1876phae.proj.1352w

KG
11366
v.830

Part II. 1876.

Observations and Reductions.

Value 1 Rev. Microm. of
15in Equatorial.

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In taking means of
9 wires remember that

$\frac{1}{9} = 6^{5}.67$

2 = 13.33

3 = 20.00

4 = 26.67

5 = 33.33

6 = 40.00

7 = 46.67

8 = 53.33

9 = 60.00

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ε Cornae
μ Herculis
T Cygni
78. Peg.

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1876phae.proj.183:4W

Micm. Scw.

1. The investigation of the actual errors of the screw by direct measurement.
   a. The value of each revolution the clamp screw.
   b. " " " " space of the Micrometer plate.
   c. " " " " half revolution of the Microm. Screw.

2. The investigation of the value in arc derived from star transits.

3. " " " " " " " " " Measurement of focal length and value 1 rev. screw in inches.

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Index.

1876. Telescope

λ Ursæ Minoris. (old observations by the Bonds 15 – 23)

e	Oct 7.		above		65 – 70
W	" 8		"		71 – 76
e	" 9.		"		77 – 82
W	" 9.		"		89 – 94.
λ Ursæ Minoris.	Sept. 13.	10 – 90° (Eye & Ear)		9″.7883	7 – 13
U.C.	Sept. 28	10 – 90 Chron.	e	9.7983	45 – 51
U.C.	Oct 1	10 – 90 "	e		55 – 59
U.C.	Oct 3	10 – 90 "	e	9.7990	59 – 65
U.C.	Oct. 9	10 – 90 "	W.		83 – 87

Zero of Position 3

Limit of Error in Screw – How close to observe – Error in zero of position – 24

Machine Measures (direct & reversed)

Sept. 20. Description of apparatus & observations	25 – 33
Back lash of Micrm. Screw – Diameter of Spider lines –	35
Sept. 22. Machine Measures	37 – 43
Approx. value in inches of Micrm. & Machine Screw	43.

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1876phae.proj.19334w

March 30. 1897.

Assuming 1.ᵀ000 Micrm. = 9ᵀ.800
1.000 Machine = 0ᵐ.04167
and the 1.000 Micrm = 0ᵀ.30674 ± .00029 Engine

then at the focus of the 15ⁱⁿ Equat.

1' = 6ᵀ.12244 = 0ᵐ.078238

1" = 0ᵀ.0102 = 0ᵐ.00130
2" = 0ᵐ.00261

0.40439
8.10653
8.51092

1ᵀ = 0ᵐ.012779 = 00ʰ25ᵐ374 × 0.01278 = 0ˢ.003243
25ᵐ = 0ᵐ.2495 = 4' 5".0

.60959
3.04794

12)30479
0ᵐ.025374

∴ 1 sec = 0ˢ.003243 ± (log 8.51092)

$$R = \frac{0+0^{s}.003243}{682^{s}.84 \sin 1''}$$

log 682.84 = 2.834231
4.68557
7.51988
2.48012
2.51092
10.99104
∴ 1 sec. = 9".796 (approx.)

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1876.

	Aug 26.	29.	30.
Assume 1 rev. microm. head = 9".8			
δ	+37° 4'	+2° 32'	−8° 10'
	50ʳ.0885	50ʳ.0824	50ʳ.0886
	49.000	49.000	49.000
d =	1ʳ.0885	1ʳ.0824	1ʳ.0886
t =	12ˢ.98	16ˢ.04	9ˢ.15
Log t	1.11327	1.20520	0.96142
Log 15	1.17609	1.17609	1.17609
Log (15.t.)		9.99958	
(Cor) Log d	~~9.90197~~ ~~0.12183~~	~~9.99557~~	9.99557
I	2.19133	2.38087	2.13308
Log d	0.03683	0.03443	0.03683
Log 9.8	.99123	.99123	.99123
II	1.02806	1.02566	1.02806
II − I	8.83673	8.64479	8.89498
Log sin Δz.	3° 57'	2° 32'	4° 30'
	32 11	24 22	32 25
∴ Zen. of position =	36° 08'	36° 54'	36° 55'

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1876 Sept. 13. λ Ursae Minoris. S. W. obs.

Chron. Arnold 3451 Clock Arnold 1327. Sid Ec.

$18^h\ 32^m\ 11^s.5 = 18^h\ 32^m\ 25^s.0$
$33\ \ 6.5 = \ \ 33\ \ 20.0$ } within $0^s.2$ [Eyepiece No. 4. (401) Field Ill.]

Set Micr. pos. to 5 cm at Zero of position by star about 6 mag at +65°19' and R.A. $19^h.0 \pm 0^h.2$.

Micrm. head towards the pier.

	No.	Micrm.	Chron. 3451			
	1	10.000	19^h	52^m	$58^s.0$	
	2			[53	34.0]	misfed & inserted afterwards for case in taking [illegible]
	3	12.000		54	10.0	
	4	13.		54	44.5	
I	5	14.000		55	19.5	$19^h\ 55^m\ 19^s.78$
40.0	6	15.		55	54.0	
40.0						
40.0						
38.5	7			56	30.0	
39.0	8			57	6.0	
	9			57	42.0	
	10			58	16.5	
	11	20.		58	52.5	
	12			59	34.5	
	13			60	2.5	
II	14			0	36.5	$20^h\ 0^m\ 36^s.35$
74.0	15			1	11.5	
75.0						
72.5	16	25.		1	48.0	
74.0						
73.0	17			2	22.5	
	18			2	57.5	
	19			3	33.0	
	20			4	9.5	
	21	30.		4	42.3	
	22			5	19.0	
III	23			5	55.0	$20^h\ 5^m\ 56^s.19$
49.5						
49.5	24			6	29.0	
45.8						
48.0	25			7	3.5	
50.0						
	26	35.000		7	40.0	
	27	36.00		8	16.5	

$\frac{37}{26}$ 10
$\frac{9}{129}$ 8.0
3 3.11
13.33
19.78

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1876phae.proj.1834w

Fr. 3451. I

Groups.	Microm. mean Read.	Microm. Rev.	Mean of transits			Int. from 50.000			=		
			h	m	s	h	m	s		°	′	″
I	14.000	10.000 – 18.000	19	55	19.78	+0	21	7.53	= +	5	16	52.95
II	23.000	19.000 – 27.000	20	00	36.35		15	50.96		3	57	44.40
III	32.000		20	05	54.19		10	33.12		2	38	16.80
IV	41.000		20	11	11.73		5	15.58		1°	18′	53.″70
V	50.000		20	16	27.31	±	0	00.00	±	0	0	0.0
VI	59.000		20	21	45.00		5	17.69		1	19	25.35
VII	68.000		20	27	2.00		10	34.69		2	38	40.35
VIII	77.000		20	32	18.83		15	51.52		3	57	52.80
IX	86.000		20	37	35.57	–	21	8.26	–	5	17	3.90

Fr. 3451 has a gaining rate of $0^s.855$ per hour. ∴ the above column I must be corrected for this rate as follows

δI

Group I	$-0^s.030$	$= -4''.50 - 0''.45 \equiv 4''.05$
II	-0.23	$= -3.45$
III	-0.15	$= -2.25$
IV	-0.08	$= -1.20$
V	± 0.00	$= \pm 0.00$
VI	$+0.08$	$= +1.20$
VII	$+0.15$	$= +2.25$
VIII	$+0.23$	$= +3.45$
IX	$+0.30$	$= +4.50$

0.0855

·0186
930
7440
0″·075330 = 0ˢ·00021
188·
·0564
·0376
·0188
·0000

cos δ = 8.2682949 = ·01855

0.0002

Diff. in rev.	Rev.	I + δI			sin I	sin I cos δ	i	i
		°	′	″				
+36	I	+ 5	16	48.45	8.9637141	7.2322016	= 5′ 52″.065	= 352.065
+27	II	3	57	40.95	8.8393788	7.1076783	= 4′ 24.305	264.305
18	III	2	38	14.55	8.6628707	6.9311885	= 2′ 56.041	176.041
9	IV	1	18	52.50	= 8.3605815	6.6289223	1′ 27.771	87.771
0	V	± 0	0	0.00				0.0
−9	VI	1	19	24.15	= 8.3636239	6.6319370	1′ 28.383	88.383
18	VII	2	38	38.10	= 8.6639644	6.9322659	2 56.480	176.480
27	VIII	3	57	49.35	= 8.8396220	7.1079260	4 24.451	264.451
36	IX	− 5°	16	59.40	8.9639420	7.2324512	= 5′ 52″.270	352.270

	log i				
I	2.546622 / 1.556830	0.99032	∴ 14ʳ – 50ʳ	1ʳ = 9.″7795	= I
II	2.422111 / 1.431136	0.99078	23 – 50	9.7893	= II
III	2.245561 / 1.255527	0.99034	32 – 50	9.7800	= III
IV	1.843358 / 0.954524	0.99911	41 – 50	9.7524	= IV
V	1.946377			9.8204	= VI
VI	2.023486 / 0.954524	0.99213	59 – 50	9.0428	
VII	2.246970 / 1.255527	0.99143	68 – 50	9.8046	= VII
VIII	2.422334 / 1.431136	0.99098	77 – 50	9.7945	= VIII
IX	2.546888 / 1.556830	0.99058	86 – 50	9.7854	= IX

+0021

[Note. The arith mean of these 8 rates as they stand is 9.″7883]

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1876. Sep 13. Cont.

2.10. obs.

	No	Microm	Chron. 3451			
	27	~~36.000~~	~~20~~	~~8~~	~~16.5~~	Ill. 1 wire & field begins to grow faint, and definition bad.
	28		20^h		~~51.0~~ ~~46.0~~ ?	
	29				~~49.0~~	
				9	25.0 ?	
	20			10	3.0	
	21	40.000		10	36.0	
IV	32			11	13.0	20^h 11^m $11.^s73$
82.5	33			11	46.5	
82.5						
85.0						
82.5	34			12	22.0	
86.0	35			12	57.5	
				13		
	36	45.000		~~14~~	31.5	
	37			14	8.0	
	38			14	42.0	
	39			15	16.0	
	40			15	51.5	
V	41	50.000		16	19.0	28^h 16^m $27.^s31$ Below ~~Ins~~ (rej)
55.0						
54.5	42			17	3.0	
54.0						
54.5						
58.0	43			17	38.5	
	44			18	12.5	
	45			18	47.0	
	46	55.000		19	24.5	
	47			20	1.5	
	48			20	33.0	
VI	49			21	9.0	
30.5	50	59.000		21	45.0	20^h 21^m $\{44.^s99.4$ $\{45.00$
31.0						
28.0	51	60.000		22	21.5	
30.5						
30.0						
	52			22	55.0	
	53			23	29.5	
	54			24	6.0	

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Reductions Continued –

Wire.	Rev.	mean from mean of V			Corrected to mean wire (Rev)
I	10 – 18	+ 352.065	I – II	"	
II	19 – 27	264.305	III – III	87.760	18.5
III	28 – 36	176.041	III – IV	88.264	27.5
IV	37 – 45	87.771	Cts eq.	88.290	36.5
V	46 – 54	± 0.0		87.771	45.5
VI	55 – 63	88.383		88.383	54.5
VII	64 – 72	176.480		88.097	63.5
VIII	73 – 81	264.451		87.971	72.5
IX	82 – 90	– 352.270		87.819	81.5

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1876phae.proj.1834w

1876. Sept. 13. Cont.

Sw. 06.

No.	Mt Cinn.	Chinn.		
51	60.000	22	21.5	
52		22	55.0	
53		23	29.5	See preceding page
54		24	6.0	
55		24	41.5	
56	65.000	25	16.0	
57		25	52.5	
58		26	24.5	
VII 59		27	3.0	20 27 2.00
65.5 60		27	36.0	
62.0 67.0 60.5 61	70.000	28	14.5	
66.0 62		28	46.0	
63		29	24.0	
64		29	59.0	
65		30	33.0	?
66	75.000	31	9.5	37mm
67	76.000	31	42.5	
VIII 68	77.000	32	19.0	$20^h\ 32^m\ 18^s.83$
37.0 37.3 38.5 69	78	32	55.0	
37.5 38.0 70	79	33	29.0	
71	80.000	34	4.3	
72	81.000	34	38.0	

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$14^r.000$ to $50^r.000$ = $1267^s.53$ = $21^m\ 7^s.53$ = $5^\circ\ 16'\ 52''.95$

50.000 to 86.000 = 1268.26 = $21\ 8.26$ = $5^\circ\ 17'\ 3.90$

I	$5^\circ\ 16'\ 52''.95$	$5^\circ\ 17'\ 3''.90$
$\sin I$	$8.963\,94\,20$ (4 5 5 / 2 0 5 / 1 1)	$8.964\,16\,97$ (6 8 2 / 2 0 4)
$\cos \delta$	$8.268\,29\,49$	$8.268\,29\,49$
$\therefore \sin i$	$7.232\,30\,40$ (2 3 2 / 1 1 7 3 / 1 8 6 7 / 1 2 3 2 9)	$7.232\,55\,32$ (2 3 2 / 1 1 7 3 / 4 3 5 9 / 1 2 3 2 1)
$\therefore i$	$5'\ 52''.152$	$5'\ 52''.354$
	$352''.152$	$352''.354$
1 rev = mean of 36 revs =	$9''.782$	$9''.788$
Mean. =	$9''.785$	

Using Bond's Formula Ann. Harv. Coll. Obs. Vol I pt. I p. XIV. r at $61^\circ F = 9''.797$.

$31^h\ 32^m$
$18\ \ 32$
$13^h\ \ 0.$ assume daily rate of 1327 to be $0^s.4$ $\therefore 1^m = 0^s.016$

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1876. Sept. 13 Cont – End. SW obs.

	W.	Micrm.		Chron.			
	73	82.000	20.	35	12.0	7.0	
	74			35	49.0	6.0	
	75			36	25.0	7.0	
	76	87.000		37	2.0	8.5	
IX	77			37	35.5	7.0	$20^h\ 37^m\ 35.^s57$
9.0 10.7 10.5 14.5 11.0	78			38	12.5	3.0	
	79			38	45.5	6.2	
	80			39	21.7	8.3	
	81	90.000		39	57.0	5.0	
	82	91.000	20	40	32.0		

Casella. 12530 = 61.°3
at micrometer. 9.30 (with)

P.V.Fl 3451 Floyd 1327

21	9	0.0	=	21	9	13.0
21	10	32.0	=	21	10	45.0

λ Ursae Min. Sept 13. 1876. Var A = 126° 25'
R = 19 47 54.21 B = 306° 25'
D = +88° 56' 14".0.8
1° 3' 46"

Sept. 13. 1876. (Morning) P.V.Fl. 3451. Floyd 1327

		31 7	32	18.0	= 7	32	30.0
"	"	21	9	0	= 21	9	13.
		10^h	23	18.0	= 10	23	17.

∴ Considering the necessary inaccuracy of the comparison between P.V.Fl. 3451 & Floyd 1327 it is within the limits of error of observation to assume that P.V.Fl. 3451 gained 0.s9 in the 10^{hrs} following the observations made above.

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Reduction of following Obs. Copied from H_3 of Equatorial Records. — p. 169.

15	40	19.4	15	40	43.5	15	40	43.5
15	48	12.8		48	12.8		44	28.7
Mw =	7	53.4	18 =	7	29.3		3	45.2
=	473.4			449.3		15	48	12.8
∴ 1w =	$24^s.93$		1w =	$24^s.96$			3	44.1
						mean =	3^m	$44^s.6$ = 56'.09"

Sin 56' 9" = 8.21306

88 30 15 = 8.41671

6 62977

5 63982

0.98995

1876phae.proj.1834W

1847. Dec 27. [Copy of old Observations from original "Records".]

[Observer seems to begin with G.P.B.]
(I think it must be W.C.B. throughout W)

Extr. Ther − 3°
at close " " +4°
Lowest power 140

Polaris

	Micrum.	chron. at close	——	?	Axis 2557 ? [W]
	62	15	39		30.4
	61				51.5
	60				19.4
					30.0
II	59				43.5 (W.C.B. observer)
					55.5
	58				08.8
					22.4
	57				32.8
					46.8
	56				58.3
					12.0
	55				24.0
					37.4
	54				48.8
					01.0
	53				13.4
					26.2
	52				39.4
					53.5
	51.				8.3
					17.4
I	50.000		44		28.7
					42.0
	49.				53.5
					06.8
	48				18.5
	7		45		31.8

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1847 Dec 27.

47.	15	45	44.4
			57.4
46			08.4
			22.8
45			35.4
			47.4
44			58.4
		47	12.0
43			24.8
			35.8
42.			48.5
			02.4
IV	41.000	48	12.8

[Thus $-z$ to ± 0 by Robsemus]

	16	6	16.7
		6	29.6
			42.3
			55.3
		7	07.4

There do not seem to be next. W

[Remark here says "Higher powers - Beginning 45", Sufficiently zero]

35 > 45	16	11	17.3
			29.3
34? 44			43.2
			55.7
33? 43		12	06.8

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1847. Dec 27.

	16	12	20.4
82? 42			32.5
			45.6
81? 41			57.5
			09.3
80? 40			20.8
			35.2
79? 39			47.6
			0.4
78? 38.			14.0
			25.2
77? 37			38.8
			49.0
76? 36			02.8
			16.0
75? 35			27.2
			40.7
74? 34			53.0
			05.8
73? 33			18.
			30.8
III 72? 32			43.4
			55.2
71? 31			8.0
			20.5
[20?] Pond 30	16	17	33.5

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1876phae.proj.1834w

Reduction of Following obs. Copied from H_3 p196.

$50^s.000 = 15^m\ 49^s.1$ at δ of Polaris.

21	51	12.4
22	12	01.5
2 ⟌ 20		49.1
10		24.6 = 2° 36′ 09″

8.65711 88
8.41751 68
7.07463 56
6.08351 49
0.99112 07 = 9″.797

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1876phae.proj.1834w

1848. Mar 16. [Atmosphere clear but disturbed – Therm. in room +16° Ext + 14°.] Heeren ?
Polaris. Power ?
Chron 1351 ? ?

	25.000	21h	51m	12.4
	27.		52	3.8
	29		52	51.5
	31		53	41.8
III = 32				
	33		54	31.8
	35		55	23.4
	37		56	10.9
	39		57	2.8
IV	41		57	53.3
	43		58	41.0
	45		59	33.3
	47	22	00	20.8
	49		01	12.2
V	Zero 50		01	37.8
	51 51		02	02.4
	53		~~032~~	48.5
	54		~~043~~	17.0
	56		054	05.4
	58		05	54.4
VII = 59				
	60		5	46.3
	62		6	38.4
	64		7	27.0
	66		8	17.0
VIII	68		9	07.4
	70		9	56.8
	72.		10	46.6
	74		11	38.4
	75.000	22	12?	01.5

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[Note by VV - the Summary of the Bonn work is formed p 418–19 $\frac{7}{5}$]

[cannot find Obs of Sept 17. 1847 – Temp = 55°.re
A_5 4191 W]

1848 Aug. 17. [Wires probably not set right in position] Temp of dome 81°.

Polaris.

(2557 ? is this the Chron.W).

VI = 50	50.r045	9	50	05.0	$10^m\ 01^s = 24^\circ.00$	$2^\circ\ 30'\ 45''$	8.6418442
	26.045	10	2	6.0		$88\ 29\ 50$	8.4187223
	25.045		2	29.5			7.0605665
II = 23							6.0657861
	20.045	"	4	35.			$9''.881 = 9.9947804$

1848 Aug 17.

	Mic.						
Polaris	71.05	16	18	51.	$20^r = 8^m\ 18^s.5$	$2^\circ\ 4'\ 46''$	8.5596714
VII = 68	70.05		19	15.5	$= 8\ 19.0$		8.4187223
	69.05		19	39.5	$= 8\ 19.5$		6.9783437
	51.05		27	09.5			5.9866049
V = 50	50.05		27	34.5			$9''.813 = 0.9917888$
	49.05		27	59.0			

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1876phae.proj.1834w

1876. Sept. 20. Observations on following pages.

1ʳ.000 = Firm's sp 43. 1 rev. microm. = 0ⁱⁿ.012658
0ʳ.010 = $\frac{1}{100}$ rev = 1 div. " = 0ⁱⁿ.000127
0ʳ.001 = and 0ᵈⁱᵛ.1 " = 0ⁱⁿ.000013 = $\frac{13}{1000.000}$, the ultimate reading.

1ʳ.0000 = and Similarly 1 rev. Machine = 0ⁱⁿ.04166 7
0ʳ.0100 = $\frac{1}{100}$ rev = 1 div. " = 0.000417
0ʳ.0010 = 0ᵈⁱᵛ.1 " = 0.000042
0ʳ.0002 = 0ᵈⁱᵛ.0·2 " = 0.000008 = $\frac{8}{1.000.000}$, the ultimate reading.

According to Rowan Clarke's Fr. the extreme limit of visibility with the microscope employed is about $\frac{1}{60000}$ of an inch = 0ⁱⁿ.000017
We may assume in this investigation that 0ⁱⁿ.000021 = 0ʳ.0005 is the limit of our ability to see or bisect in the field of the Machine Microscope.
Supposing the microscope to magnify 160 diam. this would correspond to vision of about $\frac{3}{1000}$ inches at 10 inches from the eye.

Assuming approx. that 1ʳ.0 = 9".8
0ʳ.01 = 0".098
0ʳ.001 = 0".0098

°°° In our investigations if we retain the 3ᵈ decimal place in " of arc
and " " " " " " " " " Microm. revolutions,
" " " " " $\frac{1}{2}$" " " " Machine "
we will preserve the same degree of accuracy in our observations, and read certainly up to the capacity of the instruments employed.

Length of arc measured by screw = 784".* about.
784"×cos 2° = 784×.9994
∴ the error arising from assuming position angle of 2° = on 80 revolutions, −0".47

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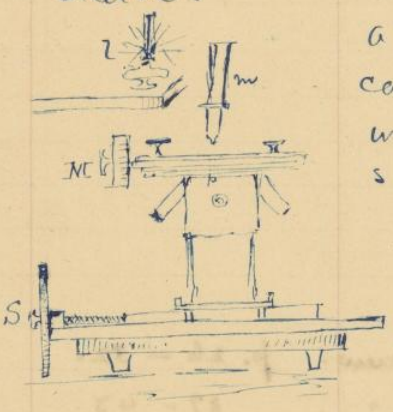
1876phae.proj.1834w

1876. Sept. 20. Measurements of Micrm. Screw by the large Measuring Machine by Clark (Alvan & Sons) usually standing in the S.E. cor of the room over the Library.

Meas. Mach. made by Clark to measure photographs etc. I removed all but the plate carried by the lower screw, so as to make room for the position micrometer bodily. I then had Buff & Berger make a wooden chock and long piece to clamp it (which is now in some drawer "Micrometer") - so that the microscope could be raised high enough to be brought directly on the epidiascope lines.

The screwhead of the machine is about 5 5/8 inches in diameter, having its rim divided into 100 parts each about 3/16 inches in length and read by a pointer divided into 10 parts which in the observations were again subdivided to 0.2 0.4 0.6 0.8 tenths.

The general appearance and arrangement is shown in the annexed sketch:



a lamp at L illuminated a disc of white smooth paper carefully introduced from the other side of the wires at p. This was found to be the most satisfactory way of seeing the wires.

The following are the constants of the steel screw as given by Mr. W. A. Rogers—

The microscope magnifies about 160 diameters, the object being about 6 in from the eye — this by roughly estimating at 10 in. from the eye that 1/48 of an inch in the field covered 2 in as seen with the other eye at the distance of the stage of the microscope.

The head M is always turned in the increasing direction, from 0 to 10 to 20 etc -
" " S " " " " " decreasing " " 20 to 10 to 0 etc.
Both are turned toward the observer in the following observations.

Thermometer by Casella from Clock case of Feb 1877.

Micrm wire par. to screw adjusted so the wire bisects the microscope X very nearly for its whole length.

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1876phae.proj.1824w

Groups.	Mean of 8 intervals in each group in parts of 1 revolution of Micrometer Screw.	
I.	0.30656	.00018
II	.30640	.00034
III	.30698	.00024
IV	.30751	.00077
V	.30644	.00030
VI	.30662	.00012
VII	.30704	.00030
VIII	.30688	.00014
IX	.30625	.00049
Mean =	.30674	.00288
		10.04

∴ Mean = .30674 ± .00029

∴ 1 rev. microm. = 0.30674 Clark Screw. p. 26 – 32.
0.30669 " " . 37 – 43

Mean = 0.30672

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1876. Sept. 20. Cont. S. W. observer.

Time of beginning 8h. 30 P.M.

Max. & Min. Ther. which had been standing by apparatus for 1 hr. read & set at 69.0

The whole revs in brackets [ ] were put in at the time of observation. The rest afterwards.

[Left hand edge of Micrometric fiducial and Micrometer fiducial set at 45° to Micrm. wires]

	Micrm.	Machine		
	10.000	[Means] [57]. 5413		
			.3041	
	11.000	57. 2372		
			.3082	
	12.000	56. 9290		
			.3103	
	13.000	. 6187		24525
			.3039	Arith mean
I	14.000	. 3148	.3063	I = .30656
	.	56. 0085	.3085	and
	.	55. 7000	.3052	56.2816
	.	. 3948	.3060?	56.3148
	18.000	55. 0888 [prob.]		
			.3086?	
	19.000	54. 7802		
			.3061	
	.	. 4741	.3028	
	.	54. 1713	.3098	
	.	53. 8615	.3106	24512
II	23.000	. 5509	.3039	II = .30640
	.	53. 2470	.3050	53.5541
	.	52. 9420	.3112	
	.	. 6308	.3018	
	27.000	. 3290		
			.3085	
	28.000	52. 0205		
			.3105	
	.	51. 7100	.3035	
	.	. 4065	.3056	
	.	51. 1009	.3106	24558
III	32.000	50. 7923	.3070	III = .30698
	.	. 4853	.3048	50.7928
	.	50. 1805	.3075	
	.	49. 8730		
	36.000	. 5667	.3063	
			> .3057	

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1876phae.proj.1334w

I. p. 25–31

Group.	Mean Mean. Read.	Mean Machine Read.	Interval
I	14.000	56.$^{\nu}$3148 / 2816	
II	23.000	53.5541	II − I = 2.$^{\nu}$7275 / 7607 −8
III	32.000	50.7928	III − II = 2.7613 −9
IV	41.000	48.0329	IV − III = 2.7599 +5
V	50.000	45.2718	V − IV = 2.7611 −7
VI	59.000	42.5127	VI − V = 2.7591 +13
VII	68.000	39.7520	VII − VI = 2.7607 −3
VIII	77.000	36.9918	VIII − VII = 2.7602 +2
IX	86.000	34.2317	IX − VIII = 2.7601 +3
			Mean 2.76039 (±22)

Mean Int. Mach. ∴ 0.30671

14$^{\nu}$.000 − 23$^{\nu}$.000	2$^{\nu}$.7590	+7
23.000 − 32.	.7600	−3
32.000 − 41.	.7554	+43
41.000 − 50.	.7603	+6
50.000 − 59.	.7605	−8
59.000 − 68.	.7618	−21
68.000 − 77.	.7594	+3
77.000 − 86.000	2$^{\nu}$.7609	−12
86.000	Mean 2$^{\nu}$.75966 (±52)	
	0.30674	

II. p. 37–43.

Mean Machine Read	Interval.
34.2482	
37.0075	2$^{\nu}$.7573 +29
39.7662	2.7587 +15
42.5270	2.7608 −06
45.2865	2.7595 +7
48.0483	2.7618 −16
50.8112	2.7629 −27
53.5698	2.7586 +16
56.3317	2.7619 −17
	Mean 2$^{\nu}$.76019 (±67)
	0$^{\nu}$.30669

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1876 Sept 20. Cmt.

	Microm.	Machine		
	37.000	49.2610	.3080	
		48.9530	.3060	
		.6470	.3060	
		.3410		24601
IV	41.000	48.0335	.3075	IV = .30751
		47.7255	.3080	48r.0329
		[Means] 46.4185	.3070	
		47.1150	.3035	
	45.000	46.8009	.3141	
			.3034	
	46.000	.4965		
		46.1932	.3033	
		45.8848	.3084	
		.5748	.3100	
			2998	24515
V	50.000	45.2750	.3090	V = .30644
		44.9660	.3075	45r.2718
		.6585	.3065	
		.3520	.3070	
	54.000	44.0450		
			3055	
	55.000	43.7395	.3082	
		.4313	.3053	
		43.1260	.3055	
		42.8225		24520
VI	59.000	.5110	3115	VI = .30662
		42.2070	.3040	42r.5127
		41.9000	.3070	
		.5905	.3095	
	63.000	41.2865	.3040	

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1876. Sept. 20. Cont.

	Micom.	Machine		
	64.000	40. 9795		
		.6710	3085	
		.3655	3055	
		40. 0600	3055	24563
VII	68.000	39. 7520	3080	VII = .30704
		.4445	3075	39r. 7520
		39. 1400	3045	
		[nearest] 38. 8325	3075	
	72.000	.5232	3093	
			3032	
	73.000	38. 2200		
		37. 9122	3078	
		.6030	3092	
		37. 2997	3033	24550
VIII	77.000	36. 9913	3084	VIII = .30688
		.6840	3073	36r. 9918
		.3780	3060	
		36. 0725	3055	
	81.000	35. 7650	3075	
			3095	
	82.000	.4555		
		35. 1530	3025	
		34. 8452	3078	
		.5370	3082	
IX	86.000	34. 2330	3040	24500
		33. 9265	3065	IX = .30625
		.6148	3117	34r. 2317
		.3110	3038	
	90.000	[33*] 0055	3055	

* The mark is nearer 33 than 32.

10 P.M. Camit = 68°.5 { min 68°.0 / Max 69.0

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1876. Sept. 20. End.

Microm.	Machine
45, 000	[next left] [46 .] 8115
.250	46 . 7335
.500	46 . 6543
.750	46 . 5795
46. 000	46 . 5001
.	
50. 000	[next left] [44 .] 2780
.250	.45. 2000
.500	45 . 1235
.750	45 . 0472
51. 000	44 . 9715
.	.
55. 000	43 . 7425
.250	43 . 6638
.500	43 . 5845
.750	43 . 5075
56. 000	[O/p. main] [43 .] 4330

10.20 P.M. { Min Hum = 68.0
Max = 69.4

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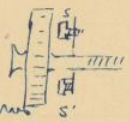
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1876. Sept. 22 · 9 AM · Temp. 60°.5 S.W. Obs.

Examination of back lash by alternate directions. 0 to 10 to 20 etc = +.
20 − 10 − 0 etc = −.

Micrm. screw +	Micrm. screw −	Machine screw +	Machine screw −
39.996	39.953	.0675	.1029
.997	.952	.0671	.1024
.997	.955	.0678	.1027
.997	.951	.0670	.1024
39.997	39.955	.0670	.1024
39.997	39.953	.0673	.1056
.953			673
0.044			.0383

slightly altered the screws (tightened them) at S and S' and then read as follows



+
39.980
39.983
39.983
Mean 39.982

+
40.000
.003
.000
40.001
39.982
.019

Again adjusted the screws and read as follows

+	−
64.525	64.510
.525	.515
.520	.508
.525	.513
.523	512
.524	.512
512	
.012	

Temp 61°. and so left them.

Apparatus same as on p 25 Except worked by daylight instead of lamp. I shall not investigate the Clark screw as I do not believe it is as well divided as the Micrometer screw itself — but shall always move the Clark screw in the same reverse (−) direction and shall make the 2d series following by going from 90° to 10° always moving the Micrm. screw in a positive direction at the end.

Measurement of apparent diameter of movable & fixed wire near 50°.00.

Movable wire

(I) Big Micrm. Screw		(II) By machine —	
1.000	.976	.4680	.4617
1.000	.976	.4687	.4620
1.000	.976	.4700	.4630
1.000	.976	2067	67
		.4689	.4623
		623	

∴ Dia. mov. wire = 0".024 of Micrm. head

0".0066 = value of dia mov. wire by Machine

Fixed wire by machine

.0285	.0220
.0300	.0220
.0290	0.0220
.0875	
.0292	.0220
220	

.0072 = val. of dia. movable wire by Machine.

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1876. Sept. 22. S.W. obs.

Apparatus same as on p. 25, except that the illumination is by daylight on the same sheet (disc) of white paper placed beyond the wires.

The screw is moved as it was on p. 25 — but the micrometer head is turned 180° in azimuth and the Machine screw is so adjusted as to read the same when its microscope bisects the movable wire at 90r.00 as it did before when the microscope bisected the movable wire at 10r.00 — Thus the Machine screw measures the micrometer over its same spaces but in the opposite direction.

Microm.	Machine scr.			
90.000	57	.5553 (new 57r)		2.30 P.M. t = 61°.0
	57	.2515	.3038	
	56	.9480	.3035	
		.6380	.3100	
86.000		.3285	.3095	.30591
	56	.0295	.2990	56r.3317
	55	.7205	.3090	
		.4055	.3150	
82.000	55	.1080	.2975	
			.3082	
81.000	54	.7998	.3153	
		.4845	.2980	
	54	.1865	.3063	
	53	.8802	.3132	
77.000		.5670	.3045	.30760
	53	.2625	.3035	53r.5698
	52	.9590	.3095	
		.6495	.3105	
73.000	52	.3390		

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1876. Sept. 22. Cinc.

L. W. obs.

72.000	52 .0400		
		.3087	
	51 .7313		
		.2701	
	.4612		
		.3422	
	51 .1190		
		.3060	
68.000	50 .8130		50r.8112
		.3150	
	.4980		
		.3010	
	50 .1970		
		.2035	
	49 .8935		
		.3150	
64.000	.5785		
		.3037	
63.000	49 .2748		
		.3030	
	48 .9718		
		.3100	
	.6618		
		.3118	
	48 .3500		
		.2990	
59.000	48 .0510		48r.0483
		.3075	
	47 .7435		
		.3150	
	.4285		
		.2995	
	47 .1290		
		.2945	
55.000	46 .8245		
		.3155	
54.000	.5090		
		.3090	
	46 .2000		
		.2950	
	45 .9050		
		.3130	
	.5920		
		.3153	
50.000	45 .2867		45r.2865
		.3012	
	44 .9855		
		.3110	
	.6745		
		.3130	
	.3615		
		.2985	
46.000	44 .0640		

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1876. Sept. 22. Cont.

L. W. ob.

45.000	43 . 7560		
	. 4412	.3148	
	43 . 1413	.2999	
	42 . 8375	.3038	
	. 5225	.3150	42r.5270
41.000	42 . 2220 {obs 42 .5		$3^h 5^m$ fine t = 61°.5
	41 . 9180	.3040	
	. 6060	.3120	
37.000	41 . 2985	.3075	
		.3020	
36.000	40 . 9965	.3165	
	. 6860	.3100	
	. 3760	.3012	
	40 . 0748	.3068	
32.000	39 . 7680	.3138	39r.7662
	. 4542	.2982	
	39 . 1560	.3060	
	38 . 8500	.3155	
28.000	. 5345		
		.3020	
27.000	38 . 2325	.3010	
	37 . 9315	.3125	
	. 6190	.3065	
	. 3125	.3020	
23.000	37 . 0105	.3100	37r.0075.
	26 . 7005	.3110	
	. 3895	.3010	
	36 . 0885	.3060	
19.000	35 . 7825		

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Sept. 22. 1876 Cont.

S.W. obs.

Micrm.	Machine			
18 r. .000	.4675			
.	35. 1687	.2988		
.	34. 8662	.3025		
.	.5505	.3157		
14 . 000	34. 2478 {mean 33.27		34. 2482	3h 40m P.M. t = 61°.7
.	33. 9470	.3008		
.	.6330	.3140		
.	.3260	.3070		
10 . 000	33. 0265	.2995		

Micrm. accidentally disturbed before following measurements were made.

56. 000	46. 8170			
.750	46. 7400			
.500	46. 6620			
.250	46. 5825			
55. 000	46. 5035			
51. 000	45. 2800	opp. 45		
.750	45. 2052			
.500	45. 1322			
.250	45. 0550			
50. 000	44. 9780			
46. 000	43. 7480			
.750	43. 6705			
.500	43. 5922			
.250	43. 5120			
45. 000	43. 4350 {Query mean 43			5h 15m P.M. t = 61°.8

By direct comparison 1 Rev. of Micrm. Screw = $\frac{1}{79}$ inch. = 0.in 012658

" " " " " " " Machine " = $\frac{1}{24}$ " . = 0.in 041667

$\frac{9}{79}$ in. should equal $\frac{2.76}{2400}$

0.in 114 = 0.in 114 nearly.

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1876. Sept. 28. Reductions. Obs. follows.

Limb.	Micrm. Mean	Feods 1327.						Phase = I.		
					h	m	s	°	'	"
I	14.000	19h	41m	44s.30	+0	21	11.53	5°	17'	53".0
II	23.		47	3.39		15m	51.44	3	57	51.6
III	32.		52	20.32		10	35.51	2	38	52.6
IV	41.		57	38.23		5	17.60	1	19	24.0
V	50.	20	2	55.83	±		0.0			0.0
VI	59.		8	12.91	−	5	17.08	1	19	16.2
VII	68.		13	30.33		10	34.50	2	38	30.8
VIII	77.		18	45.77		15	49.94	3	57	29.1
IX	86.000		24	4.35	−	21	08.52	5	17	7".8

	Cos δ = 8.26875 / 8.26899	sin i	i			
I	sin I = 8.96417	7.23236	5'	52".$\frac{22}{123}$	+353".01	
II	8.83970	7.10769	4'	24 $\frac{51}{164}$	264.31	88".70
III	8.66463	6.93262	2'	56 $\frac{153}{246}$	176.62	87.69
IV	8.36350	6.63149	1'	28 $\frac{143}{490}$	+ 88.28	88.34
V	0.0					88.28
VI	8.36279	6.63078	1'	28 $\frac{72}{490}$	− 88.15	88.15
VII	8.66364	6.93163	2'	56 $\frac{54}{246}$	176.22	88.07
VIII	8.83901	7.10700	4'	23 $\frac{147}{165}$	263.90	87.68
IX	8.96417	7.23234	5'	52".$\frac{22}{123}$	− 352.18	88.28
						88.149

Mean 9".7933

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1876phae.proj.1834w

1876 Sept. 28. Observations on λ Ursae Minoris. M.C. Observer S.W.

$\alpha = 19^h\ 47^m\ 35^s.6$ $\delta = 88°\ 56'\ 16''.7$

Seeing poor. Telescope e. Power 401. Micrm. head towards the fries.
Temp. at. 8.45 P.m. (External) = 50°.3 Var B. = 307° 38'
Clock Frodsham 1327 and Spring governor chronograph in clock Room.
Set for zero of position so that hor. wire bisects ε, Sygae in transit.

No.	Micrm.	Frods. 1327 (Daily rate — 0^s.40)				
	9.000	19^h	38^m	50^s.8		
	10.000		39	26.4		
	.		40	1.6		
	.		40	36.1		
	.		41	12.8		
	14.000		41	44.5	19^h 41^m	44^s.30
	.		42	21.5		
	.		42	58.1		
	.		43	33.1		
	18.000		44	4.6		
	19.000		44	42.5		
	.		45	15.7		
	.		45	50.7		
	.		46	28.0		
	23.000		47	3.9	47	3^s.39
	.			38.4		
	.		48	16.5		
	.		48	51.0		
	27.000		49	23.8		
	28.000		50	0.8		
	.		50	34.2		
	.		51	8.5		
	.		51	45.0		
	32.000		52	20.4	52	20.32
	.		52	56.6		
	.		53	31.0		
	.		54	4.2		
	36.000			42.2		
	37.000	[See next page	55	17.1		
	38.000		55	51.2]		

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1876. Sept. 28. . Cont.

SW. obs.

Microm. Finds 1327.

37.000		55	17.1			
38.000		55	51.2			
39.000	19h	56m	27.s7			
.		57	3.3			
41.000			39.0	19h	57m	38.s23
.			12.3			
.			49.1			
.			25.0			
45.000	19	59	58.4			
46.000	20	0	33.2			
.		1	10.0			
.		1	45.4			
.		2	19.8			
50.000	[illegible]	2	55.6		2	55.83
.		3	34.0			
.		4	4.8			
.		4	42.4			
54.000		5	17.0			
55.000			52.2			
.			24.2			
.		7	0.9			
.			39.5			
59.000		8	15.0		8	12.91
.			47.6			
.			24.7			
.		9	58.2			
63.000			33.9			
64.000	Su	11	8.8			
.	next		47.2			
.	page.		19.2			
.		12	53.8			
68.000		13	30.4			

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1876. Sept. 28. Cont.

S. W. 06

Microm.	Trans 1327.					
64.	11	8.8				
65		47.2				
66		19.2				
67.		53.8				
68.000	13	30.4	20h	13m	30.s33	
69.000	20h 14m	5.s7				
.		43.7				
.		15.8				
72.000	15	48.4				
73.000	16	27.3				
.	17	0.3				
.	17	34.2				
.		[49.2 50] ?				
77.000	18	45.0		18	45.s77	
.	19	[22.0]				
.		54.5				
.		32.5				
81.000	21	6.6				
82.000		43.2				
.		17.7				
.		54.2				
.		27.5				
86.	24	05.0		24	4.s35	
.		39.0				
.		15.6				
.	25	49.2				
90r.000	26	27.8				

Telescope not clamped in R as is the usual custom in all these observations.

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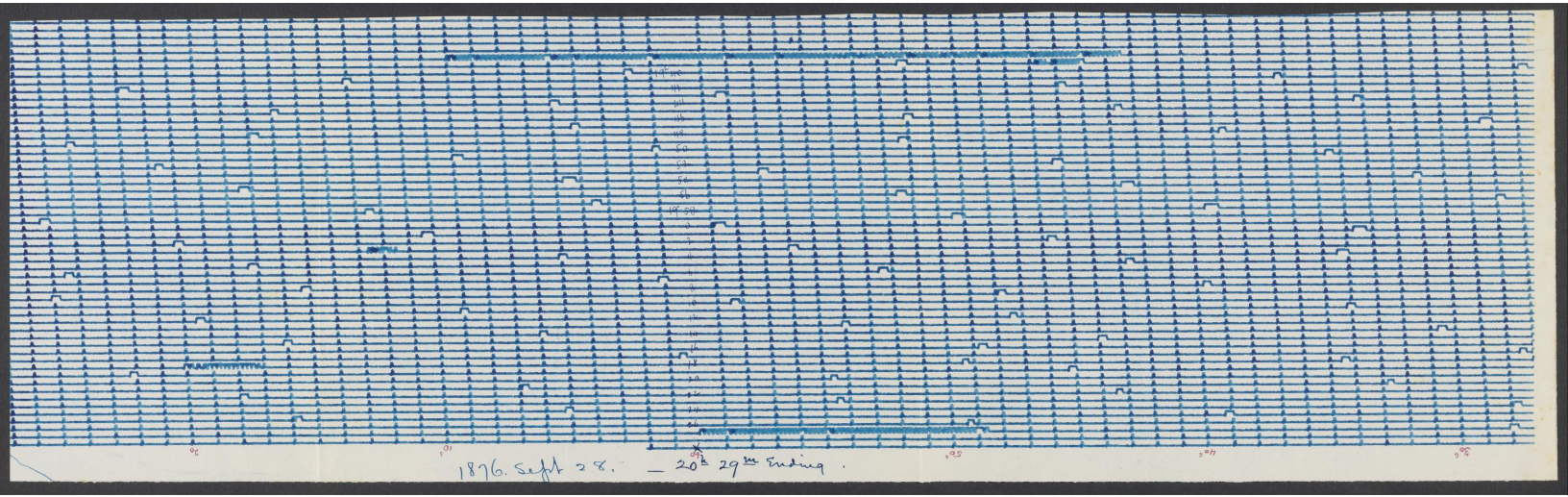
1876phae.proj.1834w

1876. Sept. 28. Chronograph Record. Flood. 1327.

The observations begin with a long rattle.
The 1st short rattle precedes the transit over the micrm. screw at
2d " " denotes that the two wires are together (tangent) and the star is taken over the double wire.
3d short small rattle denotes that I have observed a fixed instead of the movable wire, and consequently 1 rev. must be omitted here.

S. W.

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1876phnae.proj.1834w

1876. Oct. 1. λ Ursae Minoris. M.C.

Eye piece No 4. Telescope e. Micum. head towards fies. Ver B = 307° 38'
Telescope clamped in R. Definition extremely poor. Began observations by setting each whole revolution for 4 wires say 3 wires. Then about 4 quarter revolutions, which were so rapid as to finally lead me to adopt the half revolution as the easiest to observe.
1st wire is at coincidence (follows it) with fixed wire 1.
Chronograph failed before completion; I did not know of it however till I had completed the whole set. Began with Micum. at 10ᵐ.000.
(The minutes are lost of Trods. 1327 from chron. failing.)

No.	Micum.	Trods 1327.		No.	Micum.	Trods 1327	
	10.000	38.9			23.000	12.4	
	11.	13.3	34.4		.5	30.8	18.4
	12.	43.6	30.3		24.000	48.8	18.0
	13.	22.1	38.5		5	7.2	18.4
	14.	54.7	32.6		25.000	24.1?	16.9
	.500	11.5	16.8		.5	41.3	17.2
	15.000	32.6	21.1		26.000	59.0	17.7
	.250	44.0	11.4		.5	15.7	16.7
	.500	53.1	9.1		27.000	35.0	19.3
	16.000	7.0	13.9		.5	50.6	
	.500	25.6	18.6		28.000	9.7	
	17.	46.1	20.5		.5	27.2	
	.500	58.7	12.6		29.000	44.9	
	18.000	17.8	09.1		.5	3.0	
	500	35.6	17.8		30.000	20.4	
	19.000	52.5	16.9		.5	35.6	
	.500	7.4	14.9		31.000	55.0	
	20.000	26.6	19.2		.5	12.9	
	.500	45.5	18.9		32.000	29.0	
	21.000	0.5	15.0		.5	47.4	
	.500	19.2	18.7		33.000	3.5	
	22.000	35.6	16.4		.5	21.6	
	.500	54.2	18.6		34.000	40.4	

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No.	Microm.	Floor 137
	34.500	58.5
	35.000	15.6
	.5	33.2
	36.000	50.0
	.5	8.0
	37.000	26.3
	.5	44.3
	38.000	0.0
	.5	22.4
	39.000	36.5
	.5	54.6
	40.000	11.0
	.5	29.0
	41.000	45.6
	.5	5.1
	42.000	22.0
	.5	39.1
	43.000	59.4
	.5	15.5
	44.000	30.7
	.5	49.4
	45.000	7.3
	.5	26.2
	46.000	43.7
	.5	2.7
	47.000	16.0
	.5	35.0
	48.000	52.2
	.5	11.1
	49.000	26.0
	49.500	46.0

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1876phae.proj.0834W

8

1876. Oct 3. Reduction of following observations.

	Bond 312		m.	Bond 312	
10	20h 27	34.3	10.5	20h 27	55.9
11		10.0	11.5		28.½
12		45.1	12.5		4.0
13		20.1	13.5		38.0
14	29 ~	57.5	14.5	29	12.2
15		30.3	etc		49.3
16		6.2			22.5
17					59.6
18	32	41.7			34.3
		16.2			33.88
	26.82	26.82			+40.00
	26.67	+~~32.33~~			
	53.49	~~153.49~~			
	29m	~~60.15~~		39	13.88
19	32	52.3	19.5		10.9
20		30.7	etc		45.0
21		3.7			19.5
22		38.7			55.2
23	34	12.1		34	31.6
24		48.3			6.6
25		22.3?			40.0
26		56.4			14.0
27	37	34.0			51.5
		33.16			30.47
		−20.00			
	34	~~13.85~~ 13.16		34	30.47
28	38	7.5	28.5		28.9
29		44.1	etc		2.6
30		21.6			37.0
31		56.1			14.5
32	40	33.0		40 ~	48.5
33		4.9			25.5
34		41.3			57.3
35		16.0			32.0
36	42	49.0	26.5		7.3
		20.38			28.51
					+20.00
	40	30.38		40	48.51
37	43	28.8	37.5		44.2
38		~~40.9~~	etc		20.8
39		~~33.8~~			53.6
40		12.0			31.2?
41	45	~~48.5~~			5.2
42		28.0			38.3
43		59.0			16.4
44		34.8			51.4
45	48	7.7			24.4
		28.~~42~~4			31.72
		+20.00			−26.67
	45	48.44		46	5.05
46	48	43.2	46.5		60.0
47		~~60.0~~	etc		37.2
48		17.8			14.0
49		54.8			48.2
50	51 ~	29.0		51	22.7
51		~~37.01~~?			~~58.5~~
52		21.4			33.0
53		14.3			8.2
54		~~49.5~~			42.4
	53	51.2			
		25.1			
		20.97			36.02
		−26.67			−13.33
	51	4.30		51	22.69

	Bond 312		m.	Bond 312.
55	20h 54m	2.6		19.6
56		36.5		52.8
57		10.4		29.0
58				3.9
59	56	48.2		39.0
60		21.0		15.7
61		57.7		50.0
62		33.2		27.5
63	58	5.5	63.5	0.3
		43.0		
		28.67		26.42
		−6.67		+13.33
	56	22.00	56	39.75
64	20h 59m	19.7		35.4
65		53.7		12.4
66		29.3		47.9
67	1	5.2		23.9
68		39.8		57.2
69		14.8		32.5
70		49.3		7.5
71		26.4		43.9
72	21 4	2.2		18.8
		26.71		31.05
		+13.33		26.67
	1	40.04	1	57.72
73	4	35.2		53.2
74		13.0		27.6
75		45.5		4.5?
76		53.2		38.5
77	6 ~	55.0		12.3
78		34.3		51.7
79		5.8		26.2
80		43.8		2.6
81				
82	9	22.6		39.5
		30.93		28.45
		+26.67		13.33
		57.60	15.12	~~1.78~~
82	9	57.2		14.0
83		33.0		49.8
84		10.3		27.3
85		44.8		59.1
86	12 ~	18.1		35.6
87		53.7		12.2
88		30.2		46.5
89		3.4		20.6
90.0	20h 14m	40.0	90.5	57.9
		32.30		35.88
		−13.33		
	12	18.97	12	35.88

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1876. Oct. 3. λ Ursae Minoris $\left\{\begin{array}{l}\alpha = 19^h\,47^m\,29^s.4 \\ \delta = 88°\,56'\,17''.3\end{array}\right.$ Clock Bond 312.

Tel. e. Power No 4. Clock Bond 312. Micum. head toward pier.
slightly adjusted focus of spider lines. $+\frac{1}{4}$ turn of screw at side of tube inwards.

Eased the two adjusting screws of Micum. head about $\frac{1}{5}$ turn each so that the screw moves with less friction, though presumably with more "back lash" than it had.

Ver B. 307° 38'

Began at 10ᵛ.000 setting the screw at half revolutions to 91ᵛ.000 ± 1ᵛ or 2ᵛ.
Definition very good generally: but where the chronograph record shows a short irregular rattle after or including the signal of transit, it indicates the star was hazy + poorly defined.

Temp at 8.15 P.M. Ext. = 52°.0
Int. = 56.3

No.	Micum.	Bond 312
	10.000	20h 27m 34.3
	.500	55.9
	11.000	28 10.0
		28.2
	12.000	45.1
		29 4.0
	13.000	20.1
	.500	38.0
	14.000	54.5
		30 12.2
	15.000	30.3
		49.3
	16.000	31 6.2
		23.5
	17.000	41.7
		59.6
	18.000	32 16.2
		34.3
	19.000	52.3
		33 10.9
	20.000	30.7
		45.0
	21.000	34 3.7

No.	Micum.	Bond 312
	21.500	34 19.5
	22.000	38.7
		55.2
	23.000	35 12.1
		31.6
	24.000	48.3
		36 6.6
	25.000	22 22.3?
		40.0
	26.000	56.4
		37 14.0
	27.000	34.0
		51.5
	28.000	38 7.5
		28.9
	29.000	44.1
		39 2.6
	30.000	21.6
		37.0
	31.000	56.1
		40 14.5
	32.000	33.0

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1876phae.proj.1834w

1876. oct. 3. Reduction Cnt.

Group	Mean Mucim	Bmd 312		V-II - I	I'-I'.	Group I—IX	I'—IX'
I	14.000	20^h 29^m $53^s.49$	$21^m 10^s.81$	~~21 8.81~~		$5° 17' 42''.2$	~~5° 17' 12''.2~~
I'	14.500	30 13.88		21 8.81			5° 17 12.2
II	23.000	3 5 13.16	$18^s 50.14$			4^s 57 32.1	
II'	23.500	3 5 30.47		$16^s 52.22$			4 58 3.3
III	32.000	40 30.38	10 33.92			2° 38' 28.''8	
III'	32.500	40 48.51		10 34.18			2 38 32.7
IV	41.000	45 48.44	5 15.86			1 18 57.''9	
IV'	41.500	46 5.05		5 17.64			1 19 24.6
V	50.000	51 4.30	0 0.0				
V'	50.500	51 22.69		0 0.0			
VI	59.000	56 22.00	5 17.70			1 19 25.''5	~~1 19 15.''8~~
VI'	59.500 20	56 39.75		5 17.06			1 19 15.8
VII	68.000 21	1 40.04	10 35.74			2 38 56.1	
VII'	68.500	1 57.72		10 35.03			2 38 45.5
VIII	77.000	6 57.60	15 53.30			3° 58' 19''.5	
VIII'	77.500	7 15.12		15 52.43			3 58 6.''5
IX	86.000	12 18.97	21 14.67			5° 18' .40.''0	
IX'	86.500 21	12 35.88		21 12.19	~~5° 18~~		5° 18' 2.''9

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1876phae.proj.1934w

1876. vol. 3.

Clock comparisons.

Bmd 312		Flam 1327
$21^h\ 20^m\ 55^s.6$	=	$21^h\ 19^m\ 0^s.0$
$23^h\ 7\ 55.6$	=	$23\ 6\ 0.0$

No.	Micrm.	Bmd 312
	32.500	40 48.5
	33.000	41 4.9
		25.5
	34.000	41.3
		59.3
	35.000	42 16.0
		32.0
	36.000	49.0
		43 7.3
	37.000	28.3
		44.2
	38.000	44 0.9
		20.8
	39.000	36.8
		53.6
	40.000	45 12.0
		38.2 ?
	41.000	48.5
		46 5.2
	42.000	22.0
		38.3
	43.000	59.0
		47 16.4
	44.000	34.8
		51.4
	45.000	48 7.7
		24.4
	46.000	43.2
		60.0
	47.000	49 17.8
	47.500	20h 49m 37s.2
	48.000	54.8
	.5000	50 14.0
	49.000	29.0
		48.2
	50.000	51 4.1 ?
	50.500	22.7
	51.000	39.4
		58.5
	52.000	52 14.3
		33.0
	53.000	~~47.5~~ 51.2 ?
		53 8.2
	54.000	25.1
		42.4
	55.000	54 2.6
		19.6
	56.000	36.5
		52.8
	57.000	55 10.4
		29.0
	58.000	48.2
		56 3.9
	59.000	21.0
		39.0
	60.000	57.7
		57 15.7
	61.000	33.2
		50.0
	62.000	58 5.5

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1876phae.proj.1834w

1876 Vol. 3. Reduction cont.

Cos δ = 8.26792

Comparison	I	Sin I	Sin i	i		
V–I	+ 5° 17′ 42.2	8.96513	7.23305	5′	52″	352″.76
VI–II	3 57 32.1	8.83910	7.10702	4′	23 $\frac{147}{165}$ .006	263.89
VII–III	2 38 28.8	8.66355	6.93147	2′	56 $\frac{38}{246}$ .004	176.15
VIII–IV	+ 1 18 57.9	8.36103	6.62904	1′	27 $\frac{395}{497}$ .002	87.80
IX–V	0 0 0.					
V–VI	– 1 19 25.5	8.36364	6.63156	1′	28 $\frac{150}{490}$ .002	88.30
VI–VII	2 38 56.1	8.66479	6.93271	2′	56 $\frac{162}{246}$	176.65
VII–VIII	3 58 19.5	8.84055	7.10847	4′	24 $\frac{129}{164}$	264.77
IX–V	– 5 18 40.0	8.96644	7.23436	5′	53 $\frac{101}{122}$	353.82

I

V′–I′	+ 5° 17′ 12″.2	8.96445	7.23237	5′	52″ $\frac{25}{122}$	352″.20
II′	3 58 3.3	8.84006	7.10798	4	24 $\frac{80}{164}$	264.48
III′	2 38 32.7	8.66372	6.93164	2	56 $\frac{55}{246}$	176.22
IV′	+ 1 19 24.6	8.36355	6.63147	1	28 $\frac{141}{490}$	88.28
V′	0 0 0.					
VI′–I	19 15.8	8.36277	6.63069	1	28 $\frac{63}{490}$	88.13
VII′	2 38 45.5	8.66431	6.93223	2	56 $\frac{114}{246}$	176.45
VIII′	3 58 6.5	8.84016	7.10808	4	24 $\frac{90}{164}$	264.54
IX′–V	– 5 18 2.9	8.96583	7.23375	5′	53 $\frac{40}{122}$	353.33

Int.	Mean Rw.		Mean Res.	
I – II	14.000–23.000	= 88″.87	14.500–23.500	87″.72
II – III	23.000–	= 87.74	23.500	88.26
III – IV	32.000–	= 88.35	32.500	87.94
IV – V	41.000–	= 87.80	41.500	88.28
V – VI	50.000–	= 88.30	50.500	88.13
VI – VII	59.000–	= 88.35	59.500	88.32
VII – VIII	68.000–	= 88.17	68.500	88.09
VIII – IX	77.000–86.000	= 89.05	77.500–86.500	88.79

153

88.191

9.7990

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1876phae.proj.1834w

1876. oct. 3.

No.	Micum.	Bmd 312
	62.500	20h 58m 27s.5
	63.000	43.0
		59 0.3
	64.000	19.7
		35.4
	65.000	53.7
		21 0 12.4
	66.000	29.3
		47.9
	67.000	1 5.2
		23.9
	68.000	39.8
		57.2
	69.000	2 14.8
		32.5
	70.000	49.3
		3 7.5
	71.000	26.4
		43.9
	72.000	4 2.2
		18.8
	73.000	35.2
		53.2
	74.000	5 13.0
		27.6
	75.000	45.5
		6 4.5?
	76.000	23.2
		38.5
	77.000	55.0

Micum.	Bmd 312
77.500	21h 7m 12.3
78.000	34.3
	51.7
79.000	8 5.8
	26.2
80.000	43.8
	9 2.6
81.000	22.6
	39.5
82.000	57.2
	10 14.0
83.000	33.0
	49.8
84.000	11 10.3
	27.3
85.000	44.8
	59.1
86.000	12 18.1
	35.6
87.000	53.7
	13 12.2
88.000	30.2
	46.5
89.000	14 3.4
	20.6
90.000	40.0
90.500	57.9
91.000	15 17.3

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Reduction of following Observations.

10	18	58	56.3
20	19	3	35.4
		4^m	$39^s.1$
			8
			$312^s.8$
		32	
		5	12.8
		37^m	13.
	18	58	56.3
$\therefore 90 \text{ revs} =$	18^h	36	09

10 =	18^h	58^m	$56^s.3$
	18		36.4
	19	17	32.9

	19		
15 Revs =	18	1	14.7
25 revs =	19	5	55.1
10 r		4^m	$40^s.4$
35 =	19	10	35.5

90 rev =	19	36	28.0
80 rev =		31	52.4
		4^m	$35^s.6$

4	39.1
	4
16	156.4
2	36.4
18	36.4

10	90
20	80
30	70
40	60
50	50
60	40
70	30
80	20
90	10

19	36	28.	
	31	52	
	27	13.5	
	22	34.2	
	17	57.9	
	13	16.4	
	8	~~39.8~~ 40.6	
	3	~~48.5~~ 35.4	
18	58	56.3	

4	36	✓
4	38	✓
4	39	✓
4	36	✓
4	41	✓
4	49 (39)	
	52	
4	~~39~~	✓
~~4~~	~~520~~ 391	✓

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1876. Oct. 7. α Ursae Minoris (e Elong.) (Examine for wiping wire).

Telescope tube above polar axis. Micrometer set at 10.000 and position angle 127° 38'. Illuminated by daylight and during latter half of observations by polaris itself.

Telescope undamped. Clock Bond 312. U. Spring Gov. First made one whole revolution, and thereafter set the screw at half revolutions, ending with 91.000.

Somewhere about 40° behind transit, accidentally touched the Key and made an irregular rattle, which however is about the time of transit.

Stars moderately defined. High wind. Sky clear. Power 401 — and at close of observations

Ther. in tube of Telescope = 56°.5
" external dome = 50.0

Rattle after coincidences with fixed wires.

Micrm.		Bond 312.		Micrm.		Bond 312.	
10.000	18h 58m	56.3	10	22 21.5	4	30.5	22
11.5 11	59	23.7	11	22.0	4	44.6	
11.0	59	38.6		23	4	59.0	23
.5 12	59	50.4	12	23.	5	12.8	
12.0	19 0	5.6		24	5	27.8	24
.5 13	0	19.7	13	24.	5	40.0	
13.0	0	34.4		25	5	53.1?	25
.5 14	0	47.3	14	25.	6	10.0	
14.0	1	1.2		26	6	23.7	26
.5 15	1	14.7	15	26.	6	35.6	
15.0	1	29.0		27	6	50.4	27
.5 16	1	42.0	16	27.	7	4.1	
16.0	1	58.0		28		18.0	28
.5 17	2	11.7	17	28.5 28.		32.2	28.5
17.0	2	25.8		29.5	7	59.1	29.5
.5 18	2	39.3	18	29.5 30 29.	8	13.2	30
18.0	2	53.4?		30		27.8	
.5 19	3	6.5	19	30.		40.6	31
19.0	3	20.4		31	8	53.6	
.5 20	3	35.4	20	31.	9	8.7	32
20.0	3	48.3		32		22.8	
.5 21	4	2.0	21	32.		37.6	33
21.0	4	17.3		33 33.5	9	50.3	

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166

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1876. Oct. 7.

Micum.		Rmd 312		Micum.		Rmd 312.	
~~33.0~~	18h 10	6.8	34	52 ~~54.5~~	18	51.9	53
34 .5		19.0		~~52.0~~	19	5.5	
~~34.~~		32.7	35			19.0	54
35	10	59.8	36	53.0		35.0	
~~35.~~	11	15.0			19	46.9	55
36		26.5	37	54.	20	0.2	
~~36.~~		41.8				15.5	56
37	11	54.7	38	55.		29.0	
~~37.~~	12	11.0				44.3	57
38		23.5	39	56.	20	58.0	
~~38.~~		33.0?			21	12.1	58
39	12	51.3	40	57.		25.9	
~~39.~~	13	5.3				40.0	59
40		16.4	41	58.	21	55.0	
~~40.~~		33.4			22	7.3	60
41	13	48.2	42	59.		20.0	
~~41.~~	14	0.0				34.2	61
42		14.7	43	60.	22	47.5	
~~42.~~		27.5			23	1.5	62
43		39.8	44	61.		15.9	
~~43.~~	14	55.7				29.6	63
44	15	9.6	45	62.		45.1	
~~44.~~		23.6			23	58.4	64
45		37.5	46	63.	24	12.4	
~~45.~~	15	54.2				27.5	65
46	16	7.3	47	64.		40.8	
~~46.~~		20.7		65	24	53.5	66
47		33.5	48	65.	25	7.4	
~~47.~~	16	48.7		66		20.8	67
48	17	3.0	49	66.		35.2	
~~48.~~		14.8		67	25	50.4	68
49		29.3?	50	69.	26	4.0	
49.		46.2		68		17.6	69
50	17	57.9	51	68.		31.3	
~~50.~~	18	8.5		69 ~~69.~~		46.0	70
51		25.6	52	69.	26	59.5	
~~51.~~		38.7					

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1876. oct. 7.

Microm.		Bond 312.	Microm.	Bond 312.	Microm.
70 ~~69.500~~	37	13.5	71 87.5	32.0	89
70.		26.6	88.0	49.3	
		> 14.0	72 88.5	1.5	90
71.	27	55.8	89.0	15.6	
	28	9.0	73 ~~90.9~~ 90.95 19h 36m	28.0	91.00
72.		23.8			
		35.8	74		
73.	28	50.5			
	29	4.5	75		
74.		19.5?			
		30.7	76		
75.		43.5			
	29	59.1	77		
76.	30	12.1			
		26.6	78		
77.		40.3			
	30	54.2	79		
78.	31	8.6			
		22.1	80		
~~79.~~		37.4			
80	31	52.4	81		
~~80.~~	32	5.9			
		18.8	82		
81.		32.5			
		48.0	83		
82	32	59.8			
	33	13.8	84		
83.		28.2			
		43.0	85		
84.	33	56.6			
	34	11.5	86		
85.		22.8			
		37.5	87		
86.	34	51.3			
	35	6.2	88		
87.		17.0			

Clock Comparison.

Bond 312

Twds. 132

20 hr. 30 m. 0.0 sec. = 20 hr. 31 m. 57.2 sec.

9 hr. 50 m. 0.0 sec. = 9 hr. 51 m. 58.8 sec.

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1876. Oct. 8d. 18h (Monday 5 PM). α Ursae Min. (W elong). L.W.Sth.

Telescope tube above polar axis. Daylight illumination. Telescope clamped. Power 401 (No. 4) — Definition rather poor. Clock Rmd 312. U. Spring Jar. Micrm set at 10r.000 and every half revolution thereafter to 91r.000.
1st fixed wire in coincidence followed by a rattle.
2d " " " " " " " " " "
3d " " " " not " " " " until the 2d half turn after it.
Doubtful bisections, wiped & late observations followed by a short rattle.

at 18h 50m Sd. Bar. = 30in.120 att. 51° { Dome Tel. ther. = 44°.0 / Dome Ext. " = 33.0

19h 57 Sd " = 30.120 " " 50° { Dome Tel. Ther = 43.5 / Dome Ext. Ther = 42.0

(The bulb of the ext. Dome Ther. was not exposed to the suns rays, but the upper part of the mercury in the tube was exposed to the suns rays.)
Came down from Mount at 20h 2m and found the chronograph had run over its paper — stopped think for not more than 3m 11s.

Micrm.	Rmd 312.	Micrm.	Rmd 312.
10.000	36.8	20.000	37.0
.500 7th Rmd	12.0		50.1
11.000	26.5	21. 30	4.2
	39.7		18.4
12.	52.6	22.	34.2
7th Rmd	10.1		46.3
13.	22.0	23. 31	1.3
	34.2		13.5
14.	47.6	24.	27.0
8th Rmd	2.7		42.0
15.	17.7	25.	57.3?
	32.5	32	9.0
16.	48.4?	26.	22.5
9th Rmd	1.5?		37.4
17.	13.6	27.	50.2
	28.3	33	4.4
18.	40.2	28.	18.4
	52.4		32.7
19. 10th Rmd	9.2	29.	48.3
.5	21.6	.5 34	1.5

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1876. Oct. 8.

Micim.		Bmd 312.
30.000		15.2
		29.5
31.		43.2
		59.5
32.	35	11.2
		25.4
33.		39.2
		52.5
34.	36	6.8
		20.3
35.		34.6
		48.0
36.	37	3.0
		16.8
37.		29.8
		45.0
38.		58.0
	38	12.4
39.		25.0
		40.4
40.		53.6
	39	9.0
41.		21.3
		36.5
42.		49.8
	40	2.2
43.		16.8
		30.5
44.		45.8
		58.7
45.	41	13.5
		27.2
46.		43.2
47.		57.6
47.5 ~~48.5~~	42	24.8

Micim.		Bmd 312.
48.0		35.8
48.5		50.1
	43	2.2
49.		18.0
		32.3
50.		48.1
	44	1.8
51.		15.0
		29.2
52.		40.0
		55.2
53.	45	9.5
		22.2
54.5		36.2
55.0		52.6
55	46	5.2
		19.3
56.		33.0
		47.2
57.		39.7
	47	14.0
58.		28.5
		42.8
59.		57.7
	48	10.3
60.		23.0
		37.2
61.		52.6
	49	6.4
62.		21.3
		32.7
63.		48.6
	50	3.3
64.5		16.8
65.50		29.3

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1876. oct. 8.

Micms		Bond 312
65.500		44.2
		55.9
66.	(54)	9.8
		24.5
67.		39.0
		50.5
68.	(52)	4.5
		18.2
69.		34.3
		47.8
70.	(53)	1.6
		16.6
71.		28.6
		44.7
72.		56.7
73.0	(54)	11.5
73.5		26.8
		41.5
74.		53.0
	(55)	8.0
75.		17.2
		34.2?
76.		50.0
77.0	(56)	2.1
77.5		18.7
		30.3
78.		46.1
		58.0
79.	(57)	12.0
		29.3
80.		44.2
		55.6
81.	(58)	7.5
		22.3 8v
82.		36.2

Micms.		Bond 312.
82.500	(58)	52.0 83

Lost through failure of chronograph.

[Assume the last reading obs'd 19h 58m 52s.0

Oct. 8th. 19h.

(7 A.M. (Monday morning.)

Clock Comparison.

Frods. 1327

8 0m. 19

Bond 312 sec.

= 8h 7m 1m. 0.8

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76

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1876. Oct. 9. Mind P.M. α Ursae Minoris. E. elong. 4. Spring Gov. Lw, obs.
Daylight illumination.
Eye Pce Power No 4 (401) – Telescope near polar axis & clamped – seeing good.
Micrometer set at 10ʳ.000 & read to 91ʳ.000 on Meteorological Observations as follows:

5.30 P.M. (mean time)	Bar #	att. ther	Exter. Ther	Ext. Dome Ther	Max. in tube	Min. in tube
5ʰ.30ᵐ P.M.	30.176	45.3	46.3	44.3	Set	Set.
6ʰ.30ᵐ "	30.104	52.9			49.5	49.7
6ʰ 21ᵐ			42.8	42.4	Set.	Set.
7 .21			40.8	40.7		
7 39			40.4	40.4		
7 45	29.947	50.0			48.0	45.9

Microm.		Bnd 212.
10.000	19 5	16.0
.5000		29.5
11.		41.6
		57.5
12.	6	11.5
		26.0
13.		39.7
		52.5
14.	7	6.6
		21.4
15.		36.0
		47.7
16.	8	3.0
		17.8
17.		32.0
		45.0
18.		57.3
	9	14.0
19.		27.6
		40.7
20.		55.0
	10	7.6
21.		21.0
		36.2
22.		50.2

Microm.		Bnd 212.
22.5	11	3.0
23.		17.6
		32.2
24.		44.3
		59.0
25.	12	14.4
		28.7
26.		40.8
		53.7
27.	13	9.0
		22.4
28.		36.5
		51.5
29.	14	5.4
		18.5
30.		33.0
		46.0
31.		59.8
	15	13.6
32.		28.3
		42.0
33.		56.8
	16	10.3
34.		23.7
		37.9

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1876. Oct. 9.

Micrms.		Bond 312
35.000		57.2
	17	4.8
36.		20.4
		34.1
37.		47.0
	18	2.0
38.		15.0
		29.8
39.		44.5?
		56.5
40.	19	11.2
		24.1
41.		38.7
		51.8
42.	20	6.8
		20.7
43.		33.6
		48.0
44.	21	1.4
		16.3
45.		29.5
		43.6
46.		55.0
	22	11.6
47.		25.2
		39.7
48.		54.5
	23	7.0
49.		21.5
		35.2
50.		47.3?
	24	1.7
51.		16.2
		30.5
52.		44.2

Micrms.		Bond 312.
52.500		57.8
53.00	25	12.5
13.5		24.2
		39.5
54.5		54.2
	26	7.7
55.5		21.4
		35.4
56.5		48.5
	27	2.3
57.5		17.3
		31.0
58.5		44.0
		59.5
59.5	28	14.5
		27.3
60.5		41.5
		55.2
61.5	29	10.2
		23.8
62.5		37.0
		50.8
63.5	30	4.6
		18.5
64.5		32.3
		46.4
65.5	31	0.4
		14.3
66.5		27.6
		41.6
67.5		56.4
	32	9.5
68.5		24.0
		37.5
69.5		52.4
70 69,500	33	6.2

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1876. oct. 9.

Microns.		Bond 312.
70.500		20.5
		33.8
71.5		46.7
	34	0.4
72.5		15.0
		28.3
73.5		42.1
		58.2
74.5	35	10.6
		25.2
75.5		39.5
		53.3
76.5	36	6.1
		20.3
77.5		35.4
		48.8
78.5	37	3.0
		15.7
79.5		30.0
		44.3
80.5	38	0.3
		12.0
81.5		24.3
		40.6
82.5		53.8
	39	8.5
83.5		21.0
		36.0
84.5		49.0
	40	3.8
85.5		17.0
		31.0
86.5		46.0
		58.8
87.5	41	11.0
		26.2

Microns.		Bond 312.
88.5		39.9
		54.0
89.5	42	8.3
		22.0
90.5		35.6
91.000019	42 min.	49.8

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1876. Oct. 9. (continued) λ Ursae Minor. u.c. Leo, Obs.

Same as λ Urs. Min. Except that Telescope is VV. × Field illuminated. Adjusted two small screws mentioned on p. 35 so that the screws should not show a slight roughness to the touch when it is turned near 90°.000.

Microm		Band 312	Microm		Band 312.
10r.000	15	4.5			30.5
		22.7	26.		48.3
11.		38.7		25	4.8
		57.5	27		23.9
12.	16	16.7			43.5
		33.7	28		59.6
13.		50.8		26	17.4
	17	9.6	29		33.5
14.		25.2			51.0
		43.0	30	27	10.0
15.	18	0.3			28.1
15.0	18	20.2	31		45.0
16. 15.5	18	35.0(?)		28	2.2
16.0		d 53.3	32		17.8
16.5	19	13.6			37.6
17.	19	29.5	33		55.3
	19	48.2		29	11.6
18.	20	6.4	34		32.5
	20	24.0			48.3
19.	20	43.4	35	30	7.2
	21	0.5			23.9
20.	21	17.0	36.		42.0
	21	34.4			58.3
21.	21	52.5	37	31	18.0
	22	9.8			33.0
22.	22	26.3	38		51.7
	22	46.1		32	11.4
23	23	4.4	39		28.0
	23	20.5			44.1
24	23	[37.3]	40	33	4.0
	22	55.3(?)			21.6
25	24	14.1			

Mean 15-25 = 21m 1s.60 — 44m 54s.6 / 58.6 — Mean 26.93 — 20 min

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1876phae.proj:1834w

1876. oct. 9.

Micium.		Bruhns 312.
41.		
~~40.~~ 000		38.4
		56.2
42.	34	12.1
		31.5
43		49.8
	35	7.2
44		23.5
		42.0
45	36	2.0
	36	18.1
46.		35.1
		54.0
47	37	11.4
		28.5
48		46.5
	38	3.4
49		21.9
		38.6 (?)
50		56.5
	39	14.2
51		31.0
		48.0
52	40	4.7
		24.6
53		40.4
		56.4
54	41	16.4
		33.3
55		50.8
	42	7.9
56		27.1
		43.5
57	43	3.2
		19.3
58		37.0
		54.0
59	44	9.3
		29.9
60.		46.1
	45	3.6
61		21.7
		40.3
62		58.0
	46	14.0
63		31.4
		52.5
64	47	11.5
		28.0
65		45.1
	48	4.8
66		20.0
		35.3
67		56.0
	49	12.0
68		32.7
		49.0
69	50	7.5
		25.0
70		44.0
	51	1.0
71		19.5
		34.3
72		53.4
	52	12.7
73		30.2
		47.5
74	53	2.9
		24.6
75		39.3 (?)
		58.5
76	54	16.6
		35.5
77		51.0
	55	6.7

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1876 oct. 9.

Micms.		Bmd 3/2.	Micms.		Bmd 3/2.
78		27.7	89.500		43.4
		45.0	89.	2	0.0
79	56	3.7			18.2
		21.9	90.		35.8
80		39.6	90.500	21 1w 2 4w	49.8
		58.0			
81	57	14.2			
		29.4			
82		51.2			
	58	11.2			
83		26.1			
		46.2			
84	59	2.4			
		20.5			
85		37.2			
		55.2			
86	0	13.2			
		30.9			
87		50.9			
	1	4.6			
88		26.0			

Bmd 1327 ? Bmd 3/2

21h 8m 0.0 = 21h 10m 0.0

The chronograph records clear beats so it is impossible to give the exact comparison.

With telescope W the bisection of a zenith star by par. wire was found to be sensibly accurate from end to end with one piece 1. and reading of position circle VB = 127° 38'. For observations to test coincidence of method of bisection & of transits for this might see [Eq. observations – No 1 part I page 2] .– [For Chron. readings & reductions see part III p. 5.]

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1876. Oct. 9d 18h (Am Monday) α Ursae Min. W. Elong. N. Sping Sov. Leo.

Tel. above the polar axis — Daylight ill. — power 401 — Tel. clamped in R. star seen through fleecy clouds — latter part of transits: at such times firmly defined — not good at any time. Observed 10 — 91 revs.

	Bar	att Ther	Ext. Dome Ther.	Tube of Tel.	max.	min.
				Set.		
6.10 Am.	29.884	47.7	40.1			
7.00 Am	29.836	48.0			44.5	43.5

Micum head below — ver B = 307° 38'

Micum		Bond 312.	Micum.		Bond 312
10,000	41	14.3	24.5		59.3
		29.6	24	48	14.1
11.		43.0	25		27.0
		57.0			42.0
12.	42	10.4	26		53.5
		23.8		49	9.4
13.		38.6	27		23.2
		51.2			35.6
14.	43	7.9	28		48.6
		20.2		50	2.3
15.		33.5	29		18.5
		48.0			30.8
16. 15	44	1.4	30		45.0
		15.0			57.3
17. 16		30.9	31	51	14.3
		44.1			27.8
18. 17		58.4	32		40.2
	45	13.4			54.0
19. 18		26.6	33	52	8.6
		40.9			22.5
20. 19		52.4	34		37.0
	46	8.3			51.5
21. 20		21.4	35	53	4.6
		35.8			19.2
22. 21		49.3	36		32.8
	47	2.6			
22.		17.4	37	54	1.8
22.5		30.1			13.5
23					

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1876. oct. 9.

Micms			Rmds 3/2
38.000	37.5		28.5
	38		38.8
39			56.0
	39	55	6.5
40			24.6
	40		40.5
41	41	56	5.2
			18.3
42			32.5
			46.8
43		57	0.0
			13.8
44			27.3
			42.8
45			58.2 or 54.8
		58	9.3
46			21.3
			38.0
47			52.0
	7	59	6.3
48			20.8
			33.8
49			47.7
		0	2.3
50			16.6
			27.2
51			41.2
			56.3
52		1	9.4
			24.8
53			39.0
			52.8
54		2	5.6
			19.9
55			33.0
			48.0
56		3	2.5 (?)
			16.4
57			29.5
			43.2
58			57.1
		4	11.5
59			24.5 (?)
			40.3 (?)
60			54.5
		5	8.6
61			22.0
			33.8
62			49.8
		6	4.4
63			17.3
			30.6
64			45.0
			58.6
65		7	13.0
			25.4
66			41.0
			55.3
67		8	9.4
			23.0
68			37.5
			49.3
69		9	5.0
			17.4
70			32.8
			45.3
71			58.8
		10	14.4
72			28.1
			41.0
73			55.7
		11	9.8
74			21.2
			31.4 (?)

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1876. vel. q.

Mucinus		Bmd 312.
75.		51.0
	12	5.6
76.		18,5 (?)
		33.3
77.		45.0
	13	0.2
78.		13.8
		27.3
79.		40.0
		54.5
80.	14	9.9
		23.8
81.		36.0
		51.2
82.	15	6.2
		20.1
83		34.3
		50.0
84.	16	0.4
		14.3
85		29.8
		43.4
86.		56.5
	17	12.6
87.		24.9
		40.0
88.		51.8
	18	7.6
89.		20.1
		34.4
90.	8h 18m	47.8

Flows, 1327 — Bmd 312

8h 27 0.0 = 8h 29 3.2

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84

Page		[7–13] 10.	[44–54] 44.	59
Date		1876. Sept 13.	Sept. 28.	Oct. 3.
Observer		S. W.	S. W.	S.W.
Mean Temp.		61°.3	50°.3	56.°
Object		λ Ursae Minoris.	λ Ursae Minor.	

Group.	From m To	Mean Rev.	Dist. from V	Dist.	Dist. from V	Dist.	Dist. 10–18	Dist. 10.5–18.5
I	10ʳ.000 – 18ʳ.000	14.000	+352".07		+353".01		88.87	87.72
II	19. – 27.	23.	264.30	87".76	264.31	88".70	87.74	
III	28. – 36.	32.	176.04	88.26	176.62	87.69	88.26	88.26
IV	37. – 45.	41.	+ 87.77	88.27	+ 88.28	88.34	87.94	87.94
V	46 – 54.	50.	0.0	87.77	0.0	88.28	88.28	88.28
VI	55. – 63.	59.	– 88.38	88.38	– 88.15	88.15	88.30	88.13
VII	64. – 72.	68.	176.48	88.10	176.22	88.07	88.35	88.32
VIII	73. – 81.	77.	264.45	87.97	263.90	87.68	88.12	88.09
IX	82.000 – 90.000	86.000	– 352.27	87.82	– 352.18	88.28	89.05	88.79

Means = 88".041 88".149

Residuals

+.28	–.22	–.55	+.46
.27	.23	19	8
+.29	–.44	13	47
7	6	–.13	+ 0
+.84	–.84	100	101

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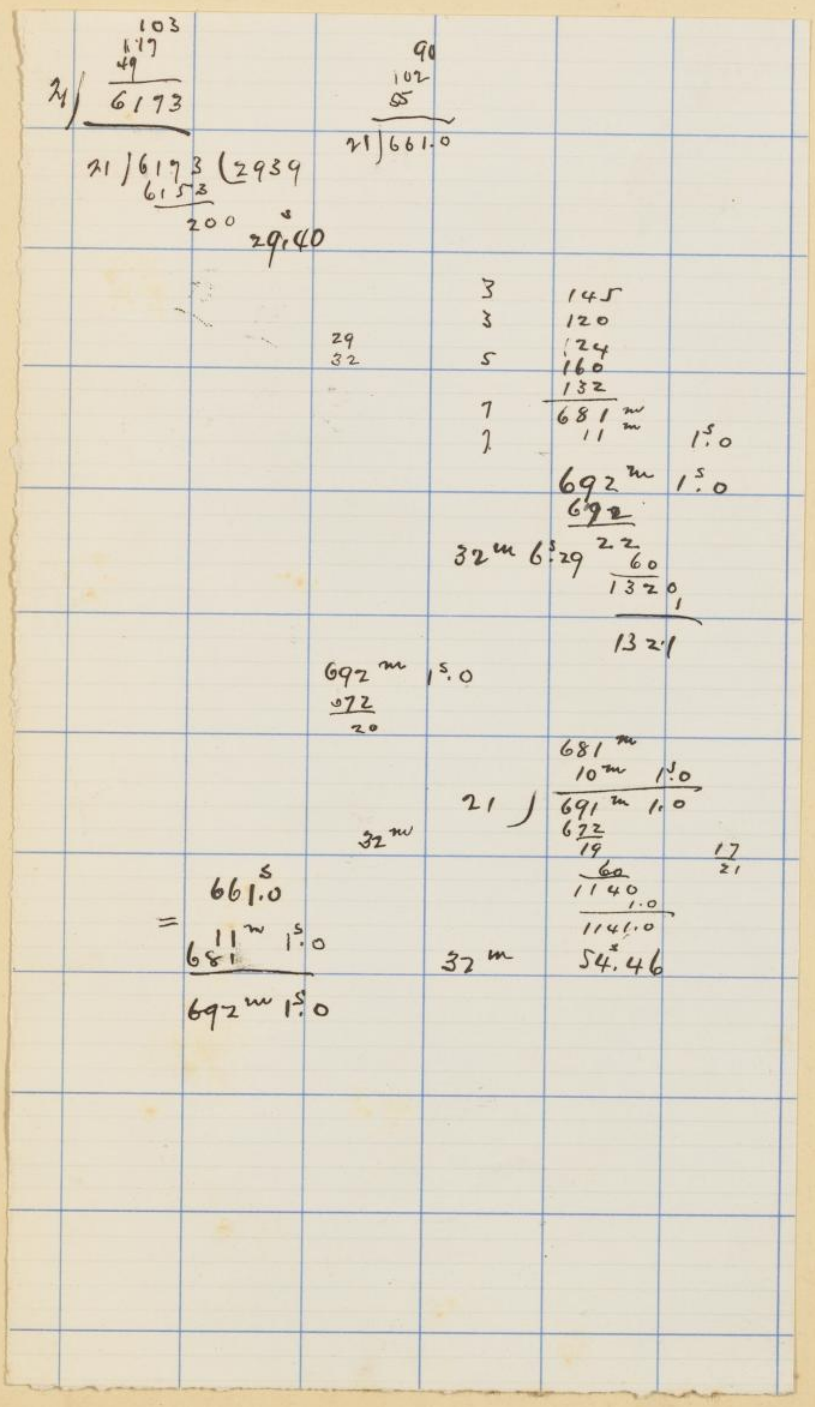
1970phac.proj..103W

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103
617
49
21 | 6173

21 | 6173 (2939
6153
200
29.40

90
102
55
21 | 661.0

3 145
3 120
5 124
160
132
7 681 m
1 11 m 1s.0
692 m 1s.0
692
32m 6s.29 22
60
1320
1321

692 m 1s.0
672
20

681 m
10 m 1s.0
21 | 691 m 1.0
672
19
60
1140
1.0
1141.0
54.46

32 m

17
21

661.0s
= 11 m 1s.0
681
692 m 1s.0

32 m

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9

	Date	Ltr.	Pos.	Red	
1	Sept. 13 d	2	a	R	9.788
2	1	Dark Trans Sept. 20. Red.			9.793
3		" " " 22 Red.			9.799
4					
5					

1	Sept. 13	λ Umae min.	u.c.	Red.	
2	28	" "	u.c.	Red.	
3	Oct. 1	" "	u.c.	not. ⊙ rej	
4	" 3	" "		Red.	
5	" 7	α " "	ε.	not.	Red
6	" 8	α " "	π	not.	
7	" 9*	Mindf. m. α " "	e	not.	Red
8	" 9	λ " "	l.c.	not.	
9	" *9 18h Tues.	α " "	π	not.	
10	" 9 P.m. Tues	α " "	ε	not.	
11	" 10	λ " "	u.c.	not.	
12	" 11	α " "		not.	
13	" 18	α " "	ε	not.	
14	" 24	α " "	ε	not.	
15	Dec 1	α " "	u.c.	not.	

*prob. cum q alt.

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MEAN PLACES FOR 1876.0. (Jan. 0^{d}.711, Washington.)

Star's Name.	Magnitude.	Right Ascension.	An. Variation.	Declination.	An. Variation.
		h m s	s	° ′ ″	″
α Andromedæ	2	0 1 58.822	+ 3.089	+28 24 21.59	+19.90
γ Pegasi (*Algenib*)	3.2	0 6 51.115	3.083	+14 29 39.60	20.04
* β Hydri	3	0 19 12.141	3.250	−77 57 12.96	20.24
α Cassiopeæ	var.	0 33 28.872	3.367	+55 51 24.85	19.80
β Ceti	2	0 37 21.820	3.014	−18 40 2.74	19.83
*21 Cassiopeæ	6	0 37 29.361	+ 3.836	+74 18 33.49	+19.73
ε Piscium	4	0 56 30.532	3.109	+ 7 13 19.94	19.47
* α Ursæ Min. (*Polaris*)	2	1 13 21.109	21.020	+88 38 52.85	19.03
θ^{1} Ceti	3	1 17 49.531	2.998	− 8 49 24.25	18.72
*38 Cassiopeæ	6	1 22 1.770	4.358	+69 37 31.59	18.71
η Piscium	4.3	1 24 50.922	+ 3.200	+14 42 22.51	+18.72
α Eridani (*Achernar*)	1	1 33 5.431	2.234	−57 52 1.01	18.41
ο Piscium	4	1 38 50.883	3.162	+ 8 31 58.64	18.25
β Arietis	3.2	1 47 47.539	3.302	+20 12 4.80	17.78
*50 Cassiopeæ	4	1 52 52.856	4.986	+71 49 10.45	17.67
α Arietis	2	2 0 11.161	+ 3.369	+22 52 31.22	+17.22
ξ^{1} Ceti	4.5	2 6 25.680	3.170	+ 8 15 50.82	17.06
* ι Cassiopeæ	4	2 18 52.198	4.845	+66 50 34.66	16.46
γ Ceti	3.4	2 36 52.600	3.103	+ 2 42 44.10	15.38
α Ceti	2.3	2 55 47.911	3.129	+ 3 36 7.28	16.35
*48 Cephei (H.)	6	3 4 39.321	+ 7.359	+77 16 32.04	+13.82
ζ Arietis	4.5	3 7 46.581	3.438	+20 35 1.81	13.63
α Persei	2	3 15 28.618	4.250	+49 25 4.10	13.14
δ Persei	3	3 34 6.012	4.241	+47 23 19.88	11.87
η Tauri	3	3 40 6.918	3.555	+23 43 12.39	11.44
ζ Persei	3	3 46 20.411	+ 3.757	+31 30 48.87	+11.02
γ^{1} Eridani	3	3 52 14.660	2.797	−13 51 44.14	10.52
γ Tauri	4	4 12 44.277	3.408	+15 19 36.16	9.04
ε Tauri	4.3	4 21 22.628	3.496	+18 54 14.05	8.36
α Tauri (*Aldebaran*)	1	4 28 48.407	3.436	+16 15 30.56	7.60
* 9 Camelopardalis	4	4 41 43.928	+ 5.916	+66 7 44.03	+ 6.72
ι Aurigæ	3	4 48 55.200	3.897	+32 58 4.20	6.11
11 Orionis	5	4 57 29.123	3.426	+15 13 47.16	5.39
α Aurigæ (*Capella*)	1	5 7 31.866	4.423	+45 52 9.89	4.12
β Orionis (*Rigel*)	1	5 8 34.741	2.881	− 8 20 47.06	4.46
β Tauri	2	5 18 27.240	+ 3.788	+28 30 2.20	+ 3.44
* Groombridge 966	6.7	5 23 9.612	7.991	+74 57 24.80	3.21
δ Orionis	2	5 25 40.358	3.064	− 0 23 33.66	2.98
α Leporis	3	5 27 15.760	2.647	−17 54 44.27	2.88
ε Orionis	2	5 29 55.306	3.042	− 1 16 57.85	2.63
α Columbæ	2	5 35 9.613	+ 2.172	−34 8 28.05	+ 2.15
α Orionis	var.	5 48 27.550	3.247	+ 7 22 55.97	+ 1.03
*22 Camelopardalis (H.)	5.4	6 5 10.552	6.618	+69 21 35.03	− 0.56
μ Geminorum	3	6 15 27.559	3.633	+22 34 31.34	1.46
α Argus (*Canopus*)	1	6 21 12.062	1.330	−52 37 43.12	1.86
γ Geminorum	2.3	6 30 32.929	+ 3.469	+16 30 12.38	− 2.69
α Canis Maj. (*Sirius*)	1	6 39 40.999	2.645	−16 32 50.29	4.67
*51 Cephei (H.)	5	6 41 44.656	30.215	+87 14 0.77	3.66
ε Canis Majoris	2.1	6 53 45.236	+ 2.359	−28 48 16.30	− 4.66

* Circumpolar Stars.

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Star's Name.	Magnitude.	Right Ascension.	An. Variation.	Declination.	An. Variation.
		h m s	s	° ′ ″	″
δ Canis Majoris . .	2	7 3 21.032	+ 2.439	−26 11 49.67	− 5.44
δ Geminorum . . .	3.4	7 12 43.025	3.591	+22 12 32.31	6.25
* Piazzi vii. 67. . .	6	7 17 57.732	6.310	+68 42 54.96	6.77
α Geminor. (*Castor*) .	2.1	7 26 40.885	3.839	+32 9 30.39	7.49
α Can. Min. (*Procyon*)	1	7 32 48.705	3.146	+ 5 32 27.98	8.95
β Geminor. (*Pollux*) .	1.2	7 37 43.594	+ 3.682	+28 19 26.67	− 8.34
φ Geminorum . . .	5	7 45 54.460	3.684	+27 5 6.12	8.96
* 3 Ursæ Majoris (H.) .	6	8 0 27.039	6.065	+68 50 9.57	10.07
15 Argus (ι)	3	8 2 15.882	2.556	−23 56 51.94	10.13
ε Hydræ	3.4	8 40 12.567	3.184	+ 6 52 21.84	12.93
ι Ursæ Majoris . .	3	8 50 42.567	+ 4.139	+48 31 36.48	−13.86
* σ^2 Ursæ Majoris . .	5	8 59 27.425	5.373	+67 38 7.14	14.24
κ Cancri	5	9 1 1.766	3.255	+11 9 58.57	14.22
ι Argus	2	9 13 46.157	1.601	−58 45 16.61	14.94
* 1 Draconis (H.) . .	4.5	9 19 15.070	9.113	+81 52 18.58	15.32
α Hydræ	2	9 21 29.652	+ 2.949	− 8 7 18.88	−15.40
* *d* Ursæ Majoris . .	5.4	9 23 28.960	5.424	+70 22 24.06	15.51
θ Ursæ Majoris . .	3	9 24 33.140	4.049	+52 14 28.12	16.17
ε Leonis	3	9 38 48.639	3.419	+24 20 39.79	16.37
μ Leonis	4	9 45 42.472	3.424	+26 35 24.40	16.76
α Leonis (*Regulus*) .	1.2	10 1 46.053	+ 3.203	+12 34 21.98	−17.42
* 32 Ursæ Majoris . .	6	10 9 0.453	4.436	+65 43 32.21	17.78
γ^1 Leonis . . .	2	10 13 8.028	3.317	+20 28 6.06	18.03
* 9 Draconis (H.) . .	5.4	10 24 30.335	5.300	+76 21 1.64	18.37
ρ Leonis	4	10 26 16.922	3.166	+ 9 56 39.01	18.40
η Argus	2	10 40 15.222	+ 2.310	−59 1 55.29	−18.76
l Leonis	5	10 42 44.291	3.159	+11 12 4.05	18.92
α Ursæ Majoris . .	2	10 56 3.590	3.757	+62 25 11.27	19.36
δ Leonis	2.3	11 7 30.765	3.202	+21 12 10.84	19.66
δ Crateris	3.4	11 13 8.557	2.996	−14 6 27.16	19.44
τ Leonis	5	11 21 33.642	+ 3.088	+ 3 32 20.74	−19.78
* λ Draconis	3.4	11 24 7.198	3.636	+70 0 53.17	19.87
υ Leonis	5.4	11 30 36.038	3.072	− 0 8 20.71	19.14
β Leonis	2	11 42 44.038	3.066	+15 15 55.77	20.09
γ Ursæ Majoris . .	2.3	11 47 18.037	3.187	+54 23 2.97	20.02
υ Virginis	4	11 58 53.575	+ 3.060	+ 9 25 19.12	−20.02
* 4 Draconis (H.) . .	5.4	12 6 22.276	2.902	+78 18 17.62	20.06
* β Chamæleontis . .	5	12 11 5.995	3.349	−78 37 26.21	20.04
η Virginis	3.4	12 13 33.753	3.069	+ 0 1 21.59	20.03
α^1 Crucis	1	12 19 42.297	3.269	−62 24 37.76	19.93
β Corvi	2.3	12 27 52.572	+ 3.139	−22 42 37.03	−19.94
* κ Draconis	3.4	12 28 10.891	2.600	+70 28 17.52	19.93
* 32 Camelop. (H.) (*foll.*)	5.4	12 48 14.155	0.364	+84 5 11.37	19.63
12 Canum Venaticorum.	3	12 50 13.502	2.816	+38 59 18.85	19.51
θ Virginis	4.5	13 3 31.885	3.101	− 4 52 34.55	19.31
α Virginis (*Spica*) .	1	13 18 39.755	+ 3.154	−10 30 47.50	−18.90
ζ Virginis	3.4	13 28 22.549	3.053	+ 0 2 20.73	18.51
η Ursæ Majoris . .	2	13 42 39.229	2.374	+49 55 57.86	18.10
η Bootis	3	13 48 46.880	2.859	+19 1 13.40	18.17
β Centauri	1	13 55 5.240	+ 4.167	−59 46 25.54	−17.64

* Circumpolar Stars.

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MEAN PLACES FOR 1876.0. (Jan. 0^{d}—.711, Washington.)

Star's Name.	Magnitude.	Right Ascension.	An. Variation.	Declination.	An. Variation.
		h m s	s	° ′ ″	″
* α Draconis	3.4	14 1 2.003	+ 1.623	+64 58 6.24	−17.35
α Bootis (*Arcturus*)	1	14 10 0.348	+ 2.734	+19 49 45.22	18.88
θ Bootis	4.3	14 20 58.487	+ 2.043	+52 25 28.89	16.77
* 5 Ursæ Minoris	5.4	14 27 48.570	− 0.206	+76 14 48.35	16.04
α^2 Centauri	1	14 31 12.466	+ 4.036	−60 19 9.68	15.03
ε Bootis	2.3	14 39 34.332	+ 2.621	+27 35 53.38	−15.36
α^2 Libræ	2.3	14 44 1.242	+ 3.308	−15 31 29.68	15.19
* β Ursæ Minoris	2	14 51 5.152	− 0.244	+74 39 42.59	14.75
β Bootis	3	14 57 16.508	+ 2.260	+40 52 50.22	14.38
β Libræ	2	15 10 20.156	+ 3.220	− 8 55 25.04	13.53
μ^1 Bootis	4.3	15 19 48.431	+ 2.268	+37 48 47.48	−12.80
* γ^2 Ursæ Minoris	3	15 20 56.349	− 0.144	+72 16 31.33	12.80
α Coronæ Borealis	2	15 29 26.293	+ 2.539	+27 8 0.37	12.32
α Serpentis	2.3	15 38 9.639	+ 2.950	+ 6 49 2.57	11.57
ε Serpentis	3.4	15 44 38.164	+ 2.987	+ 4 51 9.20	11.09
* ζ Ursæ Minoris	4.5	15 48 31.643	+ 2.278	+78 10 29.99	−10.88
ε Coronæ Borealis	4	15 52 27.354	+ 2.484	+27 14 18.71	10.63
δ Scorpii	2.3	15 53 0.209	+ 3.537	−22 15 59.23	10.55
β^1 Scorpii	2	15 58 13.697	+ 3.478	−19 27 51.09	10.18
* Groombridge 2320	6.5	16 5 59.262	+ 0.135	+68 8 12.95	9.50
δ Ophiuchi	3	16 7 50.892	+ 3.138	− 3 22 23.12	− 9.55
τ Herculis	3.4	16 16 0.711	+ 1.798	+46 36 34.37	8.76
α Scorpii (*Antares*)	1.2	16 21 48.424	+ 3.670	−26 9 16.90	8.35
η Draconis	3.2	16 22 18.988	+ 0.805	+61 47 42.88	8.22
* Λ Draconis	5	16 28 14.101	− 0.140	+69 2 10.89	7.78
ζ Ophiuchi	3.2	16 30 19.919	+ 3.298	−10 18 49.51	− 7.60
* α Trianguli Australis	2	16 35 33.262	+ 6.288	−68 47 48.05	7.30
η Herculis	3	16 38 38.717	+ 2.054	+39 9 34.31	7.03
κ Ophiuchi	3.4	16 51 47.912	+ 2.835	+ 9 34 11.03	5.86
d Herculis	5	16 57 1.535	+ 2.209	+33 44 57.83	5.41
* ε Ursæ Minoris	4.5	16 58 44.532	− 6.373	+82 14 17.47	− 5.29
α^1 Herculis	var.	17 8 59.614	+ 2.733	+14 32 0.44	4.37
44 Ophiuchi	5	17 18 47.896	+ 3.659	−24 3 30.49	3.67
β Draconis	3.2	17 27 37.829	+ 1.351	+52 23 37.50	2.81
α Ophiuchi	2	17 29 10.700	+ 2.783	+12 39 7.64	2.90
* ω Draconis	5	17 37 40.765	− 0.355	+68 48 52.29	− 1.65
μ Herculis	3.4	17 41 36.357	+ 2.345	+27 47 41.34	2.32
* ψ^1 Draconis (*pr.*)	4.5	17 44 8.803	− 1.082	+72 12 33.16	1.65
γ Draconis	2.3	17 53 43.764	+ 1.394	+51 30 14.85	0.58
γ^2 Sagittarii	3.4	17 57 50.577	+ 3.852	−30 25 24.11	− 0.41
μ^1 Sagittarii	4	18 6 20.857	+ 3.586	−21 5 20.43	+ 0.56
* δ Ursæ Minoris	4.5	18 12 19.895	−19.424	+86 36 28.55	1.12
η Serpentis	3	18 14 53.545	+ 3.099	− 2 55 43.95	0.63
* σ Octantis	6	18 17 12.758	+108.692	−89 16 36.69	1.51
1 Aquilæ (3 H. Scuti)	4.5	18 28 27.490	+ 3.265	− 8 19 43.11	2.18
α Lyræ (*Vega*)	1	18 32 44.401	+ 2.031	+38 40 9.78	+ 3.14
β Lyræ	var.	18 45 30.097	+ 2.215	+33 13 11.69	3.94
σ Sagittarii	2.3	18 47 34.562	+ 3.724	−26 26 53.80	4.07
* 50 Draconis	6	18 50 21.720	− 1.901	+75 17 10.92	4.43
ζ Aquilæ	3	18 59 42.560	+ 2.754	+13 40 51.21	+ 5.08

*Circumpolar Stars.

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*226 Cephei (B.)	5.6	22 30 5.424		1.082	+75 35 14.42	18.52
ζ Pegasi	3.4	22 35 16.602		2.989	+10 11 5.67	18.71
* ι Cephei	4.3	22 45 16.116		2.119	+56 32 54.18	18.86
λ Aquarii	4	22 46 8.609	+	3.131	− 8 14 19.04	+19.08
α Pis.Aus.(*Fomalhaut*)	1.2	22 50 47.706		3.328	−30 16 43.23	19.00
α Pegasi (*Markab*)	2	22 58 35.088		2.995	+14 32 19.62	19.32
* ο Cephei	6.5	23 13 32.488		2.438	+67 25 58.27	19.66
θ Piscium	4.5	23 21 40.662		3.041	+ 5 41 54.42	19.75
ι Piscium	4.5	23 33 34.413	+	3.084	+ 4 57 16.36	+19.49
* γ Cephei	3.4	23 34 16.217		2.405	+76 56 25.22	20.08
* Groombridge 4163	7	23 48 49.179		2.853	+73 43 12.28	20.00
ω Piscium	4	23 52 56.675	+	3.078	+ 6 10 37.28	+19.94

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MEAN PLACES FOR 1876.0. (Jan. 0^d—.711, Washington.)

Star's Name.	Magnitude.	Right Ascension.	An. Variation.	Declination.	An. Variation.
		h m s	s	° ′ ″	″
d Sagittarii	5	19 10 22.719	+ 3.513	−19 10 14.50	+ 6.11
* δ Draconis	3	19 12 31.305	+ 0.033	+67 26 35.68	6.31
* τ Draconis	5	19 17 55.607	− 1.109	+73 7 28.15	6.79
δ Aquilæ	3.4	19 19 14.706	+ 3.025	+ 2 52 9.85	6.89
κ Aquilæ	5	19 30 13.153	+ 3.230	− 7 18 3.45	7.72
γ Aquilæ	3	19 40 21.850	+ 2.853	+10 18 45.56	+ 8.51
α Aquilæ (*Altair*)	1.2	19 44 43.957	+ 2.928	+ 8 32 32.69	9.24
* λ Ursæ Minoris	6.7	19 48 16.936	−60.951	+88 56 0.07	9.12
* ε Draconis	4	19 48 34.925	− 0.174	+69 57 6.12	9.15
β Aquilæ	4	19 49 13.297	+ 2.947	+ 6 5 55.22	8.73
τ Aquilæ	6.5	19 58 4.933	+ 2.933	+ 6 55 46.80	+ 9.90
α^2 Capricorni	3.4	20 11 10.368	+ 3.333	−12 55 38.84	10.88
* κ Cephei	4.5	20 13 1.733	− 1.901	+77 20 12.15	11.00
α Pavonis	2	20 15 49.948	+ 4.792	−57 7 46.67	11.17
π Capricorni	5	20 20 13.305	+ 3.441	−18 36 58.94	11.49
ε Delphini	4	20 27 17.287	+ 2.866	+10 52 59.60	+12.00
* Groombridge 3241	6.7	20 30 31.679	− 0.211	+72 6 41.54	12.23
α Cygni	2.1	20 37 12.280	+ 2.044	+44 50 16.87	12.70
μ Aquarii	5.4	20 45 57.816	+ 3.240	− 9 26 48.82	13.27
ν Cygni	4	20 52 33.016	+ 2.234	+40 41 27.55	13.73
* 12 Year Cat. 1879	6	20 53 9.056	+ 2.505	+80 5 9.22	+13.70
61 Cygni (*pr.*)	5.6	21 1 20.421	2.688	+38 8 26.77	17.51
ζ Cygni	3	21 7 39.528	2.551	+29 43 9.58	14.59
α Cephei	3.2	21 15 37.140	1.437	+62 3 36.66	15.12
1 Pegasi	4.5	21 16 21.183	2.775	+19 16 31.23	15.24
β Aquarii	3	21 25 1.818	+ 3.164	− 6 6 55.04	+15.65
* β Cephei	3	21 27 3.157	0.799	+70 0 58.34	15.72
ξ Aquarii	5.4	21 31 8.956	3.198	− 8 24 32.52	15.96
ε Pegasi	2.3	21 38 5.767	2.948	+ 9 18 27.37	16.34
* 11 Cephei	5	21 40 5.987	0.905	+70 44 25.55	16.50
μ Capricorni	5	21 46 32.052	+ 3.279	−14 8 2.35	+16.78
* 79 Draconis	6.7	21 51 19.386	0.735	+73 6 56.18	16.97
α Aquarii	3	21 59 24.864	3.083	− 0 55 16.66	17.34
α Gruis	2	22 0 24.624	3.812	−47 33 36.80	17.20
θ Aquarii	4.5	22 10 17.361	3.170	− 8 23 59.28	17.79
π Aquarii	5.4	22 18 56.635	+ 3.065	+ 0 44 56.24	+18.14
η Aquarii	4.3	22 28 59.020	3.083	− 0 45 21.07	18.44
*226 Cephei (B.)	5.6	22 30 5.424	1.082	+75 35 14.42	18.52
ζ Pegasi	3.4	22 35 16.602	2.989	+10 11 5.67	18.71
* ι Cephei	4.3	22 45 16.116	2.119	+56 32 54.18	18.86
λ Aquarii	4	22 46 8.609	+ 3.131	− 8 14 19.04	+19.08
α Pis.Aus. (*Fomalhaut*)	1.2	22 50 47.706	3.328	−30 16 43.23	19.00
α Pegasi (*Markab*)	2	22 58 35.088	2.995	+14 32 19.62	19.32
* ο Cephei	6.5	23 13 32.488	2.438	+67 25 58.27	19.66
θ Piscium	4.5	23 21 40.662	3.041	+ 5 41 54.42	19.75
ι Piscium	4.5	23 33 34.413	+ 3.084	+ 4 57 16.36	+19.49
* γ Cephei	3.4	23 34 16.217	2.405	+76 56 25.22	20.08
* Groombridge 4163	7	23 48 49.179	2.853	+73 43 12.28	20.00
ω Piscium	4	23 52 56.675	+ 3.078	+ 6 10 37.28	+19.94

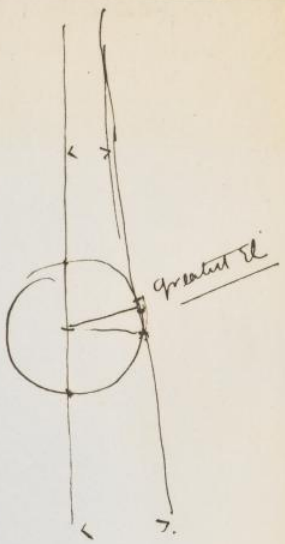
*Circumpolar Stars.

*Circumpolar Stars.

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Scheme for Reducing ~~Double~~ Micr. Screw Wire.



1. Take means $15^r - 25^r$ $45^r - 55^r$ $75^r - 85^r$
2. Correct the intervals for hourly rate.
3. Convert " " into arc = I

   M = 30.

~~4. Sin i = Sin I cos δ~~

4. $R = \frac{\sin I \cos \delta}{M}$ For u.c.w l.c.

For c or w.

1. Find hour ang. (elong. $\cos t_0 = \cot \delta \tan \varphi$.
2. Take the interval nearest to to reduce 15 ~~75~~ to t_0.
3. 2 & 3 as above. = I
4. $\sin i = \sin I \cos \delta$
5. ~~R = Sin~~

Aug. Wis. Mim. Assume $t_0 = 5^h\ 54^m$

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46
90
57
64-4.6

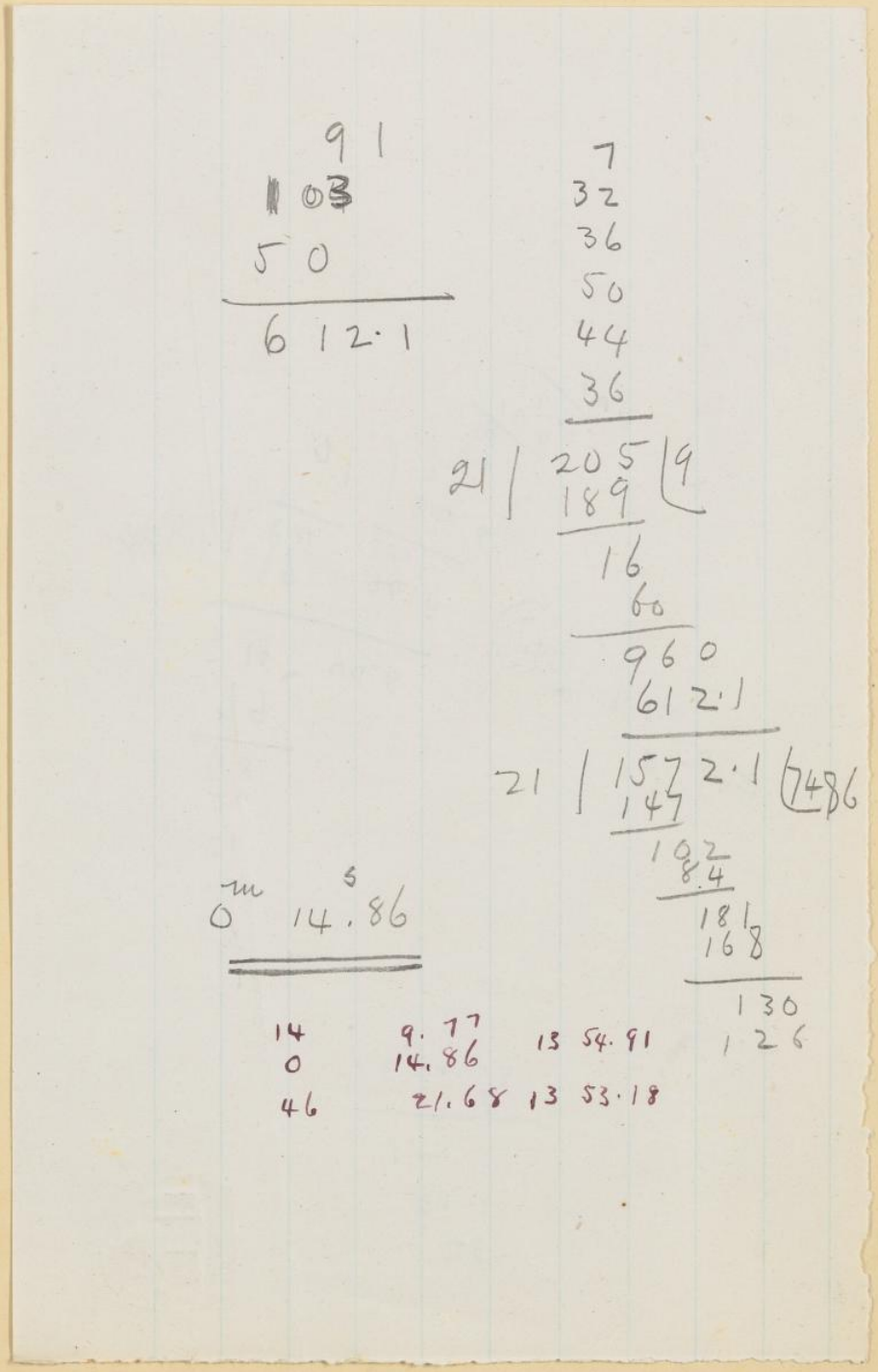
1
8
12
20
20
18
79
10m 44.6

(4m 14.5 #

21 | 89 44.6
84 300
304.6
21 | 21
94
84
106
105
10

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1.4 = 15.0

15.0
30.9 16
44.1 17
13.4
26.6 18
40.9
52.4 19
8.3
21.4 20
35.8
49.3 21
2.6
17.4 22
30.1
59.3 23
14.1 24
27.0 25
42.0

24
28
24
20
16

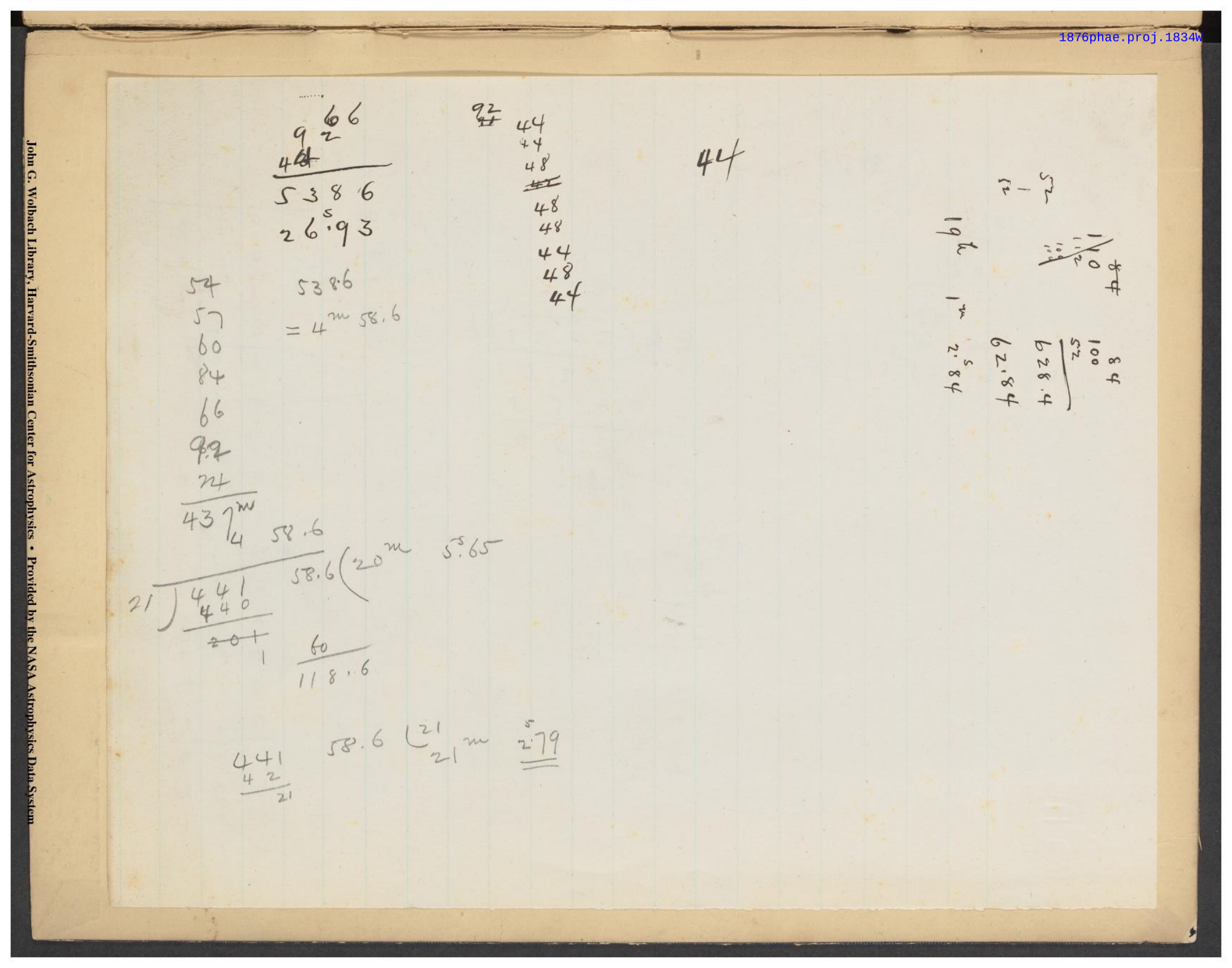
19 | 112 m | 5
95
170
60
1020

70
75
45 6
5320.5
1020

19 | 1552. | 81.68
152
32
19
130
114
160

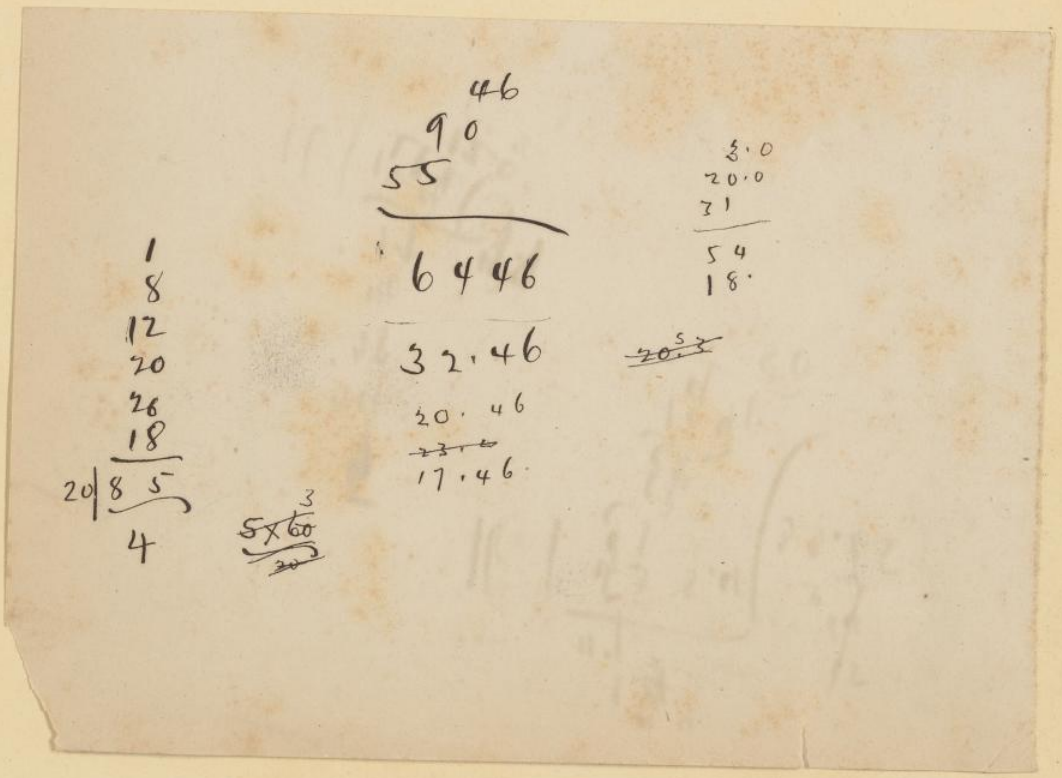
5 m 81.68 s
6 m 21.68 s

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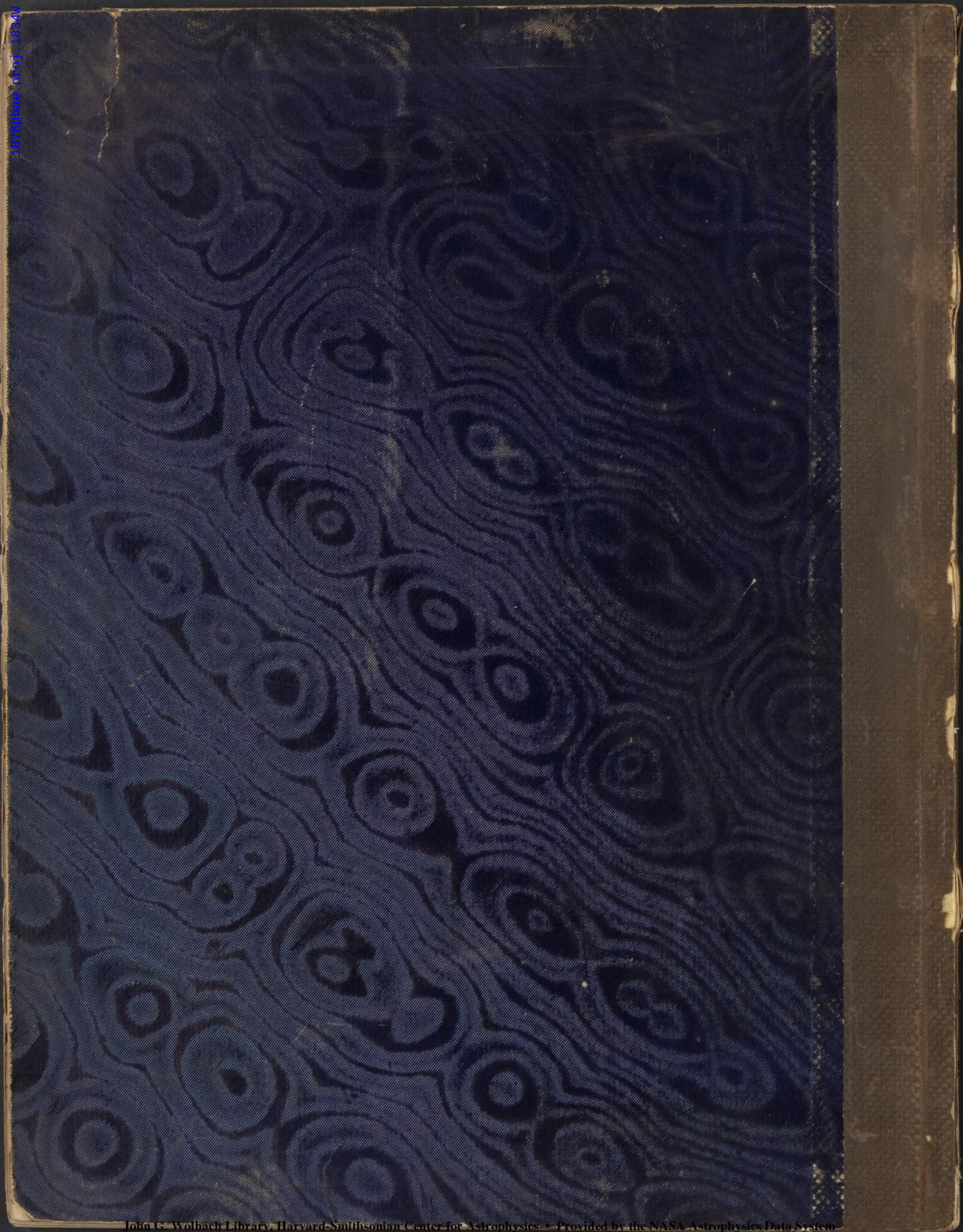
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Prec. RA & δ - compared
with my Cat

Prec in Declination -

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