

KG
11366
v.1060

NATIONAL		NATIONAL	
Plate No.	Date	Page	
✓ 14455	Dec. 26, 1917	1	

16190
11546
4542
74

14455

Star Measures.

1

1	17898	16888	18594	17190
14.8	1009688	14700	10498	15290
6.8	00	00	98	90
	98	88	94	90
	<u>14.7800</u>	<u>14.7812</u>	<u>68096</u>	<u>6.8100</u>

2	17556	16820	17142	16460
21.2	14890	9488	13000	10610
5.4	90	88	00	10
	56	20	42	60
	<u>21.2666</u>	<u>21.2668</u>	<u>5.4142</u>	<u>5.4150</u>

3	16570	16098	16040	16702
22.9	678688	15882	16028	16712
27.9	90	82	28	12
	70	98	40	02
	<u>22.9782</u>	<u>22.9784</u>	<u>28.0012</u>	<u>28.0010</u>

4	16872	17660	16490	18324
29.2	1513028	9410	11660	13160
26.4	26	10	60	60
	72	60	90	24
	<u>29.1744</u>	<u>29.1750</u>	<u>26.4830</u>	<u>26.4836</u>

1				
22				
16.9				
			16192	17236
			7250	16172
			50	72
			92	30
			<u>- 16.8942</u>	<u>16.8936</u>

2				
21				
17.4				
			16120	17908
			11654	12360
			54	7266
			20	08
			<u>- 17.4466</u>	<u>17.4458</u>

4455

Star Measures

1

	17898	16888	18594	17190
4	1009688	14700	10498	15290
8	00	00	98	90
	98	88	94	90
	<u>14.7800</u>	<u>14.7812</u>	<u>68096</u>	<u>6.8100</u>
2	17556	16820	17142	16460
2	14890	9488	13000	10610
4	90	88	00	10
	56	20	42	60
	<u>21.2666</u>	<u>21.2668</u>	<u>5.4142</u>	<u>5.4150</u>
-	16570	16098	16040	16702
29	678688	15882	16028	16712
19	90	82	28	12
	70	98	40	02
	<u>22.9782</u>	<u>22.9784</u>	<u>28.0012</u>	<u>28.0010</u>
	16872	17660	16490	18324
2	1513028	9410	11660	13160
4	26	10	60	60
	72	60	90	24
	<u>29.1744</u>	<u>29.1750</u>	<u>26.4830</u>	<u>26.4836</u>

Moon

	16192	17236
	50	16172
	50	72
	92	36
-	<u>168942</u>	<u>16.8936</u>
	16120	17908
	11654	12360
	54	72
	20	08
-	<u>17.4466</u>	<u>17.4452</u>

14455

noon

2

3	16466	16542
20.7	1018488	12830
18	92	30
	66	42
	<u>20.6278</u>	<u>20.6288</u>

4	16450	16558
20.6	1186870	11142
18.7	72	42
	50	58
	<u>20.4580</u>	<u>20.4584</u>

5	16440	16570
20.9	7580	15424
20	80	24
	40	70
	<u>20.8860</u>	<u>20.8854</u>

6	16978	16832
21.0	15678	8728
20	78	28
	78	32
	<u>20.1300</u>	<u>20.1296</u>

7	16242	16834
22	9392	13674
20.7	92	74
	42	34
	<u>20.6850</u>	<u>20.6840</u>

8	17212	16364
22.5	996662	13610
20.7	58	10
	12	64
	<u>20.7250</u>	<u>20.7246</u>

14455

Moon

2

3	16466	16542
20.7	1018488	12830
18	92	30
	66	42
	<u>20.6278</u>	<u>20.6288</u>

4	16450	16558
21.6	1186870	10142
18.7	72	42
	50	58
	<u>20.4580</u>	<u>20.4584</u>

5	16440	16570
20.9	7580	15824
20	80	24
	40	70
	<u>20.8860</u>	<u>20.8854</u>

16978	16832
15678	8228
78	28
78	32
<u>20.1300</u>	<u>20.1296</u>

16242	16834
9342	13674
92	74
42	34
<u>20.6850</u>	<u>20.6840</u>

17212	16368
996662	13870
58	70
12	64
<u>20.7250</u>	<u>20.7246</u>

14455

Lunes etc

3.

Date Dec 26, 1917

Exp. to Stars	5	04		5	16	
" " Moon	5	10	12.9	5	10	13.2
Clock Slow		02	08.6			

H. Sid. Time	5	12	21.65
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" Long	4	44	31.05
--------	---	----	-------

S. Sid. Time	9	56	52.70
--------------	---	----	-------

" " " M.N	18	17	39.07
-----------	----	----	-------

Interval	15	39	13.63
----------	----	----	-------

Red		02	33.87
-----	--	----	-------

C. M.T.	15	36	39.76
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 $\Theta - 0^h 2^m$
 $15^h 61104$

From Naut. Alman. - R.A.

Dec.

Moon 15 ^h	05	13	28.04	+24	08	11.2
----------------------	----	----	-------	-----	----	------

Motion 1 ^m			2.4112			-0.36
-----------------------	--	--	--------	--	--	-------

" 36.6627		01	28.40			-13.5
-----------	--	----	-------	--	--	-------

Tabular Place.	05	14	56.44	+24	07	57.7
----------------	----	----	-------	-----	----	------

 $934 = 14.9$
 $a = -500.0$
 $+24.0$
 -476.0

Moon's age 12.6

Parallax	56	59.3
----------	----	------

Semi-diam	15	33.3
-----------	----	------

R	933.3
---	-------

ang	14.9
-----	------

Dist 5	-0.3
--------	------

R	947.9
---	-------

R	20320
---	-------

RA	-96.7
----	-------

(1+a)R	1.9353
--------	--------

R ²	3.7454
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4455'

Junes etc

3.

Gate Dec 26, 1917

Exp to Stars 5 04

" Moon 5 10 12.9

5 16

5 10 13.2

Clock Slow 02 08.6

24 Sid Time 5 12 21.65

" Long 4 44 31.05

5 Sid Time 9 56 52.70

" M. IV 18 17 39.07

Interval 15 39 13.63

Red 02 33.87

C. M. T. 15 36 39.76

C. M. - 0^h 2^m15^h 61104

From Naut. Alman. R. A.

Dec.

Moon 15^h 05 13 28.04

+24 08 11.2

motion 1^m 2.4112

- 0.365

" 36^h 6627 01 28.40

- 13.5

Tabular Place. 05 14 56.44

+24 07 57.7

934" = 14.9

Means age 12.6⁴

a = -5000

+24.0

-4760

Parallax 56 59.3

Semi-diam 15 33.3

R 933.3

avg 14.9

2nd 5th -0.3

R 947.9

R 20320

9A - 967

11+9A 1.9353

R² 3.7459

14455

Plate Constants.

4

$$\begin{array}{r} X \\ S \\ X-S \end{array} \begin{array}{r} 14.7806 \\ 14.5004 \\ + .2802 \end{array}$$

$$\begin{array}{r} 21.2667 \\ 21.3226 \\ - 0.559 \end{array}$$

$$\begin{array}{r} 22.9783 \\ 22.9275 \\ + 0.508 \end{array}$$

$$\begin{array}{r} y \\ \eta \\ y-\eta \end{array} \begin{array}{r} 6.8098 \\ 6.2459 \\ .5639 \end{array}$$

$$\begin{array}{r} 5.4146 \\ 4.8366 \\ + .5780 \end{array}$$

$$\begin{array}{r} 28.0011 \\ 28.5740 \\ - .5729 \end{array}$$

$$\begin{array}{r} X-S + 5001 \\ + 2802 + 7390 = 10192 \\ - .0559 + 10633 = 10074 \\ + 0508 + 11489 = 11997 \\ 22.39467 \quad 11197 \end{array} \quad \begin{array}{r} - 84.74 \\ - 577 \\ - 458 \\ - 2381 \\ - 1591 \end{array} \quad \begin{array}{r} - 9615 \\ = 9615 \\ = 9616 \\ = 9616 \\ = 22.3937 \end{array}$$

$$\begin{array}{r} y-\eta + 5005 \\ + .5639 + 3405 = \\ + 5780 + 2707 = \\ - 5729 + 14000 = \\ 18.7890 + 9395 \end{array}$$

$$\begin{array}{r} + 86.3X \\ 9044 + 1277 = 10321 \\ 8487 + 1838 = 10325 \\ 8271 + 1986 = 10257 \\ + 1932 \end{array} \quad \begin{array}{r} + 3y - 10341 \\ + 20 = 10341 \\ + 16 = 10341 \\ + 84 = 10341 \\ + 56 = 18.8932 \end{array}$$

$$\begin{array}{r} \text{tables} \\ \text{Ans.} \end{array} \begin{array}{r} a = +0.4 \\ = -500.0 \end{array}$$

$$\begin{array}{r} e = +0.4 \\ -503.0 \end{array}$$

$$\begin{array}{r} a-e = 0.0 \\ + 3.0 \end{array}$$

$$\begin{array}{r} b+d = 0.0 \\ - 1.6 \end{array}$$

$$- 500.4$$

$$- 503.4$$

$$+ 3.0$$

$$- 1.6$$

4453

Plate Constants

4

X	14.7806	21.2667	22.9783
S	14.5004	21.3226	22.9278
-S	+ .2802	-0.559	+ 0.508

y	6.8098	5.4196	28.0011
y	6.2459	4.8366	28.5740
-y	.5639	+ 5780.	- 5729

-S + 5000	-84.74	-9615
2802 + 7390 = 10192	-577	= 9615
0539 + 10633 = 10674	-458	= 9616
05708 + 11989 = 11997	-2381	= 9618
22.3946 + 11197	-1591	= 22.3932

y - y + 5008	+ 86.5X	+ 3y - 10341
+ 5639 + 3405 =	9044 + 1277 = 10321	+ 20 = 10341
+ 5780 + 2707 =	8487 + 1838 = 10325	+ 16 = 10341
-5729 + 14000 =	8271 + 1986 = 10257	+ 84 = 10341
18.7890 + 9395 =	+ 1932	+ 56 = 18.89

$$\text{Plus } a = +0.4$$

$$1. = -500.0$$

$$2 = +0.4$$

$$-503.0$$

$$a - e = 0.0$$

$$+ 3.0$$

$$\text{Lind} = 0.0$$

$$- 1.6$$

1
2
3
4
5
6
7
81
2
3
4
5
6
7
8

14455

Moon center

5

0 - C

1	22.0000	-0.3940	0.1552	3.7469	+15
2	21.0000	-1.3940	0.9432	3.7465	+11
3	20.6283	-1.7657	3.1177	3.7402	-52
4	20.4582	-1.9358	3.9473	3.7473	+19
5	20.8857	-1.5083	2.2750	3.7417	-37
6	21.0000	-1.3940	0.9432	3.7412	-42
7	22.0000	-0.3940	0.1552	3.7485	+31
8	22.3940	0.0000	0.0000	3.7477	+23

R² 3.7454

3368

arc

1	16.8939	-1.8951	-1	3.5917	192
2	17.4462	-1.3428	-1	1.8033	226
3	18.0000	-0.7890	0	0.6225	246
4	18.7890	0.0000	0	0.0000	270
5	20.0000	+1.2110	+1	1.4667	309
6	20.1298	+1.3408	+1	1.7980	314
7	20.6845	+1.8955	+1	3.5933	348
8	20.7248	+1.9358	+1	3.7477	360

166232

Range 168

$$x = 22 \quad y = 16.8939$$

$$20.6845$$

$$37.5784$$

$$y_0 \quad 18.7892$$

$$y_{\max} \quad 20.7248$$

$$R \quad 1.9356$$

$$\cos R \quad 1.9353$$

$$y_{\min} \quad 20.4582$$

$$x_0 \quad 22.3935$$

Moon Center

$$x_0 \quad 22.3940$$

$$y_0 \quad 18.7890$$

14455

Moon center

0 - C 5

1	22.0000	-0.3940	0	0.1552	3.7469	+15
2	21.0000	-1.3940	0	0.9432	3.7465	+11
3	20.6283	-1.7657	0	3.1177	3.7402	-52
4	20.4582	-1.9358	0	3.7473	3.7473	+19
5	20.8857	-1.5083	0	2.2750	3.1411	-37
6	21.0000	-1.3940	0	0.9432	3.7412	-42
7	22.0000	-0.3940	0	0.1552	3.7485	+31
8	22.3940	0.0000	0	0.0000	3.7477	+23

R² 3.7454

arc

1	16.8939	-1.8951	-1	3.5917	192
2	17.4462	-1.3428	-1	1.8033	226
3	18.0000	-0.7890	0	0.6225	246
4	18.7890	0.0000	0	0.0000	270
5	20.0000	+1.2110	+1	1.4667	309
6	20.1298	+1.3408	+1	1.7980	314
7	20.6845	+1.8955	+1	3.5933	348
8	20.7248	+1.9358	+1	3.7477	360

Range 168

$$x = 22 \quad y = 16.8939$$

$$20.6845$$

$$37.5784$$

$$y_0 \quad 18.7892$$

$$y_{\text{max}} \quad 20.7248$$

$$y \quad 1.9356$$

$$\text{Corr } A \quad 1.9353$$

$$y_{\text{min}} \quad 20.4582$$

$$x_0 \quad 22.3935$$

Moon Center

$$x_0 \quad 22.3940$$

$$y_0 \quad 18.7890$$

Formation of Normals.

1	+ 0.74	- 5.8	- 28.5
2	+ 1.86	- 15.2	- 14.7
3	+ 1.40	+ 91.8	+ 41.0
4	0.00	- 35.9	0.0
5	- 1.83	+ 55.8	- 44.8
6	- 1.86	+ 58.4	- 56.2
7	- 0.74	- 12.1	+ 59.0
8	- 0.00	- 0.0	+ 44.6
	+ 4.00	+ 206.0	+ 144.6
	- 44.3	- 69.0	- 144.2
	- 0.43	+ 137.0	+ 0.4

28.8

14455

Conditional Equations

6

								0 - 2
1	-0.39	-1.90	= +1.5	- 5	- 1	= - 6	+ 21	
2	-1.39	-1.34	= +1.1	- 17	- 0	= -17	+ 28	
3	-1.77	-0.79	= -5.2	- 21	- 0	= -21	- 31	
4	-1.94	0.00	= +1.9	- 24	0	= -24	+ 43	
5	-1.51	+1.21	= -3.7	- 18	+ 0	= -18	- 19	
6	-1.39	+1.34	= -4.2	- 17	+ 0	= -17	- 25	
7	-0.39	+1.90	= +3.1	- 5	+ 1	= - 4	+ 35	
8	0.00	+1.94	= +2.3	- 0	+ 1	= +1	+ 22	

+149 - 75

ar. 28

$$+11.34 - 0.43 = +1.37.0$$

$$- 0.43 + 16.62 = + 0.4$$

$$+() - 0.02 + 5.2$$

$$+ 16.6 = + 5.6$$

$$b = + 0.3$$

$$+11.34 = +13.7.0 + 0.1 = +13.7.1$$

$$a = + 12.1$$

arc 168

$$\frac{P}{n} = .27^{\circ}$$

$$\frac{\Sigma V}{n} = + 9.25^{\circ}$$

$$\frac{+ 9.25}{.27} = + 34.3^{\circ}$$

$$\Delta R = + 0.4^{\circ}$$

14455

Conditional Equations

6

1	-0.39	-1.90	= +1.5	- 5	- 1	= - 6	+ 21
2	-1.39	-1.34	= +1.1	- 17	- 0	= -17	+ 28
3	-1.77	-0.79	= -5.2	- 21	- 0	= -21	- 31
4	-1.94	0.00	= +1.9	- 24	0	= -24	+ 43
5	-1.51	+1.21	= -3.7	- 18	+ 0	= -18	- 19
6	-1.39	+1.34	= -4.2	- 17	+ 0	= -17	- 25
7	-0.39	+1.90	= +3.1	- 5	+ 1	= - 4	+ 35
8	0.00	+1.94	= +2.3	- 0	+ 1	= +1	+ 26

+149 = 75

ar. 28

$$+11.34 - 0.43 = +137.0$$

$$- 0.43 + 16.62 = + 0.9$$

$$+ () - 0.02 = + 5.2$$

$$+ 16.6 = + 5.6$$

$$b = + 0.3$$

$$+11.34 = +137.0 + 0.1 = +137.1$$

$$a = + 12.1$$

arc 16.8

$$\frac{p}{m} = .27$$

$$\frac{\Sigma K}{m} = + 9.25$$

$$+ \frac{9.25}{.27} = + 34.3$$

$$\Delta R = + 0.9$$

14455

Moon's Mean Position.

7

$$\begin{array}{r}
 Y_0 \quad 22.3940^{\circ} \\
 \quad \quad +6 \\
 \hline
 22.3946^{\circ}
 \end{array}$$

$$\begin{array}{r}
 Y_0 \quad 18.7890^{\circ} \\
 \quad \quad 0 \\
 \hline
 18.7890^{\circ}
 \end{array}$$

From Plate Constants.

$$\begin{array}{r}
 22.3937^{\circ} \\
 22. \\
 \hline
 +0.3937^{\circ}
 \end{array}$$

$$\begin{array}{r}
 18.8932^{\circ} \\
 18. \\
 \hline
 +0.8932^{\circ}
 \end{array}$$

$$9.59517^{\circ}$$

$$9.96129^{\circ}$$

$$8.50724$$

$$1.12664^{\circ}$$

$$+13.39^{\circ}$$

$$9.6452^{\circ}$$

$$9.1903^{\circ}$$

$$7.0534$$

$$5.8889^{\circ}$$

$$Y_0 \quad 0.8932^{\circ}$$

$$A_0 \quad 5 \quad 14 \quad 40.00^{\circ}$$

$$\alpha_0 \quad 5 \quad 14 \quad 53.39^{\circ}$$

$$\text{Red} \quad +06.30^{\circ}$$

$$\alpha' \quad 5 \quad 14 \quad 59.69^{\circ}$$

$$9.95095^{\circ}$$

$$7.33115^{\circ}$$

$$2.61980^{\circ}$$

$$+416.7^{\circ}$$

$$+6 \quad 56.7^{\circ}$$

$$\delta_0 = +23 \quad 43 \quad 01.0^{\circ}$$

$$S_0 \quad 23 \quad 49 \quad 57.7^{\circ}$$

$$\text{Red} \quad +6.5^{\circ}$$

$$\delta' \quad +23 \quad 50 \quad 04.2^{\circ}$$

14453"

Moon's Mean Position

7

$$\begin{array}{r}
 Y_0 \quad 223940 \\
 \hline
 \quad \quad +6 \\
 \hline
 223946
 \end{array}$$

$$\begin{array}{r}
 Y_0 \quad 187890 \\
 \hline
 \quad \quad \quad 0 \\
 \hline
 187890
 \end{array}$$

From Plate Constants

$$\begin{array}{r}
 22.3937 \\
 \hline
 22 \\
 \hline
 +0.3937
 \end{array}$$

$$\begin{array}{r}
 18.8932 \\
 \hline
 18 \\
 \hline
 +0.8932
 \end{array}$$

$$\begin{array}{r}
 9.59517 \\
 9961.29 \\
 8507.24 \\
 1.12664
 \end{array}$$

$$\begin{array}{r}
 9.6452 \\
 91903 \\
 70534 \\
 58889
 \end{array}$$

$$+13.39$$

$$H_0 \quad 0.8932$$

$$A_0 \quad 5 \quad 14 \quad 40.00$$

$$q_0 \quad 5 \quad 14 \quad 53.39$$

$$Red \quad \quad \quad +06.30$$

$$\alpha' \quad 5 \quad 14 \quad 59.69$$

$$\begin{array}{r}
 995.095 \\
 7331.15 \\
 261980
 \end{array}$$

$$+416.7$$

$$+6 \quad 56.7$$

$$R_0 +23 \quad 43 \quad 01.2$$

$$S_0 \quad 23 \quad 49 \quad 57.7$$

$$Red \quad \quad \quad +6.5$$

$$S' +23 \quad 50 \quad 04.2$$

14455

35

Reduction to apparent Place

8

$H + \alpha'$	04	57.0	$74^\circ 15'$	$\delta_0 + 23^\circ 50'$	
H	23	42.1			
α_0	05	14.9		$\cos \delta_0$	9.9613
β_0	0	03.0		l	9.8397
$\beta + \alpha'$	05	17.9	$79^\circ 28.5'$	(6)	9.8010

$\cos \beta + \alpha'$	9.2616
q	1.4267
$\sin \beta + \alpha'$	9.9926
$\tan \delta_0$	9.6452
	8.8239

$\sin \delta_1$	9.6065
$\cos H + \alpha_0$	9.4337
h	1.3109
$\sin H + \alpha_0$	9.9834
$\sec \delta_0$	0.0387
	8.8239

$\log q$	0.6883
q	9.8884

$\log l'$	0.3511
l	0.1569

z	+4.096
q	+0.773
h	+1.435
Red	+6.304

q'	+4.879
h'	+2.245
l	-0.632
Red	+6.492

+55°

Reduction to apparent place

8

H + x	0.4	51.0	74° 15'	S ₀	+23° 50'
H	23	92.1			
x ₀	0.5	14.9		cos δ ₀	9.9613
C	0	03.0		l	9.8397
C + x	0.5	17.9	79° 28.5'	(l)	9.8010

cos C + x	9.2610
q	1.4267
sin C + x	9.9926
tan δ ₀	9.6452
	9.8239

sin δ ₀	9.6065
cos H + x ₀	9.4337
h	1.3109
sin H + x ₀	9.9834
sec δ ₀	0.0387
	8.8239

log q'	0.6883
q	9.8884

log l'	0.3511
l	0.1569

f	+4.096
g	+0.773
h	+1.435
Red	+6.304

q'	+4.879
l'	+2.245
i	-0.632
Red	+6.492

14453

Lunar Parallax.

9

α'	05	14	59.69	II	56	59.3
δ	05	12	21.65			
$\delta - \alpha'$	-	2	38.04		9.86913	
"	-	39	30.60		8.21949	
$1/2 \alpha \cdot \alpha'$	-		15.93		8.06042	
$\delta - \alpha' - 1/2 \alpha \cdot \alpha'$	-	39	14.67		0.03972	
					6.18876	

9.95727
 0.00000
 0.00003
 9.95730

$\alpha - \alpha'$ - 31.86
 = - 2.12

γ 42 11 16.8

δ' + 23 50 04.2

$\gamma - \delta'$ 18 21 12.6

9.82640
 8.21949
 9.49814
 0.17291
 7.71694

$\delta - \delta'$ + 77 54.9

δ 24 07 59.1

$\text{cpl } \delta + 24$ 07 57.7

$\delta - \delta'$ + 1.4

$\text{cpl } \delta$ + 0.2

Lunar Dist. Ref. 0.0

$\delta + 24$ 07 59.3

$\delta - \delta'$ + 1.6

α 05 14 57.57

$\text{cpl } \alpha$ 05 14 56.44

$\alpha - \alpha'$ + 1.13

$\text{cpl } \alpha$ + 0.01

α 05 14 57.58

$\alpha - \alpha'$ + 1.14

+455°

Lunar Parallax.

9

x'	05°	14	59.69	π	56"	59.3
θ	05°	12	21.65			
$\theta - x'$	-	2	38.04			9.86913
"	-	39	30.60			8.21949
$\frac{1}{2} x \cdot x'$	-		15.93			8.06042
$\frac{1}{2} x \cdot \theta$	-	39	19.61			0.03972
						6.18876

9.95727
 0.00000
 0.00003
 9.95730

$\alpha - x'$ - 31"80
 = - 2.12

y 42 11 16.8

δ' + 23 50 09.2

$y - \delta'$ 18 21 12.6

9.82640
 8.21949
 9.49814
 0.17291
 7.71694

$\delta - \delta'$ 17 54.9

δ 24 07 59.1

$\text{apl } \delta + 24$ 07 57.7

$\theta -$ + 1.4

corr + 0.2

$\text{true } \delta$ 0.0

$\delta + 24$ 07 59.3

$\theta - \delta$ + 1.6

λ 05° 14 57.57

$\text{apl } \lambda$ 05° 14 56.44

$\theta - \lambda$ + 1.13

corr + 0.01

λ 05° 14 57.58

$\theta - \lambda$ + 1.14

