KG
11366
v. 296

R2

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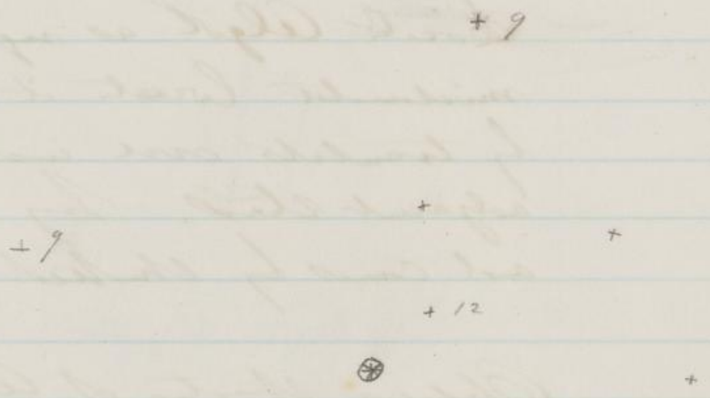
-180

march 6 1877

Observation with the Equatorial. 1877.

March 6th. Dome opened at 8. Seeing bad at first afterwards good. Observed β Algol. Sketched surrounding stars as below:-



Steadiness of images of faint stars encourages attempt to measure their brightness photometrically.
Observed Nebula in Orion. 6 stars in trapezium visible easily. Brightness of nebula probably sufficient for measurement.

Observed. Sirius. Brightness around star ? whether due to reflection from atmosphere or from sides of tube. If the former, it will be easily measured. Saw old companion, but not the faint one.

Observations to be made. Can a uniform disk be obtained by [illegible] focusing the star in ground glass and drawing out the eyepiece? Are the scintillations very obvious. Is greater uniformity secured by projecting the image on CaS.?

Locate Algol as regards adjacent stars. By micrometer locate it as regards its comes and by transits over inclined lines as regards adjacent stars. Try equalizing light of ~~the~~ Algol and comes by smoked glass.

Observe spectra of Algol, and see if it is in motion around supposed companion.

Friday March 9th Observed nebula in Orion β Orionis Pleiades, Algol, Cluster Perseus &c

Friday March 23rd. 2.10 Looked at Sun (no planets)
3.20 " " " (no planets
3.55
5.00
5.20
5.30
5.40

Zöllner Compar. Algol

ω	ω	ω	ω	ω	ω		
ρ	ρ	ρ	ρ	ρ	ρ		
	β	β				β	β.
	κ	κ	κ	κ		κ	
			ν				
				π	π		

δ
ξ Algol
φ Andr
ω Andr

Argelander
Comparison Stars for Algol

1000
1800
ξ ρ
ρ
β
δ ε
ν
ν

Electric Clock started at 6.10 Saturday March 6th ran very well with three excepts to 3 P.M. Thurs. March 22nd then stopped hands at 2h 20m to put on force

Friday March 23rd noon Sidereal Clock 0.0.0

	S T	ε h	ε tim
	0 0, 0	0; 0 ,0	
	0 25, 0	0 14 44	0 29 28
	3 14 0	1 38 25	
Saf..	6 30	3 30	

Photometric Work

I Nebula photometer
  1. Nebula Orion, Andromeda, other nebulas.
  2. Comet various days.
  3. Brightness around Sirius Venus other stars. Moon.
  4.

II Zöllner Photometer.
  1. Comparison Variable Stars
  2. Variable Stars.
  3. Effect atmosphere.

III Star Photometry.
  1. Dove Photom. Eye Glass.
  2. Photospherical. colour

IV Zöllners Photo. on E Equatorial
  1. Faint Polar Stars.
  2. Dimensions asteroids
  3. Dimension satellites
  4. Brightness comets

V. Direct Comparison
  1. Sun and Stars.
  2. Satellites and planets
  3. Comets and Stars.

VI. Spectrum photometer.
1. Intrinsic brightness various stars.
2. Artif. sources of light.

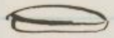
VII. Planet photom. R.A. Rule
1. Various positions planets
2. Moon various phases.
3. Diff parts sky.

Zöllner Photometer.

Pole Star.		42°
Companion Stars.	α Ursae Majoris	75° – 15°
	β Cassiopeae	
Vega	α Lyrae.	0 – 90
Capella	α Aurigae	0 – 90
Mizar	ζ Ursae Majoris	
	γ Androm.	
	α "	
Arcturus	α Bootes	

Pole Star. N.P.D.
α Ursae Majoris
ζ " "
γ Andromeda
β Cassiopeae

α Lyrae.	Vega
α Andromedae	
α Bootes	Arcturus
α Aurigae	Capella



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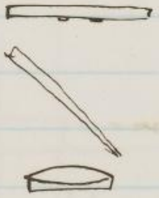

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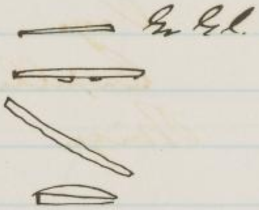

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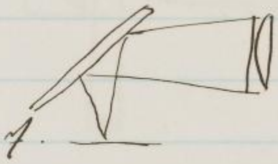

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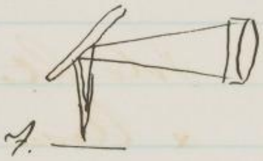
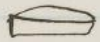
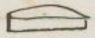
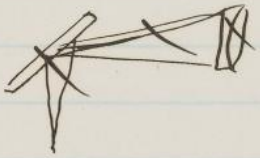
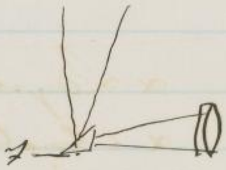








~~VI~~



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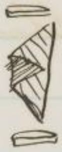

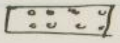

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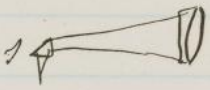

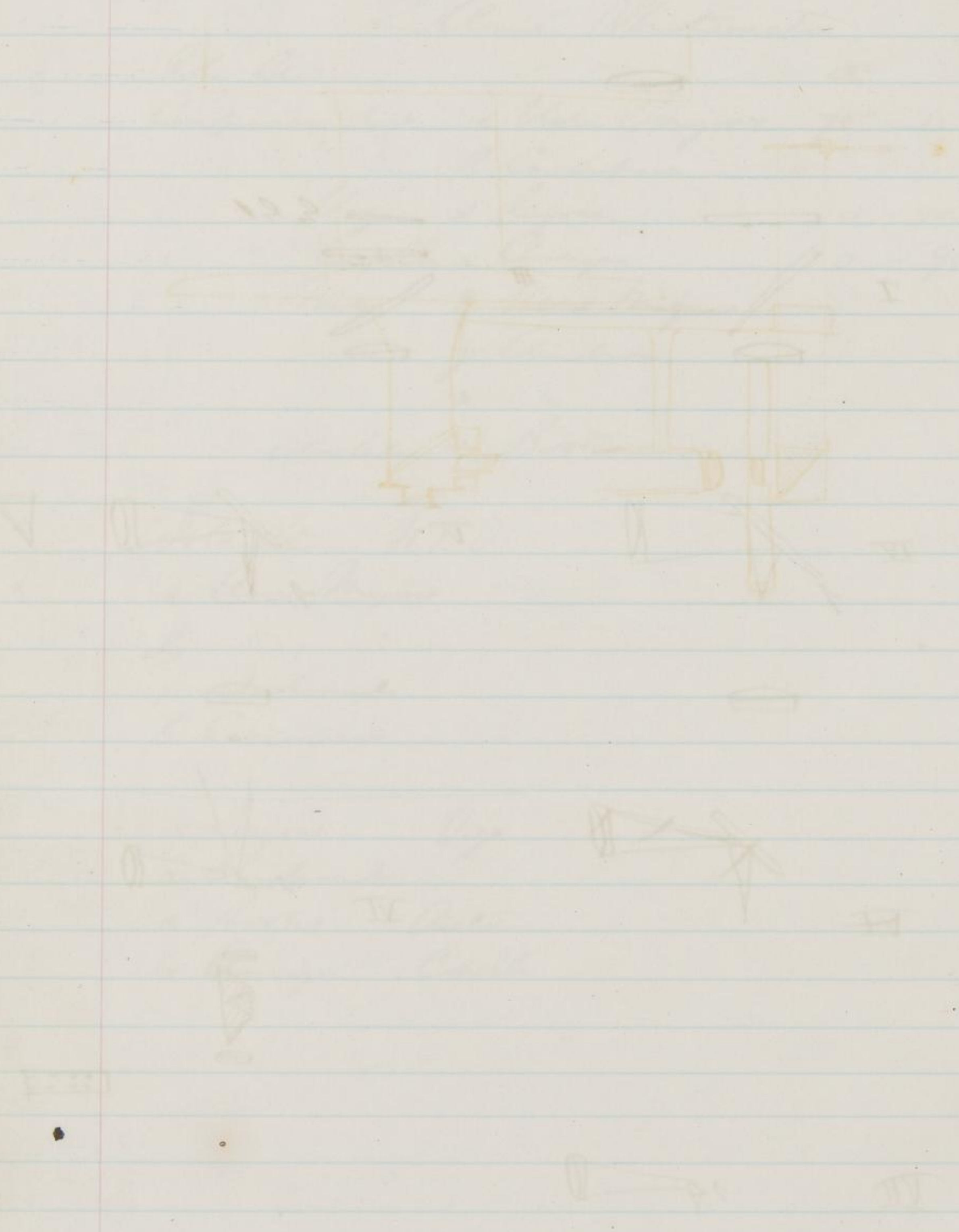
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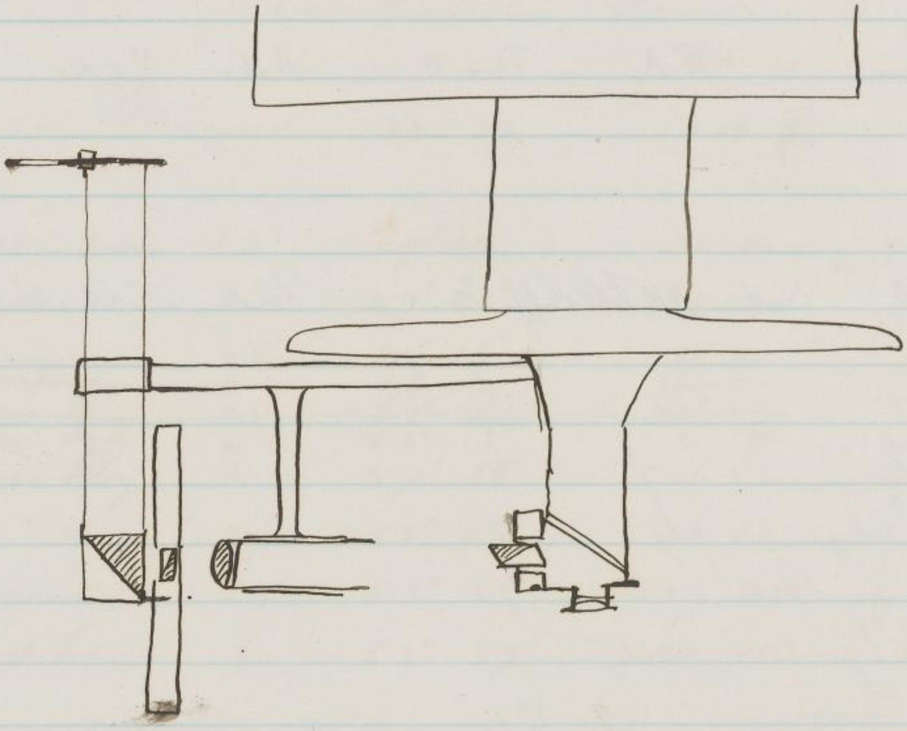


Name. R.A. Dec A.des Sch.des. A br. Sch Br.

A. Sch. D.M. Eld. Aff. N. Seid. Zöll

Page			Arg	Sch.
53-29	70	R Leonis.	7	—
53	76	R Virginis	12	—
25	84	R Hydrarum	3	9
36	90	S Serpentis	14	
32	94	R Coronae	10	10
37	96	R Serpentis	15	12
33	108	R Scuti	11	11
35	136	S Aquarii	29	
35	142	R Aquarii	13	
		α Orionis		

Comparison Stars.

			D	R.A.	
+	α Ursae Minoris.		88 39	1 13	
–	β Cassiopeae	2.5	58° 20′	0h. 1	3 13
	α Persei	2.5	49° 20′	3h 14	2 33
–	δ Aurigae	3.5	54° 16′	5h 47	2 31
	~~θ Draconis~~	~~3~~	~~59 0~~	~~16 0~~	
	~~α Ursae Maj.~~	~~1.5~~	~~62° 34′~~	~~10h 57′~~	~~5 6~~
	o Ursae Maj.	4	61° 13′	8 18	2 35
–	β Ursae Maj	2	57° 11′	10h 53	2 25
	ζ " "	3	55° 43′	13 18	4 21
–	β Draconis.	2½	52° 25′	17 37	3 38
	α Cephei	3	61° 57′	21 15	2 46
	α Geminorum (Castor).	2.1	32 9	7 26	
	α Leonis. (Regulus)	1	12 34	10 1	
	α Bootis (Arcturus)	1	19 49	14 10	
–	α Lyrae. (Vega)	1	38 40	18 32	
	α Andromedae	2	28 25	0 2	
–	α Aurigae. (Capella)	1	45 52	5 7	

Schonfeld's Stars Sitz. Wien. 1860

	Arg.	Sch.			max	min	Per.	Diff m.	
C = [illegible]	6	1	β Lyrae	(8)	3.4	4.5	12.8	1.1	
	8	2	δ Cephei	(5)	3.7	4.9	5.4	1.2	
	5.	3	η Aquilae	(4)	3.5	4.7	7.2	1.2	
	–	4	ρ Persei	(4)	3.4 –	4.2	irreg	.8	
may jun. c	4	5	β Persei	(7½)	2.2 ~~3.4~~ –	3.7 ~~4.2~~	2.9	1.5	
July aug. c	25.	6	S Cancri	(3½)	8.2 –	9.8	9.5	1.6	
	1	7	o Ceti	2	1.7 5.0 –	8.9	331.3	6.	
	2	8	χ Cygni	3½	4. 6.	12.8	406.5	7.8	Ab 5th Mar. 77
apr. my. jun c	28		λ Tauri		3.4 –	4.2	3.9	.8	
	19		ζ Geminorum		3.7 –	4.5	10.2	.8	
	=		W Virginis						
Oct-Nov. c	–		δ Librae		4.9 –	6.1	2.3	1.4	
c	–.		U Coronae		7.6 –	8.8	3.5	1.2	
	–		X Sagit.		4	6	7.0	2.	
	–		W "		5	6.5	7.6	1.5	
	–		U "		7.0	8.3	6.7	1.3	
	.		β Lyrae		3.4	4.5	12.9	1.1	
	.		η Aquilae						

Comparison Stars of Variable Stars.

C 10 Ceti

A		Wolff.		Avg. Br
a = α Piscium	28.5 a = α Piscium	8	8.67	26.5
b = 75 Ceti				8.6
c = β Aurigae.		5	9.38	40.6
d = β Tauri		9	9.44	42.0
e = α Arietis		5	9.31	44.0
f = β Arietis	37.7 b = β Arietis	10	9.09	32.8
g = α Tauri				50.0
i = ι Aurigae		6	9.03	
Ceti				
γ	30.8 γ	5	8.80	28.3
δ	24.6 δ	3	8.61	20.8
ξ^1				20.9
ξ^2	20.2 ξ^2			19.1
φ				
α	39.1 ~~28.5~~ α	5	9.19	35.3
β				42.4
λ	14.5 λ			16.1
μ	19.0 μ			19.1
ν	10.0 ν			13.0
	c			
	u			
	s			
	4			
	t			
	r			
	q			
	p			
	n			
	m			

C κ Cygni.

Arg.	Sch.	m	s	Dec	Wolff	Arg.	mag. DM.	
						17.9? 17.1		
a = 68 B.								
b = 9 Fl. 9 Cygni.	b = 33.5	29	6. 5.2	29	8.4 8.5		20.3	5.8 3.80
c = Px IX. 295	c = 22.5	3					12.7	6.9 490
d = 72 B	d = 27.5						16.8	6.7 468
φ = φ Cygni	φ = 40.8	33	37. 39.5	29	49.3 48.8	1 8.44	27.0	5.3 339
η = η "	η = 40.9					2. 8.66	32.1	4.2 263
ι = ι "						2 8.72	34.4	
e	e = 25.7						15.9	6.5 447
f	f = 29.3							6.0 398
g	g 7.2						4.0	8.5 708
h 17 Cyg.	h = 38.2						24.2	5.4 347
k	k 14.2						7.5	8.2 661
l	l 10.3						5.5	8.0 631
m	m 3.7						1.1	8.9 776
	n 0							9.0 794
	i = 18.0							7.4 539

3 = R 38 Hydrae

Cmp. Bode		Sch R.A.	Decl	Bac.	mg Heis	mg Piazzi
α = 36 δ Hydrae	34 45	~~8 29 58.7~~ Bur. 9 30 45.0	−8 46 28.1. −8 46 Heis −6 12 25.4 +6 13 Heis	3293 2901 ~~B.A.C.~~	6.7 4.5	
b = P XIII 86	6	13 20 19.8	−21 38.7			8 ?
c = 57 Virginis	3	13 8 8.6	−19° 10.11.3 Heis	4435	6	
d = 55 Virginis	2	13 6 25.9	−19° 10.3.0 Heis	4430	6	
f = 61 "	4 f	h m s 13 10 50	−17.30.1 Sch.			
ψ = ψ Hydrae	1 ✓	13 1 15	−22 20.5 Sch.			
ν = ν "	5 ✓	13 11 3	−22 24.3 Sch.			
π = π "	8	13 58 7.5	−25 58 ~~51.2 Heis~~ ~~+7 25 Heis~~	4685 ~~4052~~	4.3 ~~4.5~~	
	7	13 24.14				
k = 73 Virginis			−17 58.7 Sch.			

C β Persei (Algol)

9.3173

Arg.	Sch		Sch Mann 1870	
ν	p 1.5	ν Persei	0.9	8.6666
ρ		ρ (var)		8.7994
δ	p 7.8	δ	7.8	8.9255
γ	10.9	γ	10.9	8.9233
ε	12.4	ε	12.8	8.9776
a =	p 4.0	a = α Trianguli	3.5	8.8205
b =	p 8.9	b = β "	9.1	8.9479
c =	22.1	c = γ Andromedae	23.4	9.2529
	16.1	h = β Arietis	16.7	9.0938
ζ ? Persei				8.9890
		i = ι Aurigae	17.3	9.0350

C 5 η Aquilae

	Arg. Arg.		Sch			Br.
1	ε	6.2 Aquilae	ε	5.8	8.6266	6.2
6	β	8.1	β	8.2	8.7401	8.1
5	ι	3.0	ι	3.2	8.5724	3.8
4	μ	0.5	μ	-1.7	8.4311	0.5
3	ν	-1.7	ν	-1.6		-1.7
2	δ	12.9	δ	13.5	8.8542	12.9

β Lyrae

Arg.	Sch.						
κ Lyrae	κ Lyrae	1.05	.37 ~~#7~~	.17	8.53355	2.5	
δ	δ	2.10	1.22	1.34	8.5023	2.0	330
ζ	ζ	2.44	2.05	2.24	8.5612	3.2	
ε	ε	4.08	3.63	3.98	8.5253 8.4487	4.8	
γ	γ	1353 ~~8.41~~	14.07	15.31	8.8894	12.7	
θ Herculis	θ Herculis	8.41	6.67	5.98	8.6394	8.7	?6.7
ο	ο	7.35	7.72	8.16	8.6891	7.6	
ξ	ξ	10.20	10.20	10.20	8.7035	9.8	
	μ	–	–	1283	8.3842		
ν Lyrae					8.3283		

7 R ~~Draconis~~ Leonis 420 Megali

Arg.

a	18 Leonis	25.5
b	19 ..	19.7
e	21 ..	16.1
v		27.4
ξ		30.4
A		33.5
c	11° 2102	11.0
d	914 Weisse	12.0
f	903 "	7.4
i	937 "	18.4
k	896 "	
g	12 2094	0
h	12 2093	3.0
l		~~18.9~~

δ and μ Cephei

See p. 364

Arg.	Sch.				
ε	21 ε	Cephei	8.5320	332	2.0
ξ	2.8 ξ		8.8333	330	3.0
ι	10.3 ι			341	10.6
ζ	12.3 ζ		8.8399	331	11.4
	5.6 γ		8.8284	353 336 ~~318?~~	
a	6.9 α = 7 Lacertae				7.1

μ is near Uranus

b = 14 Cephei   329.10   57? 14

323 30

Bess   21, 34 35   28 10 1855   56° 46 50 55 35 1873

c = 13 Cephei Hev.

gamut seiden

μ is P XXI 285

A.R.	Arg.	Sch.	Asc.	Dec	Bac.	mg.	
8	ε	ε	22 9 42	+56 19	7778	5.4	
6	ξ	ξ	21 59 35	+63 55	7700	5.4	
10	ι	ι	22 44 32	+65 26	7967	3.4	
7	ζ	ζ	22 5 50	+57 29	7749	3.4	
4		γ	23 ~~30~~ 33 ~~37~~ 26	+76 49	8238	3.4	
1		α	21 15 19 22 25	+61 58 + ~~57~~ 43 ~~14~~ 32	7416 1855	3.2	7
9	a el Lacertae						
5	b		21 57 12	+57 18	7683	6.4	
2	c		21 34-28				
3	μ		21^h ~~39~~ 39 ~~27.7~~ 6.6	+58 7.0			Var

9 α Herculis

Arg.

1	β = β Herculis	9.0359	246		7.5
4	δ = δ Herculis	89005	257	97	2.8
3	a = κ Ophiuchi	8.9110	252	154	2.
2	b = κ "	8.4603	251		~~7.5~~
5	c = β "	9.0430	264		3.8

1877phae.proj.129βW

R Coronae. Ag. no 10
Sch. P. 504, II.

Ag	Sch.		R.A.	Dec.		DM.	W₂	Heis.	BAC no.
R = XV.185 = Bac.5236		9	15ʰ 42ᵐ 36ˢ	+28° 36.3					5236
a W₂ XV.717	a	2	15 30 57.0 w.	+30° 28.4	w.		7		
b W₂ XV.1035	b	6	15 41 44	+28 54.9					
c W₂ XV 971	c	3	15 39 10.4 w.	+28° 55.4	w.				
a = o Coronae		1	15 14 8.8	+30° 8.7				6.5	5061
d +28°.2473	d'	4	15 41 18.3	+28° 43.5		9.2			
h W.₂ XV.1073	h	11	15 43 17	+29 0.8					
	f	8	15 42 34	+28 43.9					
	e	7	15 42 25	~~+28 5~~					
	d"	5	15 41 21						
	g	10	15 43 4						
	p	13	15 46 20						
	n	12	15 46 4						
	m	14	15 47 10						

P. 509. Sch. II. 11 R Scuti = 59 Scuti B

R. 18h 39m 45s −5° 41.'4

Sch.	AR. R	R.A. order	Heis.	B.A.C. No.		1855. R.A.	Dec.	LL. mag.
	f = 6 Scuti H = 6 Aquilae Fl.	5		6388	5½ B.A.C.	18 39 28.8	−4°54.'0	
g	g = 14 g Aq.	9	6	6501		18 55 16.3	−3 54.3	~~7½~~
h	h = 15 h Aq.	10	6	6518		18 57 18.4	−4 15.4	
k	k = 7 Scuti H. = 9 Aq. Fl.	8			BAC mg.5½	18 49 17.9	−6 1.8	
	a = Ll. 34857 Aquilae	4			Ll	39. 21.7 18h ~~36 42.7~~	−6 3.1 ~~−6 5.8~~	7½
b	b = Ll 34929	6			Ll	18 40 54 sch. ~~18 38 14.4~~	−6 9.7 sch ~~−7 6.7~~	7
c	c = Ll 34984	7			Ll	18 41 55 sch ~~18 39 16.2~~	−6 4.3 sch. ~~−6 7.2~~	7½
	d = 8.9 mag. preceding R 4m 10s + 2' N.					18 35 3.5	−5 39.4	
	e = ~~P. XVIII.~~h 171	3			P 8.9	18 38 15	* −6 24.0	
	m = W. 18h 934	2		mag. 8.9	W	18 37 21.5	−5 38.8	

R Virginis

R	
α	16.0
b	17.0
c	14.4
e	26.8
f	32.7
g	8.0
h	10.3
i	20.8
k	24.7
m	4.7
n	5.2
d	

Var. Ophiuchi (Nova)

Pos 1855 = 16h 51m 23.5s −12° 39'.0

Var.	6 yr. Cat. No 1085.	Pos 1850	16 51 5.72	−12° 39' 27".5	W.	His.	LL.
a	20 Ophiuchi	" 1855	16 41 48.9	−10 31.3		5	
b.	LL. 31188						
c	LL. 30804						
d	LL. 30718.9						
e	LL. 30903.4						
m	LL. 30819						
n	W. 16.h 962		16h 51' 7".8	−12° 52'.3		9 W.	
v	V Serpentis		17 12 40.5	−12° 41'.7		.5,4	

13 R Aquarii

R. 23ʰ 36ᵐ 18ˢ.8 −16° 5′.3

			R.A.			Dec.		
ARf		$\boxed{4}$	23	36	18.84	−16° 5′ 16.″3		
a = LL	46574	6	23	36	57.0	−15 13.4	10.0	
c =	46558	8	23	38	32.8	−15 56.2	8.1	
d =	46434	3	23	34	26.9	−16 15.9	8.7	
g	46286	2	23	30	30.1	−15 57.8	17.4	
h	Pi. XXIII. 122	1	23	27	16.2	−16° 2.5 ~~+2° 30′~~	23.4 ~~8.1~~	6.7 P.
b		9	23	38 35	41 ± 50	~~+5° 8′~~ −15° 24′ −15 45	12.6	
e		7 1855 1800	"	38 35	31 ± 40	~~+2° 47′~~ −15° 12′ −15 30	3.0	
f		5	"	36 33	21.5 30	~~+1° 37′~~ −16° 20′ −16 38	4.6	

S Aquarii

			R.A. order				
	S	LL. 44860.	3	22ʰ 49′ 19.″8			−21° 6.′9
	a		4	22	49	35	−21 12.
	b	Ö.2 22509	5	22	49	43	−21 26
LL.	c	LL. 44835	2	22	48	7.6	−21 18.2
	d	Ö.2 22531	7	22	51	7	−21 40
	e	LL. 44877	6	22	50	8.2	−21 2.9
	g	LL. 448~~77~~ 23	1	22	47	43.4	−20 54.7

δ Serpentis

Ag.? ~~R~~	R.A. order									
	B	15	14	52.34	+14	50	18.2	Dm.	Ag.	LL.
α = Lal. 28070	4	15	~~14~~ 16	~~14.1~~ 33.0	+14	~~44.8~~ 33.9			8.8	8
b = 27973	1	15	18	~~26.8~~ 14.2	+15	~~16.4~~ 5.2			12.4	7½
c = 28104	5.	15	~~15~~ 17	~~15.6~~ 24.14	+ ~~15~~ 14	~~34.1~~ 36.3			5.8	8½
d = 14°.2862	2	15	14	17.1	+14	41.8		9.3	1.9	

α Orionis

15 R Serpentis (12. Sch.)

				No.	R.A.	55 Dec.	Ag.	dm. W₂.	L.L.
	R	15° 2918 Dm.		7	15 44 0.8	+15 34.7			
	a	Lal. 29002		12	15 48 35.3	+15 2.1	7.4		8½
	b	W₂. XV. 1097 = Str. Du. 1978	b	13	15 49 34	+15 10.5	9.5		
	c	LL. 28910	c	9	15 45 21 Sch. ~~15 45 20.6~~ L.L.	+15 39.7 Sch. ~~+15 40.8~~ L.L.	14.8		4
	d	LL. 28929	d d'	10 2	d = 15 46.17 Sch. d' = 15 39 44 " ~~15 46 17.0~~ L.L. 58 Sch.	+15 52.5 +15 59.1 + ~~15 52~~ L.L. ~~+16 12.6~~ L.L. 30.6 Sch.	13.2		7
	e	LL. 28950	e	11	15 46 ~~56.4~~ L.L.	+16 ~~30.5~~ L.L.	23.5		6
	f	W₂ XV 1023		4	15 41 18.2	+15 51.0	5	9.	
	g	W₂ XV 1146.7	g	8	15 44 32. ~~15 46 14.0~~	+16 35.1 ~~+16 22.6~~	7.8		
H.A.C. m = 7½.	h	29 Sch.		1	15 39 43.8	+15 58.9	19.2		
	k	Dm 15, 2917		6	15 42 34.8	+15 33.2	1	9.5	
	l	LL. 28797		5	15 41 27.7	+14 14.6	28.6		6½

Her's.	B.A.C. No.		No.	R.A.	Dec.	Ag.
6.5	52~~34~~ 93	φ = φ Serpentis	14	15 50 33.5	+14 ~~50~~ 49.9	30.1
6	5223	υ = υ Serpentis	3	15 40 33.4	+14 ~~34~~ 33.8	

t

16 α Cassiopeiae

9.2119

1	β Cass.		9.2025	6.3
2	γ	"	9.2383	7.0
3	δ	"	8.9983	.0

17 α Orionis

2	1	a = α Aurigae	Capella	9.1
4	3	b = α Canis Min.	Procyon	5.5
3	2	β = β Orionis	Rigel	5.9
1		d = α Tauri	Aldebaran	2.2
5	4	e = β Geminorum	Pollux	.0

18 α Hydrae.
~~17 α Orionis.~~

b = β Canis Maj. 94
β = β Leonis. 175
γ = γ Orionis. 79
δ = δ Leonis 166

19 ξ Geminorum

3	ζ	8,6163
4	λ	8,6842
5	δ	8.7289
1	ν	8,5499
2	ξ	8.8131
6	υ	8,5753

18 α Hydrae
19 ξ Geminorum

"ε Aurigae

	ε = ε Aurigae	8.9451
2	α = ε Persei	8.9776
1	b = β Trianguli	8.9479
[illegible]	η = η Aurigae	8.8572
[illegible]	ζ = ζ Aurigae	.7029

505 R Pegasi
" R Cassiopeiae
507 S "
~~540 R Aquilae~~

Z Variabilis Ophiuchi

v
a = 20 Ophiuchi
b = Lal. 31188
c = Lal. 30804
d = " 30818?
e
m
n
r = v Serpentis.

β Pegasi

4	β	9.1812
6	δ = α Andromedae	9.2981
5	α	.1739
7	γ	.0578
2	η	.0138
1	ε	.2062
3	μ	8.8038

23 R. Pegasi

R 9°.5158
a
b
c

R Cancri

R
α
b
c
d
e
f
g
h
i
k
l

25 S Cancri

Sch.
1.3 f
5.8 e
10.0 b
14.3 g

α		14.5
b		7.0
c	~~19.0~~	
d,	~~22.0~~	16.0
~~d~~	~~22.3~~	
e	~~28.2~~	3.7
f		0

R Aquilæ

RA.	R	DM 8° 3970 ~~BDM~~	ρ			Mag.	D Bm.
5	a	7° 3971	a				
9	b	8° 3961	b				
10	c	8° 3977	c			19.0	
9	d	8° 3960	d			22.0	
	d'	8° 4004	d'			22.3	
1	e	8° 3996	e			28.3	
11	f	8° 3956	f			30.5	
7	g	7° 3987	g			35.8	
2	h	8° 3957	h			42.1	
4	k	6° 3978		18 48 42.9	6 59.7	47.8	7.0
6	m	6° 4023	m	18 59 21	6 56.1	41.2	7.2
5	~~l~~	~~k~~	n				
		p	r				
		q	q				

27 R Bootis

	Sch.	ang			Br.
		R	27°	240	
3	a	a	28	2348	20.1
9	b	b	26	2592	13.4
10	c	c	26	2598	11.0
8	d	d	27	2404	10.5
1	e	e	27	2396	7.7
11	f	f	27	2403	5.0
7	g	g	27	2401	
2	h	h	27	2398	
4	k				
5	l				
6	m				

λ Tauri :

	λ Tauri	8.8722	
4	γ	8.7792	6.1
5	ε	.8212	7.8
3	ν		3.0
1	ο	.7672	9.0
2	ξ	.7293 +	4.5

29 S Aquarii

S	
a	4
b	6
c	7
d	
e	12.5
g	

Great Bear.

η Aquilae see page 27

Aug.	Sch
~~noon~~	μ Aquilae
	ν
	ι
	ξ
	β
	θ

ρ Persei

	Sch.		
0.0	κ Persei		
1.5	ν		8.6666
2.6	ο	?0 = 40	8.6259
7.8	δ		8.6689
4.0	α Trianguli		8.8205
8.9	β "		.9479

R Leonis (P. 363. Ag.)

Ag.	~~Ag~~ no.	R.A. order					Heis.	B.A.C. no.	W	DM.
g	DM. 12° 2094	4	9 39 32.9	+12° 2.9						9.5
h	" 12° 2093	3	9 39 27.0	+12° 5.6						9.4
f	W. 903 (+9h.)	8	9 41 12.3 ~~9 42 45.2~~	+12 62.5 ~~+21 28.5~~					9. ~~9~~	
c	DM. 11° 2102	6	9 39 42.1	+11° 30.5						7.8
d	W. 914 (+9h.)	9	9 42 5.2 ~~9 43 34.5~~	+12 3.4 ~~+44 42.8~~					9. ~~8.9~~	
e	21 Leonis	10	9 43 1.1	+12 31.6 ~~+24 27~~			3	3331		
i	W 937 (+9h.)	11	9 43 11.0 ~~9 44 20.9~~	+14 1.0 ~~+33 26.6~~					8. ~~9~~	
b	19 Leonis	5	9 39 38.0	+12 14.3 ~~5.9~~				3344		
k	W. 896. (+9h.)	7	9 41 1.9 ~~9 42 25.9~~	+13 28.1 ~~+37 9.9~~					9 ~~8~~	
a	18 Leonis	2	9 29 2.2	+17 5.2			6.5	3278		
v	Bayer Leonis	12	9 50 25.2	+13 8.1 ~~7~~			5.6	3406		
ξ	" "	1	9 24 9.3	+11 56.4			5.6	3250		
A 31	" "	13	9 60 12.4 ~~14.0~~	+10 42.4 ~~43~~			5.4	3457		

R Virginis (P. 479 Ag.)

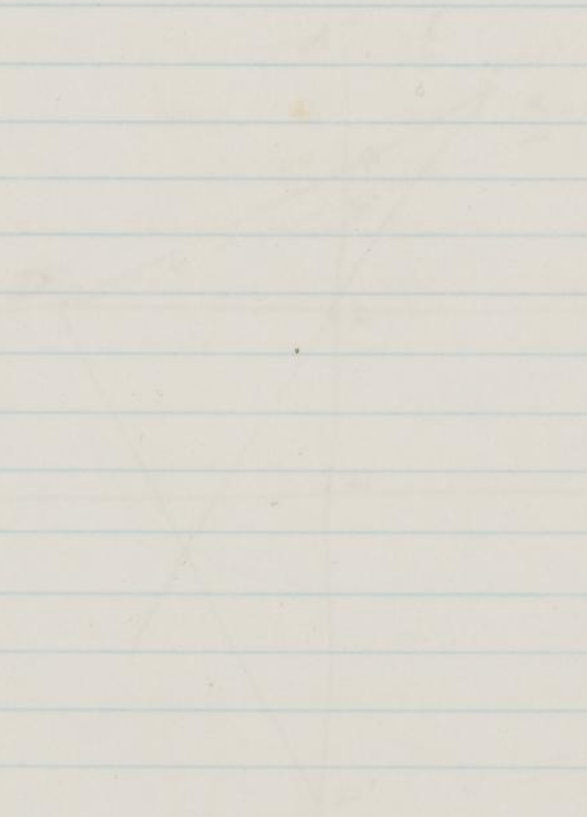
Ag.	Name	R.A. order	R.A. '55	Dec.	Heis	B.A.C. no.	W.	DM.	S.L. Mg.
a	~~W. XII 551~~	9	12 33 17.9 ~~12 26 13.0~~	+8° 49.7 ~~+32° 50.4~~			9. ~~9~~		
b	W. XII. 582	11	12 34 55.5 ~~12 27 26.5~~	+9° 10.1 + ~~16° 37~~.0			8. ~~7~~		
c	LL. 23738	12	12 36 16.9 ~~33 37.4~~	+8° 21' 29.8"					8
e	LL. 23503	4	12 27 7.9	+8 32 15.6					6½
f	W. XII. 398	1	12 23 51.8 ~~12 18 48.7~~	+8° 44.3 ~~+30° 55.7~~			9. ~~9~~		
g	DM. +7° 2562	7	12 32 19.7	+7 52.2				9.3	~~9~~
h	W XII. 496	5	12 29 58.2 ~~12 23 34.1~~	+7° 59.7 ~~+35 18.8~~			9. ~~9~~		
i	W. XII 430	2 ~~3~~	12 26 3.5 ~~12 20 47.2~~	+9° 4.9 ~~+19 7.9~~			7.8 ~~8~~		
k	W XII. 432	3	12 26 11.8 ~~12 20 49.2~~	+8° 48.6 ~~+31°~~ 7.8			9. ~~9~~		
m	DM. +7° 2564	8	12 32 31.0	+7 56.6				9.5	
n	DM. +7° 2560	6	12 30 34.6	+7 58.1				9.5	
d = 31 d' Virginis		10	12 34 36.3	+7 36.2	6	4274			

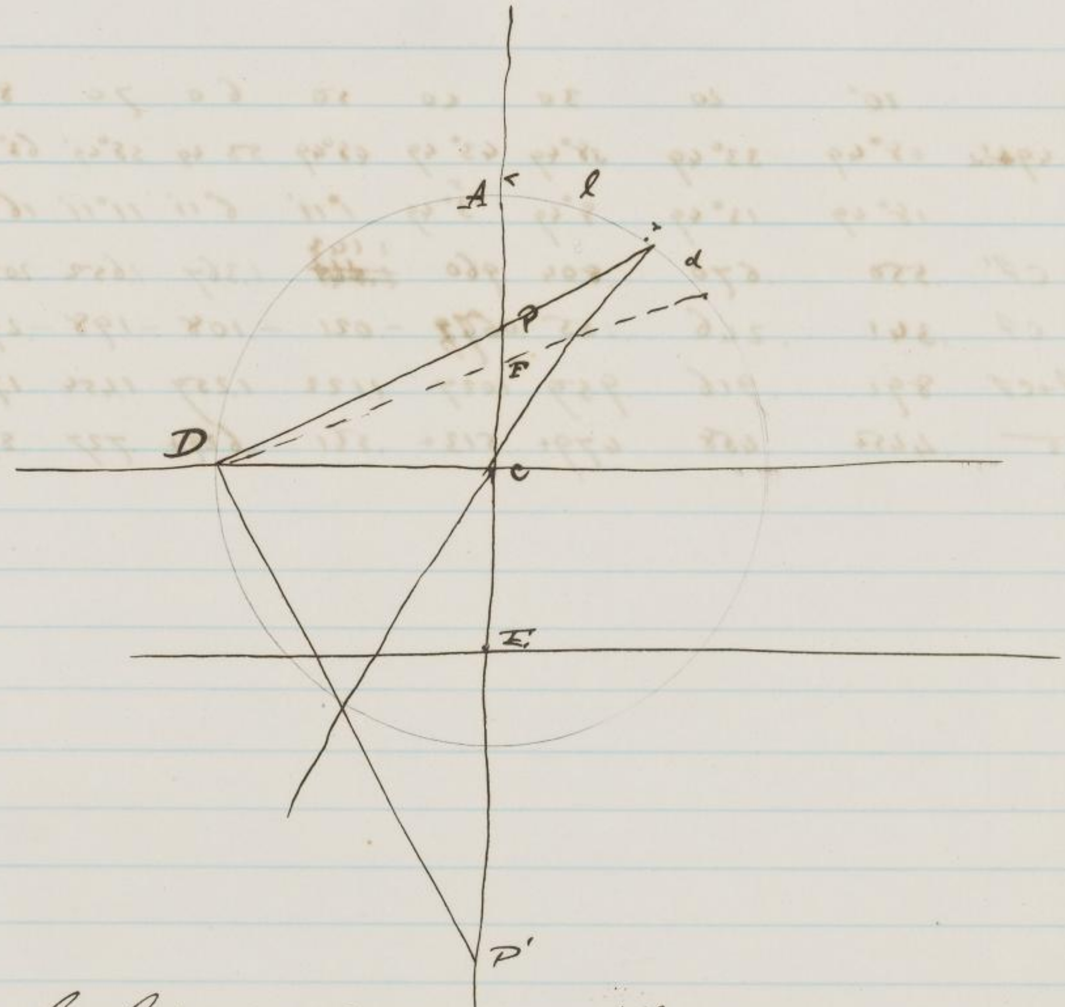
	Period	Max	Min.	Diff.
β Lyrae	12.8	3.4	4.5	1.1
δ Cephei	5.4	3.7	4.9	1.2
η Aquilae	7.2	3.5	4.7	1.2
ρ Persei	irreg	3.4	4.2	.8
β Persei	2.9	2.2	3.7	1.5
S Cancri	9.5	8.2	9.8	1.6
o Ceti	331.3	1.7 5.0	8-9	5:
χ Cygni	406.5	4 6	12.8	7.8
λ Tauri	3.9	3.4	4.2	.8
ζ Geminorum	10.2	3.7	4.5	.8
W Virginis				
δ Librae	2.3	4.9	6.1	1.2
U Coronae	3.5	7.6	8.8	1.2
X Sagittarii	7.0	4	6	2.
W "	7.6	5	6.5	1.5
U "	6.7	7.0	8.3	1.3

	Arg.	Sch.	Com.	Compar ++ Arg.	Sch.	pp. Obs. ~~Arg. Obs.~~ Arg. Sch.
β Lyr.	6	1		9 ^{10}	9	8
δ Ceph.	8	2		8 ^{9}	6	5
η Aquil.	5	3		6 ^{6}	6	4
ρ Persei	–	4		$^{\beta+2}$	6	4
β ,,	4	5	May June	9 ^{10}	9	7.5
S Cancri	25	6	July Aug.		4	3.5
o Ceti	1	7		16 ^{26}	19	2
χ Cygni	2	8		7		3.5
λ Tauri	28		– Apr. May. Jun.			
ζ Geminor.	19					
W Virg.						
δ Librae			Oct. Nov.			
X Sagit.						
W ,,						
U ,,						

	Sch.	Arg.		R.A. h	m	Dec.		Period	Max.	Min.	Diff.	
		16	α Cassiop.	0	32	+55	44	irreg.	2.2	2.8	· .6	b.
	13		R Piscium	1	23	+2	7		1.7	8		
+	7	1	o Ceti	2	12	−3	38	332.	5.0	9		f
+	4		ρ Persei	2	56	+38	16	..	3.4	4.2	· .8	b
+	5	4	β Persei	2	59	+40	23	2.9	2.2	3.7	· 1.5	b
+		28	λ Tauri	3	53	+12	5	3	3.4	4.2	· .8	b
		20	ε Aurigae	4	53	+43	36	irreg.	3.0	4.5	· 1.5	b
		17	α Orionis	5	47	+7	23	irreg.	1	1.4	· .4	b
+		19	ζ Geminorum	6	55	+20	47	10.2	3.7	4.5 ~~3.7~~	· .8 ~~1.5~~	b
	14		S Can Minoris	7	24							
			U Geminorum	7	46	22	22	~~6.~~				
		24	R Cancri	8	9	+12	10	354.4	6.2 7.3 ~~<11.7~~	<11.7		f
+	6	25	S Cancri	8	36	+19	33	9.5	8.2	9.8	1.6	f
			S Hydrae	8	46							
		18	α Hydrae									
		7	R Leonis	9	40	+12	6	312.6	5.2 6.4	9.4 10.0		f
		12	R Virginis	12	31	+7	47	145.7	6.5 7.5	10.0 10.7		f
	9	3	R Hydrae	13	22	−22	32	469.3…	4.0 5.5	10.?		f
			S Virginis	13	25							
		27	R Bootis	14	31	+27	22	223.0	5.9 7.8	11.3 12.2		f
		14	S Serpentis	15	15	+14	50	361.0	7.6 8.6	12.5?		f
	10	10	R Coronae	15	43	+28	36	irreg.	5.8	13.0	7.2	f
	12	15	R Serpentis	15	44	+15	35	357.6	5.6 7.6	<11.		f
		9	α Herculis	17	8	+14	33	irreg.	3.1	3.9	· .8	b
		21	Variab. Ophiuchi	16	51	−12	39					
+	1	6	β Lyrae	18	45	+33	12	12.9	3.4	4.5	· .9	b
	11	11	R Scuti	18	32				6.4	10.9		f
		26	R Aquilae	18	59	+8	1	345.1	7.4	11.2		f
+	8	2	χ Cygni	19	45	+32	33	406.5	4.0 6.0	12.8		f
+	3	5	λ η Aquilae	19 ~~19~~	45	+0	38	7.6	3.5	4.7	· 1.2	b
		8°	μ Cephei	21	39	+58	7	irreg.	4?	5?	·	b
+	2	8	δ Cephei	22	24	+57	40	5.4	3.7	4.9	· 1.2	b
		29	S Aquarii	22	49	−21	7	7	7.7 9.1	<11.5		f
		22	β Pegasi	22	57	+27	18	irreg.	2.2	2.7	· .5	b
		23	R Pegasi	22	59	+9	46	382.0	6.9 7.7	12?		f
		13	R Aquarii	23	36	−15	3	388.0	5.8 8.5	11?		f

Numb. Arg.	No. St. Arg.	Sch		Column Arg.	Sch.	*Bright Arg.
16	3			3		·
1	16	7 19 6	26	5	.5 1 ~~3~~	·
4	9	9	10	17	7	
28	5			2		·
20	5			3		
17	5			6		·
19	6			10		
24	11	7,3		3	.5 .5	
25	6 ~~4~~	4 6	7	5	4 1	·
18	4			1		
7	13			6		·
12	12			7		·
3	8	4		3	.5	
27	8	8		1	2.5	·
14	4			6		·
10	6	12		5	5	
15	12	7		5	5	·
9	5			13		·
21	8			1		
6	9	9	10	25	5	·
11	9	9 5		13	1	
26	11			2		·
2	~~14~~			9	3	·
5	6	6	4	18	4	·
8^9				]24		·
8	8	6	9		5	·
29	6			1		·
22	6..			4		
23	3			1		
13	8			3		·
	317		23			





$l = lat = 42^\circ\ 22'\ 51$ $\frac{1}{2} l = 21\ 11$

$PC = \tan PDC = \tan(45^\circ - \frac{1}{2} l) = \tan 23\ 49$ .4412

$P'C = \tan(45^\circ + \frac{1}{2} l) = \tan 66^\circ 11$ $\underline{2.266}$

$PE = \frac{1}{2}\left[\tan(45^\circ + \frac{1}{2} l) + \tan(45^\circ - \frac{1}{2} l)\right] =$ 1.354

$CE = \frac{1}{2}\left[\tan(45^\circ + \frac{1}{2} l) - \tan(45^\circ - \frac{1}{2} l)\right] =$ .912

$CF = \tan(45^\circ - \frac{1}{2}(l + d))$

$CF' = \tan(45^\circ - \frac{1}{2}(l - d))$

10

	10°	20	30	40	50	60	70	80	90
23° 49 + α	28°49	33°49	38°49	43°49	48°49	53 49	58°49′	63°49′	68°49′
	18°49	13°49	8°49	$\overset{5}{3}$°49	1°11′	6°11′	11°11′	16°11	21°11′
ct′	.550	.670	.804	.960	1.143 ~~1.143~~	1.367	1.652	2034	2.580
ct	.341	.246	.155	.0679	−.021	−.108	−.198	−.290	−.388
ct+ct′	891	.916	.959	1.027	1.122	1.259	1.454	1.744	2.192
$\frac{\quad}{2}$	.4457	.458	479+	.513+	.561	.629+	.727	.872	1.096

Flexure of Telescope.

$$\mathcal{E}\frac{d^2y}{dx^2} = P(\overset{a}{\cancel{h}}-y)$$

$$\mathcal{E}\frac{d^2y}{dx^2} = \cancel{M}\ m(l-x)$$

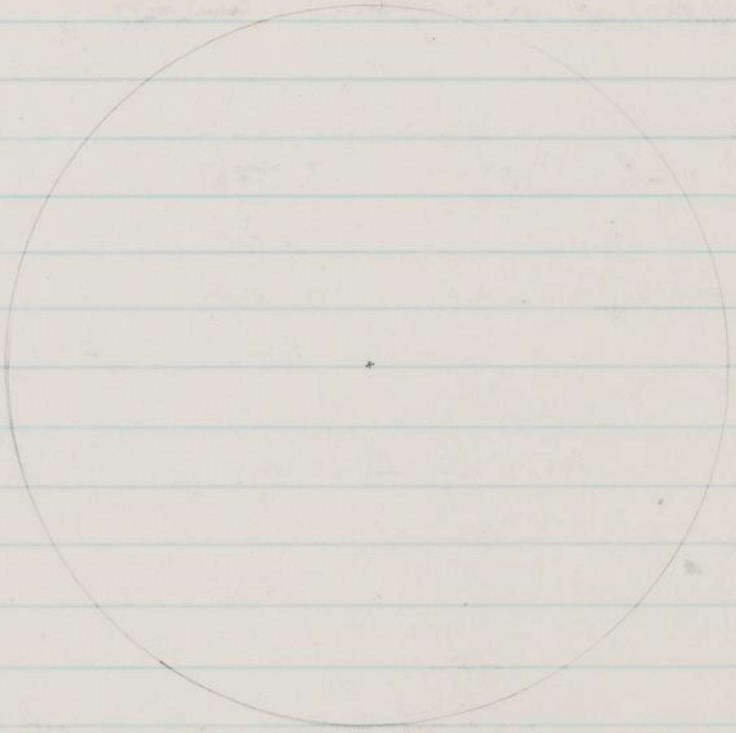
Gesellschaft Zones

90	
80	
75	Kasan.
70	Dorpat.
65	Christiania
60	Helsingfors
55	
50	Cambridge U.S.
45	Bonn.
40	
35	Chicago
30	Leipzig
25	Cambridge, Eng.
20	Berlin
15	
10	Leipzig
4	Mannheim
1	Neuchâtel
-2	Palermo.

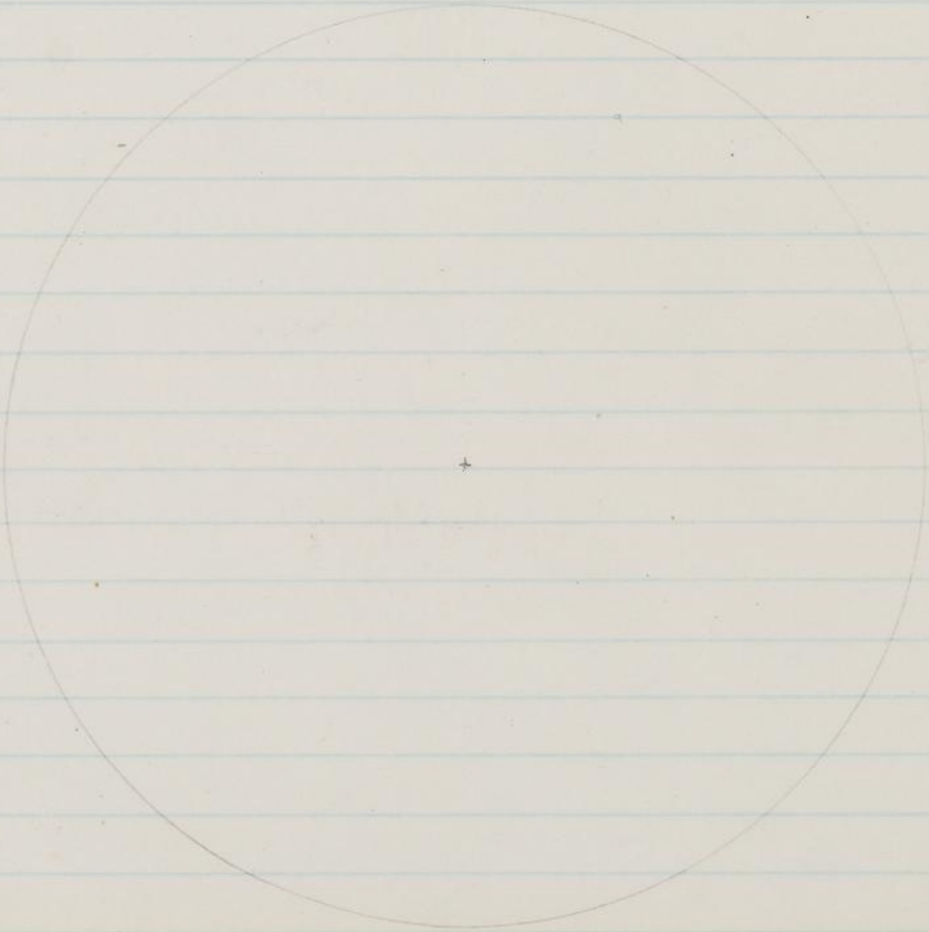
o Ceti Arg. 409

1838. Dec.	23.5,	25.0
	24.5	22.8
	22.3 .	
	20.3	22.5
	18.8	18.6
1839 Jan. 11	11.6	11.5
	10.1	$\overset{+>}{12.2}$

18.46



20.4



March 14th. 1877

Measurement of focal length of ~~small 2½~~ 2.5" lens,

	a	B	c
	1	0	10

aC = ~~3.15 - .04.4 3.106~~

1,19 - 4,4 1.146

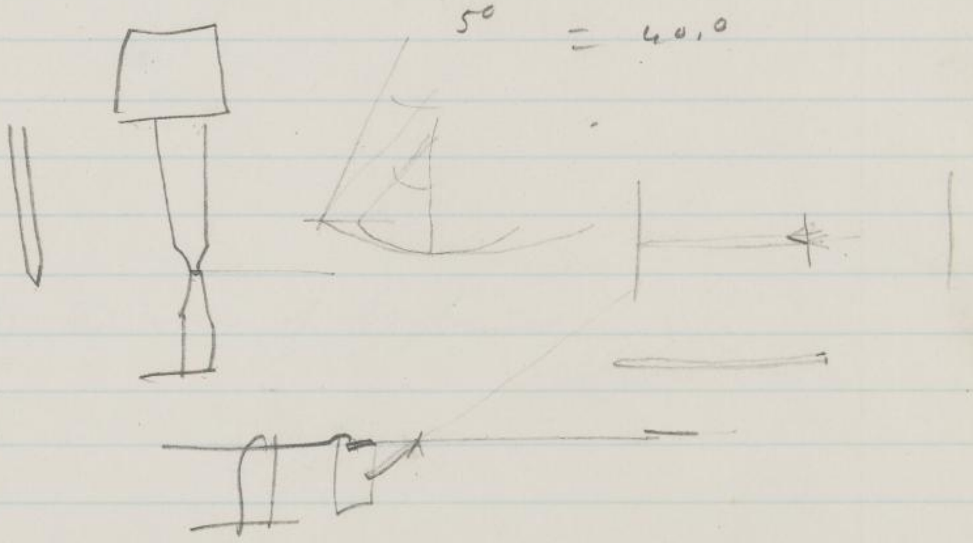
aB = 2,39 - 4.4 2,346

1.2 foc. = ,5.865

Time of Revolution.

-47 | 47
864
188
282
376
40.608

5° = 40.6 s pr day.
1° = 1,6 24
2° = 6.4
3° = 14.4
4° = 25.6
5° = 40.0



Friday, March 23d, 1877. ~~E Equatorial.~~

Z Phot.

~~39.1~~	21.1	30.0	20
8.9	136.0	72.5	22.5
148.7	150.0	175.0	40.0
147.4	29.6	56.5	80
23.			

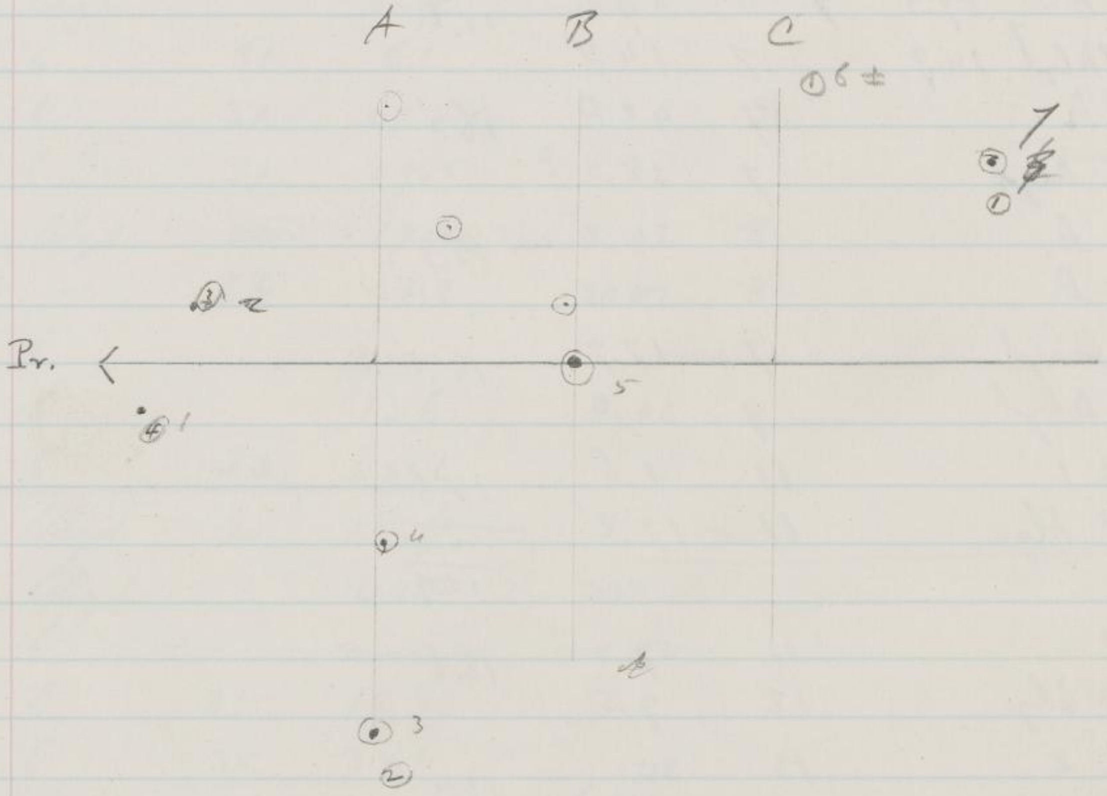
Zero = 50°.0

135°.0

Saturday March, 24th 1877

E. Equatorial

++ near Algol.



① ② ③ ④ order of brightness

Obs. for R. A. only.

Wires A. B. C

1 A 9.6	59.1	9 6	59.1	15.8
C Algol	14.9	7	14.9	
1 A		7	42.0	16.0
C Algol		7	58.0 ?	
1 A		8	34.2	15.9
1 A		8	50.1	
C Algol		9	17.9	16.1
C Algol		9	34.0	
A. 1		11	1.6	15.6
C Alg.		11	17.2	
				4.4
				s 15.9
A 2		11	57.4	12.1
C Alg.		12	9.5	
A 2		12	35.1	11.4
C Alg.		12	46.5	
A 2		13	15.8	12.1
C Alg		13	27.9	
A 2		13	57.4	12.0
C Alg		14	9.4	
A. 2		14	13.3 X	29.0
C Algol		14	42.3	
				s 11.9

Algol and 3 differ in R.A. an amount exactly equal to the interval of the wires.

4 cannot be seen with bright illumination of wires

~~A~~ C	Algol ~~4~~	9	29	13.5	32.8
C	6		29	46.3	
C	Algol.			33.2	32.9
B	Algol			54.7	32.8
C	6		31	6.1	
B	6		31	27.5?	
A	6		31	49.5	
C	Algol		~~32~~	19.3	
B	〃		32	41.2	32.4
C	6			missed	
B	6			13.6	
A	6		33	35.1	
C	Algol.		~~3~~	18.4	
B	Algol			40.2	32.4
C	6			missed	
B	6		35	12.6	
A	6		35	34.4	

Algol flaring. from low altitude.

C	Algol.		35 x 36	25.6	32.5
B	〃		36	47.3	33.0
C	6		36	38.1	
B	6		37	20.3	
A	6		37	41.4	

Algol flaring.

C	Algol		40	28.7	55.1
B	Algol		40	50.2	53.0
A	Algol			12.3	× 49.8
C	7		41	23.8	
B	7		41	45.2	
A	7		42	2.1	

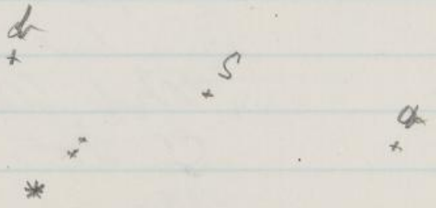
2	C	Algol	9	42	42.9	55.2	
	B	"		43	4.5	55.2	55.1
	A	"			26.5	54.9	
	C	7		43	38.1		
	B	"		43	59.7		
	A	"		44	21.4		
3	C	Algol.			53.1	54.6	
	B	"		45	14.6	54.9	54.8
	A	"		45	36.0	55.0	
	C	7			47.7		
	B	"		46	9.5		
	A			46	31.0 ± .2		
4	C	Algol.		49	23.1	54.7	
	B	"			44.5	55.1	54.8
	A	"			6.2	54.7	
	C	7		50	17.8		
	B	"			39.6		
	A	...		51	0.9		
	C	Algol.			26.4	55.2	
	B	"			48.1	54.9	55.0
	A	"		52	9.6	54.9	
	C	7			21.6		
	B	"			43.0		
	A	"	9	53	4.7		

Chron 3451   Eyepiece 150 diameter   White illumination
Vernier B ~~308° 24'~~ 307° 26'   Vernier A 127° 25'   Telescope East
Error Chron 2s   hourly rate insensible
Attached thermometer 40°

R.A. 8 35 37   19° 36′

March. 30th.

Showed Col Tolson. Neb Orion. ι Orionis and Praesepe.



Observed. S Cancri

a 36ᵐ 20.5ˢ   1ᵐ 45ˢ
S 37 11
. b
a 9h 39 8.5   '   1ᵐ 45ˢ
S 39 58.5   1 50
b 41 48.5

Measured. S Cancri from companions preceding and following. 22 7-3

Apr. 9th. Companion to Sirius, not seen, cloudy.

March 31st 1877

Mr. Waldo Absolutes of Circ. began at 7.40

Clouds.

April. 3rd most clear night

Apr. 7th Clear.

Smoked Glass effect on stars.

Met. Obsn. ? vernier called [illegible].

Six stars visible in 5½ in.

Uranus.

Neptune.

Apr. 16th 1877.

Foci of Burditt Comet Seeker Objective 6.56 cms. aperture.

| 0 0
C B a

a = 3.00 3.00
B, 1.25 1.00 2.00
C .31 .12 .88

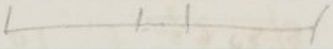
1 | .88
1.137
88
120
88
320
264
560

$\frac{1}{2.00} + \frac{1}{.88} = \frac{1}{F}$

$.5 + 1.137 = \frac{1}{F}$

$1.637 = .6$

a & C = ~~269.4 mm.~~ 2.69.96 cm.



23.5
53.5

251.7
125.85
15
140.85
110.85

B 53.22

53.3
53.4 ✗
53.1
53.1
9

.710
.902
1.612
62.0

59.79
50.79

22.5
23.3
22.8
23.0
24.0
15.6

B' 23.12

61.83 / 25.4
508 24.34
110.3 24.4
1016
870
762
1080
1040

.08
.04

B - B' = 30.1

250.79
.04
250.92
125.46
15.05
110.41
140.57

a & C 110.41 140.51 61.83

.9057
~~.7117~~
1.6174

app 62.0
com 61.83

If this lens is used for deter. of flexure of Merid Circle its dist. from reticule must be as follows. Focal length objective 9' 4".4 = 112.4" = 285.5 cmt.

$u + v = 285.5 \quad F = .62$ to find u

$\frac{1}{62} = \frac{1}{u} + \frac{1}{285.5 - u} \qquad \frac{1}{F} = \frac{1}{u} + \frac{1}{D-u}$

$uD - u^2 = FD - uF + uF \qquad u^2 - uD = -FD$

$u = \frac{D}{2} \pm \sqrt{\frac{D^2}{4} - FD} = \frac{1}{2}\left[D \pm \sqrt{D(D-4F)}\right.$

$D - 4F = 37.5 \times 285.5 \qquad \sqrt{7613.} \qquad 87.25$

$\sqrt{22840}$
$76.13 \times$

~~$u = \frac{1}{2}\left[285.5 - 87.25 = 198.25 = 99.125\right.$~~ $v = D - u = 186.375$

~~$\frac{1}{u} = 1.0\ldots \quad \frac{1}{v} = .5376 \quad \frac{1}{F} = 1.613$~~

285.5
$8 \overline{) 8565}$
10,706. $\div$ 103.5 $\quad \frac{1}{2}(285.5 \pm 103.5) = .91.0 = u \quad v = 194.5$

1.099 $\qquad u = 91$ cmt.
.514
1.613

.91 | 254
762 $\quad$ 36.-
1480
1524
440

Copy of page 79

Focal Length of Objective of Comet Seeker

April 10th, 1877. Aperture 6.56 cms.

Bessel's Method

Approx. by focussing flame on screen

C B'' B' a

~~[illegible]~~ ~~[illegible]~~

Reading of $B'' = 53.5$

$B' = $ ~~23.5~~ 23.5

$B''-B' = 30.0$ $AC = 251.7$

$AC + \frac{1}{2}(B''-B') = 140.85$ $AC - \frac{1}{2}(B''-B') = 110.85$

This leads to the approx focal length of 62.0 cms.

A more accurate measurement was made with an eyepiece ~~[illegible]~~ Reading of B' & B'' gave:—

B'	B''
22.5	53.3
23.3	53.4
22.8	53.1
23.0	53.1
~~24.0~~	
15.6	.9
23.12	53.22

$AC =$	251.7 125.85		250.92 125.46	
$B'' =$	53.5		53.22	
B'	23.5		23.12	
$B''-B'$	30.0		30.1	
$\frac{1}{2}(B''-B')$	15.0		15.05	
$m = \frac{1}{2}AC + \frac{1}{2}(B''-B')$	140.85	.710	140.57	.7117
$n\ AC - \frac{1}{2}(B''-B')$	110.85	.902	110.41	.9057
$\frac{1}{m} + \frac{1}{n} = \frac{1}{F}$		1.612		1.6174
F		62.0 cms.		61.83
		24.4 inches		

Apr. 23d. Moon. Uranus. cloudy. Defin. before
sunset excell. tried power No 9!
Apr. 24th. Obs. Procyon before sunset.
Apr. Tried Photometer with Mr. Clark.
intrinsic brill. of star insuffic.

Opposition of Mars.

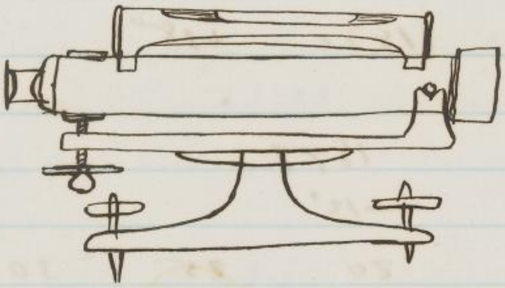
		H. Asc.	
Sept.–Oct.	1877.	$23^{h}46$	−12°
Nov.	1879	$18^{h}32$	+18°

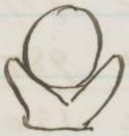
	1877				1879			
~~Alt.~~								
~~Log. H.P.~~	−12°				−18°			
Alt.	15	20	25	30	15	20	25	30
H.A.	55° ~~35°~~ 62°	50 ~~37°~~ 57°	37° 44°	25° 32°	85° ~~78°~~	80° ~~81~~	72° ~~88~~	65° ~~82~~
Log. H.Par.	.3703	.3703	.3703	.3703	.2628	.2628	.2628	.2628
Cos. Alt.	.9605	.9397	.9063	.8660	.9605	.9397	.9063	.8660
Sin. Ang.	.8829	.7771	.6947	.5299	.9781	.9877	.9976	.9994
	1.2137	1.0871	.9713	.7662	.2014	.1902	.1.667	.1282
	16.4	12.2	9.36	5.84	15.9	15.5	14.7	13.4

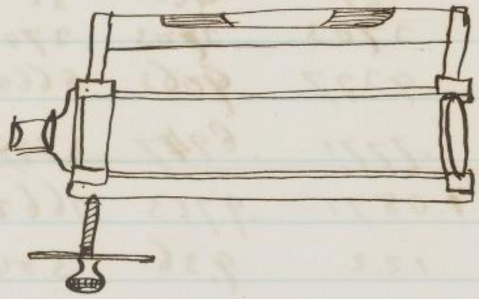
Alt.	1877.	1879.
15	32″.8	31″.8
20	24″.4	31″.0
25	18″.2	29″.4
30	11″.7	26″.8

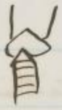
Hence the opposition of 1879 will be more favorable ~~than~~ at Cambridge than that of 1877, for observations out of the meridian.

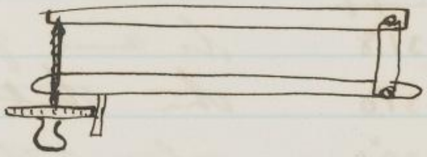
Micrometer Level

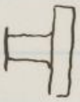


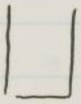




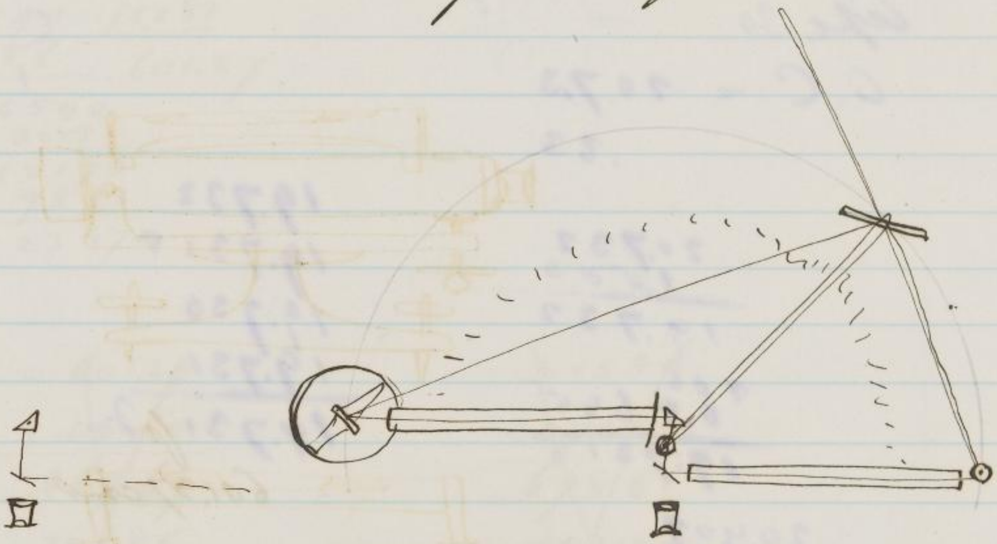








Photometer for Reflection



Focus of Transit Circle Objective

Apl. 30

C	B	A
1	0	1

a.C = 20.73
.33

20.732
1.000
19.732

20.6
0.8685
19.7315

20.409
0.679
19.730

20.250
0.519
19.731

19.732
19.7315
19.730
19.731
19.731 fr mean, aC. before
= 601,37 cms

131,68 cms = BB'

I

CP	W
3.00	29.6
3.09	29.9
3.07	30.1
2.92	29.6
3,02	29.7

II

P	W
2.80	270
2.72	2,6.5
2.38	3,09
3.10	2,46
2.65	2.86
3.65	3.76
2,730	2.752

21.632 22,000 22,008 22.160
1.900 2,267 2,217 2,428
19.732 19.733 19.791 19.732 after.

mean 19.732

19.731 | 3.281
19686 601.37
4500
3281
12190
9843
23470

60137
×16.5
61785

~~o + u = 601.37~~
~~u − o = 131.68~~
~~2o 469.69~~
~~o 234.85~~
~~2u 733.05~~
~~u 366.52~~

~~3937~~
~~1.4314~~
~~15748~~
~~3937~~
~~11811~~
~~15748~~
~~3937~~
~~56.354 21~~

$\frac{1}{\quad}$

~~.42580~~
~~.27283~~
~~.69863~~
~~143137~~
~~143.14 cms.~~
~~56.35 ins.~~

~~3937~~
~~1.945~~
~~59.05~~

$\frac{1}{24}$

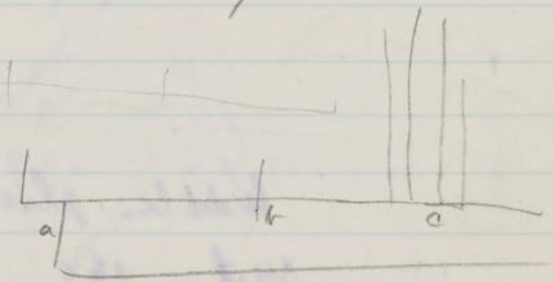
$\frac{1}{250} = .9$

$\frac{1}{240} = \frac{25}{24} \times .9$

225 | 24 .93
~~192~~ .9375
~~330~~
216
90
72
180

20 div. on .9375
46875
.8887

19



ab 16.50
bc 5.9

55.00	55.00
38.50	38.50
32.58	32.58
5.92	9

]

May 1st 1877
Width of double lines.
plate 1

57.5 54.0
57.0 53.3
57.2 53.7
57.1 53.2
57.1 53.7
57.18 53.54
53.58
2".60

May 2d 1877

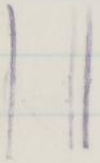
1/480" .0.087 ~~1.~~2.206
.078 .216
.082 .212
.088 .212
.088 .216
~~reading~~ .0846 1.2124

readings
1.2124
.0846
2.1278 / 28.5
1.140 4
138 39".5
285 / 2.1278
2138 13".5
1220

Readings of micrometer H ½ inch objective 1
readings of circle. 3' 21".7 3' 50".3
21.9 50.3
22.2 50.4
22.0 50.2
21.5 50.3
21.86 50.3
21.4
28.5

1.1278 turns = 39".5

6000



1/6000
12000
8
1
1
1
3

Width line plate 2

~~14.7~~ 16.8 25.2
~~15.3~~ 16.8 25.9
~~15.0~~ 16.9 26.3
~~17.0~~ 17.0 26.7 126
17.2 27.2
16.94 63 26.66

2626
1694
10

Width of double line fine to coarse plate! ½ Adj.

Micrometer			
0.297	46.9	4' 0.0	2.5
.297	47.3	0.3	2.6
.290	48.2	0.0	2.4
.303	48.0	0.0	2.6
.293	47.0	− 0.3	2.5
30	24		26
29.60	47.48	4 0.0	2.5.2

Replaced ½" Adjustm by ¼".

Interval of 1/480"

Micrometer H.

.24, eighth line

680. = 22"

upper edge	lower edge	other line upper edge	lower edge	upper edge	Circle upper edge other line
0.340	0.578	7 ~~6~~.191	7 ~~6~~.44.2	4' 18".3	3' 56.8
.330	0.587	.200	.448	18.1	56.7
.332	.595	.192	.463	18.8	56.8
.327	.585	.190	.467	18.2	57.0
.320	.584	.205	.477	18.5	56.9
49				18.38	56.84 18.38
3298	586	19.6	45.9		21.54

Should be 7 turns.

Turned the screw once, lines out of field.

" " after setting on other fine line, line returned exactly but a little out of focus.

1788 / 2522
18 / 2532
141 18
73
72
11

21.54 / 687
2061 .0313
930 26
687 1878
2430 626
8138

687 : 26 = $\frac{1}{480}$: width lines

.002

26 13

480 687

24

2748

1374

16488 / 13000

165 / 13009

33 / 26018

788 231

291

264

270

.0000788"

Read = 20ins. 1" = $\frac{1}{10000}$

Mag Ed. Evening. Accuracy of setting a line

6.6	6.7	6.0	37.0	36.2
5.7	6.3	6.2	6.7	35.5
6.4	6.3	5.1	7.2	36.3
6.9	8.2	4.4	6.7	36.2
7.5	8.7	4.2	6.7	38.3
37	2	5.9	4.3	2.5
6.62		5.18	36.86	36.50
5.18			36.50	
1.5			.36	

05 .0313

01

7°

+9.990 −15.066

−10.228 + 4.686

~~9.990~~

1.11

5.542

5.070

47

10.228

4.686

5.542

2736.84

5.29

2731.55

43

76

46

2736.84

4.69

2741.53

10.23

2731.30

2736.84

9.99

2746.83

15.07

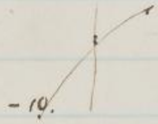
2731.76

−.110 −10.

+.038 .0

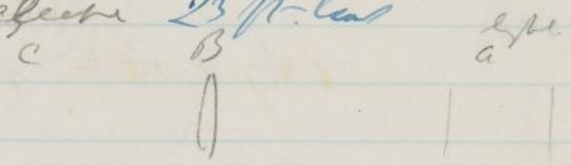
+.031 .4

+.071



Focal length of telescope 23 ft. lens

May 3d. 1877.



Diff in a

aa	bb	cc	dd
−10.01	+.04	+8.56	+.40
10.02	.04	8.58	~~.38~~
−10.015	.04	+8.57	−.39
10.01	.04	.856	39

−5.290	aa −10.013		+4.723
−5.438	+	.04	−5.478
−[illegible]431	+	8.597	−13.998
5.471	+	.39	−5.861 ~~39~~

aa		bb		cc		dd	
+ 4.52	30	−4.84	54	−13.46	44	−5.56	20
4.60	22	4.93	45	.76	14	5.61	15
4.66	16	5.19	19	.83	9	.64	12
4.72	10	5.22	16	.89	1	.74	2
4.75	7	5.31	7	.94	4	.76	0
4.87	5	5.40	2	.02	12	.84	8
4.90	28	5.49	11	.10	20	.87	11
4.91	9	5.58	20	.13	23	92	16
5.04	22	5.88	50	.95	5	95	19
5.26	44	5.94	56	.90	0	6.02	26
8.23	.173 26	37.8 51	280 40	8.98	.132 19	7.61	129 17
+4.823	1.49	5.378		13.898		5.761	
4.723		5.478		13.998		5.861	

× 5.79?

.74
1.10
.67
.46

Prof. E. Obs.

a	.149 cms.	±.047
b	.240	±.075
c	.113	±.036
d	.112	±.035
	214	
	.154	See page 101

~~89.8070~~ Prof. E. Waldo 34

89.8978 1.7 2.1 36

[illegible] 2736.37 correct: 2736.84

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{F} \qquad u + v = d$$

$$\frac{1}{u+a} + \frac{1}{v+b} = \frac{1}{F}$$

$$\frac{1}{u+a'} + \frac{1}{v+b'} = \frac{1}{F}$$

$$\cancel{Fu} + Fb + Fd - \cancel{Fa} + \cancel{Fa} = vd - v^2 + va + bd - bv + \cancel{Fa}$$

$$Fb + Fd = vd - v^2 + va + bd - bv$$

$$F(b+d) = -v^2 + v(a+d-b) + bd$$

$$\overset{}{|\,|}_{a} \quad \overset{u}{} \quad 0 \quad \overset{v}{} \quad |\,|_{b}$$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{F}$$

$$v = d - u \qquad F - b + a$$

$$\frac{1}{u+a} + \frac{1}{v+b} = \frac{1}{F}$$

$$Fv + Fb + Fu + Fa = uv + ub + va + ab$$

$$Fd - \cancel{Fa} + Fb + \cancel{Fu} + Fa = du - u^2 + ub + da - ua + ab$$

$$F(d+b+a) = -u^2 + u(d+b-a) + ab + ad$$

$$F \quad =$$

$$F = \frac{D}{4} - \frac{\cancel{D^2}\,(d-u)^2}{4D}$$

$$\frac{1}{u+a} + \frac{1}{v \pm b} = \frac{1}{F}$$

$$Fv \mp Fb + uF + aF = uv + av \mp bu \mp ab$$

$$Fd - \cancel{Fu} \mp Fb + uF + aF = ud - u^2 + ad - au \mp bu \mp ab$$

$$F(d \mp b + a) = -u^2 + u(d+a-b) - ab + ad \quad {}_{+a^2-a^2}$$

$$FD = -u^2 + uD + aD - a^2$$

$$F = -\frac{u^2}{D} + u + a - \frac{a^2}{D}$$

	47033
89.777	42.744
	1848
44.889	44.592

Waldo
Disv.

682.84

I 2731.67

2731.32

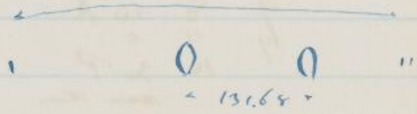
2728.

Corrected Computation of Focus of Transit-Circle Objective from page 87

$u + v = 601.37$
16.5
617.87
$u - v$ 131.68
$2v$ 486.19
z 243.09
$2u$ 749.57
u 374.78

60137
16.5 ·65
302
P 620.89
63
w 620.84
~~621.52~~
~~621.63~~
620.89

601.37
16.5
273
P 620.60
w 620.62



$\frac{1}{u} =$ 2668
4114
$\frac{1}{v} =$ ~~1272~~
.6782

$u - v = 131.68$

1.47457
3937
19685
15748
27559
15748
3937
58.0510665 ins.

	P.	w
$u + v =$	620.89	620.84
$u' + v' =$	620.60	620.62
$u - u' =$	131.68	131.68

$F = -\frac{u^2}{620.89} + u.$

$F' = -\frac{u^2}{620.60} + u - 131.68 - \frac{(131.68)^2}{620.60}$

10	40	$\frac{40}{3}$
10	20	$\underline{20}$

53.3

F	u	v
$\frac{1}{10}$	$\frac{1}{20}$	$\frac{1}{20}$
$\frac{1}{10}$	$\frac{1}{40}$	$\frac{3}{40}$

$D = 40 \quad \cancel{a\,\frac{1}{40}}$

$10 = -\frac{400}{40} + 20 + 20 - \frac{400}{40}$

$10 = -2\frac{400}{40}$

$-\frac{400.}{53.3} + 20 + 20 - \frac{400.0}{53.3}$

vol VI 2081.34
VII. 3271.52
VIII 1 1966.42
3485.86

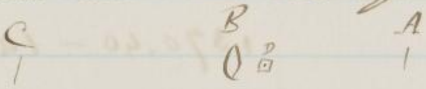
Error of Watch

May

3.	9.45	−1m − 2m	25 ℓ. 57.5		
4			2.5		
	van dorn.				
7	10 30	0	+25	25	
8	8 30	−2	+ 21.	−99	
	5 20	−2	+ 6	−114	
9	8 30 A	−4	+36	−204	
9	11 0	0	0		7.5
	10 30 P	−1	.21		
	van dorn				
10	8 25.		+34		
11	9.0. A.m.		+18	+18	
	1.0 P.m.		+ 13	.13	
	~~2~~.45 P.m.	~~5~~	+11	11	
12	8 30 A.m.		+ 3	3	
13	9 05 A.m.	−1	+44	−16	
	9 P.m.	1	+60	−20	
14					
	11 P.m.	1	+22	−38	
15	8 30 A.m.		+18	−42	
	11 20 P.m.		+ 15	−45	
16	8 30 A.m.		+ 8	−52	
	11 let at jewellers				
	11 P.m.	−1	+56	−4	
17	8.15 A.m.	−1	+ 58	−2	
	10 P.m.		53	−7	
19	20		55	−5	

			Hen	Bessel
May 18	20		+9	
19	10		+28	-1
	21		+28	-2
20	9	20	+36	-3
	20	20	+39	-5
21	16	30	+47	-6
	21 ~~17~~		+46	-7
22	12	0	+57	-9
	20	40	+49	-9
23	11	20	40	-10
	20	30	34	-11
26	21 at	15	-57 +3	-16
26	9	45	+17	

Measurement of the 23 ft Objective
at Cambridge Arsenal. May 3d, 1877.

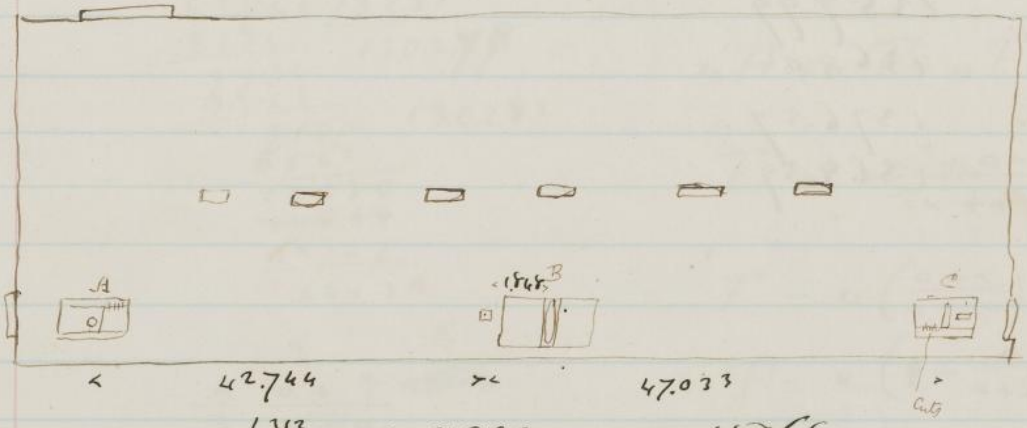
The lens was fixed in position and the settings were made by moving C and 

drawing line ~~with~~ knife
across edge of slider and base. The readings were made alternately bringing C to and from B. The distance apart of the cuts was measured in the afternoon. The rapidity of this method is very great 40 readings being made between 12.45 and ~~1.05~~ (12.52)

The same measurements of A C were used as those of Mr. Waldo.

The observations (see p. 91 93) gave the following results
Mean distance =

	A	C			
2736.84	+ 10.013	+ 4.723	=	2731.55	±.047
	+ .04	− 5.478	=	2731.40	±.075
	+ 8.567	− 13.998	=	2731.41	±.036
	+ .39	− 5.861	=	2731.37	±.035



1312 2736.84 .08	+ 9.990 ~~− 15.066~~	− 15.066 ~~+ 9.990~~	=	2731.76	±.05
	+ 10.228	+ 4.686	=	2731.30	±.06

Assuming optical centre 4 cms. within glass.

[illegible] edge to cell cell to gl. gl. to [illegible]

u = 1302.82 + 18.48 + 41.80 + 3.30 + 4.00 = 1370.40

67 58 1.60 1368.00

u v = D − u f.

1370.40 − 10.013 = 1360.39		682.87
+ .04 = 1370.44		.84
+ 8.567 = 1378.97		.78
+ .39 = 1370.79		.88
		17
		682.842

L.A.	682.861	682.838	682.84	.23
	682.815			.23
E.C.P.	682.87	682.842		.3
	682.84			0
	682.78			.6
	682.88			.4

Corrected

u

1357.99

1368.04

1376.57

1368.39

33

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{F'}$$

$$vF' + uF' = uv$$

$$(D - u)F' + uF' = uD - u^2$$

$$DF' = uD - u^2$$

$$D\,dF' = D\,du - 2u\,du$$

$$\frac{dF'}{du} = \frac{D - 2u}{D} = 1 - \frac{2u}{D}$$, if $2u$ = nearly $D = 4F'$

$\frac{dF'}{du}$ becomes very small or the method very sensitive

If u is constant, to find the change in F' from a change of D

$$D\,dF' + F'\,dD = u\,dD$$

$$\frac{dF'}{dD} = \frac{u - F'}{D} = \frac{1}{4} \text{ when } u = 2F'$$

$$\frac{1}{2F' + a} + \frac{1}{2F' + b} = \frac{1}{F'}$$

$$\cancel{2F'^2} + \cancel{bF'} + \cancel{2F'^2} + \cancel{aF'} = \cancel{4F'^2} + 2aF' + 2bF' + ab$$

$$aF' + bF' + ab = 0$$

$$a = \frac{-bF'}{b + F'}$$

$$\frac{1}{u + a} + \frac{1}{u} = \frac{1}{F'}$$

$$uF' + uF' + aF' = u^2 + au$$

$$F' = \frac{u^2 + au}{2u + a} =$$

$$F' = u\left(\frac{a + u}{a + 2u}\right)$$

$$F' = u\left(1 - \frac{a}{a + 2u}\right)$$

$$u\left(1 - \frac{a}{D}\right) = \frac{u(D - a)}{D}$$

42.744 / 3.281

3281

9934

~~9843~~

9100

6562

25380

~~22848~~

22967

24130

13.02~~98~~

13.0282

$$\frac{u}{2}\;\frac{a' + \frac{u}{2}\;\overset{-\frac{a'}{2}}{}}{a' + u}\quad \frac{a'}{2}$$

$$\frac{u}{2}\left(1 - \frac{u}{2(a' + u)}\right) = \frac{u}{2}\left(1 - \frac{u}{D}\right)$$

$$\frac{u}{}$$

$$\frac{1}{u+a} + \frac{1}{u} + \frac{1}{F} \therefore 2uF + aF = u^2 + au$$

$$F = \frac{u(a+u)}{a+2u} = \frac{u}{2}\left(1 + \frac{a}{a+2u}\right) = \frac{u}{2}\left(1 + \frac{a}{D}\right)$$

$$\frac{u}{2}\left(1 + \frac{u-v}{u+v}\right) = \frac{u}{2}\,\frac{2u}{u+v} = \frac{u^2}{u+v} = F \quad \cancel{\frac{1}{F} =} \quad uv = uF + v/$$

$$F = \frac{uv}{D}$$

	1380.55	1360.33
	1351.21	1370.97
	2731.76	2731.30
lg. u	.1400524	.1336442
	.1307228	.1370280
	.2707752	.2706722
	.4364425	.4363690
	.8343327	.8343032
	682.86	682.815

295/63

Computation of v and u for assumed focus 682.8

u	1365.6 ~~682.8~~	1375.6	1355.6
v	1365.6		
$\frac{1}{u}$	29290	29078	29507
$\frac{1}{F}$	14645	14645	14645
$\frac{1}{v}$		14433	14862
v	1		
	14645	.145391	147536
	146456	.146456	146456
		72695	73768
		.73761	.72688
	1365.6	.1355.73	1375.74
D	2731.2	2731.33	2731.34

	2731.55	2731.40	2731.41	2731.37
u	1360.39	1370.44	1378.97	1370.79
v	1371.16	1360.96	1352.44	1360.68
a = u − v	−10.77	10.52	16.53	10.11
log u	.1336602	.136859	.139535	136969
log v	.1370881	.133848	.131118	.133758
log uv	.270748	.270704	.270673	.270727
log D	.436409	.436385	.436387	436380
log F	.834339	.834319	.834286	.834347
F	~~682.24~~ 682.87	~~681.27~~ 682.84	682.78	682.88

Elimination of Personal Equation.

May 7th. tried eyepiece. difficulty cannot push it in to focus.

3060

May 8th. Observed several stars. 299.8 = β Leonis
$\overset{7\,99}{74°}$ $\overset{8}{45}$ 225 = Pole $\underset{54}{315}$ = equator.
γ Ursa. 260.6

299.8	260.6
15.3	54.4
315.1	315.0 = eq.

δ Virg = 315.0 − 9.4 = 305.6 Obs. 305.24

images of stars probably too large to give satisfactory results after 2D! in diameter
Mr. W. calls saying with Ruddam Franklin "exceptionally poor"
β Corvi − 22.7 337.7

Occultation of Regulus May 19th
Observed with large equatorial
9h 34m 7.2s
2m 31.6s fast of S. Clock 1327

4 f 2451 Comp. with Bond 394
9 43 18 5 51 0
34 7.2 9 9.3
9 10.8 5 41 50.7 M.T. if Bond 394 is right
550.8 16.

1.5
9 34 7.2
3 49 23.3
5 45 4.9

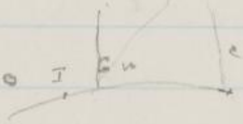
~~5 8 12.4~~

3 49 23.3

5 8 12.4
23 41.5
4 44 30.9 = Long. H.C.O.

9 34 7.2
4 44 30.9
14 18 38.1 = S. Sid
3 49 2.3
10 29 35.8

3 49 53.0 I



23 41.5

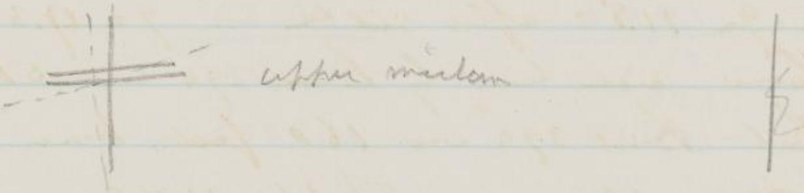
9 34 7.2 Obs. time
3 49 49 = S. time of mean noon Greenwich
5 44 18.2
50.5
5 43 27.7 m.t. by F.3451 chron.
5 41 50.7
1 37.0 = other chron.

5 41 34.7 will be obtained time if Bond 394 is 16s fast.

Result.

Observed time of disappearance 9h 34m 7.2s
by F 3457
Took F 3457 to clock room and compared with
B. 394. 9h 43m 18s coincided with 5h. 51m 0s *
or 9m 11.8s after sid time = 9m 9.30. m. time after.
Hence mean time by Bond 394 was 5h 41m 50.7s
But Bond 394 was 16.0. fast, hence ~~the~~ true time
of immersion was 5h 41m 34.70.

March 8th 1877 Setting of 12 plates at 30°
Middle E.
~~60° 0 0.0~~ altered since plate not horiz.
59 0 0.0
Glass line set on upper side of upper double micrometer line.



May 10th 1877, 9-11 P.M. tried new plate holders.

May 11th 1877. 10.15. A.M. set two lines remained nearly in focus but moved radially

May 15th.
36.0 85.42 522 dir. 43.5
Set. 12 plates twice second time after 522 dir.

May 16th 22.20 began setting ~~[illegible]~~ micrometers with 1st objectives 23.20 1 hour.
56.3 - 17.5 = 38.8 2.4. 54.0
~~17.5~~
55.9
56.1
57.1
57.2
56.0

1st Set of twelve readings 23 25
by I.

59° 0	1.4	1.7	59.8
	1.3	1.7	59.7
	1.8	1.5	59.9
	1.5	1.2	59.4
	1.9	1.1	59.6
	29	22	3.4
	1 58		
	1.58	1.44	59.68
	57.5	1.2	57.7
	58.3	0.2	9.7
	57.7	1.3	9.2
	57.7	0.7	9.0
	57.7	1.0	9.7
	3.9	4.4	2.3
	57.7.8	0.88	59.46
	1.5	1.7	6.1
	1.4	2.1	5.6
	1.3	2.0	6.2
	1.3	2.7	6.2
	0.7	2.2	6.2
	7.2	.7	3
	1.24	2.14	6.06

6.2	6.8	4.8
5.7	6.5	5.0
5.7	6.3	5.4
5.7	5.7	5.4
5.8	6.3	5.0
4.1	1.6	.6
5.82	6.32	5.12

23, 50

		Mich. mean	
3.3		54.6	3
3.3	54.0	55.5	6
3.2		54.2	7
3.3		54.6	3
3.3		55.6	7
1.4		54.9	26 .46 div. = P.E
63.28			

Magnitude of one div. micrometer

46.4 1 turn Mic. A = 63.28 − 46.72 = 16″.46
46.7 1 div. = ″.277
46.6
46.8
47.1
36
46.72

2nd Series of tenths settings 17d 6.0

Micro. E. Micro A. 54.1

59 0 3.7	2.7	0.7
4.0	2.6	0.9
3.5	2.4	0.7
3.4	3.0	0.8
3.3	3.2	0.6
2.9	3.9	3.3
3.58	2.78	0.66
59.0	2.0	1.6
59.1	1.7	1.3
59.6	1.0	1.7
59.6	1.2	1.8
59.2	1.2	1.7
1.5	2.1	3.1
59.30	~~1.4~~2	1.62
		+0″.5 diff per.
2.3	1.4	4.8
1.7	2.3	5.3
1.9	1.3	4.7
1.9	1.8	5.2
1.7	1.8	5.6
3.5	8.6	55
1.90	1.72	5.10

	−5″ out	−5″
6.7	7.0	7.8
6.9	6.5	7.2
6.3	6.3	7.5
5.8	6.6	7.2
6.8	6.0	7.6
2.8	2.4	23
6.56	6.48	7.46

? repeated

12h 33m

Setting A

7.0	5.4		49.3	4	
7.1	5.0		50.1	4	Should have
6.8	5.3	54.1	50.2	5	been 53.7
7.3	5.4		49.6	1	$= 54.1 - \frac{54.1 - 49.72}{2}$
7.3	4.8		49.4	2	
.5	9		3.6	16 .28 = PE	
7.10	5.18		49.72	4.4	

Magnit of 1 div of micrometer.

2′	9.2	2	a″ 42.7	2	3.2	1	1	28.3 ~~29.0~~	1
	9.2	2	42.9	0	3.7	4		27.8	.6
	9.0	0	42.7	2	3.2	1		28.3	1
	9.0	0	43.2	3	3.3	0		28.7	3
	8.7	3	42.8	1	3.3	0		28.7	3
	.1	.7 .12	4.3	8 .14	17	6 .11		18	14 25 .24
	129.02		42.86		3.34			28.36 3.32	

42.86 5 turns head = 300 div

~~33.84 = 300 div.~~

86.16 85.02

~~28.7~~ ″.2872 ″.2834

I	II	II − I ~~I − II~~		Diff from mean		Av.
1.58	3.58	+ 2.00		+.79	−.17	+31
1.44	2.78	+ 1.34		+ 93	+.63	+.78
59.68	0.66	+ .98		+ 2.69	+275	+2.72
57.78	59.30	+1.52		+459	+411	+4.35
0.88	1.42	+ .54		+1.49	+ 1.99	+1.74
59.46	1.62	+1.16		+2.91	+179	+2.35
1.24	1.90	+ .66		+1.13	+157	+1.32
2.14	1.72	− .42		+ .23	+1.69	+.96
6.06	5.10	− .96		−3.69	−169	−2.69
5.82	~~[illegible]~~	+ .68	+.44	−3.45	−307	−3.26
6.32	6.48	+ .16	+.66	−3.95	−4.05	−4.00
5.12	7.46	+2.34	+1.14	−2.75	−3.69	−3.22
3.28	7.10	+3.82	+1.98	−.91	−1.77	−1.34
	5.18		+1.90			29.04
Mean 2.37	3.41					

Comparison Av. deviations with Resid. from curve of light

ΣD 29.04 Ch ± 1

Σ Resid. 6.48 7

Mech Dis

+.10	+.21
+1.50	-.72
+2.40	+.32
+2.90	+1.45
+2.70	-.96
+2.10	+.25
+1.20	+.12
.00	+.96
-2.00	-.69
-3.30	+.04
-3.60	-.40
-2.90	-.32
-1.30	-.04
	6.48

May 17th 1877 22h.
Replaced 1" by 1/2"
Set a heavy line upper short line of eyepiece ~
heavy line of plate
No 2. three fine, and [illegible] line
Set approx without brass circle readings.
No 11 upper ~~line~~ end of upper line.
12 upper part of upper line
6.7 1st reading of H. 2 3.5 after
3.7
124.12 4.5
6.7 4.1
117.42 6.8
9.78 6
6.7 4.12
16.5
Set. H at 16.5 22h45m

Series III, IV.

Set 1 Set

	I	G	I	G	I	G
0	1.2	15.9	0.0	15.2	59.2	17.7
	0.8	16.1	0.2	.9	58.8	.8
	0.9	16.5	59.8	.6	58.7	.4
	1.1	16.9	0.0	.4	58.7	.9
	0.7	16.5	0.0	.8	58.2	18.1
	refocused A 4.7	19	0.0	29	36	39
	0.94	16.38	0.00	15.58	58.72	17.78

3		4		5	
I	G	I	G	I	G
57.8	21.9	57.5	22.1	1.4	19.2
7.7	2.1	58.0	22.1	1.2	19.8
7.9	2.4	57.6	22.3	1.3	19.7
7.7	2.7	58.0	22.5	1.6	19.6
7.7	2.7	57.7	22.1	1.3	19.9
	28	38	1.1	18	32
57.70	22.36	57.76	22.22	1.36	19.64

moved back 5.7 to set
vertical line & did not [illegible]

6		7			
I	G	I	G	I	G
3.3	3.9	6.7	25.9	7.8	24.7
3.3	3.4	6.6	.6	7.7	5.0
2.9	3.9	6.7	.5	7.5	5.2
3.0	3.7	6.4	.9	7.3	5.7
3.4	4.2	6.7	.7	7.3	4.9
09	41	31	36	2.6	5.5
3.18	3.82	6.62	25.72	7.52	25.10

9		10		11	
I	G	I	G	I	G
10.9	20.8	9.9	20.9	13.0	21.9
.9	1.2	10.4	1.3	2.9	22.2
.7	1.5	10.8	1.7	3.4	22.3
.7	1.3	10.4	1.1	3.1	22.7
5	1.4	10.3	1.1	3.3	22.7
35	1.2	18	1.2	7	18
10.70	21.84	10.36	21.24	13.14	22.36

12				
I	G	Mic.		
11.7	23.3	16.5	16 28.9	
12.1	23.8		28.3	236 24
11.5	23.7		29.3	
11.6	24.0		29.5	
16.6	24.2		29.6	
25	40		56	
11.50	23.80		29.12	

2

Rest. 16.5 16. 28.8 apparent condition of
an [illegible]

29.5
29.2
29.0
29.5
10
29.20

23440

89.20
16.5
72.7
606
165
226

Set again with A at 22.6 1

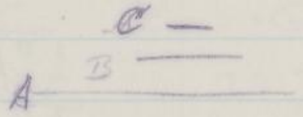
17.2
~~15.8~~
17.0
17.0
17.1
17.7
1.0
17.20

77.2
22.6
54.6

Magnit of divisions. [illegible]

I

55.2 4	58.7	7	55.4 ~~55.4~~ 20.5	2	53.3	41.8	5
	59.1	3	19.8	5		41.0	3
	59.1	3	19.9	4		1.0	3
	60.2	8	20.4	1		1.6	3
	59.7	3	20.8	5		1.3	0
	1.8	24 .48 .41	6.4	17 34 .29		17	14 28 .24
	59.36		20.28			41.34	
	20.28		80.24 41.34				
	39.08		38.96				
	".1303		".1298				



A 0 13.5
B 0 41.2
C 1 6.6

27.7
25.4

277
831
3.60

254
762
3.30

Prob. Er. (41 27 24 94 .31

".05

May 22d 1877. 8 P.M. Set 12 places. [illegible] much too close. Set by circle 5 3″.7 out;

5

repeated without touching the plates. All agreed exactly except 9 and 10. 9 being ″.6 – ″.7 out 10 about .2″ out;

Mic H at first 6.7 at end 6. 59.7 6.7 6 53.0 = 35~~3~~.0

~~49~~

35/3
/3
1059
35/3
45,89

7.0

413
13
1237
413
5369

12/413
34.4
6.7
41.1

rund = 7 minutes ~~39.9 6~~ 41.1
41,0

41.1
39.94
1.16

40.7
~~37.5~~
39.4
39.4
39.5
40.7
147
39.94

Error 1.16 div = ″.15

·5, 6

10.03 P.M. Time at 41.0

		2		3	
Σ	G	Σ	G	Σ	G
4.7	21.4	2.3	22.7	59.3	24.8
4.5	21.3	2.4	22.8	9.3	24.9
4.4	21.8	2.3	23.2	0.8	25.2
4.3	21.9	2.2	22.5	9.8	24.9
4.5	21.7	2.1	22.3	9.5	25.2
2.4	31	12	35	17	50
4.48	21.62	2.24	22.70 22.70	59.34	25.00

4		5		6	
Σ	G	Σ	C	Σ	G
59.5	24.5	1.2	25.5	1.2	22.7
60.0	4.7	1.5	5.2	0.7	3.8
9.7	4.3	1.1	5.3	1.5	4.2
9.9	4.0	1.4	5.7	0.9	4.0
9.7	4.3	1.3	5.4	0.9	4.0
38	18	1.5	2.1	5.2	4.7
59.76	24.36	1.30	25.42	1.04	23.94

7		8 at ^{H}.7 ±		9	
Σ	G	Σ	G	Σ	G
2.1~~4.5~~	22.3	3.4	22.3	7.0	18.8
2.0~~1.9~~	22.7	3.7	22.2	6.2	18.8
1.8	23.2	3.7	22.2	6.8	18.9
2.1	23.3	3.9	22.1	6.8	18.7
2.2	22.7	3.9	21.9	6.7	18.7
.2	42	36	.7	35	39
2.04	22.84	3.72	22.14	6.70	18.78

10		11		12	
Σ.	ς.	Σ	ς.	Σ	a
5.5	17.5	7.9	18.8	7.2	20.8
5.2	17.8	7.4	18.7	7.3	20.5
5.2	18.3	7.7	18.5	7.1	20.8
5.3	17.9	7.8	18.7	6.8	20.3
5.5	17.8	7.6	18.7	6.8	20.9
17	4.3	34	34	.2	3.3
5.34	17.86	7.68	18.68	7.04	20.66

Mean. H. from 41,0

49.7
49.3
50.8
50.2
50.0
70
50.20

10.40 went round again

7	8 41.0	
2 right,	40.3	-.7
3 right	39.2	-1.8
4 +.4	34.0	-6.0
5 about right	38.0	-3.0
6 right ~~do~~	42.5	+1.5
7 right,	3~~9.7~~ 6.5	-4.5 dist not lit
8 .3 below	37.2	-3.8
9 .3 above	35.2	-5.8
10 .2 above	37.0	-4.0
11 right	39.9	-1.1
12 .1 above	39.7	-1.3
1 ~~right~~ 1.1 below	45.8 45.8	+4.8

11.1

Micr. H set at 41.0

	9 Estim.	10 Mic. H	
2	1."0 ab. above 4."9	~~36~~ 34.7	-6.3
3	.4 ab.	35.0	-6.0
4	.2 ab.	34.5	-6.5
5	~~right~~ .6 above	36.2	-4.8
6	.3 below.	43.0	+2.0
7	.3 above	36.0	-5.0
8	right	39.7	-1.3
9	.9 above.	33.4	-7.6
10	.1 above	40.4	-0.6
11	.1 above	40.3	-0.7
12	.2 below.	42.7	+1.7
1	.9 below.	46.2	+5.2

Compar. last two col.

-.7	-6.3	+5.6
-1.8	-6.0	+4.2
-6.3	-6.5	+0.2
-3.0	-4.8	+1.8
+1.5	+2.0	+0.5
-4.5	-5.0	+0.5
-3.8	-1.3	-2.5
-5.8	-7.6	+1.8
-4.0	-0.6	-3.4
-1.1	-0.7	-0.4
-1.3	+1.7	-3.0
+4.8	+5.2	-0.4

May 22d. 1877 W. A. R. and J. F. McC.
see Rogers Obsn. Record Bk. A1, 1877 under
date of May 22d. 1877.

May 23rd. 8.45 Set 12 plates. dist [illegible] [illegible].

E H

4.2 to 43.7 13.7 to 19.0

39.5 305.3

25.4 39.1

13.7

305.3 / 39.5

12. 305.3

947°

9.02 set at 39.1

Meridian 39.2 to 57.0 + denotes above

9.12 ±

24-25		1	2	+.1	3	−0.1
	E	G	E	G	E	G
0	7.7	22.8	6.2	25.3	3.7	29.7
	7.0	23.4	6.6	26.0	3.8	29.2
	7.2	23.4	6.8	25.2	4.0	29.3
	7.7	23.7	6.5	26.2	4.6	28.9
	7.3	23.1	6.0	25.8	4.2	28.8
	1.9	14	21	35	.3	.9
	7.38	23.28	6.42	25.70	4.06	29.18

	−0.1	5	−0.1	6	−0.2
E	G	E	G	E	G
4.2	28.0	5.5	28.9	6.3	~~29.3~~
4.3	27.5	5.8	28.7	6.8	28.2
4.4	28.2	5.5	28.3	7.2	28.4 28.6
4.2	28.7	5.7	28.8	7.0	28.7
4.0	28.0	5.4	29.7	6.7	28.3
11	4	29	1.4	40	2.2
4.22	28.08	5.58	28.88	6.80	28.44

7 −0.0		−0.2		9 −0.3	
E.	G.	E	G	E	G
8.0	27.7	9.0	26.4	12.8	23.8
7.8	27.8	9.1	26.6	12.2	23.2
8.4	28.0	8.6	26.8	12.7	23.2
8.3	27.8	8.8	26.7	13.0	23.2
8.0	27.8	8.6	26.4	12.8	23.2
5	4.1	41	29	35	16
8.10	27.82	8.82	26.58	12.70	23.32

E. 10 −0.0	G	E 11 −0.0	G	12	−0.4
11.9	22.2	12.8	23.2	12.2	24.5
12.2	21.9	13.0	23.6	12.3	24.9
11.3	22.3	13.3	23.5	12.2	24.8
11.6	22.3	12.7	24.2	12.2	25.2
12.2	22.3	13.7	23.0	12.2	25.2
42	10	5	25	11	46
11.84	22.20	13.10	23.50	12.22	24.92

Min H 39.1

58.1
57.0
57.2
58.2
57.0
25
57.50

Read again

H = 39.1

	23 exp. 126.7 Ecl.	26 Est.	27 Read.		
2	+.1	−0.1	39.7	−.6	.09
3	−.1	−0.1	40.8	−1.7	.22
4	−.1	+0.1	37.8	+1.3	.17
5	−.1	−0.1	39.8	−.7	.09
6	−.2	+0.6	36.2	+2.9	.38
7	−.0	−0.1	41.2	−2.1	.27
8	−.2	−0.3	42.3	−3.2	.42
9	−.3	−0.2	41.2	−2.1	.27
10	−.0	−0.1	40.0	−0.9	.12
11	−.0	−0.1	41.3	−2.2	.29
12	−.4	−0.7	48.2	9.1	1.18
1		−3.1	61.0		

61.0
60.0
59.9
61.0
61.2
31
60.62

last reading (−3.1) seems to be out of focus

May 24th 1877. Went around levelled lens

I.

11.7
8.15

3.2

H = 1.3 to 2
10.3
11.6

3.7
4.9
4.7
4.7
4.4
24
4.48

124.4 8
1.3
123.1
10.3

Jy.

'36. 37 ? 37.

1		2		3		4	
E	G	E	G	E	G	E	G
14.2	31.2	13.4	32.5	10.3	36.9	10.8	35.3
14.7	31.6	13.0	32.6	9.8	37.2	10.6	36.2
15.1	30.8	13.4	32.7	9.8	38.3	10.4	36.0
15.7	31.2	13.2	32.5	10.3	38.3	10.9	36.0
15.0	30.8	13.6	32.7	10.3	37.8	10.5	36.2
4.7	56	16	28	55	35	32	47
14.94	31.12	13.32	32.56	10.10	37.70	10.64	35.94

5		6		7		8	
E	G	E	G	E	G	E	G
12.2	36.2	12.4	35.2	13.4	35.2	15.3	34.3
12.1	36.0	11.8	35.3	13.3	35.0	14.4	34.1
12.0	36.1	12.7	36.1	13.7	35.2	14.8	33.7
11.7	36.0	12.4	35.8	13.7	35.3	15.1	33.5
11.8	36.8	12.1	35.8	13.9	35.3	15.3	33.1
4.8	11	15	32	30	1.0	50	3.7
11.96	36.22	12.28	35.64	13.60	35.20	15.00	33.74
		+.2	13.6	+.1	14.0	−.1	16.1

9		10		11		12	
E	G	E	G	E	G	E	G
18.8	30.0	18.1	30.3	20.0	29.9	17.8	30.8
18.7	29.8	18.3	30.2	20.2	30.9	17.8	31.3
18.3	29.7	18.1	30.1	20.3	30.7	18.1	31.9
18.3	30.0	18.2	30.0	20.4	30.7	18.1	31.8
18.0	30.0	18.2	30.1	20.1	31.0	18.0	31.3
21	25	9	7	10	32	4.8	21
18.42	29.90	18.18	30.14	20.20	30.64	17.96	31.42
.0	16.1	−.3	18.3	−.2	19.7	−.4	19.2

	H	E	G
−1.8	29.5	16.8	33.2
	29.7	16.3	33.2
	29.9	16.5	33.2
	29.7	16.5	33.1
	30.8	17.2	33.1
	46	83	8
	29.92	16.66	33.16

17 5'

52.7 [illegible] for in [illegible] reading.
~~53~~.2 8.48 P.m.
52.6
53.2 15.1 26.8
52.7 27.4
64 27.4
5288 27.6
11.6 27.8
12 | 6228 20
3.52 27.40
11.6 15.1
15.1 12.3

	28	29	30	31	32	33	34	35
	ab 15.1					III		
Time	9.01	I	Time 9 13	II	10-1 P.m. & 10-14 "		10 45	
2	-.2	17.6 ~~22.5~~	0	14.7	+.1	13.1	+.2 ~~+.2~~ ~~-.1~~	12.0 ~~14.3~~
3	.0	14.7	+.1	12.7	2.2 +.3	13.4	-.1 ~~-.1~~	18.0 ~~16.7~~
4	+.2	11.2 ~~9.9~~ ~~7.7~~	.0	14.3	+.2	13.4	.0	14.8
5	+.3	10.2	+.5	10.3	+.2	11.3	.0	14.8
6	.0	15.1	-.2 ~~+.3~~	17.2 ~~10.2~~	+.3	9.8		
7	+.6	8.6	+.2	11.7	+.2	12.0		
8	0	14.2	.0	13.2	+.1	12.7		
9	+.4	9.2	+.3	8.3	+.8 ~~+.7~~	7.3		
10	-.1	15.6	.0	14.7	-.1	16.3		
11	.0	15.4	-.1	15.8	.0	14.2		
12	+.1	12.8	.0	13.2	.0	14.2		
1	-1.4	25.7	1.7	28.1	3 -1.7	26.7		
	? should have been 1.7			28.7	3	27.5		
			9.26	27.8	6	28.1		
Read 2 [illegible] 3 went back				28.3	1	28.8		
	53			29.1	7	28.2		
				28.40	20	27.86 43		
					17	.34		

11.25 ~~[illegible]~~

11.27

May 24th, 21h, 1877. [illegible]

.1

Ecl.

3 3 30.5

30.3

30.5 lines on left time

31.3

31.4

40

30.80

9-26

	40 ~~[illegible]~~ Ecl.	41	42	43	44 Ecl.	45 133	for [illegible]
2	+3.0 ~~+.1~~	53.9 ~~+6.8~~	+2.2	59.0	+1.5	6.1	[illegible] 2
3	-.8	18.9	-.2	18.7	-2.2	33.4	4
4	+1.5 ~~+2.1~~	3.0 ~~1.8~~	+.9	9.0	+0.9	6.2	4
5	+1.4	5.6	+1.3	4.8	+0.5	13.2	2
6	+2.0	2.1	+1.5	5.7	-0.3	17.6	5
7	+0.8	8.7	+1.0	10.5	-0.9	21.3	5
8	+1.8	0.8	+1.7	4.1	+0.8	8.7	4
9	+3.6	52.4	+3.7	52.7	+0.9	8.0	4
10	+.3	11.2	+.4	9.8	+0.3	11.7	4
11	+.5	8.1	+.7	7.7	-0.1	24.1	2-
12	-.2	17.2	-.1	15.7 17.2?	-1.7	26.7	5
1	+.3	12.7	-0.7	16.2	-1.0	19.7	2

9.37

May 25th 0h. [illegible] H [illegible]

[illegible] plates

[illegible] 45

13.3

13.4

13.3

13.2

14.0

22

13.44

Last. of 39
29.3
31.3
31.7
31.4
30.7
44
30.88

$I_1 = a^m \quad \cdot \log I_1 = m \log a$

$\log I_1 = .4m$

Comput of Sch. S Cancri

f 1.3
4.5
e 5.8
4.2
b 10.0
4.3
g 14.3

7.3	7.3	7.3	7.8 = 7.5		5.8 3.5 9.3	9.0	9.5
6.3	6.6	8.8	8.25	8.5	7.8	8	7.9
5.1	4.3	7	9.	8	6.8	7	6.9
5.3	4.8						
5.3	4						
16.5							
6.0							

---

11 25

11.27

	38	39	
2	+.1	14.9	1
3	-.2	17.7	2.6
4	.0	15.3	.2
5	-.3	16.9	1.8
6	-.2	16.2	1.1
7	-.2	17.6	2.5
8	-.6	19.8	4.7
9	-.1	14.9	.2
10	-.2	17.1	2.0
11	-.3	18.2	
12	~~-1.0~~ .9	19.8	
1	-1.9	293	

Computation of Secular Precession in Declination

$$d\delta = d\delta_0 \left[1 - .0000043\,(y-1850)\right]$$

$$d\delta_0 = 20.0564 \cos a$$

$$d\alpha = m + ny + d\alpha \tan\delta$$
$$d\delta = m'(1-\mu y) = d\delta = P\cos\alpha\,(1-\mu t)$$

$$d\alpha = m + nt + d\alpha \tan\delta \quad d\alpha = \frac{m+nt}{1-\tan\delta}$$
$$d\delta = P\cos\alpha\,(1-\mu t)$$
$$\alpha = A + a \qquad \delta = D + d$$

$$d\delta = P(\cos A \cos a - \sin A \sin a)(1-\mu t)$$
$$d\delta = P(\cos A - \sin A\, d\alpha_0)(1-\mu t)$$

$$d\alpha = \frac{m+nt}{1-\frac{\tan D + \tan d}{1+\tan D \tan d}} = \frac{m+nt\,(1-\tan D \tan d)}{1-\tan D\tan d - \tan D + \tan d}$$

$$d\delta = 20''.0564\,(\cos A - \sin A\, d\alpha_0)(1 - .0000043\, t)$$

Assuming that the change in R.A. can be neglected

$\Delta\delta = \Delta_0\delta - .0000043\, y\, \Delta_0\delta$ $\qquad dx = dx_0 - at\, dx_0$

$\delta = y\Delta_0\delta - \frac{1}{2} y^2 .0000043\, \Delta_0\delta$

$\delta = \delta_0 + (y - \frac{1}{2} y^2 .0000043)\Delta_0\delta$

$\left(\mu - \frac{\delta - \delta_0}{t}\right)$

9

.3

.02

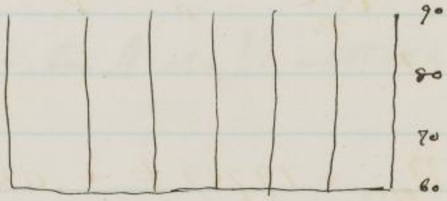
$\delta' = \delta + p \cos\alpha$

$\alpha' = \alpha + m.\ \tan\delta \sin\alpha \qquad \alpha$

2d Diff. when 1st Diff > 500

47 H Cephei	48 H Cephei		c Persei		Groom 716
2h49	3h4		3h59		3.31
700 - 751	731	774	542	550	588 - 598
11		8	1		2
9		9	2		3
11		8	2		2
9		9	2		3
11		9	1		2

H Camel.	1 Camel.	4 Camel.	9a Camel.
3 46	4 32	4 37	
604 - 621	623 - 630	672 - 681	
3	2	1	
4	1	3	
3	1	1	
4	1	3	
3	2	1	



Groom 966
5.23

1117	1151		
6	6	1117	
			6
9	8	1123	
			7
4.?	6	1130	
			8
9	8	1138	
			7
6.	6	1145	
			6
		1151	

λ Ursae

55	4.526	1870	9.570
56	36.723	80	8.782
58	0.789	90	7.936
59	16.164	1900	7.040

.788 58 . 8
.846 50
.896

7.222
7.131
.91
04

α Ursae Minoris

									Δ.
1750	19.719								310
			.031					31	
60	.688			2					330
			33					34	
70	.655			2					350
			35					37	
80	.620			4				40	390
			39			39			
90	.581			3			4	43	420
			42 43			43			
1800	.539			6			4	46	480
		2	48 7			47			
10	.491		50	1	492		3	49	490
		3	49			50			
20	.442			9	443		8 7	52	580
			58			58			
30	.384			5	384		5	55	630
			63						
40	.321			6					690
			69						
50	.252								
	D_1		D_2	D_3	D_4				

$D = 1$

$$D = D_{1750} + 19.719\,t + .031\,\frac{t(t-1)}{1.2}$$

1870	55	4.526			
			92.197		
80	56	36.723		8.131	.560
			94.066	8.691	
90	58	0.789			
			75.375		
00	59	16.164			

$$\delta = \delta_0 + \mu_2 t + \Big| a t^2 + b t^3$$

3.6220
4

$\mu_2 = 3.6220$
60

5 23 21.7320

5h 26m 37.320
37.258

.062

3.9591
14.9404
3.5083

22.4078

448156
~~14.9.717~~ 345
149.404

~~5~~ 2' 149.404

.019

.019

3.9591
14.4880
~~37~~
3.2787

6 | 21.7258
3.6210

37351
4

149.404

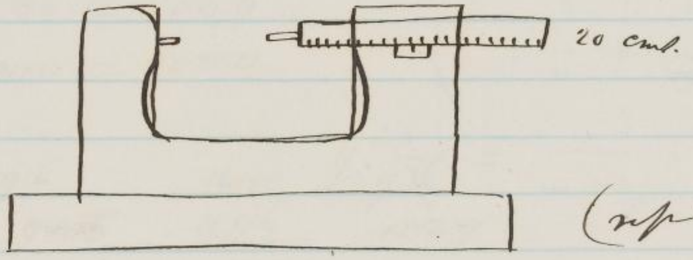
~~t = 40~~

t	
40	.019
60	.062

1.5 3.15

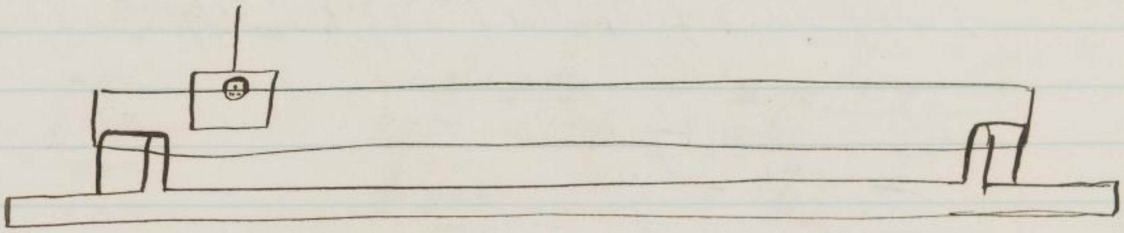
A

Calipers.

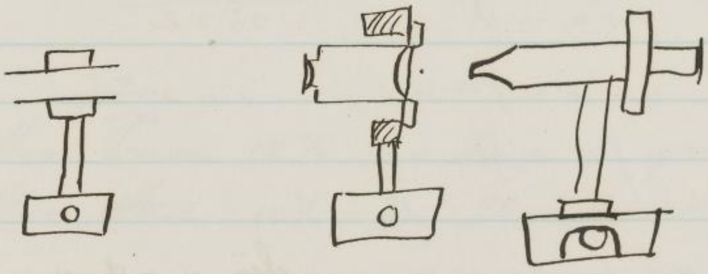


(replaced see later A)

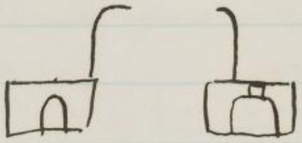
Focus lenses.



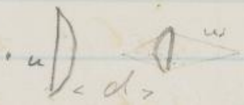
I



A)



Focal length of Eyepiece



$$\frac{1}{u+\frac{t}{n}} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{d-v} + \frac{1}{\frac{t'}{n} \mp w} = \frac{1}{f'}$$

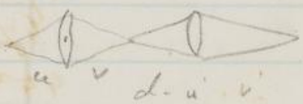
$$\frac{1}{u'} + \frac{1}{v} = \frac{1}{f} \qquad u'f + vf = u'v$$

$$\frac{1}{d-v} + \frac{1}{w'} = \frac{1}{f'} \qquad w'f' + df' - vf' = dw' - vw'$$

$$w'f' + df' - dw' = (f'-w')\frac{u'f}{u'-f}$$

$$u'w'f' + dfu' - dw'u' - w'ff' - dff' - dw'f = u'ff' - u'w'f$$

$$u'w'(f'-d+f) + u'(df'-ff') - w'(ff'-df) - dff' = 0$$



$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{u_1} + \frac{1}{v_1} = \frac{1}{f'}$$

$$\cancel{\frac{1}{d}}$$

$$v + u_1 = d$$

$$vf + uf = uv \qquad v = \frac{uf}{u-f}$$

$$v_1 f' + u_1 f_1 = u_1 v_1$$

$$v + u_1 = d$$

$$vf + uf = uv \qquad \text{elim } u_1 = d - v$$

$$v_1 f' + df_1 - vf_1 = v_1 d - v_1 v$$

$$v_1 f' + df_1 - v_1 d = v(f_1 - v_1) = \frac{(f_1 - v_1)uf}{u-f}$$

$$v = \frac{v_1 f_1 + df_1 - v_1 d}{f_1 - v_1} = \frac{uf}{u-f}$$

$$k\,uv_1 f_1 + udf_1 - uv_1 d - v_1 ff_1 + dff_1 + v_1 df = uff' \cancel{-ddf}$$

$$uv_1(f+f_1-d) + (df_1 - ff')u + v_1(df - ff') - dff_1 = 0$$

$$uv_1(f+f_1-d) + (d-f)f'u + (d-f')fv - dff' = 0$$

See page 157

Horizontal Refraction

29.6 : 280 = 1000 :

29.6 : 310 = 1000

280 / 296
2664 .946
1360
1184
1760
1776
16

310 / 29.6
296 1047
1400
1184
2160
2072
880

49

273
9
5 / 245.7
491.4

491.
49
442
540
491
89
580

471 : 540 = 1 : x = 1.156 = 1.146

~~471~~ 580 : 540 = 1 : x' = .927 = .931

540 / 471.4
4714 1.146
6900
4714
2190
1884
3060

270 / 29
261 .931
90
87
30

273
546
9
491.4

Var. barom 10%
Var thermo 10%
} Hence a variation of .20 in possible normal refract.

20 miles refract = 40 ft uncert. = 8 ft
100 " " = 1000 ft. " = 125 ft

$\frac{40}{100.000} = \frac{1}{2500}$ = 80" at 20 miles   18" at 2.5 miles at 4.0 Kms.

Calc. = 60 sec at 4 Kms.   10" at 4 Kms.

~~Mts~~ visible from Arlington Hts.

	Miles.
Blue Hill	13
Wachusett	35
Watatic	41
Monadnock.	56.5
Crotched	54.
P. Monad.	47.
Uncanoonuc.	45
Kearsarge	76

Observed with compass.

Uncan.	346.6
?	357.0
Pack Monad?	325.8
Temple ? ×	327.3
Monad.	318 0
Lucky Hill	37.
Pawcat ?	254.7
Prospect	246.9

Arl Hts nearly in line with
Bald 6^{2}1 Stoddard 69

Refract = 4" per mile

Hutchinson's Arlington Hts Expenses

Star-Photometer.

~~Anon~~ May 11th 1877. Anon Secchi's and of four compared with artif star

Readings

94	89	265 132	53	.48	27.6	36.2	3.8
1.71	140		50		17.4	41.3	1.3
269		618 309	48		10.5	44.7	4.7
349			52		24.2	37.9	2.1
883						401	11.9
221 41						40.0	3.0 4.5
							2.6

$\cos^2\alpha =$ $\cos 2\alpha = \cos^2\alpha - \sin^2\alpha = 1 - 2\cos^2\alpha$

$\cos^2\alpha = \frac{1-\cos 2\alpha}{2}$

Intens = 40.0 ± 2.6 or prob error 1 obs. = 6.5% or in this preliminary measurement the error is only two third that of other photometers.

May 22d, 1877 Mr Clark brought tube and attached to telescope

May 29th, 1877 Determined zero pt of Nicol's Prism

~~3598~~

0.3	180.6
0.2	0.6
0.2	0.6
0.2	
0.3	
12	.180.6
0.24	

603 light of Dome.

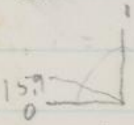
16.1	148.5	17.8	146.8
164.6		164.6	
196.6	147.8	196.4	147.9
344.4		344.3	
721.7	296.3	3.1	294.7
0.4	74.1	0.8	73.7

16.2	8	164.4	7	197.4	7	345.2	2
17.4	4	165.4	3	196.9	2	345.6	2
17.7	9	165.4	3	196.7	4	345.2	2
16.8	2	164.9	4	196.4	7	346.3	9
17.8	8	165.3	2	197.6	5	344.9	5
5.1	31 6.2	0.4	19 38	.4	.25 30	2.2	20 40
17.02 ± .53		165.08 ± .34		197.08	± .43	345.44 ± .34	

P.E.		.04			
± .53	17.02	148.06	74.1	144.46	72.23
.34	165.08		73.7	141.94	70.97
.43	197.08	148.36	74.10		72.23
.34	345.44				
44					
± .41	4.62	296.42			
		74.10			

139 163
326

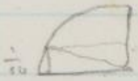
$$\cos 2a = \cos^2\alpha - \sin^2\alpha \qquad \cos^2\alpha$$



$$1 + \cos 2a = 2\cos^2\alpha$$

$$\cos^2\alpha = \frac{1+\cos 2a}{2}$$

$$\frac{1-\cos 2a}{2} = \sin^2\alpha$$



a
b b − a
c d − c
d

$a+b+c+d$ $b-a+d-c$

$\frac{a+b+c+d}{4}$ $\frac{b-a+d-c}{4}$

%

15.9	84.99	15.01	7.55
16.3	84.24	15.76	7.88

$b = \sin^2 \alpha$

$\frac{db}{d\alpha} = 2 \sin \alpha \cos \alpha = \sin 2\alpha$

June 12th 1877 10 P.M. light of Cat

5.7 6.2 ~~349.4~~
173.6 ~~173.6~~ 172.9
186.4 185.8
352.6 ~~352.7~~ 4.

(1)
5.7 8
6.4 1
6.4 1
7.4 9
48
1.9
6.47 ±.42

(1)
5.8 .2 6
9.1 17
6.4 0
4.2 ;,
9.3
31 8 6.36

*✓

(1)
W. A. R.

10.6	349.4
11.5	348.5
9.6	191.4
10.6	349.4
12.5	167.5
14.0	346.0
10.3	169.7
8.8	351.2
10.6	169.4
11.5	345.5
11.0.0	

(1)

5.6	5.6
6.4	173.6
6.6	186.6
7.9	352.1
25	
6.62	

(2)
another star 2

6.2	6.2	351.9	8.1
171.6	8.4	6.8	6.8
186.8	6.8	170.9	9.1
359.2 (21.2)	8.4	189.2	9.2
	22		332
	7.55		8.30

J. R. E.
Chr.

9.2 170.4 348.4

9.2
9.6
11.6
10.2
8.4
10.2
8.7
9.2
9.1
8.1
6.2
98.3
8.0

169.8
188.4
349.8
171.3
9.2
9.1
186.1
186.2

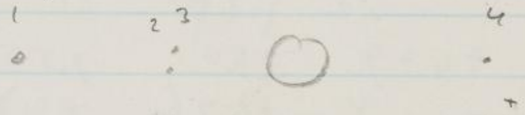
185.6
171.3

El.P. obs. F.W. Lea.

June 17th 9.20 Photometer.
Zero Pt.

179.9	181.6
0.1	0.6
180.8	181.4
180.2	0.4
0.4	

Jupiter



Satellite 4

	53.6	53.6	Neb.		Too bright
53.5	126.0	54.0	04.9	6.2	357.5
	235.2	55.2	358.7		359.6 faint
	308.8	51.2	03.9	5.0	
	44.2	44.2	358.9		
	99.0	89.9	04.3	5.3	
	258.1 40	78.1	359.0		
	290.2	69.8	04.0		
			358.1	5.9	
			03.8	4.8	
			359.0		

Dec − 6° 11′

2

Circle Watch

10h 18m 40s = 15h 57m
have 7h 41 1 41
14h 32m

obs. RA 17 32 6° 11′ − 2 55
17 31 3 16
Error 1 + 6

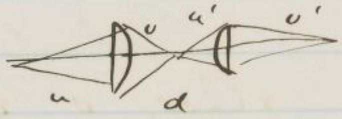
4315 m

15.7 δ = −5° 23′
168.8
192.9
(−) 351.3

κ Cass.	0	26	62.2	9
21 "	0	37	74.3	11
γ "	0	49	61.0	12
α Ursæ Min.	1	12	88.6	–
50 Cass.	1	53	71.6	13
55 "	2	4	65.9	16
i "	2	19	66.8	21
47 H Ceph.	2	49	78.9	57
48 " "	3	4	77.3	43
Groom 716	3	31	62.8	10
9 H. Camel.	3	46	60.7	17
9 Cam	4	41	66.1	3
10 "	4	53	43.6 ?	9
Groom 966	5	23	75.0	34
22 H Cam.	6	5	69.3	
51 H Cephei	6	40	87.2	–
Groom 1374	7	45	74.3	-11
o U. Maj.	8	20	61.0	-29

Focal length of eyepieces.

See page 138



~~$u v_1 (f+f'-d)+(d-f)f'u$~~

$u v_1 (f+f'-d)+(d-f)f'u+(d-f')f v_1 - dff' = 0$

$u=\infty \quad v_1 = \frac{(f-d)f'}{f+f'-d}$,, $v_1 = \infty$, $u = \frac{(f'-d)f}{f+f'-d}$.

$$u v_1 + \frac{(d-f)f'}{(f+f'-d)}u + \frac{(d-f')f}{f+f'-d}v_1 - \frac{dff'}{f+f'-d} = 0$$

$uf + vf = uv$

$u_1 f_1 + v_1 f_1 = u_1 v_1$

$v + u_1 = d$

to find $\frac{v v'}{u u'} = b$

$$v' = \frac{u_1 f_1}{u_1 - f_1} = \frac{(d-v)f_1}{d-v-f_1}$$

$$\frac{v_1}{u_1} = \frac{f_1}{u_1 - f_1} = \frac{f_1}{d-v-f_1} = \frac{f'}{d-f_1-\frac{uf}{u-f}} \times \frac{f}{u-f} = \frac{ff'}{du-uf_1-df+ff'-uf}$$

$$v = \frac{uf}{u-f}$$

$$b = \frac{ff'}{du-uf_1-df+ff'-uf} = \frac{ff'}{ff'-df+u(d-f_1-f)}$$

$B = \frac{a}{u-b}$ in which $a = \frac{ff'}{d-f_1-f}$, $b = \frac{df-ff'}{d-f_1-f}$.

$$v_1 = \frac{\frac{dff'}{f+f'-d} - \frac{(d-f)f'}{f+f'-d}u}{u + \frac{(d-f')f}{f+f'-d}} = \frac{dff'-df'u+ff'u}{u(f+f'-d)+(d-f')f}$$

$v_1 = \frac{c+eu}{g+hu}$ $\quad c = dff'$,, $e = ff'-df'$ $\quad g =$ ~~$f+f'$~~ $(d-f')f$

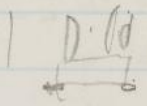
$h = f+f'-d$

Optical Center of Eyepiece I, IV, I

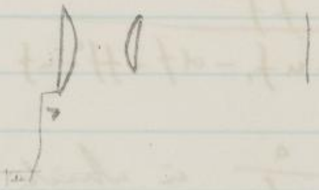
	699.00	609.30	577.88	650.52
	583.52	494.24	692.64	535.40
	~~128.52~~ 115.48	115.06	114.76	115.12
E to Centr	57.74	57.53	57.38	57.56
E to f ~~to Cent~~	21.1	21.1	21.1	21.1
f to Centre	36.6	36.4	36.3	36.5

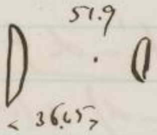
correcting for thickness of lens f — thick lens $\varepsilon = \frac{\frac{1}{3}(5.1-3.1)}{2} = \frac{.7}{2} = .35$
Cent = 36.45 − .35 = 36.1

Readg. E	602.84	602.98	289.52	290.12
dist f	20.8	104.3	20.8	104.3
Rdg f	623.6	707.3	310.3 ~~268.7~~	394.4
		623.6		310.3
		83.7		84.1
		41.85		42.05



I. 646.9
A 400.0
246.9
138.5
108.4



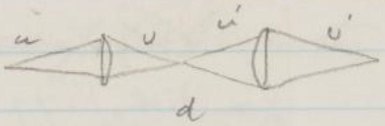


< 36.457
531.357

121.94 + 85.96 : 121.94 = 51.9 : x

121.94
51.9
109746
12194
60970
6328686 | 2079 ~~117~~
6237 | 30.3
9168 | 5.1
35.4 should be

730 cm.
7.54
292
365
146
1654 2



$$u' = d - v \qquad v = \frac{fu}{u-f}$$

$$\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$$

$$\frac{1}{u_1} + \frac{1}{v_1} = \frac{1}{f'} \qquad v_1 = \frac{1}{\frac{1}{f_1} - \frac{1}{v_1}} = \frac{f'u'}{u_1 - f_1}$$

$$v_1 = \frac{f'd - f'v}{d - v - f_1} = \frac{f'd - \frac{ff'u}{u-f}}{d - f_1 - \frac{fu}{u-f}} = \frac{udf' - ff'd - ff'u}{ud - uf_1 - df + ff' - fu}$$

$$v_1 = \frac{u(df' - ff') - ff'd}{ff' - df_1 + u(d - f_1 - f)} = \frac{ff'd + u(ff' - df')}{df - ff' + u(f + f' - d)}$$

$$v_1 = \frac{a + bu}{c + eu} \qquad a = ff'd, \quad b = (ff' - df')$$

$$c = (df - ff') \qquad e = (f + f' - d)$$

$$M = \frac{v}{u} \times \frac{v_1}{u_1}$$

$$\frac{v}{u} = \frac{f}{u-f}$$

$$M = \frac{f}{u-f} \times \frac{f'}{u_1 - f_1} = \frac{f}{u-f} \times \frac{f'}{(d - v - f_1)} = \frac{f}{u-f} \times \frac{f'}{d - f_1 - \frac{fu}{u-f}}$$

$$= \frac{ff'}{du - df - uf_1 + ff' - fu} = \frac{ff'}{ff' - df + u(d - f - f')} = \frac{-ff'}{+c + Eu}$$

$$\frac{1}{u+m} + \frac{1}{v+n} = \frac{1}{p} \qquad pv \cancel{- mp +} up + \cancel{np} = uv + vm - um - m^2$$

$$\cancel{uv + v(m-p) + u(p-m) - m^2 = 0}$$

$$\underline{vp} + np + \underline{pu} + mp = \underline{uv} + \underline{vm} + u\underline{n} + mn$$

$$uv + u(n-p) + v(m-p) + mn - mp - np = 0$$

$$euv' + cv' = a + bu$$

$$uv' + u\left(\frac{-b}{e}\right) + v'\frac{c}{e} - \frac{a}{e} = 0$$

$$n - p = -\frac{b}{e}$$

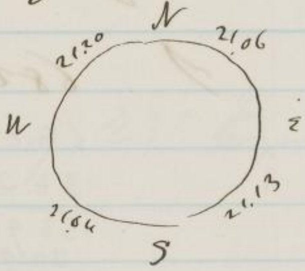
$$m - p = \frac{c}{e}$$

$$mn - mp - np = -\frac{a}{e}$$

Accuracy of Pointing by eye with Central Alidade
Jan 5th 1877. Pointed alidade on [illegible] [illegible]
and also on church turret in front

Readings
162° 43'   10 readings taken in 2m 33s = 1 rdg 15s.
46   including reading [illegible] setting [illegible]
4h.33m   for two other sets see P. 11 & 23
41 1.9   gable of Memorial Hall.
42 9   294° 19' 35" ± 36" extreme 2'10"
44 11   tower in Somerville
44 11   59.1 ± .29 = 59' 6" ± 16" extremes 1'30"
44 11
43 1
44 11
43 1
42 9
42 9
42.9 9.2 42.9 ± .79 = 42' 54" ± 47"
4h.35m33 1.3
79

Distance between instruments of Observatory
June 12th 1877



Mean side of inscribed Sq. = 21.11
Radius = 21.11 × √.5 = 14.92

wall to 1st pier	17.095	Equat. to Arch	14.92
2d	20.525	thickness of wall	1.28
	37.620	wall	28.335
		Dist. equat. to R. trans.	44.535
mdl.	18.810		

wall to ant Russ. trans. 26.75
29.92
56.67
28.335

14.92
1.28
18.81
35.01

Dist. Equat. to Transit Circle 35.01
" " to Russian Transit 44.535

Magnitude 1' in E. Equatorial

1 682.84 3437.75 log. F

,12

6828.52 | 3438

3438 1.986 mm

33905

30940 .08"

29632

27504

2128

1.986 | .94374

188748 2,1044

98520

94374

414600

377496

~~964~~

371040

1.986

3937

13902

5958

17874

5958

.07814882

24

78189

24

312756

156378

1.876536

1986

94374

7944

13902

5958

7944

17874

1.8742676

.83431

.53627

.29804 1.9862

.4048

.8932

.38021

.49300

.2734 1.8765.

3937 .94374 ~~times~~

24

377496

2 188748

2264976

254 | 24

1.05833

.94

.94498

24 | 254

2286 .94498

1140

1016 94488

1240

1016

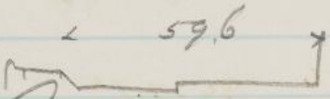
2240

2032

2080

Dynameter

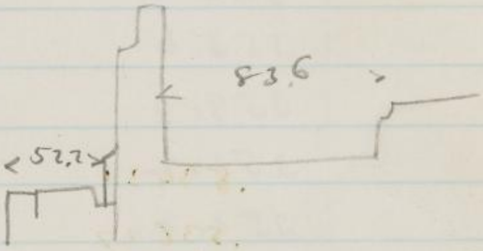
[illegible]



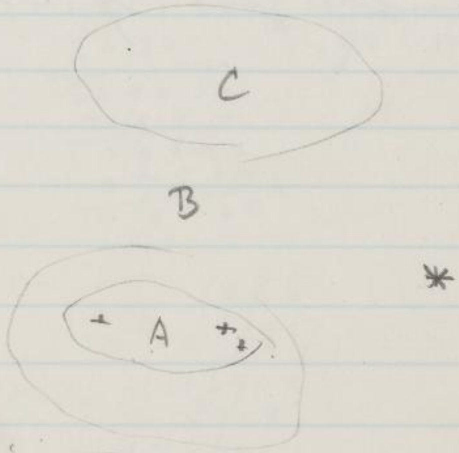
Principal focus of 23' Equat.

59.6
60.4
60.3
61.4
60.42.
6 (4) (401)
60.4
61.4 . 60.5
60.8
59.6
22
60.55

Position of Draw tube



July 7th 1877. Trifurcated nebula. Sagittarius



Series I. | Series II. Added smoked glass.

		c	A	c ~~B~~	
A =	358.1	358.8			
	359.0	354.6	360.4	180.7	
	353.2	354.0	348.4	180.6	
	353.6	358.2	348.7	180.1	
	359.0	354.1	361.3	171.8	
	352.2	353.9	183.1	172.5	
	352.2	358.4 too bright	170.0		
	359 0	354.4	184.0	85	
	352.3	358.2	169.3		
	360.3	358.5			
	360.0	21			
	35 1.4	11	344.5	170.95 183.5	172.1
	359.2	358.42	360.7	~~183.9~~	180.4
	352.6	354.20	7 1 9 4	354.4	176.3
	355.9	356.3	354.7	177.2	
	6.6	4.2	12.4	12.6	8.3
	3°.3	2°.1	6°.2 6.3		4.15

A.W

a	c
182.1	352.8
183.2	348.6
179.8	358.3
180.8	352.8
183.1	174.3
177.8	175.9
348.1	178.1
348.4	175.0

3.6 d Upt.

3.0

2.1

Position of Zero

176.2

176.2

354.0

355.0

21.4

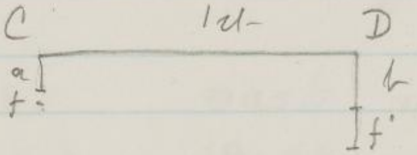
875.3

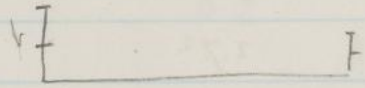
353.3

Reductions of Obsers of Circle Errors

Sec 36	37	1	2
−1.8	−1.7	−.2	−.9
−4.1	−5.6	−1.3	−3.2
−3.8	−5.5	−4.2	−4.7
−3.6	−5.2	−1.2	−2.6
−3.4	−4.4	−2.8	−2.7
−2.2	−3.0	−1.2	−2.6
−.9	−1.8	−.8	−2.8
+2.3	−.8	+3.4	+.4
+2.0	+1.2	+3.0 ~~+2.7~~	+1.7
+3.7	+1.4	+3.3 ~~+4.5~~	+2.5
+1.4	+.6	+2.0	+2.1

Hencle





1st setting C reads $a+f$ 2d setg C reads $b-f'$
" " D " $b+f'$ 2d setg D " $a-f$

$C_1 = a+f$ $D_1 = b+f'$
$C_2 = -b+f_1$ $D_2 = -a+f$

$C_1 + D_2 = 2f$ $D_1 + C_2 = 2f.$

1" = 1 ft − 40 n .04" = .5" at 40

Friday Aug 3d. 1877. Clear.

Sid. time = Mean time + 7h 50m

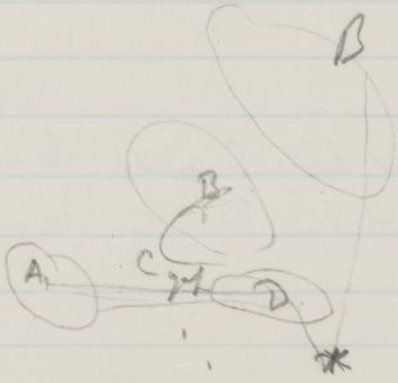
Zero of Microm.

1.2 180.8
1.0 .8 1.16) Zero position
1.1 .7 180.78)
1.3 .8
1.2 .8 2.72 light sky 7.58
1.16 180.78 357.86 355.14 3.79

light of sky 8.38

3.0 354.5 357.2 353.1 neb. A 11.0
2.8 ~~354.5~~ 4.8 ~~34~~4.1 5.5
2.6 5.3
2.2 5.4 357.6 3.6 neb. D 9.6
8 30 3.0 5.7 354.0 4.8
2.72 355.14

357.8 355.0 neb. B 7.8
M 8 62.8 3.9



358.16 16.70 Andra. 35.24
341.46 17.62

355.34 15.50 Andra 35.66
339.84 17.83

aD * = 90

-3

359.7
179.6

a		D		B	
353.8	3.7	3.8	354.1	354.4	3.6
2.6	3.7	3.1	4.3	5.2	2.9
3.5	4.5	3.7	3.6	5.3	1.9
2.4	5.2	3.8	3.9	5.2	2.7
$35\overset{43}{3.1}$	4.13	3.6	$35\overset{39}{4.0}$	355.0^{2}	2.8

10.22 Mat. Anderson

15.6	338.2
18.3	43.6
16.3	41.4
16.6	41.3
16.7	42.8
$16.\overset{3}{7}\overset{5}{0}$	$34\overset{7}{1}.\overset{3}{4}6$

interval 5 m

10 32

14.1	340.6
18.3	340.4
12.2	38.6
15.3	339.6
17.6	340.0
$1\overset{2}{5}.\overset{7}{5}\overset{5}{0}$	$33\overset{4}{9}.\overset{2}{8}4$
359.6	179.7
9.8	179.6

Aug. 3 1877.

Search for asteroid ~~No~~ (78)

Transits of stars. Comp. star supposed Oelt. 20252

		Mag.		Decl.			
	1				21h	40m	29.5
	2						35.0
	3						40.0
	4						45.0
	5					41	13.0
	6		Comp. star	0.4			19.8
a	7	10		1.9			46.7
b	8	11		1.6			59.5 + 1s
c	9			2.4		42	13.2
d	10	11		2.5			21.0
	11			2.8			40.5
e	12			1.4			44.5
	13			1.4			47.5
	14	9		.3		43	12.0
	1	11		1.1			12.2
	2	9		0.6			22.4
	3	10		0.4			27.0
	4	7	Comp. star	0.7		Comp.*	2.5
	5	9		0.3			16.5
a	6	9		1.2			28.8
b	7	9.5		0.9			42.6
c	8	8		1.6			56.0
d	9	11		1.9			3.0
	10	9		3.0			12.0
	11	9		2.1			24.5
e	12	10		0.7			28.0
	13	9		0.8			29.0
	14	7		−0.4			54.0

~~Star~~ suspected and comp. star.
over three wires. Suspected star very faint
s. f. comp. star & $\Delta\delta$ about 5', 1.4 divisions

	Susp. star	Comp. star	Diff.	
Chron. B.236	52.0 ?	54.4	2.4	2.2
	8.0	10.0	2.0	
21^h 50^m	28.0	30.3	2.3	

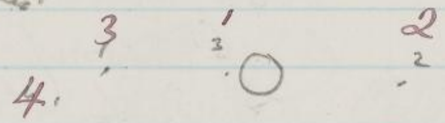
Chronometer readings for the same transits. by F. W.

52.1	54.4	2.3	2.3
8.0	10.2	2.2	
28.0	30.4	2.4	

3^d set of transits

		Magn.	Decl.				
	1	9	−0.2		22^h	40^m	18.2
	2	9	0.8				24.0
	3	10	0.6				30.0
	4	7	0.9	Comp. star		41^m	4.1
	5	10	0.4				19.0
a	6	10	1.3				30.5
c	7	8	1.7			41	58.0
	8	8	2.8			42	13.2
	9	10	2.2				21.0
	10	9	2.3				24.0
	11	9					32.0
	12	8	−0.2				56.0
	13						
	14						
	15						
	16						
	17						
	18						
	19						
	20						

August 1st 1877 W. Equatorial:
Brightness Jupiter satellites.



1 – 4

Zero a Jup

	C			
336.6 c	334.4	65.2	154.1	243.7
338.5 r.	5.7	63.6	153.0	243.8
334.9 l	7.6			

1 – 4 | 1 – 4

217.9 55.8 | 216.6 57.4
273.7 | 274.0
34.2 59.1 | 35.9 56.2
93.7 | 92.1

619.1 114.9 | 618.6 113.6
309.55 57.45 | 309.3 56.8
154.77 28.72 | 154.65 28.40

Mean 28.56 Reading
Mean 154.71 Zero

3 too near planet.

1 – 3

133.3 ~~48.3~~ 49.3
182.6
294.7 64.4
3.1

617.7
304.8
6) 922.5
153.75 Zero

68 1118
115.0 68.8

too faint.
[illegible] [illegible] [illegible].

186.8
118.0
68.8
49.3
64.4
6) 182.5
Reading 30.42

131.2 44.4 | 129.2 48.1
175.6 | 177.3
309.0 49.2 | 310.7 44.9
358.2 | 355.6

974.0 93.6 | 972.8 93.0
487.0 46.8 | 486.4 46.5
243.5 23.4 | 243.2 23.25

Reading 23.32
Zero 243.35

1	2		
118.5	66.1	123.4	72.9
184.6		186.3	
302.1	58.6	296.4	68.1
360.7		364.5	
965.9	124.7	960.6	141.0
482.95	62.35	480.3	70.5
241.47	31.18	240.15	35.25

Reading 33.21
Zero 240.81

Zero [illegible]

60.8
152.4
263.8
333.2

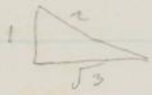
a^1 a^2 Capric.

Summary.

3-4 1-4	3-1 1-3	1-3	3-2 1-2
27.9	34.3	22.2	33.0
29.5	32.2	28.6	29.3
28.7	34.4	24.0	36.4
28.1	tt circ.	22.5	34.0
2	307	17 3	137
28.55	30~	24.3	33.4

$a \sin^2 v = b \cos^2 v$

$\frac{a}{b} = tg^2 v$



Aug. 4, 1877.

Search for asteroid (78)

Started chronograph about 19ʰ.

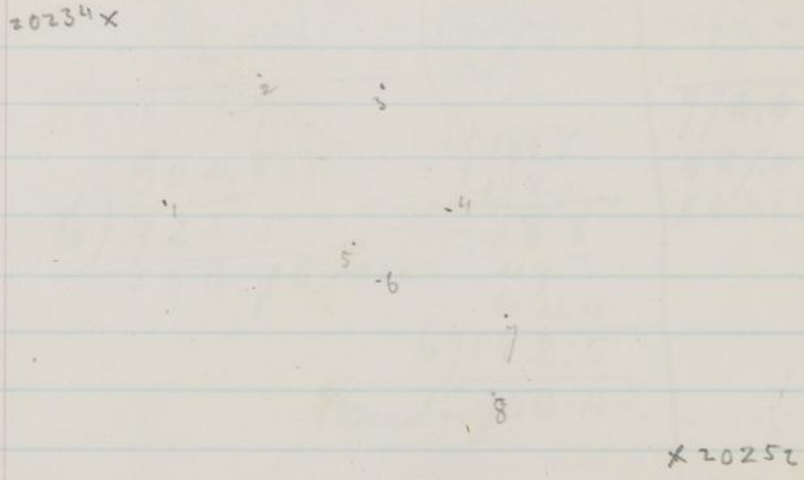
A short rattle; then transits of suspected planet preceding Oeltzen 20252-3 and of that star. E. C. P. obs.

Two rattles to mark time by Chron. B. 236. Between these rattles the minute 19ʰ 15ᵐ began according to the chronometer.

List of star positions.

1	From Oeltz. 20234		pos. 5°	dist. 6′
2			60°	5′
3	From	(2)	85°	4′
4	From	(3)	20°	4½′
5	"	(4)	290°	4′
6	"	(4)	320°	4′
7	"	(4)	15°	4′
8	"	(4)	7°	6′
9 Oeltzen 20252	"	(8)	55°	6′

No. 4 is supposed to be (78)



Transits of stars in group described above. Obs. E. C. P. Record on chronograph.

		Decl.	
20234	Oeltz.	4.0	43^m 30^s
		.2	
	Plan. ~~[illegible]~~	1.5	43 45^s
		2.8	
		1.7	
		.8	
20252	Oeltz.	.3	45 0

Transits as before. Obs. F. W.

Dec.	Mag.
Comp. *	
—	~~[illegible]~~
—.2	7
—2	11
+1.5	10
+.3	9
3.0	10
1.5	9
.8	10
.4	11
.1	
—	
—	
—	
Comp. *	

	Decl.	Mag.
Comp. *	3.8	7
	2.	10
	—.2	10
	—.2	10
	1.2	8
	3	9
		8
	3.	10
	—	
	—	
	3	10
	.4	10
	.1	11
	2.4	11
	2.3	12
	1.3	12
Comp. *		

Then 2 stars (error) } recommence }

Time 19 $55\frac{1}{2}^m$ F. W. obs. Time by B. 236

Comp. star Decl. Mag.

7

10

−.2

1.5 11

3. 10

3

—

—

—

some others

Comp. * .5 7

Time 19^h $57\frac{1}{4}^m$

Time $19^h\ 59\frac{1}{4}^m$ } by B. 236 ~~Mag.~~ Obs. F. W. | Rattled just before supposed planet
to $20^h\ 1^m$ } and long rattle after second Comp. star.

Time $20^h\ 1\frac{1}{4}^m$ } by B. 236 Obs. F. W. Rattles as above.
to 20 3 }

Suspected planet found at about $20^h 10^m$ to precede Oeltzen 20252 by $55^s.8$ instead of $53^s.1$ as it did about 19^h. Apparently this must be ⑺⑻. Obs. E. C. P. 19h 6m.

Transits of (78) & Oeltz. 20252 (false start) beginning about 20^h 19^m (Reject first?)
Observer E. C. P. Recorded on chronograph
Decl. of (78) 1.6; of star 0.3 ; difference 1.3

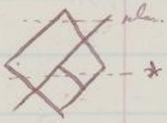
Transits of (78) & Oeltz. 20252; obs. F. W.
Time about 20h 24m to 20h 32m

During all the above work the lower vernier of the position circle stood at 126° 41', in which position the stars ran fairly well upon the lines. The circle was now set to read 176° 41'.

Observations for declination by E. C. P. beginning 20h 39½m.

Planet (78) Both ingresses & second egress of the planet.

Star Oeltz. 20252 Observed ingress & egress of comp. star on short middle line as well as on others (near the top).



The planet crosses above the middle of the square, the star below.

~~In the [illegible] Recorded two ingresses~~ &

In the second set, recorded two ingresses only of the planet, three ingresses & three egresses ~~of the~~ star. Observations also taken of Oeltzen 20334 at 20h 50m.

Third set taken, some observations; this all to be rejected.

Fourth set beginning 20h 52½m.

Observed Oeltz. 20306, 20316, 20334, in this set. Set ends at 21h 1m.

Fifth set by F. W. beginning about 21h 4m: Ingress only of Planet; ingress & egress of Oeltz 20252

Sixth set by F. W. Ingress & egress of (78), & of Oeltz 20252. Set begun about 21h 6m.

Readings from chronograph sheet.

19h	43m	~~8.8s~~	7.8s	Oeltz. 20234	[20252 minus 20234 and minus planet]
		~~11.6~~	10.6		
		~~15.4~~	14.4		
		~~25.6~~	24.6		
		~~45.3~~	44.3	Supposed (78)	
		~~47.5~~	46.5		1m 31s.0
		~~6.~~	58.5		0 54.5
	44		38.8	Oeltz. 20252	52.3
19h	49m		17s.6	Oeltz. 20234	1 31.6
			32.3		
			35.8		
			36.4		
			52.4	} (One of these Supposed (78))	0. 56.8
			54.5	}	0 54.7
	50		9.2		
			14.3		
			20.4		
			21.7		
			22.3		
			49.2	Oeltz 20252	
19	52		17.3		
			19.8		
	52		13.3	Oeltz. 20234	1 30.9
			16.1		
			21.4		
			28.0		
			31.3		
			31.8		
			48.2	} (One of these)	0 56.0
			50.3	}	0 53.9
			53.6		
			59.6		
	53		4.7		
			10.4		
			14.0		
			16.2		
			18.3		
			44.2	Oeltz. 20252	

19^h	55^m	$9^s.8$	Oeltz. 20234	1^m	$31^s.0$
		12.8			
		23.7			
		26.5			
		27.1			
		43.6 }		0	57.2
		46.2 }		0	54.6
		49.9			
		55.2			
		55.8			
	56	00.5			
		6.5			
		10.0(?)			
		13.1			
		14.0			
		17.9			
		40.8	Oeltz. 20252		

19^h	59^m	$0^s.7$	Oeltz. 20234	1	31.5
		3.4			
		9.0			
		9.8			
		15.1			
		18.3			
		19.4			
		27.5			
		31.3			
		34.8		0	57.4
		35.5		0	56.7
		40.9(?)			
		47.3			
		47.8			
		54.2			
		54.9			
		57.4			
20	0	1.3			
		4.5			
		32.2	Oeltz. 20252		

20	0	57.6	Oeltz. 20234	1	30.9
	1	0.5			
		1.3			
		5.4			
		7.0			
		15.0(?)			
		25.1			
		32.4		0	56.1
		33.1			55.4
		39.1			
		44.2			
		49.0			
		54.5			
		57.7			
		58.2			
	2	1.2			
		2.1			
		28.5	Oeltz. 20252		

				Star minus Planet	Side of square	
20h	18m	56.2s	Planet	57.2	17.4	Planet
	19	13.6		55.9	18.8	
		32.4		56.0	36.2	
		53.4	Star		16.1	Star
	20	9.5			18.9	
		28.4			35.0	
20h	23m	5.2s		56.0	16.7	Planet
		21.9		55.9	19.1	
		41.0(?)		55.9(?)	35.8	
	24	1.2			15.8	Star
		17.0			19.9	
		36.9			35.7	
20	27	15.4		55.8	16.3	Planet
		31.7		55.9	19.1	
		50.8		56.4	35.4	
	28	11.2			16.4	Star
		27.6			19.6	
		47.2			36.0	
20	29	16.3		56.7(?)	16.6	Planet
		32.9		56.9	19.0	
		51.9		56.6	35.6	
	30	13.8(?)			16.0(?)	Star
		29.0			19.5	
		48.5			35.5	

Σ ½ Σ

20h 39m 13.5s – 40.1 20h 39m 20.05 23.1

26.6) –

29.7

56.7) – 94.9 49 17.45 41.5

58.5 54.6

40 13.0)

15.6)

38.2 –

57.40s

20h 41m 22.8 22.9 52.0? 75.2 ~~29.6~~ 41 37.6 ~~9.8~~ 29.9

52.4) 54.4

52.7) 54.7 40.1

42 34.85 70.0

42 9.6) 9.5 44.1 ~~32.0~~

11.9 11.9 25.6

34.5) 34.5 9.7 57.25

36.6 36.6 ~~44.45~~

(?) 59.7 –

47 36.5

48 36.5) 36.4 ~~20.74~~ 51.1 55.55

38.2 38.1

49 14.6 ~~20.74~~

20h	52m	9.1s	31.1	20h 52m 15.55	12.9
		22.0			
		52.2)			
		54.4	26.2	53m 13.1	
	53	8.7)			
		11.2			
		34.0)			
		36.2		57.55	41.8
	57	14.0			54.7
		21.0)			
		23.6			
		32.0			
		56.6			
	58	0.0			
		11.5			
		39.4			
		41.4			
	59	35.7	~~20.234~~ 1506	59m 55.2	
		37.4			
21	0	14.8)	~~20.234~~		
		16.4			

21	3	12.2	37.2	21h 3m 18.6s	12.8
		25.0			
		55.4 -	32.2	16.1	
		58.0			
	4	36.8 -			41.4
		39.0		57.5s	54.2
	5	47.4	108.4	54.2	
		51.5			13.6
	6	1.0			
		5.0 (?)			
		31.8	~~20.234~~ 104.4	6m 52.2s	40.5
		34.4			54.1
	7	12.3	~~20.234~~		
		15.6	104.1	52.05 57.85s	

50.35

				s	Eq. Sec.	
20	40	57.40	27.3	~~22.95~~ 23.05	20.38 .46	305.70 306.24
	42	57.25	35.0 ×			
	53	57.55	27.35	23.00	20.42	306.30
21	4	57.5	27.1	23.25	20.64	309.60
	6	57.85	27.05	23.30	20.69	310.35

.8878
23
26634
17756
20.4194

33
6

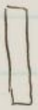
Comparisons (78) with Oeltzen's 202~~31~~ 52-3 Planet s. p. star.

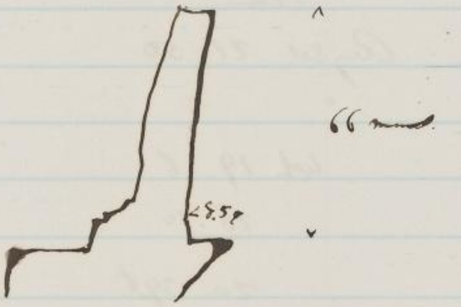
Time.			Diff RA		
Aug 3d.	21	50	2.2		
"		"	2.3		
Oct.	19	6	53.1		
	20	10	55.8		
	20	39.5	57.4	5'	6".7
		42 ~~44.5~~	57.25 (?)		
		52.	57.55	5	6.3
	21	3	57.5	5	9.6
		6	57.85	5	10.3
6					

At 4th 20h. 55m
57.6s 5' 8"4

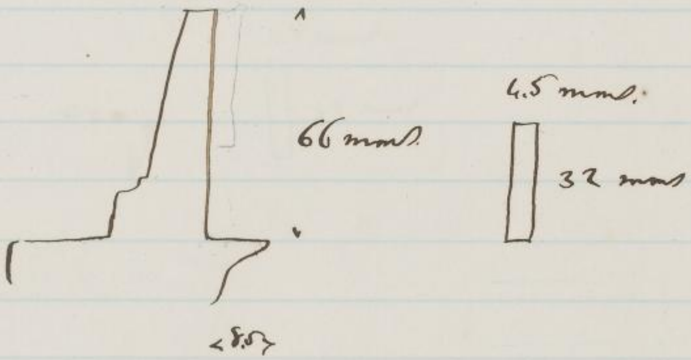
Dimensions of cell of 15 in Objective.

ring





Cross section of Cell
of 15 inch Lens.



1877phae.proj.129BW