$

$$c = +0.181$$

Jan 12 1858.

Ill. West

Ex. Ther. 48.5
A. H.

South	North	Zero	East	West
94.4	76.2	175	x83.0	72.8
93.2	77.3	16.8	x82.8	72.6
92.5	78.2	16.8	x82.5	72.5
94.3	76.6	17.0	73.5	x81.0
<u>94.2</u>	<u>78.4</u>	<u>16.5</u>	73.8	x81.0
4686	3867	846	<u>74.0</u>	<u>x81.0</u>
937	773	169	4696	46.09
<u>169</u>	<u>169</u>		783	768
768	604			<u>783</u>

1.5

0.75

$$s = 1.755$$

$$n = 1.380$$

$$n = \underline{1.380}$$

$$s = \underline{1.755}$$

$$s - n = 0.375$$

$$s + n = 3.135$$

$$\frac{1}{2}(s - n) = 0.187$$

$$\frac{1}{2}(s + n) = 1.567$$

$$- \underline{.732}$$

$$- \underline{1.377}$$

$$- .545$$

$$+ 0.150$$

$$a = -.545$$

$$b = -.060$$

$$c = +.196$$

Jan 30, 1858. A.M.
not very good seeing

Ill. West

Ex Ther. 22.2

A. Hall.
Level

South	North	Zero.	E.	W.
952	787	171	85.8	X 90.0
942	790	170	85.8	X 90.0
960	780	<u>175</u>	85.2	X 90.2
954	770	516	X 91.3	83.5
<u>950</u>	<u>770</u>	172	X 91.5	83.5
4758	3897		X 91.8	83.3
952	780		531.4	520.5
172	<u>172</u>		88.6	86.8
78.0	608		<u>86.8</u>	

$$S = \overset{s}{1,782}$$

$$\underline{1,389}$$

$$S - n = 0,393$$

$$\frac{1}{2}(S - n) = 0,196$$

$$\underline{-,732}$$

$$-,536$$

$$n = \overset{s}{1,389}$$

$$\underline{1,782}$$

$$S + n = 3,171$$

$$\frac{1}{2}(S + n) = 1,585$$

$$\underline{-,1371}$$

$$+ 214$$

$$1,8$$

$$,9$$

$$b = -.08$$

$$a = -.536$$

$$b = -.080$$

$$c = +,214$$

Feb 10, 1858 A.M. Ill West

Good seeing

Ex Ther, 37.0

South	North	Zero
94.3	79.1	173
95.7	79.6	178
<u>95.5</u>	<u>78.9</u>	<u>169</u>
155	6	520
951	792	17.3
173	173	
<u>778</u>	<u>619</u>	

Alt	E	W
	X 87.4	81.5
	X 87.5	81.2
	X 87.7	80.8
	82.2	X 85.8
	82.2	85.6
	<u>82.0</u>	<u>85.9</u>
	5090	5008
	84.8	83.5
	<u>83.5</u>	
	<u>2) 1.3</u>	
	.65	

$$\begin{aligned}
 s &= 1.778 & n &= 1.415 \\
 n &= 1.415 & s &= 1.778 \\
 s-n &= 0.363 & s+n &= 3.193 \\
 \frac{1}{2}(s-n) &= 0.182 & \frac{1}{2}(s+n) &= 1.596 \\
 & -732 & & 1.374 \\
 a &= -.550 & c &= +0.225
 \end{aligned}$$

$$\begin{aligned}
 a &= -0.550 \\
 b &= -0.050 \\
 c &= +0.225
 \end{aligned}$$

Reversed to Ill East Feb 10. A.M.
not good seeing

Feb 10 P.M.

Ex Ther 38.0

South	North
60.0	71.0
59.8	71.0
61.0	71.6
60.1	71.8
<u>60.8</u>	<u>71.0</u>
3017	64
60.3	71.3
<u>1.17.3</u>	<u>1.17.3</u>
57.0	0.460

$$\begin{aligned}
 a &= -.607 \\
 b &= -.050 \\
 c &= -.283
 \end{aligned}$$

$$\begin{aligned}
 s &= 1.302 & n &= 1.051 \\
 & \underline{1.051} & & \underline{1.302} \\
 s-n &= 0.251 & s+n &= 2.353 \\
 \frac{1}{2}(s-n) &= 0.125 & \frac{1}{2}(s+n) &= 1.176 \\
 & -732 & & -1.409 \\
 & -607 & & -.283
 \end{aligned}$$

Feb 11.

Reversed the Transit Instrument for
Mr Safford.

Ill West.

Ex Zhr 15.4

Feb 16.

not good seeing

South	North	Zero
866	82.3	170
884	82.1	178
872	83.0	<u>168</u>
882	82.6	.6
<u>887</u>	<u>83.5</u>	17.2
91	4135	
878	82.7	
<u>172</u>	<u>172</u>	
70.6	65.5	

$$s = 1.614$$

$$n = 1.495$$

$$\underline{1.495}$$

$$\underline{1.614}$$

$$s-n = 0.119$$

$$s+n = 3.109$$

$$\frac{1}{2}(s-n) = 0.059$$

$$\frac{1}{2}(s+n) = 1.554$$

$$\underline{-0.732}$$

$$\underline{-1.377}$$

$$-0.673$$

$$+0.137$$

$$a = -0.673$$

$$b = -0.160$$

$$c = +0.183$$

Alt.

E

W

$$\times 102.0$$

$$92.0$$

$$\times 102.4$$

$$91.5$$

$$\times 102.3$$

$$91.0$$

$$94.0$$

$$\times 98.0$$

$$94.5$$

$$\times 97.5$$

$$\underline{94.0}$$

$$\times \underline{97.5}$$

$$5892$$

$$5675$$

$$982$$

$$946$$

$$\underline{946}$$

$$23.6$$

$$1.8$$

Feb 22

Ill. West

Ex. Chen. 23.0

W.C. B.

A.H.

South	North	Zero	E	W
89.2	76.8	19.0	89.0	X 92.3
91.0	77.2	19.2	89.0	X 92.2
94.0	76.8	19.1	88.5	X 92.4
93.5	78.8	19.1	X 94.5	85.5
91.0	76.6		X 95.0	85.2
4587	3862		X 95.1	84.9
91.7	77.2		5511	5325
19.1	19.1		91.8	887
72.6	58.1		88.7	

$$\begin{array}{r} 2131 \\ 1.55 \end{array}$$

$$\begin{array}{rcl} S = 1.659 & n = 1.327 & \\ n = 1.327 & S = 1.659 & \\ S - n = 0.332 & S + n = 2.986 & \\ \frac{1}{2}(S - n) = 0.166 & \frac{1}{2}(S + n) = 1.493 & \\ - .732 & - 1.371 & \\ - .566 & + 0.076 & \end{array}$$

$$\begin{array}{l} a = -.566 \\ b = -.120 \\ c = +.122 \end{array}$$

Feb. 27 1858

Ill. West.

Ex. ther 41.4
Level

South	North	pretty fair seeing		E	W
963	77.6	16.9	18.1	86.0	X88.0
974	78.0	17.0	17.9	85.5	X87.3
970	77.9	17.0	18.7	85.0	X88.1
971	78.2	17.5	18.0	X89.5	81.4
971	78.5	17.0	17.8	X89.3	81.0
484.9	390.2	85.4	90.5	X89.5	80.5
97.0	78.0	17.1	18.1	5248	5065
<u>176</u>	<u>17.6</u>		<u>17.1</u>	87.5	84.4
79.4	60.4		<u>17.6</u>	<u>84.4</u>	
				<u>23.1</u>	
				1.53	

$$\begin{aligned}
 s &= 1.824 & n &= 1.380 \\
 n &= 1.380 & s &= 1.824 \\
 s - n &= 0.444 & s + n &= 3.204 \\
 \frac{1}{2}(s - n) &= 0.222 & \frac{1}{2}(s + n) &= 1.602 \\
 &- 0.732 & & 1.371 \\
 &- .510 & & + 0.234
 \end{aligned}$$

$$a = -.510$$

$$b = -.120$$

$$c = +.231$$

March 1. PM

Ill. West

Ex. ther 41.5
Level

South	North	fair seeing		E	W
97.0	79.8				
97.0	80.8				
<u>97.1</u>	<u>80.2</u>				
97.0	80.3				
<u>17.6</u>	<u>17.6</u>				
79.4	62.7				

$$s = 1.824$$

$$n = 1.433$$

$$3.257 \quad 0.391$$

$$1.628 \quad 0.190$$

$$1.371 \quad 0.732$$

$$a = -0.542$$

$$b =$$

$$c = +0.257$$

March 2, P.M. about 3^h

good seeing

South	North	Zero
965	814	178
965	822	182
<u>952</u>	<u>818</u>	<u>178</u>
961	818	179
<u>179</u>	<u>179</u>	
782	639	

$$S = 1.787 \quad n = 1.461$$

$$\underline{1.461} \quad \underline{1.787}$$

$$S - n = 0.326 \quad S + n = 3.248$$

$$\frac{1}{2}(S - n) = 0.163 \quad \frac{1}{2}(S + n) = 1.624$$

$$-0.732 \quad -1.371$$

$$a = -0.569 \quad c = +0.253$$

Ill West
M.

Level

W	E
X 87.5	83.0
X 87.0	83.2
X 87.0	83.2
80.8	X 88.8
80.1	X 89.0
<u>80.0</u>	<u>X 89.0</u>
24	62
83.7	86.0

$$\underline{83.7}$$

$$2) 23$$

$$1.15$$

$$b = -0.09$$

March 8 P.M. about 2^h

not good seeing

South	North	Zero
887	83.8	182
885	83.3	18.1
898	84.8	17.8
881	85.0	18.2
<u>885</u>	<u>84.0</u>	<u>17.8</u>
4436	4209	901
887	842	180
<u>180</u>	<u>180</u>	
707	662	

$$S = 1.616 \quad n = 1.513$$

$$n = 1.513 \quad S = \underline{1.616}$$

$$S - n = 0.103 \quad n + S = 3.129$$

$$\frac{1}{2}(S - n) = 0.051, \quad \frac{1}{2}(S + n) = 1.564$$

$$-0.732 \quad -1.371$$

$$-0.681 \quad +0.193$$

Ill. West
M.

Ex Thur. 30.5

W	E
X 92.8	89.5
X 92.5	89.8
X 92.5	89.1
86.2	X 94.8
85.3	X 94.8
<u>84.8</u>	<u>X 94.7</u>
5341	5527
890	921
	<u>890</u>

$$2) 31$$

$$a = -0.681$$

$$b = -0.120$$

$$c = +0.193$$

$$1.55$$

March 7/8 1858
marks indistinct but steady.

Ill West
AM.

Ex. Ther. 68.0

South	North	Zero
924	712	178
925	700	172
920	700	170
915	690	169
<u>938</u>	<u>680</u>	<u>178</u>
462.2	348.2	86.7
92.2	69.6	17.3
<u>17.3</u>	<u>17.3</u>	
749	523	

W	E
735	X 773
723	X 770
712	X 765
X 731	724
X 720	720
X 713	712
4334	4464
722	744
	<u>722</u>
	<u>1122</u>
	1.1

$$\begin{aligned}
 S &= 1.712 & n &= 1.195 \\
 n &= 1.195 & S &= 1.712 \\
 S-n &= 0.517 & S+n &= 2.907 \\
 \frac{1}{2}(S-n) &= 0.258 & \frac{1}{2}(S+n) &= 1.453 \\
 & - .732 & & \underline{1.377} \\
 & - .474 & & + 0.082
 \end{aligned}$$

$$\begin{aligned}
 a &= -0.474 \\
 b &= -0.080 \\
 c &= +0.082
 \end{aligned}$$

March 2/22 1858

First rate seeing.

Ill West
AM.

Ex Ther 44.5
Level

South	North	Zero
94.4	73.0	170
94.5	72.0	175
93.8	72.9	176
94.4	72.0	178
<u>94.4</u>	<u>71.8</u>	<u>173</u>
471.5	361.7	87.2
94.4	72.3	172
<u>172</u>	<u>172</u>	
772	551	

W	E
X 83.2	80.0
X 83.0	79.8
X 83.0	79.8
77.3	X 85.0
77.0	X 85.1
75.5	X 85.5
479.0	495.2
798	825
	<u>798</u>
	<u>227</u>
	1.35

$$\begin{aligned}
 a &= -.480 \\
 b &= -.090 \\
 c &= +.040
 \end{aligned}$$

$$\begin{aligned}
 S &= 1.764 & n &= 1.259 \\
 n &= 1.259 & S &= 1.764 \\
 S-n &= 0.505 & S+n &= 3.023 \\
 \frac{1}{2}(S-n) &= 0.252 & \frac{1}{2}(S+n) &= 1.511 \\
 & - 0.732 & & - 1.377 \\
 & - 0.480 & & + 0.140
 \end{aligned}$$

April 6. 1858.

Ill West
SM.

Ex Sher 48.7

not good observing, but have not been able to see the marks at all for a long time. ...

South	North	Zero	W	E
97.6	74.4	20.5	X 76.0	72.5
98.0	73.4	22.0	X 75.5	72.5
97.2	73.0	21.7	X 75.2	72.5
96.3	73.7	21.6	68.5	X 78.0
95.8	72.8	22.0	68.5	X 78.3
96.5	72.0	22.5	68.3	78.5
<u>97.7</u>	<u>73.0</u>	<u>21.3</u>	4320	23
679.1	2.3	20	72.0	75.4
97.0	73.2	21.7		72.0
<u>217</u>	<u>21.7</u>			<u>73.4</u>
75.3	51.5			1.7

$$s = 1.721$$

$$n = 1.176$$

$$n = 1.176$$

$$s = 1.721$$

$$s - n = 0.545$$

$$s + n = 2.897$$

$$a = -.460$$

$$b = -.130$$

$$c = +0.77$$

$$\frac{1}{2}(s-n) = 0.272$$

$$\frac{1}{2}(s+n) = 1.448$$

$$-.232$$

$$-1.377$$

$$-.460$$

$$+0.077$$

April 9/10 1858

Ill West.

South	North	Zero
92.2	cannot see the north mark	
91.2		
90.4		
92.7		
91.5		

April 14, 1858 A.M. about 10^h
 South much good, north bad

Ill West
 All.

Ev Ther. 43.7
 Level

North	South	Zero
88.9	97.0	17.0
70.0	96.3	18.0
69.8	96.4	17.4
69.0	96.3	17.1
68.8	97.0	17.0
346.5	30	86.5
69.5	96.6	17.3
17.3	17.3	
52.2	79.3	

E	W
x76.5	81.0
x76.8	80.2
x76.5	80.0
83.0	x82.5
82.3	x72.7
82.7	x72.5
477.8	458.9
79.6	76.5
	79.6

$$n = 1.193 \quad s = 1.822$$

$$s = 1.822 \quad n = 1.193$$

$$s+n = 3.015 \quad s-n = 0.629$$

$$\frac{1}{2}(s+n) = 1.507 \quad \frac{1}{2}(s-n) = 0.314$$

$$-1.371 \quad -0.732$$

$$+0.090 \quad -0.418$$

$$a = -.418$$

$$b = -.110$$

$$c = +.136$$

$$2) 31$$

$$1.55$$

April 24/2 1858

not good seeing

Ill West
 All

Ev Ther. 46.5

North	South	Zero
72.2	94.2	18.0
69.1	92.3	17.7
70.7	94.8	18.0
71.3	94.5	17.6
70.3	95.0	17.7
3.6	0.8	0
70.7	94.2	17.8
17.8	17.8	
52.9	76.4	

E	W
84.3	x73.1
84.2	x72.2
84.1	x72.0
x72.8	81.6
x73.1	81.0
x73.0	81.0
471.5	460.9
78.6	76.8
	78.6
	2) 1.8

$$n = 1.209 \quad s = 1.746$$

$$s = 1.746 \quad n = 1.209$$

$$s-n = 0.537 \quad s+n = 2.955$$

$$\frac{1}{2}(s-n) = 0.268 \quad \frac{1}{2}(s+n) = 1.477$$

$$-0.232 \quad -1.371$$

$$-0.464 \quad +0.106$$

$$a = -.464$$

$$b = -.080$$

$$c = +.106$$

$$0.9$$

Apr 24. 1858

good seeing

Hl West
A.H.Ex Ther. 43.6
Level

South	North	Zero	E	W
96.1	66.1	170	81.5	x 66.2
97.4	65.0	178	81.2	x 66.2
96.3	65.3	171	81.0	x 66.2
97.1	64.3	181	x 67.8	79.1
<u>97.1</u>	<u>64.8</u>	<u>180</u>	x 68.0	78.6
484.0	325.5	880	x 68.0	<u>78.5</u>
968	651	176	4475	4348
<u>176</u>	<u>176</u>		746	725
792	475			<u>746</u>

2/19
0.95

$$\begin{aligned}
 s &= 1.820 & n &= 1.086 \\
 n &= 1.086 & s &= 1.820 \\
 s-n &= 0.734 & s+n &= 2.906 \\
 \frac{1}{2}(s-n) &= 0.367 & \frac{1}{2}(s+n) &= 1.453 \\
 &- 0.732 & &- 1.371 \\
 &- 0.365 & &+ 0.082
 \end{aligned}$$

$$\begin{aligned}
 a &= -.365 \\
 b &= -.080 \\
 c &= +.082
 \end{aligned}$$

April 28, 1858

good seeing

Hl West

A.H.

Ex Ther. 39.5

South	North	Zero	E	W
97.3	70.4	17.7	x 77.7	85.0
96.7	70.6	18.3	x 77.8	84.8
97.3	70.6	18.1	x 78.0	84.5
96.6	70.8	17.4	86.3	x 75.2
<u>98.0</u>	<u>71.0</u>	<u>17.9</u>	86.0	x 75.1
5.9	3.4	894	<u>85.8</u>	x 75.1
97.2	70.7	179	491.6	4797
<u>179</u>	<u>179</u>		81.93	79.95
793	528			<u>81.93</u>

2/1.98
0.99

$$\begin{aligned}
 s &= 1.822 & n &= 1.206 \\
 n &= 1.206 & s &= 1.822 \\
 s-n &= 0.616 & s+n &= 3.028 \\
 \frac{1}{2}(s-n) &= 0.308 & \frac{1}{2}(s+n) &= 1.514 \\
 &- 0.732 & &- 1.371 \\
 &- 0.424 & &+ 0.143
 \end{aligned}$$

$$\begin{aligned}
 a &= -.424 \\
 b &= -.080 \\
 c &= +.143
 \end{aligned}$$

May 4/5 1858
seeing good and marks steady

Ill West
AH

E Ther 31.6

South	North	Zero	E	Level	W
99.6	66.1	17.5	X 68.0		78.5
99.0	66.1	16.8	X 68.0		78.2
98.4	66.7	17.6	X 67.8		78.1
99.6	66.8	17.0	78.2		X 66.1
99.4	65.8	18.0	78.2		X 63.8
6.0	5		77.8		X 65.6
99.2	66.3	17.4	438.0		432.3
17.4	17.4		73.00		72.05
81.8	48.9		72.05		
			3095		

$$s = 1.869$$

$$n = 1.119$$

$$a = -0.357$$

$$0.475$$

$$n = 1.119$$

$$s = 1.869$$

$$b = -0.03$$

$$s - n = 0.750$$

$$s + n = 2.988$$

$$c = +123$$

$$\frac{1}{2}(s - n) = 0.375$$

$$\frac{1}{2}(s + n) = 1.494$$

$$-0.732$$

$$-1.371$$

$$-0.357$$

$$+0.123$$

18 58 May 10/11
seeing pretty good,

Ill West
AH

Ex Ther. 49.8

South	North	Zero	E	Level	W
100.7	61.3	17.0	76.2		X 63.4
102.3	61.7	16.0	76.2		X 63.3
101.7	61.8	16.5	76.2		X 63.3
101.3	61.9	16.4	X 64.0		74.0
101.5	61.5	16.8	X 64.1		73.5
7.5	2	7	X 64.0		73.8
101.5	61.6	16.5	7		4113
16.5	16.5		70.1		68.6
85.0	45.1		68.5		
s = 1.942	n = 1.030		211.6		
n = 1.030	s = 1.942		0.80		

$$s - n = 0.912$$

$$s + n = 2.972$$

$$a = -0.276$$

$$\frac{1}{2}(s - n) = 0.456$$

$$\frac{1}{2}(s + n) = 1.486$$

$$b = -0.05$$

$$-0.732$$

$$-1.371$$

$$c = +115$$

$$-0.276$$

$$+0.069$$

May 13 1858 10^h AM.
w.c.B

900 West

E. Thur 52.5
Level, by A.H.

South	North	Sum
99.0	61.3	20.6
100.0	62.0	22.5
<u>98.6</u>	<u>60.7</u>	22.0
297.6	4.0	22.5
99.2	61.3	<u>21.5</u>
21.8	<u>21.8</u>	21.8
77.4	39.5	

E	W
X64.2	75.0
X63.8	75.2
X64.0	74.8
76.2	X61.2
76.0	X61.0
<u>75.5</u>	<u>X60.5</u>
419.7	407.7
69.95	67.95
<u>67.95</u>	
2)2.00	
1.00	

$$\begin{aligned}
 s &= 1.768 & n &= 0.902 \\
 n &= 0.902 & s &= 1.768 \\
 s-n &= .866 & s+n &= 2.670 \\
 \frac{1}{2}(s-n) &= .433 & \frac{1}{2}(s+n) &= 1.335 \\
 -0.732 & & -1.377 & \\
 -0.299 & & -0.082 &
 \end{aligned}$$

$$\begin{aligned}
 a &= -.30 \\
 b &= -.07 \\
 c &= -.08?
 \end{aligned}$$

May 17, 1858 AM
not good seeing

900 West
A.H.

E. Thur 59.4

South	North	Sum
97.4	61.5	16.0
97.1	60.7	16.0
97.8	61.0	16.3
97.6	60.8	17.0
<u>97.1</u>	<u>60.5</u>	<u>16.9</u>
97.4	60.9	16.4
<u>76.4</u>	<u>16.4</u>	
81.0	44.5	

E	W
74.0	X72.0
73.1	X69.0
72.7	X68.8
X67.9	73.2
X68.0	72.1
X68.0	<u>71.2</u>
423.7	424.3
70.6	70.7
	<u>70.6</u>
	2)0.1
	0.05

$$\begin{aligned}
 s &= 1.857 & n &= 1.016 \\
 n &= 1.016 & s &= 1.857 \\
 s-n &= 0.835 & s+n &= 2.867 \\
 \frac{1}{2}(s-n) &= 0.4175 & \frac{1}{2}(s+n) &= 1.4335 \\
 -0.732 & & 1.377 & \\
 -0.3145 & & +0.0625 &
 \end{aligned}$$

$$\begin{aligned}
 a &= -.314 \\
 b &= \pm .003 \\
 c &= +.062
 \end{aligned}$$

P.M.
May 29. 1858
marks indistinct

Ill West
AM

Ex ther. 51.6
Level

South	North	Zero	E	W
97.8	61.8	16.8	X 68.8	69.8
98.2	60.2	17.1	X 69.2	70.0
97.1	62.0	17.0	X 69.4	70.1
98.9	62.1	17.1	69.0	X 70.4
97.6	63.0	17.2	69.5	X 70.2
9.6	9.1	17.0	69.8	X 70.2
97.9	61.8		7	0.7
17.0	17.0		69.3	70.1
80.9	44.8			69.3

70.8

0.4

$$\begin{aligned}
 s &= 1.849 & n &= 1.023 \\
 n &= 1.023 & s &= 1.849 \\
 s-n &= 0.826 & s+n &= 2.872 \\
 \frac{1}{2}(s-n) &= 0.413 & \frac{1}{2}(s+n) &= 1.436 \\
 -0.732 & & -1.371 \\
 -0.319 & & +0.019
 \end{aligned}$$

$$a = -.319$$

$$b = +.040$$

$$c = +.065$$

June 4/5 1858
marks indistinct.

Ill. West
AM

Ex ther 69.7

South	North	Zero	Level E	W
102.2	52.2	17.0	59.2	X 60.0
101.1	51.5	17.2	57.8	X 59.1
102.0	50.2	17.1	57.5	X 59.0
101.0	53.2	17.0	X 54.8	X 60.0
101.4	53.0	17.0	X 54.9	59.8
77	01	17.1	X 54.9	58.9
101.5	52.0		91	35.6.8
17.1	17.1		56.5	59.5
84.4	34.9			56.5

$$\begin{aligned}
 s &= 1.928 & n &= 0.912 \\
 n &= 0.912 & s &= 1.928 \\
 (s-n) &= 1.016 & (s+n) &= 2.840 \\
 \frac{1}{2}(s-n) &= 0.508 & \frac{1}{2}(s+n) &= 1.420 \\
 -0.732 & & -1.371 \\
 -0.224 & & +0.049
 \end{aligned}$$

$$a = -.224$$

$$b = +.100$$

$$c = +.049$$

$$2/3.0$$

$$1.5$$

June 19, 1858
good seeing

All West
AM.

Ex Ther 79.7

South	North	Zero
110.0	43.4	15.7
110.2	42.4	15.8
110.8	42.0	15.0
110.0	42.0	15.0
<u>110.0</u>	<u>42.1</u>	<u>16.0</u>
110.2	42.4	15.5
<u>15.5</u>	<u>15.5</u>	
94.7	26.9	

level	E	W
	X 51.5	54.0
	X 50.0	52.5
	X 49.3	51.2
	47.8	X 57.3
	47.1	X 50.0
	<u>46.8</u>	<u>X 49.8</u>
	292.5	8.8
	48.75	51.47
		<u>48.75</u>
		2) 2.72
		1.36

$$\begin{aligned}
 s &= 2.164 & n &= 0.615 \\
 n &= 0.615 & s &= 2.164 \\
 s - n &= 1.549 & s + n &= 2.779 \\
 \frac{1}{2}(s - n) &= 0.774 & \frac{1}{2}(s + n) &= 1.389 \\
 & - 0.732 & & - 1.378 \\
 & + 0.042 & & + 0.018
 \end{aligned}$$

$$\begin{aligned}
 a &= +.042 \\
 b &= +.090 \\
 c &= +.088
 \end{aligned}$$

June 17 1858 P.M.
seeing superb

All West
AM

Ex Ther 72.8

South	North	Zero
103.8	48.0	16.0
102.3	48.4	16.5
102.8	48.6	17.0
103.5	48.6	17.0
<u>101.4</u>	<u>49.2</u>	<u>16.3</u>
102.8	48.6	16.6
<u>16.6</u>	<u>16.6</u>	
86.2	32.0	

level	E	W
	51.2	X 52.3
	49.8	X 50.5
	49.0	X 50.0
	X 42.1	53.0
	X 42.0	54.7
	X 42.5	53.5
	276.6	316.0
	46.1	52.7
		<u>46.1</u>
		2) 6.6
		3.30

$$\begin{aligned}
 s &= 1.9700 & n &= 0.731 \\
 n &= 0.731 & s &= 1.970 \\
 s - n &= 1.239 & s + n &= 2.701 \\
 \frac{1}{2}(s - n) &= 0.6195 & \frac{1}{2}(s + n) &= 1.3505 \\
 & - 0.732 & & - 1.371 \\
 & 0.1125 & & 0.0215
 \end{aligned}$$

$$\begin{aligned}
 a &= -.112 \\
 b &= +.200 \\
 c &= -.071
 \end{aligned}$$

There was a grand Thunder Storm on the 20th of June. gn. did the ele? change the

Jan ²²/₂₈ 1858

All West
All

Ex ther 72.1

seeing not good

South	North	Zero
101.8	45.0	16.0
100.8	44.2	16.5
100.2	44.0	16.0
100.6	45.0	16.0
<u>100.0</u>	<u>43.8</u>	<u>16.0</u>
100.7	44.2	16.1
<u>16.1</u>	<u>16.1</u>	
84.6	28.1	

Level

E	W
x 52.0	64.9
x 52.4	63.3
x 46.2	63.3
60.0	x 50.0
59.3	x 49.2
<u>59.0</u>	<u>x 48.4</u>
328.9	339.1
54.8	<u>66.5</u>
	<u>34.8</u>

2) 1.7

0.85

$$\begin{aligned}
 s &= 1.933 & n &= 0.642 \\
 n &= 0.642 & s &= 1.933 \\
 s-n &= 1.291 & s+n &= 2.575 \\
 \frac{1}{2}(s-n) &= 0.6455 & \frac{1}{2}(s+n) &= 1.2875 \\
 & -0.732 & & -1.377 \\
 & -0.0865 & & -0.0895
 \end{aligned}$$

$$\begin{aligned}
 a &= -0.09 \\
 b &= +0.12 \\
 c &= -0.07 - 0.13 - 0.084
 \end{aligned}$$

should not then be interchanged

June 28. 1858
seeing good

All West
All

Ex ther 88.4

Level

South	North	Zero
92.0	22.0	17.0
91.7	21.0	15.6
91.0	22.1	16.4
93.8	22.1	17.1
<u>92.1</u>	<u>22.0</u>	<u>16.0</u>
0.6	9.2	2.1
92.1	21.8	16.2
16.2	<u>16.2</u>	
75.9	5.6	

E	W
48.0	x 45.8
48.1	x 42.0
46.5	x 40.5
x 33.5	50.5
x 33.0	49.5
x 33.3	<u>47.8</u>
242.4	276.1
40.4	46.0
	<u>40.4</u>
	2) 5.6
	2.8

$$\begin{aligned}
 s &= 1.785 & n &= 0.128 \\
 n &= 0.128 & s &= 1.735 \\
 s-n &= 1.607 & s+n &= 1.863 \\
 \frac{1}{2}(s-n) &= 0.803 & \frac{1}{2}(s+n) &= 0.931 \\
 & -0.732 & & +1.377 \\
 & +0.071 & & -0.440
 \end{aligned}$$

$$\begin{aligned}
 a &= +0.07 \\
 b &= +0.16 \\
 c &= -0.07 - 0.49 - 0.440
 \end{aligned}$$

Tested these results June 28, and found them correct

On June 27/28 the sun shone on the west pier while taking two transits.

July 2. 1858
seeing not good

Ill West.
A.H.

E Ther 75.9

South	North	Zero	E	Level	W
87.0	invisible	14.2	x43.0		61.0
86.3		15.8	x43.4		59.8
85.0		14.6	x44.0		59.0
88.0		14.4	52.0		49.3
88.0		14.0	51.3		49.4
			51.3		48.8
			285.0		327.3
			475		5455
					4730
					27.05
					3,525

$b = +.22$

July 6 1858
seeing good

Ill West
A.H.

E Ther 80.0

South	North	Zero	E	Level	W
88.3	18.0	16.1	50.0		x48.3
87.6	19.5	16.1	48.6		x47.7
86.8	19.8	17.0	47.0		x48.0
88.4	19.6	15.4	x39.8		53.0
87.7	20.0	15.1	x39.5		52.3
88	96.9	797	x39.5		51.5
87.8	19.6	159	2644		3008
15.9	15.9				2644
71.9	3.7				273.64
					1.82

$$\begin{aligned}
 s &= 1.643 & n &= 0.084 \\
 n &= 0.084 & s &= 1.643 \\
 s-n &= 1.559 & s+n &= 1.727 \\
 \frac{1}{2}(s-n) &= 0.779 & \frac{1}{2}(s+n) &= 0.863 \\
 & - .732 & & + 1.371 \\
 & + .047 & & + 0.508
 \end{aligned}$$

$$\begin{aligned}
 a &= +.05 \\
 b &= +.11 \\
 c &= +.05 - .55 - 0.508
 \end{aligned}$$

July 12, 1858
seeing goodIll W
AtlEx ther 84.3
Sevel

South	North	Zero
95.4	23.0	14.8
94.2	22.8	16.0
95.6	22.8	13.9
96.2	23.3	15.7
95.0	22.8	13.0
6.4	4.2	5.4
95.3	22.8	15.1
15.1	15.1	
80.2	7.7	

E	W
X 44.2	56.5
X 42.3	55.5
X 42.0	54.0
47.5	X 46.7
47.5	X 46.2
47.0	X 46.0
0.5	304.9
45.1	51.0
	45.1
	75.9
	2.95

$$\begin{aligned}
 s &= 1.833 & n &= 0.176 \\
 n &= 0.176 & s &= 1.833 \\
 s-n &= 1.657 & s+n &= 2.009 \\
 \frac{1}{2}(s-n) &= 0.828 & \frac{1}{2}(s+n) &= 1.004 \\
 & -0.732 & & +1.377 \\
 & +0.096 & & +0.413
 \end{aligned}$$

$$\begin{aligned}
 a &= +.10 \\
 b &= +.18 \\
 c &= +.18 - .41 = -0.367
 \end{aligned}$$

July 19.
seeing goodIll W
AtlEx ther 77.3
Sevel

South	North	Zero	naht
95.0	20.4	16.5	13.9
94.7	21.4	17.2	15.0
95.4	21.7	16.0	13.0
95.0	21.0	17.0	13.2
95.1	21.3	17.0	13.5
95.0	21.2	16.7	15.3
16.0	16.0	16.2	
79.0	5.2	16.0	

E	W
53.6	X 47.2
52.5	X 47.6
51.0	X 47.8
X 39.5	57.4
X 39.4	56.3
X 39.3	56.0
275.3	312.3
45.9	52.1
	45.9
	76.2
	3.10

$$\begin{aligned}
 s &= 1.815 & n &= 0.119 \\
 n &= 0.119 & s &= 1.815 \\
 s+n &= 1.934 & s-n &= 1.696 \\
 \frac{1}{2}(s+n) &= 0.967 & \frac{1}{2}(s-n) &= 0.848 \\
 & +1.377 & & -0.732 \\
 & +0.450 & & +0.116
 \end{aligned}$$

$$\begin{aligned}
 a &= +.12 \\
 b &= +.19 \\
 c &= +.12 - .45 = -0.404
 \end{aligned}$$

July 23/24 1858.

W. L. B.

Ill West.

Ex ther 61.3
Level by A.H.

North	South	Zero	E	W
27.3	96.8	15.3	X 47.0	66.2
26.8	97.7	15.2	47.3	65.8
28.2	97.2	15.1	47.5	65.4
27.5	97.0	15.5	60.0	53.0 +
<u>30.0</u>	<u>94.9</u>	<u>15.5</u>	59.2	53.5
139.8	2.9	15.3	<u>59.8</u>	<u>53.0</u>
28.0	96.6		320.8	356.9
<u>15.3</u>	<u>15.3</u>		53.4)	59.48
12.7	81.7			<u>53.42</u>

$$\begin{aligned}
 n &= 0.290 & s &= 1.858 \\
 s &= 1.858 & n &= 0.290 \\
 n+s &= 2.148 & s-n &= 1.568 \\
 \frac{1}{2}(n+s) &= 1.074 & \frac{1}{2}(s-n) &= 0.784 \\
 &= 1.871 & &= 0.732 \\
 &= 0.343 & &= 0.052
 \end{aligned}$$

$$\begin{aligned}
 a &= +.05 \\
 b &= +.19 \\
 c &= +.05 - .34 - 0.297
 \end{aligned}$$

July 31. 1858

good seeing

Ill. West.
All

July 31

Ex Ther

72.8

Aug 3/3

Level

Ex ther 61.3

North	South	Zero	E	W
22.4	94.0	16.0	61.6	X 55.0
23.2	92.4	15.8	61.1	X 55.0
24.1	93.0	16.3	59.5	X 55.5
24.0	94.0	17.0	X 47.0	66.8
<u>23.0</u>	<u>93.1</u>	<u>16.0</u>	X 46.3	66.9
67	65	61	X 46.3	66.5
23.3	93.3	16.2	321.8	365.7
<u>16.2</u>	<u>16.2</u>		53.63	60.95
7.1	77.1			<u>53.63</u>

$$\begin{aligned}
 n &= 0.162 & s &= 1.761 \\
 s &= 1.761 & n &= 0.162 \\
 s+n &= 1.923 & s-n &= 1.599 \\
 \frac{1}{2}(s+n) &= 0.961 & \frac{1}{2}(s-n) &= 0.799 \\
 &= 1.371 & &= 0.732 \\
 &= 0.456 & &= 0.067
 \end{aligned}$$

$$\begin{aligned}
 a &= +.07 \\
 b &= +.24 \\
 c &= +.07 - .46 - 0.410
 \end{aligned}$$

Aug 5-1858

Ill W.
IslEx. ther. 67.2
Aug. 8/9

South	North	Zero
90.0	24.4	16.3
91.4	25.7	17.5
90.8	24.0	16.0
91.9	25.3	15.8
<u>91.0</u>	<u>25.5</u>	<u>16.0</u>
51	25.0	16
91.0	25.0	16.3
<u>16.3</u>	<u>16.2</u>	
72.7	8.7	

Level	W.
E.	
X 48.5	68.5
X 48.9	67.5
X 49.0	67.0
58.7	X 57.0
58.4	X 56.5
<u>59.4</u>	<u>X 55.0</u>
322.9	371.5
53.82	61.92
	<u>53.82</u>
	<u>218.10</u>
	4.05

$$\begin{aligned}
 S &= 1.661 \\
 n &= 0.199 \\
 S-n &= 1.462 \\
 \frac{1}{2}(S-n) &= 0.731 \\
 -0.732 \\
 -0.001
 \end{aligned}$$

$$\begin{aligned}
 n &= 0.199 \\
 S &= 1.661 \\
 S+n &= 1.860 \\
 \frac{1}{2}(S+n) &= 0.930 \\
 +1.377 \\
 -0.487
 \end{aligned}$$

$$\begin{aligned}
 a &= +0.49 \\
 b &= +.27 \\
 c &= \cancel{+1.00} - 0.441
 \end{aligned}$$

Aug 11. 1858 W. 6.13

Ill - West

Ex. ther. 66.0 Int 66

South	North	Zero
92.2	30.4	15.2
91.8	29.2	15.4
91.8	29.0	15.5
92.2	29.7	15.5
93.0	29.5	14.8
<u>92.0</u>	<u>29.0</u>	<u>15.0</u>
30	29.5	15.2
92.2	<u>15.2</u>	
15.2	14.3	
77.0		

Level	W.
E.	
55.0	60.9 +
54.8	60.5 +
54.2	61.0 +
+57.4	62.8
+52.0	62.4
+52.0	<u>62.0</u>
94	96
53.23	61.60
	<u>53.23</u>
	<u>218.37</u>
	9.18

$$\begin{aligned}
 S &= 1.759 \\
 n &= 0.327 \\
 S-n &= 1.432 \\
 \frac{1}{2}(S-n) &= 0.716 \\
 -0.732 \\
 -0.016
 \end{aligned}$$

$$\begin{aligned}
 n &= 0.327 \\
 S &= 1.759 \\
 S+n &= 2.086 \\
 \frac{1}{2}(S+n) &= 1.043 \\
 +1.377 \\
 +0.374
 \end{aligned}$$

$$\begin{aligned}
 a &= +0.27 \\
 b &= +.27 \\
 c &= \cancel{-0.02} - 0.328
 \end{aligned}$$

1858

August 16th a.m.

Ill. West.

Ex Ther 75 Int Th. 70
object flap south A. 26
E — W

South	North	Zero. W.C.B.
925	.320	.177
900	.320	.170
905	.298	.177
30	38	14
.910	.316	.175
-175	-175	
735	141	

$$\begin{aligned}
 s &= 1.679 & n &= 0.321 \\
 n &= 0.321 & s &= 1.679 \\
 s-n &= 1.358 & s+n &= 2.000 \\
 \frac{1}{2}(s-n) &= .679 & \frac{1}{2}(s+n) &= 1.000 \\
 -732 & & -1371 & \\
 -0.43 & & -0.117 &
 \end{aligned}$$

$$a = -.04$$

$$b = +.30$$

$$c = -.37$$

$$\begin{aligned}
 +49.5 & \sim 62.3 \\
 +50.0 & \sim 61.0 \\
 +50.0 & \sim 60.0 \\
 50.6 & \sim 58.8 + \\
 50.4 & \sim 58.2 + \\
 50.7 & \sim 57.8 + \\
 12 & 3582 \\
 50.2 & 59.7 \quad 109.9 \\
 & 50.2 \\
 2) 95 & \\
 & 4.75
 \end{aligned}$$

Reversed to Lamp East

Swirl in Ther 75 Ex. Th. 75.0
E — W A. 26

South	North	Zero W.C.B.
.067	.682	.150
.066	.685	.145
.080	.680	.140
.083	.687	.140
.070	.690	.143
.073	.424	.228
1.073	.685	.146
1.166		.175
1.229		.1321
		.160

$$\begin{aligned}
 57.6 & \sim 55.0 + \\
 50.8 & \sim 55.3 + \\
 50.0 & \sim 55.4 + \\
 +44.8 & \sim 59.2 \\
 +44.8 & \sim 58.2 \\
 +44.7 & \sim 57.6 \\
 286.7 & 407 \\
 47.8 & 58.1 \quad 105.9 \\
 & 47.8 \\
 2) 10.3 & \\
 & +5.1
 \end{aligned}$$

$$\begin{aligned}
 -1.073 & & -1.685 \\
 1.166 & & 1.166 \\
 1.087 & & 0.475 \\
 2.484 & & 1.086 \\
 1.086 & & 2.484 \\
 1.398 & & 3.570 \\
 0.699 & & 1.785 \\
 732 & & -1.409 \\
 -0.033 & & +1.422
 \end{aligned}$$

$$a = 0.033$$

$$b = +.32$$

$$c = +.376$$

1858 Aug ¹⁷/₁₈

Ill East

Ex therm 73.3 Lat. 72

South	North	Zero
A.H.		
.045	.732	.170
.049	.705	.171
.048	.715	.162
.042	.721	.170
<u>.060</u>	<u>.717</u>	<u>.160</u>
.049	.718	.166

W.C.B.

South	North	Zero
.036	.715	.170
.066	.713	.162
<u>.057</u>	<u>.712</u>	<u>.165</u>
.057	.725	.170
<u>.052</u>	<u>.713</u>	<u>.158</u>
268	28	325
.054	.716	.165
<u>1.165</u>	<u>1.165</u>	

1.121 0.449

S = 2.561 n = 1.026

n = 1.026 S = 2.561

S - n = 1.535 S + n = 3.587

 $\frac{1}{2}(S - n) = 0.767$ $\frac{1}{2}(S + n) = 1.793$

- .732 - 1.409

+ .035 + .430

Level A.H.	E	W
	+ 45.0	61.0
	+ 45.8	59.7
	+ 45.8	59.0
	49.2	54.8 +
	48.8	54.5 +
	<u>48.8</u>	<u>54.0 +</u>
	283.4	343.0
	472	57.2
		<u>47.2</u>

a = +.035

b = +.316

c = +.384

2/10.0

+ 5.0

a = +.024

b = +.316

c = +.419

By W.C.B. measures.

a = +.037

b = +.316

c = +.419

By A.H. measures.

Aug 18. 1858, Changed Collimation

W.C.B.

South	North	South	North
.077	.702	.095	.115
.065	.700	.106	.113
<u>.088</u>	<u>.705</u>	<u>.103</u>	<u>.117</u>
.077	.702	.101	.115
<u>1.108</u>	<u>1.101</u>		
1.031	.399		
S =	n = 0.912		

2.285

0.071

S = 2.356

n = 0.912

3.268

1.444

1.634 - 1.409 = +.225 = c

0.722 - 0.732 = -.010 = a

Aug 18 1858

Ill East

Changed Collimation

South	WCB North	North Zero	South Zero
.065	.695	.018	.034
.098	.693	.017	.035
.082	.693	.015	.037
1.082	.694	.017	.035
1.026	<u>1.026</u>		
.944	0.332		
$s = 2.157$			
$n = 0.755$			
2.916			$a = -0.033$
<u>1.398</u>			b
1.458 - 1.409 = +.049			$c = +0.049$
0.699 - 0.732 = -.033			

Aug 18/19 1858

Ill East

Ex. then 68.0 Int. 68.9
seml. obj. glass north

South	North	Zero South	Zero North	E	W
.067	.754	.029	.040	53.0	+53.1
.050	.748	.027	.030	52.5	+53.5
.071	.738	.025	.034	53.8	+53.1
.050	.734	.026	.035	+43.5	63.8
.072	<u>.747</u>	<u>.030</u>	<u>.040</u>	+43.6	63.5
.064	.744	.028	.036	+44.5	62.5
1.032	1.032			291.9	349.5
0.968	0.288			48.65	58.25
					<u>48.65</u>
					299.60
					4.8

$s = 2.211$

$n = 0.658$

2.869

1.553

1.434 - 1.409 = +0.025

0.776 - 0.732 = +0.044

$a = +0.044$

$b = +0.300$

$c = +0.035$

Aug. 26 1858
All

Ill. East

Ex ther 73.0 in ther 72.0

South	North	Zero north	Zero south
10.2	69.0	05.0	03.2
08.0	69.3	03.9	03.8
09.0	67.8	03.2	03.1
10.3	70.0	04.1	04.7
<u>10.8</u>	<u>67.2</u>	<u>02.5</u>	<u>04.0</u>
09.7	68.7	03.8	03.8
<u>103.8</u>	<u>103.8</u>		
94.1	35.7		

$$S = 2.150$$

$$n = 0.802$$

$$S+n = 2.952$$

$$S-n = 1.348$$

$$\frac{1}{2}(S+n) = 1.476 - 1.409 = +0.113$$

$$\frac{1}{2}(S-n) = 0.674 - 0.732 = -0.058$$

$$a = -0.058$$

$$b = +0.340$$

$$c = +0.067$$

Level E	W degree south
43.2x	64.5-
46.2x	60.5-
45.8x	60.2
50.0	55.3x
49.8	54.8x
<u>50.1</u>	<u>54.0x</u>
285.1	349.3
47.5-	58.2
	<u>47.5-</u>
	2) 10.7
	5.85-

Aug 30 1858
A. 26

Ill. East.

Ex ther 79.1 in ther 78.3

South	North	Zero north
05.8	73.0	05.2
05.4	73.8	05.2
05.7	76.2	03.8
06.0	71.2	06.0
<u>06.5-</u>	<u>70.8</u>	<u>05.0</u>
05.9	71.7	05.0
<u>105.0</u>	<u>105.0</u>	
099.1	05.3	

$$S = 2.264$$

$$n = 0.761$$

$$S+n = 3.025$$

$$S-n = 1.503$$

$$\frac{1}{2}(S+n) = 1.512 - 1.409 = +0.149$$

$$\frac{1}{2}(S-n) = 0.751 - 0.732 = +0.019$$

$$a = +0.019$$

$$b = +0.340$$

$$c = +0.103$$

Level E	W
47.7	x 51.1
47.8	x 51.0
47.7	x 51.2
x 41.2	57.2
x 41.2	57.0
<u>x 40.6</u>	<u>57.6</u>
6.2	5.1
44.37	54.08
	<u>43.37</u>
	2) 10.81
	5.40

72.8

not

Sept 6. 1838 p.m.
All

Ill. East.

Ex. then 74.0 74.0

South	North	Zero north	Level	
			E	W
.071	728	042	x43.5	57.8
.051	723	045	x44.2	37.0
.061	718	041	x43.5	57.3
.068	731	048	45.7	x54.5
.058	730	038	45.2	x34.4
.9	0	.043	45.0	x54.3
.061	726		7.1	53
1.043	1043		44.52	55.88
.982	0.317			44.52
				2)11.36
				5.68

$$s = 2.244$$

$$n = 0.724$$

$$2.968$$

$$1.520$$

$$1.484 - 1.409 = +0.075$$

$$0.760 - 732 = +0.028$$

$$a = +.028$$

$$b = +.420$$

$$c = +.075$$

8.3

Sept 16/17 1858
marks indistinct

Ill East.
All

Ex. then 62.9 in 63.3

South	North	Zero north	Level	
			E	W
10.9	68.8	.040	61.0	x58.3
13.8	69.0	.042	60.4	x58.5
12.3	69.5	.044	60.8	x58.8
12.0	69.0	.045	x45.8	72.0
10.0	70.2	.037	x46.1	71.6
59.0	346.5	.042	x46.4	71.2
11.8	69.3		320.5	390.4
1.04.2	104.2		54.1	65.1
.92.4	36.9			54.1
				2)11.0
				5.5

$$s = 2.111$$

$$n = 0.798$$

$$2.909$$

$$1.313$$

$$1.454 - 1.409 = +0.045$$

$$0.656 - 0.732 = -0.076$$

$$a = -.076$$

$$b = +.430$$

$$c = +.045$$

Sept 21/22 1858
Southern mark very indistinct

Ill. East
AX

Ex. thm. 54.8

South	North	Dero
12.0	70.2	03.4
13.0	72.7	05.8
11.0	71.3	05.0
12.5	72.6	04.1
<u>11.1</u>	<u>72.8</u>	<u>04.0</u>
59.6	9.6	22.3
11.9	71.9	1.04.6
<u>1.04.6</u>	<u>1.04.6</u>	
92.7	32.7	

$$S = 2.118$$

$$n = 0.747$$

$$2.865$$

$$\underline{1.371}$$

$$1.432 - 1.409 = +0.069$$

$$0.685 - 0.732 = -0.047$$

Level

E	W
X 53.0	69.3
X 52.8	70.7
X 52.2	72.2
61.3	X 63.3
62.1	X 62.7
<u>62.3</u>	X <u>62.6</u>
6) 343.7	6) 400.8
57.3	66.8
	<u>57.3</u>
	<u>279.5</u>
	4.75

$$a = -0.047$$

$$b = +0.325$$

$$c = +0.023$$

Oct 1/2 1858
clear

Ill. East
AX

Ex. thm. 47.7

South	North	Dero
17.2	71.0	04.2
16.1	69.2	4.8
17.2	71.3	5.2
17.0	71.0	5.6
<u>16.4</u>	<u>68.0</u>	<u>5.0</u>
5783.9	57350.5	24.8
16.8	70.1	4.96
<u>1.05.0</u>	<u>1.05.0</u>	
88.2	34.9	

$$S = 2.016$$

$$n = 0.798$$

$$2.814$$

$$\underline{1.218}$$

$$1.407 - 1.409 = +0.002$$

$$0.609 - 0.732 = -0.123$$

Level

E	W
65.5	X 66.8
65.6	X 68.0
66.9	X 68.5
X 58.0	77.9
X 58.8	78.0
X 59.2	78.5
6) 374.0	6) 437.7
62.33	72.95
	<u>62.33</u>
	<u>210.62</u>
	5.31

$$a = -0.123$$

$$b = +0.370$$

$$c = +0.002$$

Oct 5, 1858

Ill East
All.

Ex. Chn 64.3

South	North	Zero	Level E	W
12.2	66.2	04.1	x 48.2	72.9
12.2	64.3	4.6	x 47.8	72.7
12.5	65.5	4.0	x 49.0	70.8
12.0	67.2	3.9	59.8	x 59.9
<u>11.0</u>	<u>64.4</u>	<u>3.8</u>	59.4	x 60.0
12.0	65.5	04.1	59.2	x 60.0
<u>104.1</u>	<u>104.1</u>		323.4	396.8
921	38.6		539	66.0
				<u>53.9</u>
				2) 12.1
				6.0

$$s = 2.104$$

$$n = 0.882$$

$$2.986$$

$$\underline{1.272}$$

$$1.493 - 1.409 = +0.130$$

$$0.611 - 0.772 = -0.121$$

$$a = -0.121$$

$$b = +0.400$$

$$c = +0.084$$

Oct 7, 1858
good seeing All

Ill East

Ex. Chn 57.5

South	North	Zero	Level E	W
19.5	63.8	04.2	67.7	x 69.8
20.0	61.9	4.0	67.8	x 69.2
19.7	62.2	4.0	67.8	x 68.2
20.4	62.0	3.3	x 53.0	79.4
<u>20.7</u>	<u>62.7</u>	<u>4.5</u>	x 54.8	79.0
20.1	62.5	04.3	x 54.7	78.8
<u>1.04.3</u>	<u>104.3</u>		360.8	444.4
842	41.8		60.1	74.1
				<u>60.1</u>
				2) 140
				7.0

$$s = 1.924$$

$$n = 0.956$$

$$2.880$$

$$\underline{0.968}$$

$$1.440 - 1.409 + 0.077$$

$$0.484 - 0.732 - 0.248$$

$$a = -0.248$$

$$b = +0.500$$

$$c = +0.037$$

Oct 14, 1858.

Ill. East

Ex. then 62°3

All
marks indistinct

S	N	Sum	Level E	W
18.9	65.0	1.04.8	X 49.5	76.8
20.0	63.1	04.8	X 49.5	76.0
20.2	63.1	03.0	X 49.5	75.0
19.2	63.8	04.0	61.8	X 62.0
20.0	62.6	04.2	61.3	X 61.6
19.8	63.5	1.04.2	61.3	X 61.1
104.2	104.2		332.9	412.5
84.5	40.7		55.50	68.75
				55.50
				2) 13.25
				6.62

S = 1.930	a = -0.232
n = 0.930	b = +0.450
2.860	c = +0.021
1.000	
1.430 - 1.409 = +0.021	
0.500 - 0.732 = -0.232	

Oct 15 1858

Ill East

good seeing

All

S	N	Sum	
22.0	63.2	1.05.2	
20.0	63.0	04.2	
20.9	64.1	04.8	
21.0	62.5	05.1	
22.0	62.2	04.0	
21.2	63.0		
104.7	104.7		
83.5	41.7		

S = 1.908	a = -0.255
n = 0.953	b =
2.861	0.955
1.430	0.477
1.409	0.732

1858

Oct 18 a.m.

All seeing good

Ill East

Ex. this 5-7.2

S	N	Zero
19.8	63.3	1.030
21.0	63.0	.032
20.2	63.0	.032
19.6	62.2	.038
19.8	62.6	.032
20.4	62.8	1.035
<u>103.5</u>	<u>103.5</u>	
83.4	40.7	

Level	E.	W.
	66.8	X 66.8
	66.4	X 66.6
	65.8	X 66.6
	X 52.8	79.0
	X 53.0	78.8
	X 53.1	78.3
	357.9	436.1
	59.65	72.68
		<u>59.65</u>
		2) 13.03
		6.51

$$S = 1.906$$

$$n = 0.930$$

$$2.836$$

$$0.976$$

$$1.418 - 1.409 = +0.009$$

$$0.488 - 0.732 = -0.244$$

$$a = -0.244$$

$$b = +0.450$$

$$c = +0.009$$

Oct 25 a.m.

seeing not good, marks unsteady. All

Ill. East

Ex. this 37.0

S	N	Zero
23.0	62.4	1.040
25.4	63.4	.033
24.8	62.6	.036
23.9	64.0	.049
23.0	65.0	.051
0.1	7.4	.209
24.0	63.8	1.042
<u>104.2</u>	<u>104.2</u>	
80.2	40.4	

Level	E	W
	X 65.1	84.8
	X 65.5	84.5
	X 66.1	84.0
	73.8	X 76.4
	73.7	X 76.5
	73.5	X 76.8
	6) 417.5	6) 483.0
	69.6	80.5
		<u>69.6</u>
		2) 10.9
		5.45

$$S = 1.833$$

$$n = 0.923$$

$$2.756$$

$$0.910$$

$$1.378 - 1.409 = +0.015$$

$$0.455 - 0.732 = -0.277$$

$$a = -0.277$$

$$b = +0.410$$

$$c = -0.031$$

1858

Nov 3 a.m.

All

Ill East

Ex. Shr. 45.8

			Level	
S	N	Zero	E	W
24.0	58.9	04.0	69.6	x77.7
26.8	58.2	04.4	69.5	x77.8
25.8	58.0	04.5	69.8	x77.4
26.8	58.4	03.8	x68.0	78.5
25.9	59.3	04.8	x67.8	78.9
9.3	.8	21.5	x67.8	78.8
25.9	58.6	1.04.3	2.5	.1
104.3	104.3		68.8	78.2
78.4	45.7			68.8
				2) 9.4
				4.7

$$s = 1.791$$

$$n = 1.044$$

$$2.835$$

$$0.747$$

$$1.417 - 1.409 = +0.008$$

$$0.373 - 0.732 = -0.359$$

$$a = -0.359$$

$$b = +0.350$$

$$c = +0.008$$

Nov. 8. 1858 p.m.
unsteady

All

Ill East

Ex. Shr. 49.6

			Level	
S	N	Zero	E	W
27.2	57.4	1.04.6	x66.5	78.5
28.0	58.0	04.4	x66.3	78.2
28.5	58.6	04.9	x66.8	77.8
27.0	58.8	05.0	70.5	x73.9
28.3	58.0	03.7	70.3	x73.8
27.8	58.16	1.04.5	70.1	x73.8
1.04.5	1.04.5		410.5	6.0
76.7	46.8		68.42	76.00
				68.42
				3) 7.58
				3.79

$$s = 1.752$$

$$n = 1.058$$

$$2.810$$

$$0.694$$

$$1.405 - 1.409 = +0.004$$

$$0.347 - 0.732 = -0.385$$

$$a = -0.385$$

$$b = +0.275$$

$$c = +0.004$$

Nov 12. pm 1858

All East

Nov. 12 a.m.

Ex. Ther. 25.0

South	North	Zero
36.5	53.7	105.1
35.1	54.0	105.9
34.3	56.3	106.0
37.6	37.6	105.5
39.0	55.5	105.2
25	7.1	105.54
36.50	55.42	
105.54	105.54	
69.04	50.12	

Level	Nov. 12 a.m.
E	W
85.0	+88.2
84.7	+88.2
84.5	+88.2
+80.2	92.2
+80.8	91.3
+86.0	90.7
496.2	538.8
82.70	89.60
	82.70
	2)690
	3.45

$$s = 1.577$$

$$n = 1.168$$

$$2.745$$

$$0.409$$

$$1.3725 - 1.409 = +0.210$$

$$0.2045 - 0.732 = -0.527$$

$$a = -0.527$$

$$b = +0.280$$

$$c = -0.037$$

Nov. 17 pm 1858

All East

Ex Ther 39.6

good seeing. A H

South	North	Zero
38.0	48.8	105.8
38.2	49.2	3.8
38.0	49.5	5.0
38.1	48.8	4.1
37.3	48.5	5.3
37.92	48.96	24.0
104.00	104.00	104.0
66.08	55.04	

$$s = 1.510$$

$$n = 1.258$$

$$s + n = 2.768$$

$$s - n = 0.252$$

$$1.384 - 1.409 = -0.025$$

$$0.126 - 0.732 = -0.606$$

$$a = -0.606$$

$$b = +0.220$$

$$c = -0.025$$

Level	W.
E.	
x77.0	84.7
x77.0	84.6
x77.0	84.7
78.5	x83.0
79.0	x82.1
78.8	x82.3
7.3	1.4
77.88	83.57
	77.88
	2)5.69
	2.845

1858

Nov 19 pm

AZ

Mt East

Ex. Ther. 39.2

S	N	Zero ^{south}
36.0	50.5	104.7
37.0	50.3	104.6
37.7	50.4	104.2
39.0	49.7	104.8
<u>37.6</u>	<u>49.1</u>	<u>103.2</u>
.3	0	
37.47	50.00	104.3
<u>104.30</u>	<u>104.30</u>	
66.83	54.30	

$$S = 1.527$$

$$n = 1.241$$

$$2.768$$

$$0.286$$

$$1.384 - 1.409 = +0.025$$

$$0.143 - 0.732 = -0.589$$

E	W
78.5	X 81.3
78.5	X 81.0
78.6	X 81.0
X 73.0	86.0
X 73.3	85.2
X 73.5	85.2
5.4	9.7
75.90	83.28
	<u>75.90</u>
	3) 7.38
	3.69

$$a = -0.589$$

$$b = +0.290$$

$$c = -0.025$$

Nov. 26. 1858

AZ.

Mt. East

Ex Ther. 33.6

S	N	Zero ^{north}
37.8	53.0	106.0
38.3	51.1	103.7
39.0	51.0	104.1
37.8	52.3	105.8
<u>39.4</u>	<u>50.7</u>	<u>103.7</u>
2.5	8.1	23.3
38.5	51.6	104.8
<u>104.8</u>	<u>104.8</u>	
66.3	53.2	

$$S = 1.515$$

$$n = 1.216$$

$$2.731$$

$$0.299$$

$$1.365 - 1.409 = -0.044$$

$$0.149 - 0.732 = -0.583$$

$$a = -0.583$$

$$b = +0.160$$

$$c = -0.044$$

Level	W
E	
X 81.0	88.1
X 80.8	88.0
X 80.6	88.0
83.7	X 84.7
83.8	X 84.2
<u>83.9</u>	<u>X 84.0</u>
13.8	37.0
82.3	86.2
	<u>82.3</u>
	2) 3.9
	1.95

Dec 8/9 1858

Ill. East

Ex. elev. 22.6

S	N	Zero
44.0	56.0	105.5
44.6	56.5	5.9
45.3	58.0	4.5
45.2	56.7	6.6
44.0	57.5	6.4
44.6	56.9	105.8
105.8	105.8	
61.2	48.9	

S	N
88.0	x 88.0
88.2	x 88.8
88.9	x 88.9
x 85.8	92.3
x 85.8	92.2
x 86.0	91.8
87.1	90.3
	87.1
	3.2
	1.6

$$s = 1.399$$

$$n = 1.119$$

$$2518$$

$$0.280$$

$$1.259 - 1.409 = -0.150$$

$$0.140 - 0.732 = -0.592$$

$$a = -0.592$$

$$b = +0.130$$

$$c = -0.150$$

Dec 16 1858
Ill

Ill East

Ex. elev. 37.5

South	North	Zero
35.8	56.2	104.7
38.0	53.9	3.3
35.0	56.9	3.1
36.0	54.2	6.0
36.2	55.6	5.2
31.0	26.8	22.3
36.2	55.4	104.6
104.6	104.6	
68.2	49.2	

S	N
x 75.5	83.4
x 75.5	83.4
x 75.7	83.0
81.3	x 77.0
80.0	x 76.0
81.1	x 76.8
469.1	479.6
78.20	79.93
	78.20
	1.73
	0.86

$$s = 1.559$$

$$n = 1.126$$

$$2685$$

$$0.433$$

$$1.342 - 1.409 = -0.067$$

$$0.216 - 0.732 = -0.516$$

$$a = -0.516$$

$$b = +0.140$$

$$c = -0.067$$

Dec 27, 1858

All

Ill East

Ex. Ther 35.0

South	North	Zero	Level E	W
39.8	48.3	104.2	87.5	X85.7
38.8	47.0	5.7	87.3	X85.2
39.9	47.0	5.0	87.2	X84.5
39.1	47.6	4.5	X81.3	89.5
<u>40.0</u>	<u>48.3</u>	<u>3.3</u>	X81.3	88.8
	.2	22.7	X81.3	88.0
39.42	47.64	104.54	25.9	41.7
<u>104.54</u>	<u>104.54</u>		84.32	86.95
65.12	57.90			<u>84.32</u>
				2) 2.63
				1.31

$$s = 1.488$$

$$n = 1.323$$

$$2.811$$

$$0.165$$

$$1.405 - 1.409 = +0.004$$

$$0.082 - 0.732 = -0.650$$

$$a = -0.650$$

$$b = +0.100$$

$$c = +0.004$$

Jan 78, 1859

All

Ill East

Ex Ther 22.3

South	North	Zero	Level E	W
37.8	59.1	105.0	X82.6	88.0
39.6	59.1	5.3	X83.0	88.0
37.2	58.0	4.8	X83.2	87.7
39.0	57.2	6.1	86.8	X84.1
<u>37.4</u>	<u>57.7</u>	<u>4.5</u>	86.5	X84.2
41.0	41.1	25.7	<u>86.2</u>	X84.0
38.20	58.22	105.14	84.7	86.0
<u>105.14</u>	<u>105.14</u>			<u>84.7</u>
66.94	46.92			2) 1.3
				0.65

$$s = 1.530$$

$$n = 1.060$$

$$2.590$$

$$0.470$$

$$1.295 - 1.409 = -0.114$$

$$0.235 - 0.732 = -0.497$$

$$a = -0.497$$

$$b = +0.050$$

$$c = -0.114$$

Jan 17/8 1855
AM

Ill East

Ex Mer +13.3

South	North	Zero
41.7	58.4	105.9
40.9	58.8	5.9
40.3	58.0	4.8
41.5	58.9	6.3
<u>40.1</u>	<u>58.3</u>	<u>4.1</u>
40.9	58.4	105.4
105.4	105.4	
64.5	47.0	

E	Swel
90.8	X 88.8
90.4	X 89.0
90.5	X 88.9
X 87.3	91.8
X 87.4	91.6
X 87.8	91.2
534.2	541.3
89.0	90.2
	<u>89.0</u>
	2) 1.2
	0.60

$$s = 1.473$$

$$n = 1.075$$

$$2.548$$

$$0.398$$

$$1.274 - 1.409 = -0.135$$

$$0.199 - 0.732 = -0.533$$

$$a = -0.533$$

$$b = +0.050$$

$$c = -0.135$$

Jan 24

AM

Ex Mer 21.3

South	North	Zero
40.5	48.4	105.3
47.0	49.0	3.9
40.2	48.4	4.8
42.8	49.7	4.7
<u>41.3</u>	<u>51.2</u>	<u>5.0</u>
7.8	6.7	23.7
41.56	49.34	104.74
<u>104.74</u>	<u>104.74</u>	
63.18	55.40	

E	Swel
X 87.0	90.4
X 86.6	90.5
90.5	X 86.7
<u>90.0</u>	<u>X 86.9</u>
354.1	354.5
88.52	88.87
	<u>88.52</u>
	2) 0.35
	0.17

$$s = 1.445$$

$$n = 1.266$$

$$0.179$$

$$2.711$$

$$1.355 - 1.409 = -0.054$$

$$0.089 - 0.732 = -0.643$$

$$a = -0.643$$

$$b = +0.025$$

$$c = -0.054$$

Feb. 4, 1859.

Ath

Ill. East

Ex. Ther. 34.5

South	North	Length (South)
35.4	55.8	105.8
36.2	55.1	4.9
33.2	54.0	4.0
34.0	55.7	4.5
33.8	54.2	5.1
22.6	24.8	124.3
34.5	54.9	104.9
<u>104.9</u>	<u>104.9</u>	
70.4	50.0	

Level	E	W
	87.9	X 83.2
	87.7	X 83.0
	87.6	X 82.4
	X 81.4	87.4
	X 81.7	86.6
	X 81.5	85.8
	27.8	28.4
	84.6	84.7
		<u>84.6</u>
		210.1
		0.05

$$s = 1.609$$

$$n = 1.142$$

$$2.757$$

$$0.467$$

$$1.375 - 1.409 = +0.034$$

$$0.233 - 0.732 = -0.499$$

$$a = -0.499$$

$$b = +0.000$$

$$c = +0.034$$

Feb 9/10 1889

seeing good Ath

South

North

Zero (South)

Level

E.

W.

38.8	53.4	103.0	X 82.5	87.5
36.8	53.0	3.5	X 83.0	87.1
37.1	52.5	3.0	X 83.0	87.1
37.1	53.7	4.5	87.2	X 82.9
<u>37.7</u>	<u>53.7</u>	<u>3.4</u>	87.2	X 82.7
37.0	16.3	17.4	<u>87.1</u>	X 82.5
37.4	53.3	103.8	30.0	29.8
103.5	<u>103.5</u>		85.00	84.97
66.1	50.2			<u>85.00</u>

$$s = 1.510$$

$$n = 1.147$$

$$2.657$$

$$0.363$$

$$1.328 - 1.409 = -0.081$$

$$0.181 - 0.732 = -0.551$$

$$a = -0.551$$

$$b = +0.000$$

$$c = -0.081$$

Feb. 17 1859
A.M.

Ill. East

Ex. Ther. 110.6

South	North	Zero ^{north}	Level E	W
34.2	51.0	104.9	88.3	X 80.7
35.6	51.4	6.3	88.2	X 80.3
36.6	51.3	5.0	87.8	X 79.8
35.4	51.0	5.0	X 77.8	88.8
<u>36.3</u>	<u>50.7</u>	<u>5.0</u>	X 78.5	87.2
35.62	51.08	105.24	X 78.5	86.8
<u>105.24</u>	<u>105.24</u>		9.1	83.6
69.62	54.16		83.2	83.9
				<u>83.2</u>
				21.7
				.35

$$S = 1.591$$

$$n = 1.238$$

$$S+n = 2.829$$

$$S-n = 0.353$$

$$a = -0.555$$

$$b = +0.025$$

$$c = +0.006$$

$$1.415 - 1.409 = +0.006$$

$$0.177 - 0.732 = -0.555$$

Feb. 24 1859
A.M.

Ill. East

Ex. Ther. 36.7
Level

South	North	Zero ^{south}	E	W
38.0	53.4	104.2	X 82.0	88.0
36.0	53.0	4.2	X 82.4	87.4
38.2	52.8	3.6	X 82.6	86.8
38.0	54.3	3.3	87.5	X 81.7
<u>37.0</u>	<u>53.4</u>	<u>3.8</u>	87.3	X 81.5
	16.9	19.1	86.8	X 81.4
37.4	53.4	103.8	28.6	26.8
<u>103.8</u>	<u>103.8</u>		84.8	84.5
66.4	50.4			<u>84.8</u>

$$S = 1.517$$

$$n = 1.151$$

$$2.668$$

$$0.366$$

$$a = -0.549$$

$$b = +0.020$$

$$c = -0.075$$

$$1.334 - 1.409 = -0.075$$

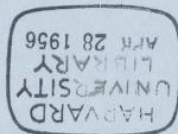
$$0.183 - 0.732 = -0.549$$

Observed values of Azimuth, Level and Collimation Errors.

Date	Ill.	$A_3 = a$	Level = b	Ill. & coll = c_1	Ill. & coll = c_2	Observer
1857 Sept 1. A.M.	West	+0.099	+0.03		+0.025	W.C.B.
" 4/5	West	+0.075	+0.22		+0.025	W.C.B.
" 22 4 ³⁰ P.M.	West	-0.207	+0.28		+0.109	G.P.B.
" 23 P.M.	West	-0.184	+0.23		+0.077	G.P.B.
" 23 P.M.	East	-0.390	+0.23	-0.070	+0.070	G.P.B.
" 27/28	East	-0.064	+0.31	-0.090		W.C.B.
" 28	East	-0.063		-0.104		W.C.B.
Oct 1/2	East	-0.248	+0.34	-0.101		W.C.B.
" 8	East	-0.244	+0.34	-0.097		G.P.B.
" 13	West	-0.180	+0.32		+0.081	W.C.B.
" 29/30	West	-0.313	+0.38		-0.013	A.H.
Nov 5/6	West	-0.293			+0.169	W.C.B.
Nov 6/7	West	-0.236	+0.22		+0.098	A.H.
" 11	West	-0.313	+0.17		+0.082	
" 11	East	-0.406	+0.17	-0.196		
" 17/18	East	-0.519	+0.15	-0.199		A.H.
Dec 2	East	-0.318	+0.15	-0.182		A.H.
Dec 19	East	-0.504	+0.11	-0.214		A.H.
" 22/23	West	-0.613	+0.00		+0.217	A.H.
1858 Jan 3/4	West	-0.559	-0.00		+0.164	A.H.
" 5	West	-0.494			+0.135	W.C.B.
" 12	West	-0.545	-0.06		+0.150	A.H.
" 30	West	-0.536	-0.08		+0.168	A.H.
Feb 10 A.M.	West	-0.550	-0.05		+0.179	A.H.
Feb 10. P.M.	East	-0.607	-0.05	-0.187		A.H.
" 16	West	-0.673	-0.16		+0.137	A.H.
" 22	West	-0.566	-0.12		+0.076	W.C.B.
" 27	West	-0.510	-0.12		+0.185	A.H.

Interpolated values of Azimuth, Level and Collimation Errors.

Date	Ill	$A_2 = a$	$L_2 = b$	$coll = c$
1858 Sept 2	West	+0.10	+0.03	+0.02
" 10	West	-0.02	+0.22	+0.05
" 27	East	-0.07	+0.31	-0.09
" 29	East	-0.11	+0.33	-0.10
Oct 3	East	-0.25	+0.34	-0.10
" 4	East	-0.25	+0.34	-0.10
" 5	East	-0.25	+0.34	-0.10
" 7	East	-0.24	+0.34	-0.10
" 8				
" 12	West	-0.19	+0.32	+0.08
" 24	West	-0.26	+0.37	-0.00
" 26	West	-0.27	+0.37	-0.01
Nov 3	West	-0.29	+0.28	+0.11
" 6				
" 23	East	-0.52	+0.15	-0.19
" 25	East	-0.52	+0.15	-0.19
" 26	East	-0.52	+0.15	-0.19
" 28	East	-0.52	+0.15	-0.18



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