

SMITHSONIAN CONTRIBUTIONS TO KNOWLEDGE.

MAGNETICAL OBSERVATIONS

ARCTIC SEAS.

IN THE

BY

ELISHA KENT KANE, M. D., U.S.N.

MADE DURING THE SECOND GRINNELL EXPEDITION IN SEARCH OF SIR JOHN FRANKLIN, IN 1853, 1854, AND 1855, AT VAN RENSSELAER HARBOR, AND OTHER POINTS ON THE WEST COAST OF GREENLAND.

REDUCED AND DISCUSSED,

BY

CHARLES A. SCHOTT, Assistant U. S. COAST SURVEY.

[ACCEPTED FOR PUBLICATION, MAY, 1858.]

MAGNETICAL OBSERVATIONS

ELISHA KENT KANE, M.D., U.S.N.

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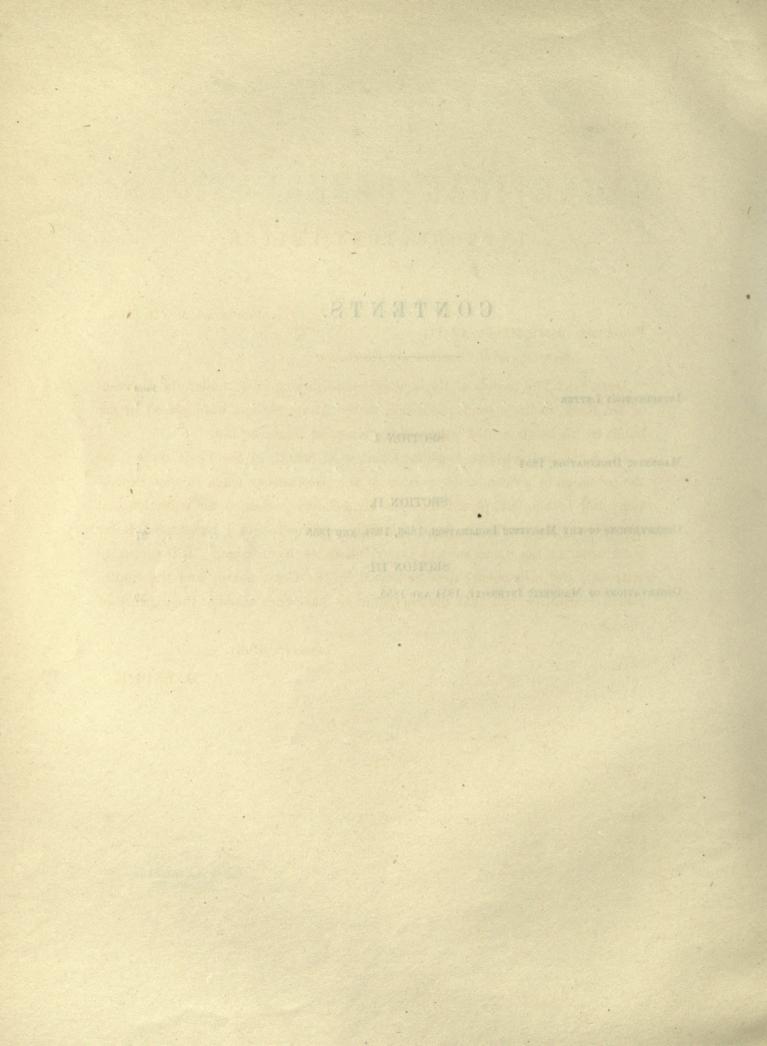
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COLLINS, PRINTER. PHILADELPHIA:

CONTENTS.

INTRODUCTORY LETTER			•			PAGE V
SECTIO	ON I.					
MAGNETIC DECLINATION, 1854	·	•				1
SECTIO	N II.					
OBSERVATIONS OF THE MAGNETIC INCLINATION, 1853	3, 1854, An	ND 1855		•		27
SECTIO	N III.					
Observations of Magnetic Intensity, 1854 and 1	855.					39



INTRODUCTORY LETTER.

WASHINGTON, May 17, 1858.

PROFESSOR JOSEPH HENRY, LL.D.,

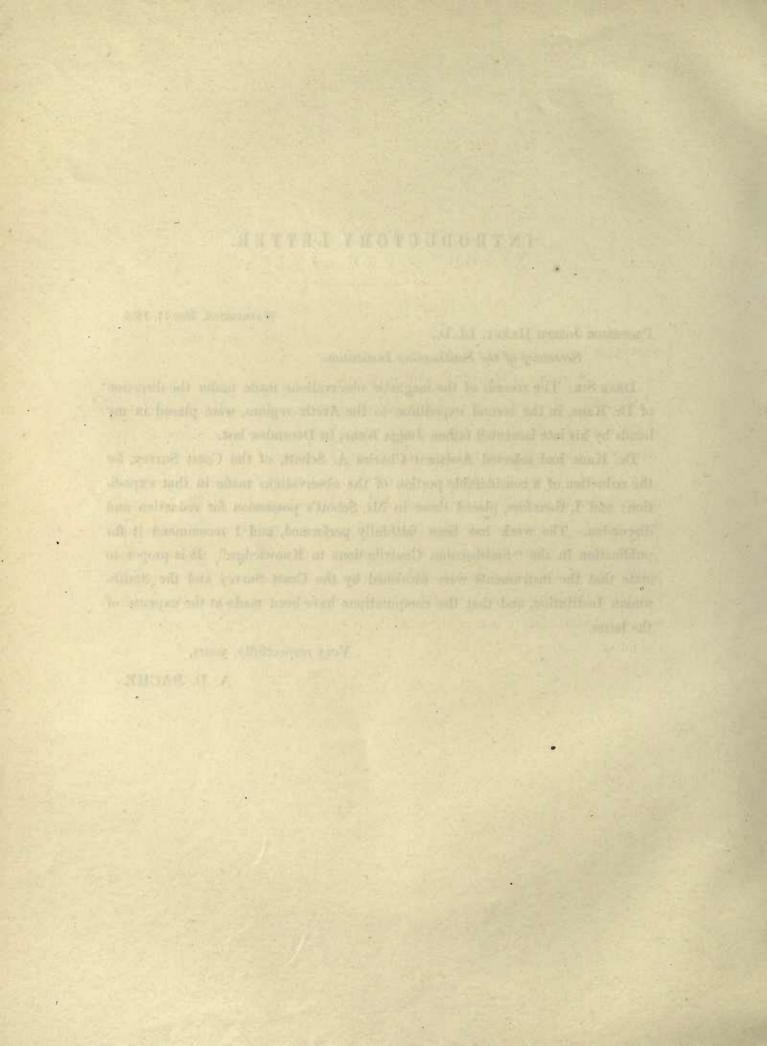
Secretary of the Smithsonian Institution:

DEAR SIR: The records of the magnetic observations made under the direction of Dr. Kane, in the second expedition to the Arctic regions, were placed in my hands by his late lamented father, Judge Kane, in December last.

Dr. Kane had selected Assistant Charles A. Schott, of the Coast Survey, for the reduction of a considerable portion of the observations made in that expedition; and I, therefore, placed these in Mr. Schott's possession for reduction and discussion. The work has been faithfully performed, and I recommend it for publication in the "Smithsonian Contributions to Knowledge." It is proper to state that the instruments were furnished by the Coast Survey and the Smithsonian Institution, and that the computations have been made at the expense of the latter.

Very respectfully, yours,

A. D. BACHE.

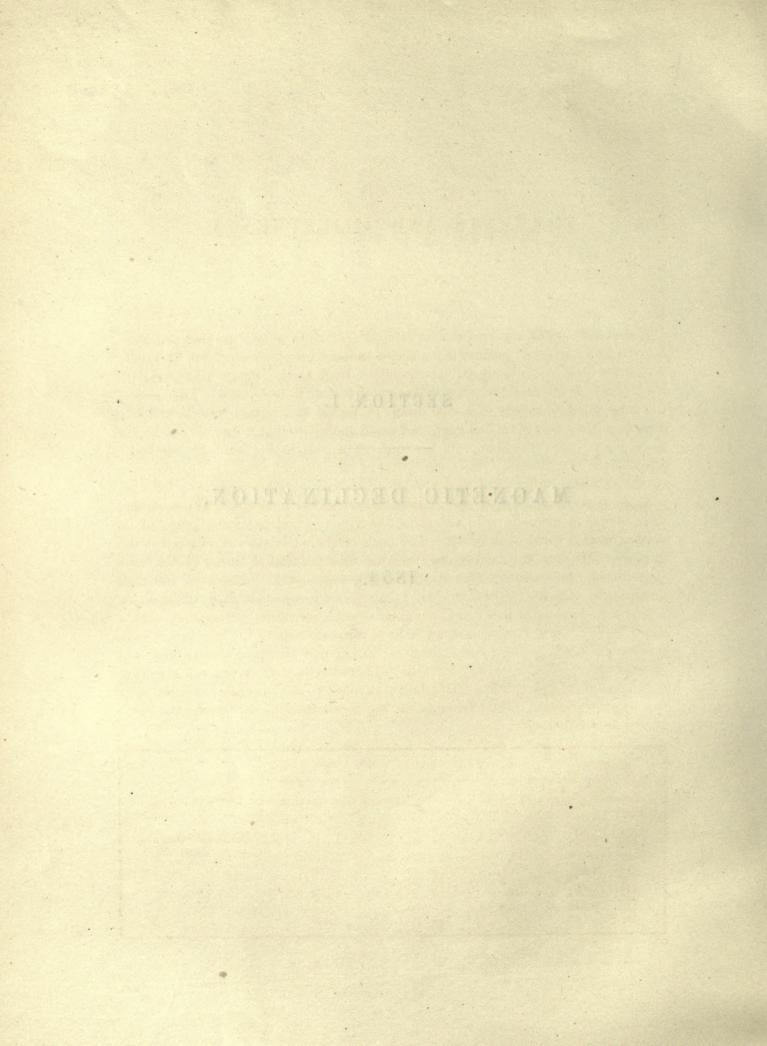


SECTION I.

4

MAGNETIC DECLINATION.

1854.



COMMENTS AND ADJUSTMENTS.

Instruments.—The observations for diurnal inequality as well as those for absolute declination, were made with a Jones unifilar magnetometer (No. 3), kindly loaned by Prof. A. D. Bache, Superintendent U. S. Coast Survey. The azimuth circle reads to 20" and the centre division of the scale reads 280. The magnet was suspended by means of a silk thread 91 inches in length. Several trials to determine the effect of torsion gave such small quantities that it was not considered necessary to take the same into account. The instrument was not originally intended to give absolute declinations, but at the Winter Quarters the observer succeeded in obtaining a few values for absolute declination by detaching the box, containing the magnet, from the circle which bears the telescope. The same was then moved in azimuth until a well defined object within the small range of its vertical motion could be observed. The focus of the telescope was adjusted to the distance. We find the instrument "perched on a pedestal of frozen gravel," the contents of two barrels. This mounting was considered as stable as the rock underneath. On the 9th of June, 1854, Mr. Sountag examined the instrument in reference to local disturbance, and found no sensible deviation arising from such a "The local deviation seems to have corrected itself; the iron in our comsource. fortless little cell seems to have been so distributed that our results were not affected by it." (Narrative, vol. I.) The adjustments were made according to Riddel's magnetical instructions. The mirror attached to the suspended magnet faces the magnetic north. The following are the determinations for the angular value of a scale division:-

Circle.	Scale.	Circle.	Scale.	perset these open strong of
Readings; Janua	ry 13, 1854.	И	Vinter Quart	ers, Van Rensselaer Harbor.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	45 ^d .5 100.7 92.5 153.5 148.0 199.0 201.0 250.5	$\begin{array}{c} 118^{\circ} \ 11'-07' \\ 117 \ 34-30 \\ 117 \ 34-30 \\ 116 \ 49-46 \\ 116 \ 49-46 \\ 116 \ 13-10 \\ 116 \ 05-00 \\ 115 \ 31-29 \end{array}$	$\begin{array}{c} 253^{4}.0\\ 303.0\\ 303.2\\ 351.0\\ 354.5\\ 394.0\\ 405.5\\ 451.0\\ \end{array}$	Taking alternate means, we obtain from each set the values: $-1^d = 0'.797.$

MAGNETIC DECLINATION.

Circle.	Scale.	Circle.	Scale.	
Readings; Janu	ary 16, 1854.			(Dr. Hayes, observer.)
$\begin{array}{c} 119^{\circ} \ 31' - 31' \\ 120 \ 48 - 46 \\ 120 \ 48 - 46 \\ 122 \ 09 - 06 \end{array}$	452 ^d 350 353 251	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\left.\right\} 1^{d} = 0'.741.$
Readings; Febru	nary 16, 1854.			
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$\begin{array}{c} 62^{d}.5\\ 153.0\\ 136.0\\ 257.0\\ 259.7\\ 355.0\\ 354.5\\ 463.0\\ \end{array}$	$\begin{array}{rrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr$	$\begin{array}{r} 453^{d}.0\\ 356.0\\ 360.0\\ 249.0\\ 254.0\\ 150.0\\ 145.5\\ 42.0\end{array}$	$\left.\right\} 1^{d} = 0'.839.$
formalization and the		qual mean of all or on Value adopted = ndicates a movement of	0'.80.	scale = 0'.804. I of the magnet to the $\left\{ \begin{array}{l} east \\ west \end{array} \right\}$.

A well rated pocket chronometer, nearly showing Greenwich mean time, was used for noting the time.

Diurnal Variation.—The observations for changes of magnetic declination were made during the months of January, February, and March, 1854, at the following dates:—

January	10-11	• .			and		February	7 10-11
"	13-14		30.		"	10. Jac	66	14-15
"	24-25		- 11-	150.	"		66	17-18
"	27-28				"		"	21-22
"	31-32				"		"	28-29
February	3-4				"		March	3-4
	7-8				"		"	7-8

To these must be added the term days during the same period of the year, viz: January 18–19, February 24–25, and March 22–23. The remaining three terms in April, May, and June, of the same year, furnish values of the change of the diurnal inequality at a later season. Readings (the mean of two extremes during a vibration when the magnet was in motion) were taken every sixth minute, commencing, with but one exception, between 4 and 5 o'clock in the afternoon. The error of the chronometer has been applied and the time in the abstracts is given in local mean (astronomical) time. The readings are, as stated above, uncorrected for torsion, and are expressed in scale divisions. In regard to the observers, Dr. Kane remarks in his narrative: "It was not until the close of the winter that I was able to take my share in the preceding (the observations for variation) or the term-day observations; and I desire to express my obligations to Dr. Hayes and

Mr. Bonsal, as well as to George Stephenson, for their zealous and intelligent cooperation with Mr. Sonntag and myself." Each set of observations extends over twenty-four hours; they were taken nearly one minute earlier (between 56° and 40°) than indicated in the abstract. The general remark on page 435 of the second volume of the Narrative, "the scale reading 280 corresponds to a magnetic declination of 108° 3' west, etc.," appears to leave no doubt that the instrument was left undisturbed, and there being no statement to the contrary, we can assume the hourly and daily means at the several days of observation to refer to the same zero or to be comparable amongst themselves. At a later period in June, 1854, the azimuth circle appears to have turned about 19 minutes.

Term-day Observations.—There were six in number. The observations commence at 10 P. M., mean Göttingen time, or about 4^{h} 37^{m} 34^{s} mean Fern Rock time, the difference of longitude being assumed to equal 5^{h} 22^{m} 26^{s} . The observations were not taken at the precise instant as indicated in the abstracts; the small deviation is noted at the head of each table.

Absolute Declination.—The expedition not being provided with a proper instrument, the magnetometer was temporarily converted into a declinometer by Mr. Sonntag, who determined the declination on June 9th, the 14th, and the 26th, 1854. The top of a mountain was used as a mark; it bore south 22° west (magnetic).

The mirror attached to the magnets can be inverted so that the mean reading of mirror direct and mirror reversed corresponds to the reading of the magnetic axis of the magnet.

Geographical Position of Observatory.—The latitude and longitude of the astronomical observatory has been determined as follows: Lat. 78° 37'.0 north, Long. 70° 40' west of Greenwich. (See p. 305, vol. II. of the Narrative, also pp. 385 and 387 of the same volume.) The island (Observatory Island) on which the observatory (Fern Rock Observatory) was placed, was some fifty paces long by perhaps forty broad. (See p. 116, vol. I. of Narrative.) The magnetic observatory was adjoining; it was of stone, ten feet square, with a wooden floor as well as roof, and supplied with a copper fire grate. No iron was used in its construction.

The following is an extract of note 56, p. 464, of vol. I. of the Narrative: "The subjoined are given as aids to physical inquiry on the part of future travellers: Directions to sites of Rensselaer harbor. The observatory was placed upon the northernmost of the rocky group of islets that formed our harbor. It is seventysix English feet from the highest and northernmost salient point of this island, in a direction S. 14° E., or in one with said point and the S. E. projection of the southernmost islet of the group. A natural face of gneiss rock formed the western wall of the observatory. A crevice in this rock has been filled with melted lead, in the centre of which is a copper bolt. Eight feet from this bolt, and in the direction indicated by the crevice, stood the magnetometer. This direction is given in case of local disturbance from the nature of the surrounding rocks."

The highest point of the island was about thirty feet above the mean tide level of the harbor. The observatory was known by the name of "Fern Rock Observatory." OBSERVATIONS FOR CHANGES OF THE MAGNETIC DECLINATION AT VAN RENSSELAER HARBOR, 1854.

Mean ocal ime.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean Iocal time,	Hourl means
		T	ern R	ack O	haorra	torr	Tanuary	10 and	11 185			
		r	ern R	OCR O	USELVA	itory, e	January	10 anu	11, 100	· I.	HD-STA	1
4 ^h	300d	300d	299d.3	299d	295ª.5	294ª	294 ^d	294ª	293d	291.d5	$5^{\rm h}$	296ª.
5	291	290.8	290.7	300	295.2	292.8	292	290.8	289	288.4	6	292.
6	290.2	292	290.6	288	290	287.5	284	282.5	281	280	7	286.0
7	280	279	277	276 .	277.5	278	279.5	280	280.5	281	8	278.
8	282	283	284	284	285	285	287	286	286	285	9	284.
9	286	287	286	288	290	289	292	290	287	286	10	288.
10	289	292	294	295	295	297.5	298	303	304	303	11	297.
11	300.5	300	300	299	298	298	297	298.5	303	304	12	299.
12	304	306	307	308	310	307.5	311	311.5	310	310.2	13	308.
13	310	309	308.5	308.2	309.3	310	309.8	306	313	314	14	309.8
14	312	310	310	309	308	306	303.3	303.5	306	308	15 16	307.0
15	309.5	308	305.8	306	304.5	303	301.5	306	306	305 289	17	305.4 296.'
16	304	302	298	298 288	$\frac{301}{292}$	301 ·287	295 302	290 299	289 297	289	18	290.
17	289	286	287		292 282	268	302 252	299 241	297	299 246	18	267.
18	$\begin{array}{c} 287 \\ 249 \end{array}$	$\frac{285}{255}$	283 256	283 254	262	208	292	295	244 294	298	20	271.9
19 20	249	255	273	271	273	250	275	233	260	251	21	269.
20	260	266	257	249	213	247	251	253	255.3	248.6	22	253.
22	246.3	255	260	258	256.5	254	256.5	258.5	255.5	256	. 23	255.8
23	240.5	262	267.5	270	272	278.5	282.3	279.0	280	273.5	0	272.
0	272	270	263	259	253	251	250	246	254	252	ĩ	257.0
1	252	360	265	268	269	271	273	273	274	274	2	267.
2	274	279	275	274	278	276	275	276	276	280	3	276.
		289	294	297	300	301	302	304	304	305	4	298.
3												
3 4	291 312	314	310	312	314	501	002	001			Mean	
		314		312	314						Mean	284.
		314	310	312	314			13 and	14, 185	4.		
4	312	314 F	310 'ern R	312 ook O	314 bserva	tory,	January •	13 and 300 ^d	14, 185 299ª	4. 295 ^d	4 ^h	284.'
4 4 ^h	312 302 ^d	314 F 304 ^d	310 ern R 308 ^d	312 ook O 311 ^d	314 bserva 314 ^d	tory , 3	January 315 ^d	13 and 300 ^d 313	14, 185 299 ^d 316	4. 295 ^d 319	4 ^h 5	284.' 311 ^d .
4 4 ^h 5	312 302 ^d 317	314 F 304 ^d 314	310 ern R 308 ^d 311	312 ook O 311 ^d 313	314 bserva 314 ^d 315	.tory , 317 ^a 319	January 315 ^d 322	13 and 300 ^d 313 328	14, 185 299 ^d 316 335	4. 295 ^d 319 337	4 ^h 5 6	284.' 311 d. 321.
4 4 ^h 5 6	312 302 ^d 317 339	314 F 304 ^d 314 340	310 ern R 308 ^d 311 336	312 ock O 311 ^d 313 331	314 bserva 314 ^d 315 326	.tory , 317 ^d 319 330	January 315 ⁴ 322 328	13 and 300 ^d 313 328 316	14, 185 299 ^d 316 335 329	4. 295 ^d 319 337 335	4 ^h 5 6 7	284.' 311 d. 321. 331.0
4 4 ^h 5 6 7	312 302 ^d 317 339 340	314 F 304 ^d 314 340 338	310 ern R 308 ^d 311 336 344	312 ock O 311 ^d 313 331 346	314 bserva 314 ^d 315 326 348	story, a 317 ^d 319 330 343	January 315 ^d 322 328 342	13 and 300 ^d 313 328 316 342	14, 185 299 ^d 316 335 329 345	4. 295 ^d 319 337 335 349	4 ^h 5 6 7 8	284.' 311 d. 321. 331.' 343.'
4 4 ^h 5 6 7 8	312 302 ^d 317 339 340 350	314 F 304 ^d 314 340 338 364	310 ern R 308 ^d 311 336 344 371	312 ock O 311 ^d 313 331 346 371	314 bserva 314 ^d 315 326 348 368	tory , 317 ^d 319 330 343 366	January 315 ^d 322 328 342 358	13 and 300 ^d 313 328 316 342 356	14, 185 299 ^d 316 335 329 345 350	4. 295 ^d 319 337 335 349 349 349	4 ^h 5 6 7 8 9	284.' 311 ^d . 321. 331. 343.' 360.3
4 4 ^h 5 6 7 8 9	312 302 ^d 317 339 340 350 344	314 F 304 ^d 314 340 338 364 338	310 ern R 308 ^d 311 336 344 371 334	312 oock Ol 311d 313 331 346 371 329.5	314 bserva 314 ^d 315 326 348 368 329	tory , 317 ^d 319 330 343 366 327	January 315 ^d 322 328 342 358 330	13 and 300 ^d 313 328 316 342 356 336	14, 185 299 ^d 316 335 329 345 350 342	4. 295 ^d 319 337 335 349 349 349 342	4 ^h 5 6 7 8 9 10	284.' 311 d. 321. 331. 343. 360. 335.
4 4 ^h 5 6 7 8 9 10	312 302 ^d 317 339 340 350 344 339	314 F 304 ^d 314 338 364 338 364 338 339.5	310 ern R 308 ^d 311 336 344 371 334 335.5	312 ook O 311 ^d 313 331 346 371 329.5 340	314 bserva 314 ^d 315 326 348 368 329 347.5	tory, 317 ⁴ 319 330 343 366 327 350	January 315 ^d 322 328 342 358 358 330 349	13 and 300 ^d 313 328 316 342 356 336 348.7	14, 185 299 ^d 316 335 329 345 350 342 350,2	$4.$ 295^{d} 319 337 335 349 349 349 342 354.8	4 ^h 5 6 7 8 9 10 11	284.' 311 ^d . 321. 331.0 343.' 360.3 35. 345.
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4 ^h 5 6 7 8 9 10 11 12 13	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ \end{array}$	314 F 304 ^d 314 340 338 364 338 339.5 352 342 342	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343.8	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 347	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 346	tory, 3 317 ^d 319 330 343 366 327 350 347 343 343 343	January 315 ^d 322 328 342 358 330 349 343 342 343 342 347	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357	14, 185 299 ^d 316 335 329 345 350 342 350.2 344.8 340 352	4. 295 ^d 319 337 335 349 349 342 354.8 342.8 342.8 341 348	4 ^h 5 6 7 8 9 10 11 12 13	284.' 311 d. 321. 331. 343. 345. 345. 345. 345. 348. 342. 346.
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4 4 ^h 5 6 7 8 9 10 11 11 2 13 14 15 16 17 18	312 302 ^d 317 339 340 350 344 339 354 341 341 355 350 370 352	314 F 304 ^d 314 340 338 364 339.5 352 342 342 352 342 352 351 368 352	310 ern R 308 ^d 311 336 344 371 334 355 350.8 343 354 354 354 354 354 354 354 354 354	312 311 ^d 313 331 346 371 329.5 340 353 344 353 344 356 358 374 341	314 bserva 314 ^d 315 326 348 368 329 347.5 351 347.5 351 343.5 346 352 362 374 339	tory, . 317 ⁴ 319 330 343 366 327 350 347 343 346 348 371 374 330	January 315 ^d 322 328 342 358 342 343 349 343 349 343 342 347 345 377 371 328	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 354 378 365 325	14, 185 299 ^d 316 335 329 345 350 342 350.2 344.8 340 352 346 374 359 324	$\begin{array}{c} 4.\\ \\ 295^{d}\\ 319\\ 337\\ 335\\ 349\\ 349\\ 342\\ 354.8\\ 342.8\\ 342.8\\ 342.8\\ 341\\ 348\\ 349\\ 372\\ 358\\ 320\\ \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18	$\begin{array}{c} 311^{d}.\\ 321.\\ 331.\\ 343.\\ 360.\\ 335.\\ 345.\\ 344.\\ 345.\\ 345.\\ 345.\\ 346.\\ 350.\\ 364.\\ 350.\\ 364.\\ 355.\\ 325.\\ 325.\\ 276. \end{array}$
4 4 ^h 5 6 7 7 8 9 10 11 12 13 114 15 16 17 18 19	312 302 ^d 317 339 340 350 344 339 354 341 341 355 350 370 352 321	314 F 304 ^d 314 340 338 364 339.5 352 342 342 342 352 351 368 352 351 368 352 352	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 344 352 371 346 330	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 353 344 356 358 374 341 335	314 bserva 314 ^d 315 326 348 368 329 347.5 351 347.5 351 343.5 346 352 362 374 339 345	tory, . 317 ⁴ 319 330 343 366 327 350 347 343 346 348 371 374 330 347	January 315 ⁴ 322 328 342 358 349 343 349 343 349 343 342 347 345 377 371 328 337	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330	14, 185 299 ^d 316 335 329 345 350 342 350.2 344 352 346 374 359 324 293	$\begin{array}{c} 4.\\ \\ 295^{d}\\ 319\\ 337\\ 335\\ 349\\ 349\\ 342\\ 354.8\\ 342.8\\ 342.8\\ 342.8\\ 344\\ 348\\ 349\\ 372\\ 358\\ 320\\ 295 \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	$\begin{array}{c} 311^{d}.\\ 321.\\ 321.\\ 331.\\ 343.\\ 360.\\ 335.\\ 345.\\ 348.\\ 345.\\ 348.\\ 346.\\ 356.\\ 364.\\ 368.\\ 335.\\ 325.\\ 325.\\ 276.\\ 269. \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	312 302 ^d 317 339 340 350 344 339 354 341 341 355 350 370 352 321 295	314 F 304 ^d 314 340 338 364 338 352 342 352 352 352 351 368 352 351 368 352 352 323 292.5	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 344 352 371 346 330 288	312 oock OI 311d 313 331 346 371 329.5 340 353 344 353 344 356 358 374 341 335 280	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 345 352 362 374 339 345 260	tory, . 317 ⁴ 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5	January 315 ⁴ 329 328 342 358 330 349 343 342 345 347 345 377 371 328 337 269.5	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274	14, 185 299 ^d 316 335 329 345 350 342 350.2 344.8 340 352 344.8 352 346 374 359 324 293 269.8	$\begin{array}{c} \textbf{4.} \\ 295^{d} \\ 319 \\ 337 \\ 335 \\ 349 \\ 349 \\ 349 \\ 342 \\ 354.8 \\ 342.8 \\ 342.8 \\ 342.8 \\ 342.8 \\ 342.8 \\ 349 \\ 372 \\ 358 \\ 320 \\ 295 \\ 272 \\ \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	284. ³ 311 ^d . 321. 331. 343. ³ 343. ³ 345. 348. 345. 348. 342. 348. 346. 356. 364. 364. 368. 335. 325. 276. 269. 277.
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	312 302 ^d 317 339 340 350 344 339 354 341 341 355 350 370 352 321 295 274	314 F 304 ^d 314 338 364 338 352 342 352 342 352 352 352 352 352 352 352 352 352 35	310 ern R 308 ^d 311 336 344 371 335.5 350.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 343.8 345.4 352 371 346 330 288 254	312 ock O 311 ^d 313 331 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 352 362 374 339 345 260 257.7	tory, . 317 ⁴ 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5 266.5	January 315 ⁴ 329 328 342 358 330 349 343 345 347 345 377 371 328 337 269.5 272.5	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270	14, 185 299 ^d 316 335 329 345 350 342 350.2 344.8 340 352 344.8 352 346 374 359 324 293 269.8 269.8	$\begin{array}{c} 4.\\ \\ 295^{d}\\ 319\\ 337\\ 335\\ 349\\ 349\\ 349\\ 342\\ 354.8\\ 349\\ 342.8\\ 341\\ 348\\ 349\\ 372\\ 358\\ 320\\ 295\\ 272\\ 285\\ 266\\ 264\\ \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	$\begin{array}{c} 311^{d},\\ 321,\\ 321,\\ 331,\\ 343,\\ 360,\\ 335,\\ 345,\\ 348,\\ 345,\\ 348,\\ 342,\\ 346,\\ 350,\\ 348,\\ 342,\\ 346,\\ 350,\\ 325,\\ 263,\\ 276,\\ 269,\\ 277,\\ 267,\\ 267,\\ \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	312 302 ^d 317 339 340 350 344 339 354 341 341 355 350 370 352 321 295 274 295	314 F 304 ^d 314 338 364 338 352 342 352 352 352 352 352 352 352 352 352 35	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343 354 355 350.8 343.8 343 354 355 350.8 343.8 343 354 355 350.8 343 354 355 352 371 346 330 288 254 285	312 ock O 311 ^d 313 331 346 371 329.5 340 353 344 353 344 356 358 374 341 335 280 263 271	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 351 343.5 352 362 374 339 345 260 257.7 272.8	tory, . 317 ⁴ 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5 276	January 315 ⁴ 329 328 342 358 330 349 343 345 347 345 377 328 337 269.5 272.5 271.5	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270 270	14, 185 299 ^d 316 335 329 345 350 342 350.2 344.8 350 352 344.8 352 346 374 359 324 293 269.8 267 266	$\begin{array}{c} 4.\\ \\ 295^{d}\\ 319\\ 337\\ 335\\ 349\\ 349\\ 349\\ 349\\ 354.8\\ 349\\ 354.8\\ 341\\ 348\\ 349\\ 372\\ 358\\ 320\\ 295\\ 272\\ 285\\ 266\\ 264\\ 242\\ \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0	$\begin{array}{c} 311^{d}.\\ 321.\\ 331.\\ 331.\\ 331.\\ 331.\\ 343.\\ 343.\\ 343.\\ 343.\\ 343.\\ 343.\\ 343.\\ 345.\\ 344.\\ 344.\\ 344.\\ 344.\\ 344.\\ 345.\\ 345.\\ 325.\\ 325.\\ 265.\\ 269.\\ 277.\\ 269.\\ 277.\\ 269.\\ 277.\\ 262.\\ \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ 355\\ 350\\ 370\\ 352\\ 321\\ 295\\ 274\\ 295\\ 274\\ 295\\ 265\\ 261\\ 212\\ \end{array}$	314 F 304 ^d 314 338 364 338 339,5 352 342 352 342 352 352 342 352 352 342 352 352 352 342 352 352 352 323 292,5 284 297 264 267 218	310 ern R 308 ^d 311 336 344 371 334 355 350.8 343.8 343 354 352 371 346 330 288 254 285 265.5 274 224	312 ock O 311 ^d 313 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267 275 231	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 346 352 362 374 339 345 260 257.7 272.8 269	tory, 317 ^d 319 330 343 366 327 350 347 343 346 347 348 371 374 330 347 263.5 276 270	January 315 ^d 322 328 342 358 330 349 343 342 347 343 342 347 345 377 371 328 337 269.5 272.5 271.5 270	13 and 300 ^d 313 328 316 342 356 348.7 343 340.5 357 344 378 365 325 330 274 270 269 250 255	14, 185 299 ^d 316 335 329 345 350 342 350 342 350 342 350 342 346 352 346 352 346 354 293 269.8 267 266 266 266 264	$\begin{array}{c} 4.\\ \\ 295^{d}\\ 319\\ 337\\ 335\\ 349\\ 349\\ 349\\ 354.8\\ 349\\ 354.8\\ 342.8\\ 341\\ 348\\ 349\\ 372\\ 358\\ 320\\ 295\\ 272\\ 285\\ 266\\ 295\\ 272\\ 285\\ 266\\ 264\\ 242\\ 273\\ \end{array}$	$\begin{array}{c} 4^{\rm h} \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \end{array}$	$\begin{array}{c} 311^{d},\\ 321,\\ 331,\\ 331,\\ 340,\\ 335,\\ 345,\\ 348,\\ 342,\\ 346,\\ 348,\\ 342,\\ 346,\\ 350,\\ 348,\\ 342,\\ 346,\\ 350,\\ 242,\\ 242,\\ 242,\\ 242,\\ 242,\\ 242,\\ \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 221 222 223 0 1	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ 355\\ 350\\ 370\\ 352\\ 321\\ 295\\ 274\\ 295\\ 265\\ 261\\ 212\\ 276\\ \end{array}$	314 F 304 ^d 314 338 364 338 339,5 352 342 352 342 352 352 342 352 352 342 352 352 342 352 352 342 352 352 323 292,5 284 297 264 267 218 277	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343 354 352 371 346 330 288 254 285 265.5 274 224 278	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267 275 231 278	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 346 352 362 374 339 345 260 257.7 272.8 269 277 242 278	tory, 317 ^d 319 330 343 366 327 350 347 343 346 347 348 371 374 330 347 266.5 276 270 269	January 315 ^d 322 328 342 358 330 349 343 342 347 345 347 345 347 345 347 345 347 345 347 345 347 345 347 345 347 345 347 328 337 269.5 272.5 270 262	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270 270 250 255 277	$14, 185$ 299^{4} 316 335 329 345 350 342 350.2 344.8 340 352 344.8 340 352 344.8 359 324 293 269.8 267 266 266 246	$\begin{array}{c} \textbf{4.} \\ \textbf{295^d} \\ \textbf{319} \\ \textbf{337} \\ \textbf{335} \\ \textbf{349} \\ \textbf{349} \\ \textbf{342} \\ \textbf{354.8} \\ \textbf{342.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{320.8} \\ \textbf{320.8}$	$\begin{array}{c} 4^{\rm h} \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \end{array}$	$\begin{array}{c} 311^{d},\\ 321,\\ 321,\\ 331,\\ 340,\\ 346,\\ 335,\\ 348,\\ 345,\\ 348,\\ 346,\\ 346,\\ 350,\\ 364,\\ 350,\\ 364,\\ 350,\\ 364,\\ 350,\\ 264,\\ 250,\\ 267,\\ 262,\\ 276,\\ 267,\\ $
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 9 20 21 22 23 0 1 2	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ 355\\ 350\\ 370\\ 352\\ 321\\ 295\\ 274\\ 295\\ 261\\ 295\\ 261\\ 295\\ 261\\ 212\\ 276\\ 290\\ \end{array}$	314 F 304 ^d 314 340 338 364 338 352 342 342 352 342 352 342 352 342 352 352 342 352 352 352 323 292,5 284 297 264 277 287	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343 354 352 371 346 330 288 254 285 265.5 274 285 265.5 274 224 278 288	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267 275 231 278 288	314 bserva 314 ^d 315 326 348 368 329 347.5 346 352 362 374 339 345 260 257.7 272.8 260 257.7 272.8 269 277 242 278 292	tory, 317d 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5 266.5 276 270 269 252 276.5 301	January 315 ^d 322 328 342 358 330 349 343 342 345 377 371 328 347 345 377 371 328 337 269.5 271.5 271.5 270 262 252 276 311	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270 270 269 250 255 277 310	14, 185 299d 316 335 350 342 350 342 350 342 350 342 350 344 352 346 374 352 346 374 359 324 269.8 267 266 266 266 246 264 282 305.8	$\begin{array}{c} \textbf{4.} \\ \textbf{295^d} \\ \textbf{319} \\ \textbf{337} \\ \textbf{335} \\ \textbf{349} \\ \textbf{349} \\ \textbf{342} \\ \textbf{354.8} \\ \textbf{349} \\ \textbf{354.8} \\ \textbf{349} \\ \textbf{372} \\ \textbf{358} \\ \textbf{349} \\ \textbf{372} \\ \textbf{358} \\ \textbf{320} \\ \textbf{295} \\ \textbf{272} \\ \textbf{285} \\ \textbf{2666} \\ \textbf{264} \\ \textbf{242} \\ \textbf{273} \\ \textbf{289} \\ \textbf{309} \end{array}$	$\begin{array}{c} 4^{\rm h} \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \end{array}$	$\begin{array}{c} 311^{d},\\ 321,\\ 331,\\ 343,\\ 343,\\ 343,\\ 343,\\ 343,\\ 345,\\ 344,\\ 345,\\ 345,\\ 345,\\ 345,\\ 345,\\ 346,\\ 350,\\ 364,\\ 356,\\ 325,\\ 269,\\ 277,\\ 262,\\ 242,\\ 278,\\ 298,\\ \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 9 20 21 22 23 0 1 2 3	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ 355\\ 350\\ 370\\ 352\\ 321\\ 295\\ 274\\ 295\\ 261\\ 295\\ 261\\ 295\\ 261\\ 212\\ 276\\ 290\\ 306\\ \end{array}$	314 F 304 ^d 314 340 338 364 338 352 342 342 352 342 352 342 352 342 352 342 352 342 352 352 323 292,5 284 297 264 277 287 299	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343 354 352 371 346 330 288 254 285 265.5 274 285 265.5 274 278 288 296.5	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267 275 231 278	314 bserva 314 ^d 315 326 348 368 329 347.5 351 343.5 346 352 362 374 339 345 260 257.7 272.8 269 277 242 278	tory, . 317 ^d 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5 266.5 276 270 269 252 276.5	January 315 ^d 322 328 342 358 330 349 343 342 345 377 345 377 371 328 337 269.5 271.5 270 262 252 - 276	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270 270 250 255 277	14, 185 299 ^d 316 335 329 345 350 342 350 342 350 342 350 342 346 352 346 352 346 354 293 269.8 269.8 266 266 266 266 264 282	$\begin{array}{c} \textbf{4.} \\ \textbf{295^d} \\ \textbf{319} \\ \textbf{337} \\ \textbf{335} \\ \textbf{349} \\ \textbf{349} \\ \textbf{342} \\ \textbf{354.8} \\ \textbf{342.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{295.8} \\ \textbf{320.9} \\ \textbf{320.8} \\ \textbf{320.8}$	$\begin{array}{c} 4^{\rm h} \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \end{array}$	$\begin{array}{c} 311^{d},\\ 321,\\ 331,\\ 343,\\ 343,\\ 343,\\ 343,\\ 343,\\ 345,\\ 344,\\ 345,\\ 345,\\ 345,\\ 345,\\ 345,\\ 346,\\ 350,\\ 364,\\ 356,\\ 325,\\ 269,\\ 277,\\ 262,\\ 242,\\ 278,\\ 298,\\ \end{array}$
4 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 9 20 21 222 23 0 1 2	$\begin{array}{c} 312\\ 302^{d}\\ 317\\ 339\\ 340\\ 350\\ 344\\ 339\\ 354\\ 341\\ 341\\ 355\\ 350\\ 370\\ 352\\ 321\\ 295\\ 274\\ 295\\ 261\\ 295\\ 261\\ 295\\ 261\\ 212\\ 276\\ 290\\ \end{array}$	314 F 304 ^d 314 340 338 364 338 352 342 342 352 342 352 342 352 342 352 352 342 352 352 352 323 292,5 284 297 264 277 287	310 ern R 308 ^d 311 336 344 371 334 335.5 350.8 343.8 343 354 352 371 346 330 288 254 285 265.5 274 285 265.5 274 224 278 288	312 ook O 311 ^d 313 331 346 371 329.5 340 353 344 347 356 358 374 341 335 280 263 271 267 275 231 278 288	314 bserva 314 ^d 315 326 348 368 329 347.5 346 352 362 374 339 345 260 257.7 272.8 260 257.7 272.8 269 277 242 278 292	tory, 317d 319 330 343 366 327 350 347 343 346 348 371 374 330 347 263.5 266.5 276 270 269 252 276.5 301	January 315 ^d 322 328 342 358 330 349 343 342 345 377 371 328 347 345 377 371 328 337 269.5 271.5 271.5 270 262 252 276 311	13 and 300 ^d 313 328 316 342 356 336 348.7 343 340.5 357 344 378 365 325 330 274 270 270 269 250 255 277 310	14, 185 299d 316 335 350 342 350 342 350 342 350 342 350 344 352 346 374 352 346 374 359 324 269.8 267 266 266 266 246 264 282 305.8	$\begin{array}{c} \textbf{4.} \\ \textbf{295^d} \\ \textbf{319} \\ \textbf{337} \\ \textbf{335} \\ \textbf{349} \\ \textbf{349} \\ \textbf{342} \\ \textbf{354.8} \\ \textbf{349} \\ \textbf{354.8} \\ \textbf{349} \\ \textbf{372} \\ \textbf{358} \\ \textbf{349} \\ \textbf{372} \\ \textbf{358} \\ \textbf{320} \\ \textbf{295} \\ \textbf{272} \\ \textbf{285} \\ \textbf{2666} \\ \textbf{264} \\ \textbf{242} \\ \textbf{273} \\ \textbf{289} \\ \textbf{309} \\ \textbf{309} \end{array}$	$\begin{array}{c} 4^{\rm h} \\ 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \end{array}$	$\begin{array}{c} 311^{d},\\ 321,\\ 321,\\ 331,\\ 340,\\ 335,\\ 345,\\ 348,\\ 342,\\ 346,\\ 348,\\ 342,\\ 346,\\ 350,\\ 348,\\ 342,\\ 346,\\ 350,\\ 242,\\ 242,\\ 242,\\ 242,\\ 242,\\ 242,\\ \end{array}$

Value of a division of the scale 0'.80.

Increase of scale readings corresponds to a movement of the north end of the magnet to the east.

7

Mean local time.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean local time.	Hour mean
			Fern	Rock (bserv	atory,	Januar	y 24 and	1 25, 18	354.		
				1	1		1	oord	oord	0054		1
4 ^h	3074.3	310ª	3134	315d	317ª	318ª	6000	305d	305d	305d	4 ^h	boro
5	337	340	342	3154	348		323d	326	331	333	5	319d.
6	355	355	357	357	359	350 360	353 361.5	355	353.5		6	347.
7	373	371	366	363	368	367	366	363	361	369	7	359.
8	364	363	362		356	358	360	367 362	367	366	8	367.
9	364	361	358	357 362	365	367	363	359	364 357	365	9	361.
10	355	354	354.5	357	356	358	358.5	360.5	359	358.5		361.9
11	356.5	354	356	358.5	359	361	363	364	359	352		358.
12	350	352	353.5		352	354	356	359.5	361	363	13	355.9
13	360	355	359	368	370	370	373	366	361	358	. 14	364.0
14	360	366	365	361	359	353	351	350.8	350	349	15	356.8
15	347	348	347	344	344	344.5	342	343	340	340	16	344.0
16	340	342	344	344	344	344.5	343	343	343	340	17	342.9
17	340	338	338	337	337	338	338	339	341	342	18	338.8
18	344	345	348	348	347	346	346	346	347	342	18	346.4
19	347	348	348	349	350.5	350	349.5	348	346	336	20	347.2
20	322	316	318	318.5	320	321	308	305	304	301	21	313.3
21	301.5	300.5	292	291	286	291.5	304	302	310	314	22	299.9
22	317	315	315	314	.316	316	318	316	314	314	23	315.8
23	315	313	312	313	314	310	309	309	308	300	0	310.3
0	298	301	304	302	292	287	282	285	288	294	1	293.3
1	300	305	300	294	292	304	304	311	309	310	2	302.9
2	312	314	316	312	308	310.5	314	315	315	314.5		313.1
3	316	316.5	318	316	310.5	310.5	310	312	315.6	318.5		314.8
4	311.5	310.5	010	010	010.0	010	010	ULM	010.0	010.0	Ξ.	014.0
-		010.0	6.00	1.0				-		1	Mean	337.0
		-	1				T	05 1	bo 70			
	1 1	F	ern R	ock Ol	Dserva	ltory,	January	27 and	28, 18	1	1	1
4 ^h	306d	305ª	307ª	313 ^d	320ª	327ª	321ª	315ª	312 ^d	308d	5h	313ª.4
5	304	302	302	306	307	308	306	308	314	316	6	307.3
6	320	325	330	332	328	326	324	323	325	326	. 7	325.9
7	326	328	323	324	324	325	325	320	319	320	8	323.4
8	319	319	319	319	318	319	320.5	321	322	322	9	319.8
9	322	322	322	322	323	324	323.7	324	323	323	10	322.9
10	322	320	322	323.7	325.8	326.5	327	327.3	325	328	11	324.7
11	329	329.8	330	329	328	326	326	337	338	334.7	12	330.7
12	332	342	342.2	341	339.5	334	331	328	330	331	13	335.1
3	331.4	336	337	334	330	336	334	332	331	330	14	333.1
	330	332	334	330	338	347	357	353	348	344	15	341.3
4	346	348	348	346	345	345	346	351	356	350	16	348.1
14 15		915	347	348	349	355	359	364	368	370	17	355.1
14 15 16	346	345				389.5	388	387	387.5	386	18	385.4
4 15 16 17	346 378	380	384	386	388	000.01	OFO I	375	375	374	19	381.2
14 15 16 17 18	346 378 386	380 386	386	386 386	388 385	381	378	010 1				
14 15 16 17 18 19	346 378 386 374	380 386 373	386 370.8	386 365			378 355	355.5	352	349.5	20	362.0
4 15 16 17 18 19 20	346 378 386 374 360	380 386 373 365	386 370.8 362	386	385 365 356	381 360 353	355 352	355.5 351.5	353	349.5 356	21	$362.0 \\ 356.8$
14 15 16 17 18 19 20 21	346 378 386 374 360 354.5	380 386 373 365 356	386 370.8 362 357.5	386 365 360 360	385 365	381 360	355	355.5	353 363	349.5		362.0
14 15 16 17 18 19 20 21 22	346 378 386 374 360 354.5 359	380 386 373 365 356 360	386 370.8 362 357.5 361	386 365 360 360 362	385 365 356 362 363	381 360 353 364.5 365	355 352 365 367	355.5 351.5 365.5 368	353 363 365	349.5 356 361 363	21	$362.0 \\ 356.8$
14 15 16 17 18 19 20 21 22 23	346 378 386 374 360 354.5 359 360	380 386 373 365 356 360 356	386 370.8 362 357.5 361 341	386 365 360 360	385 365 356 362	381 360 353 364.5	355 352 365	355.5 351.5 365.5	353 363	349.5 356 361	21 22 23 0	362.0 356.8 363.8
14 15 16 17 18 19 20 21 22 23 0	346 378 386 374 360 354.5 359 360 332	380 386 373 365 356 360 356 335	386 370.8 362 357.5 361 341 339	386 365 360 360 362	385 365 356 362 363	381 360 353 364.5 365	355 352 365 367 337 340	355.5 351.5 365.5 368	353 363 365	349.5 356 361 363	21 22 23 0 1	362.0 356.8 363.8 363.3
14 15 16 17 18 19 20 21 22 23 0 1	346 378 386 374 360 354.5 359 360 332 351	380 386 373 365 356 360 356 356 335 356	386 370.8 362 357.5 361 341 339 360	386 365 360 360 362 346	385 365 356 362 368 341.5	381 360 353 364.5 365 336	355 352 365 367 337	355.5 351.5 365.5 368 338	353 363 365 338	349.5 356 361 363 335	21 22 23 0 1 2	362.0 356.8 363.8 363.3 342.8
14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 2	346 378 386 374 360 354.5 359 360 332 351 350	380 386 373 365 356 356 356 356 335 356 356 356	386 370.8 362 357.5 361 341 339 360 350	386 365 360 360 362 346 342	385 365 356 362 363 341.5 341	381 360 353 364.5 365 336 340	355 352 365 367 337 340	355.5 351.5 365.5 368 338 341	353 363 365 338 342	349.5 356 361 363 335 346	21 22 23 0 1	362.0 356.8 363.8 363.3 342.8 .339.8
14 15 16 17 18 19 20 21 22 23 0 1 22 3	346 378 386 374 360 354.5 359 360 332 351 350 352	380 386 373 365 356 356 356 356 356 356 350 352	386 370.8 362 357.5 361 341 339 360	386 365 360 360 362 346 342 359	385 365 356 362 363 341.5 341 358	381 360 353 364.5 365 336 340 363	355 352 365 367 337 340 355	355.5 351.5 365.5 368 338 341 362	353 363 365 338 342 357	349.5 356 361 363 335 346 354	21 22 23 0 1 2	362.0 356.8 363.8 363.3 342.8 339.8 357.5
14 15 16 17 18 19 20 21 22 23 0 1 2	346 378 386 374 360 354.5 359 360 332 351 350	380 386 373 365 356 356 356 356 335 356 356 356	386 370.8 362 357.5 361 341 339 360 350	386 365 360 360 362 346 342 359 348 348	385 365 356 362 363 341.5 341 358 346	381 360 353 364.5 365 336 340 363 350	355 352 365 367 337 340 355 345	355.5 351.5 365.5 368 338 341 362 344	353 363 365 338 342 357 349	349.5 356 361 363 335 346 354 350	21 22 23 0 1 2 3	$\begin{array}{c} 362.0\\ 356.8\\ 363.8\\ 363.3\\ 342.8\\ 339.8\\ 357.5\\ 348.2 \end{array}$

Increase in scale readings corresponds to a movement of the north end of the magnet to the east. Aurora visible on the 27th and 28th.

$\begin{array}{c ccccccccccccccccccccccccccccccccccc$				12m.	18m.	24m.	30m.	local time.	means
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	ervato:	7.	, Janu	ary 31	and Feb	ruary 1,	1854.		
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$					304d	306d	325d	4 ^h	
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$.5 345ª	3	33ª.5	334 d.5	330	330	328	5	335d.(
$ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	318	610	311	313	320	325	330	6	322.2
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	358	612	359.5	356	357	358	358	7	353.2
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		00	362	363.5	365	367	368.5	8	362.5
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	371		370	371	371	371	372	9	371.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	374		372	372	372	371	370	10	372.1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	361		365	371	370	369	367	11	367.0
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	376		377	380	387	384	382	12	376.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	374		373	370	368	374	375	13	373.8
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			384	383.5	382	380	378	14	380.9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	385.5		383	380	379	376	370	15	380.1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	367		369	371	373.5	374	375	16	369.1
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			375	374	374	373	373	17	374.9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	374		374	374	375	378	382	18	375.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	388		388	389	390	385	386	19	387.9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	389		389	389	387	387	386	20	387.9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			382	382	382	376	370	21	381.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	292		288	278	284	285	291	22	319.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	338		348	359	359.5	351	350	23	333.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			312	311	314	318	323	0	322.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	333		342	346	350	359	365	1	340.9
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	381		379	.375	372	368	364	2	372.4
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	352		351	351	350	363	373	3	356.4
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	383		376	376	378	380	386	4	378.8
$\begin{array}{c c c c c c c c c c c c c c c c c c c $	396		107	419	430	440	000	5	010.0
$\begin{array}{c c c c c c c c c c c c c c c c c c c $		2		TIU	400	110	12010	Mean	362.2
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Observ	Lt	tory,	Februar	ry 3 and	4, 1854	ŀ.		
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$		-		.		0.053	0.103°	oh	-
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	E OAHA P			0513	336d	335d	342d	8h	0003
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$			372d	374 ^d	374	374	376	9	366d.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	370		365	363	362	362	363	10	368.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$			377	378	378.7	379	385	11	375.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	400		108	407	404	402	398	12	397.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	410		108	406	405	408	410	13	407.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	435		450	454	456	457	430	14	433.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	411		410	406	405	400	400	15	409.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	396		394	390	385	392	408	16	396.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	397		393	389	389.5	389	389	17	399.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	389		388	378	362	342	337	18	376.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	362		380	386	409	367	350	19	361.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	316		309	296	285	270	262	20	302.8
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	262		275	270	274	278	287	21	268.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	296		300	303	320 ·	334	340	22	309.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	340		362	350	342	340	344	23	346.
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	330		320	315	314 .	314	315	0	329.
2 298 308 315.5 316 3 304 302 300 294	345		340	339	350	348	346	1	339.
3 304 302 300 294	340		332	340	346	325	305	2	337.
	314		311	311	310	308.5	306	3	309.8
	286		294	301	307	319	333	4	304.0
4 345 349 349 353	358		361	362	364	364	362	5	356.
5 360 358 356 359	362		362	364	362	368	370	6	362.1
6 369 366 371 375	. 378		377	375	380	390	389	7	376.0
7 389 379 373 371	370	612	370	370	371	371	T	8	(373.)
					-			Mean	358.0

Note.-Another stove had been put up temporarily; it was removed at the close of the observations.

local time.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean local time.	Hourly means
		I	Fern F	lock O	bserv	atory,	Februar	ry 7 and	1 8, 1854	ł.		
								316 ^d	317ª	317ª	4 ^h	
4 ^h	316ª.5	317ª	317d	316d	314 ^d	314d	315ª	315	316	317	5	315d.
5	319	320	322	323	322	320	321	323	326	329	6	322.5
6	333	336	339	342	344	345	347	349	345	339	7	341.9
7	341	345	349	355	355	361	454	346	352	356.	8	351.4
8	357	356.5	356	355	354	354	355	355	355	356	9	355.3
9	356	356	356	355	354	352	352	354	355	360	10	355.0
10	369	370	369	368	368	369	370	372	374	375	11	370.4
11	377	379	375	370	367	368	368	368	368	368	12	370.8
12	367	367	368	369	370	372	375	377	380	383	13	372.8
13	386	389	392	395	396	-394	392	389	389	390	14	391.2
14	389	387	386	384	381	378	375	372	369	365	15	378.6
15	362	359	355	350	346	342	337	336	334	333	16	345.4
16	333	334	334	335	336	338	339	339	338	336	17	336.2
17	330	325	320	314	311	308	304	302	301	302	18	311.7
18	302	302	298	294	290	287	284	280	276	273.5	19	288.6
19	271	270	268	266.5	274	283	287	290	294	294	20	279.7
20	295	297	298	300	301	305	307	310	313	313	21	303.9
21	313	312	312	311	303	295	287	294	294	295	22	301.6
22	297	298	296	295	293	294	301	310	319	326	23	302.9
23	322	323	325	323	322	321	319	318	314	312	0	319.9
0	306	299	300	301	303	306	310	320	328	334	, 1	310.
1	335	336	337	336	332	329.5	330	332	332	330	2	332.9
2	327.5	320	313	308	301	296	288	291	308	315	3	306.7
3	317	315	312	309	313	320	329	333	333	334	4	321.8
4	336	341	347	350	352				6.00		5	
					-				and the second s		Mean	332.8
	14 . 14	r	ern K	OCK OI	JSELA	tory,	reordar					1
4 ^h	261d	266d	272d	284 ^d	294ª	300d	306d	251 ^d 312	254 ^d 318	256 ^d 323	4 ^h 5	293ª.
5	330	340	352	366	368	362	354	352	355	362	6	354.1
6	360	358	357.5	360	366	365	365	364	366	368	7	362.9
7	371	373	376	378	380	384	385	385	390	396	8	381.8
8	396	395.5	394	392.7	394	390	390	389	387	387	9	391.4
	387				380					382		
9		386	386	aan		1 382 1	382	382	1 382		10	383 5
9 10		386 381	$\frac{386}{380}$	$\frac{386}{378}$		382 376	$\frac{382}{376}$	$\frac{382}{375}$	382 374		10	
10	382	381	380	378	377	376	376	375	374	374	11	377.8
											11 12	377.3 383.9
10 11	382 376	381 380	380 383 389	378 385	377 385	376 385	$\frac{376}{386}$	375 386	374 386	374 387	$ \begin{array}{c} 11 \\ 12 \\ 13 \end{array} $	377.3 383.9 390.9
10 11 12	382 376 388 396 422	381 380 389	380 383	378 385 392	377 385 393	376 385 392	376 386 390	375 386 390	374 386 392	374 387 394	11 12	377.3 383.9 390.9 405.3
10 11 12 13	382 376 388 396	381 380 389 397	380 383 389 396	378 385 392 394	377 385 393 392	376 385 392 400	376 386 390 412	375 386 390 420	$ \begin{array}{r} 374 \\ 386 \\ 392 \\ 424 \\ 493.5 \\ 417 \end{array} $	374 387 394 422	$11 \\ 12 \\ 13 \\ 14$	377.3 383.9 390.9 405.3 464.8
10 11 12 13 14 15 16	382 376 388 396 422 501 405	381 380 389 397 430	380 383 389 396 444	378 385 392 394 460	377 385 393 392 464	376 385 392 400 470	376 386 390 412 487 448 383	375 386 390 420 480 429 379	374 386 392 424 493.5	374 387 394 422 498	$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ \end{array} $	377.3 383.9 390.9 405.3 464.8 464.8
10 11 12 13 14 15 16 17	382 376 388 396 422 501 405 362	$381 \\ 380 \\ 389 \\ 397 \\ 430 \\ 504 \\ 400 \\ 370$	380 383 389 396 444 503 398 377	378 385 392 394 460 499 397 373	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369 \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365 \end{array}$	376 386 390 412 487 448 383 357	$\begin{array}{c} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348 \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348 \end{array}$	$\begin{array}{r} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ \end{array}$	$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ \end{array} $	377.3 383.9 390.9 405.3 464.8 464.7 388.5
10 11 12 13 14 15 16 17 18	382 376 388 396 422 501 405 362 350	$381 \\ 380 \\ 389 \\ 397 \\ 430 \\ 504 \\ 400 \\ 370 \\ 329$	380 383 389 396 444 503 398 377 329	378 385 392 394 460 499 397 373 325	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321 \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ \end{array}$	376 386 390 412 487 448 383 357 312.5	$\begin{array}{c} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\end{array}$	$\begin{array}{r} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ \end{array}$	11 12 13 14 15 16 17 18 19	377.3 383.9 390.9 405.3 464.8 464.8 388.5 361.9
10 11 12 13 14 15 16 17 18 19	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272 \end{array}$	$\begin{array}{c} 381 \\ 380 \\ 389 \\ 397 \\ 430 \\ 504 \\ 400 \\ 370 \\ 329 \\ 265 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ \end{array}$	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ \end{array}$	$\begin{array}{c} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ 263\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ \end{array}$	$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ \end{array} $	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.5\\ 388.5\\ 361.9\\ 314.8\\ 264.0\end{array}$
10 11 12 13 14 15 16 17 18 19 20	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ \end{array}$	$\begin{array}{c} 381 \\ 380 \\ 389 \\ 397 \\ 430 \\ 504 \\ 400 \\ 370 \\ 329 \\ 265 \\ 268 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ \end{array}$	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ \end{array}$	$\begin{array}{c} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ 263\\ 274\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ \end{array}$	$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ \end{array} $	$\begin{array}{c} 377.3\\ 383.0\\ 390.0\\ 405.2\\ 464.8\\ 464.5\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\end{array}$
$ \begin{array}{c} 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ \end{array} $	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 261\\ \end{array}$	$\begin{array}{c} 381 \\ 380 \\ 389 \\ 397 \\ 430 \\ 504 \\ 400 \\ 370 \\ 329 \\ 265 \\ 268 \\ 256 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251 \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ 246\\ \end{array}$	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238 \end{array}$	376 386 390 412 487 448 383 357 312.5 262 279 225	$\begin{array}{c} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ 263\\ 274\\ 231\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ \end{array}$	$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ \end{array} $	$\begin{array}{c} 377.3\\ 383.0\\ 390.0\\ 405.2\\ 464.8\\ 464.5\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 242.9\end{array}$
$10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 261\\ 216\\ \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 329\\ 265\\ 268\\ 256\\ 196\\ \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ \end{array}$	378 385 392 394 460 499 397 373 325 261 270 246 193	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ \end{array}$	375 386 390 420 480 429 379 348 297 263 274 231 201	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ \end{array}$	$11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 23 \\ 23 \\ 23 \\ 23 \\ 23$	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 242.9\\ 202.7\end{array}$
$10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 267\\ 261\\ 216\\ 215\\ \end{array}$	381 380 389 397 430 504 400 329 265 265 268 256 196 216	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ \end{array}$	378 385 392 394 460 499 397 373 325 261 270 246 193 215	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 205\\ \end{array}$	375 386 390 420 480 429 379 348 297 263 274 231 201 203	$\begin{array}{c} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ \end{array}$	11 12 13 14 15 16 17 18 19 20 21 22 23 0	$\begin{array}{c} 383.5\\ 377.3\\ 383.6\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.6\\ 314.8\\ 264.0\\ 271.1\\ 242.9\\ 202.7\\ 208.5\\ \end{array}$
$10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 267\\ 261\\ 216\\ 215\\ 200\\ \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 265\\ 268\\ 256\\ 196\\ 216\\ 203\\ \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ 201\\ \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ 246\\ 193\\ 215\\ 201\\ \end{array}$	$\begin{array}{r} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ 200\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ 199\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 202\\ 205\\ 203\\ \end{array}$	375 386 390 420 480 429 379 348 297 263 274 231 201 203 211	$\begin{array}{c} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ 215\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ 220\\ \end{array}$	$ \begin{array}{c} 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1 \end{array} $	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 249.9\\ 202.7\\ 208.8\\ 205.8\\ 205.8\end{array}$
$\begin{array}{c} 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1 \end{array}$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 261\\ 216\\ 215\\ 200\\ 227\\ \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 265\\ 268\\ 256\\ 196\\ 216\\ 203\\ 232 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ 201\\ 239 \end{array}$	$\begin{array}{r} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ 246\\ 193\\ 215\\ 201\\ 254 \end{array}$	$\begin{array}{r} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ 200\\ 280\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ 199\\ 300\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 205\\ 203\\ 314 \end{array}$	375 386 390 420 480 429 379 348 297 263 274 231 201 203 211 325	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ 215\\ 320\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ 220\\ 320\\ \end{array}$	11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0	$\begin{array}{c} 377.3\\ 383.0\\ 390.0\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 242.2\\ 202.7\\ 208.3\\ 205.8\\ 281.1\\ \end{array}$
$\begin{array}{c} 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\end{array}$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 267\\ 267\\ 216\\ 215\\ 200\\ 227\\ 319 \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 265\\ 265\\ 265\\ 256\\ 196\\ 216\\ 203\\ 232\\ 319 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ 201\\ 239\\ 319 \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ 246\\ 193\\ 215\\ 201\\ 254\\ 321\\ \end{array}$	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ 200\\ 280\\ 327\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ 199\\ 300\\ 331 \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 205\\ 203\\ 314\\ 345\\ \end{array}$	$\begin{array}{r} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ 263\\ 274\\ 231\\ 201\\ 203\\ 211\\ 325\\ 350\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ 215\\ 320\\ 362\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ 220\\ 320\\ 369 \end{array}$	11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 2 23 3	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 249.2\\ 202.7\\ 208.5\\ 205.5\\ 281.1\\ 336.9\end{array}$
$\begin{array}{c} 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\\ 3\\ \end{array}$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 267\\ 261\\ 216\\ 215\\ 200\\ 227\\ 319\\ 353 \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 265\\ 265\\ 265\\ 266\\ 196\\ 216\\ 203\\ 232\\ 319\\ 359 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ 201\\ 239\\ 319\\ 361 \end{array}$	378 385 392 394 460 499 397 373 325 261 270 246 193 215 201 254 321 363	$\begin{array}{r} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ 200\\ 280\\ 327\\ 365 \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ 199\\ 300\\ \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 205\\ 203\\ 314 \end{array}$	375 386 390 420 480 429 379 348 297 263 274 231 201 203 211 325	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ 215\\ 320\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ 220\\ 320\\ \end{array}$	11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 3 4	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 249.2\\ 202.7\\ 208.5\\ 205.5\\ 281.1\\ 336.9\end{array}$
$\begin{array}{c} 10\\ 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\end{array}$	$\begin{array}{r} 382\\ 376\\ 388\\ 396\\ 422\\ 501\\ 405\\ 362\\ 350\\ 272\\ 267\\ 267\\ 267\\ 216\\ 215\\ 200\\ 227\\ 319 \end{array}$	$\begin{array}{c} 381\\ 380\\ 389\\ 397\\ 430\\ 504\\ 400\\ 370\\ 265\\ 265\\ 265\\ 256\\ 196\\ 216\\ 203\\ 232\\ 319 \end{array}$	$\begin{array}{c} 380\\ 383\\ 389\\ 396\\ 444\\ 503\\ 398\\ 377\\ 329\\ 263\\ 269\\ 251\\ 196\\ 215\\ 201\\ 239\\ 319 \end{array}$	$\begin{array}{c} 378\\ 385\\ 392\\ 394\\ 460\\ 499\\ 397\\ 373\\ 325\\ 261\\ 270\\ 246\\ 193\\ 215\\ 201\\ 254\\ 321\\ \end{array}$	$\begin{array}{c} 377\\ 385\\ 393\\ 392\\ 464\\ 479\\ 395\\ 369\\ 321\\ 261\\ 273\\ 240\\ 203\\ 211\\ 200\\ 280\\ 327\\ \end{array}$	$\begin{array}{c} 376\\ 385\\ 392\\ 400\\ 470\\ 460\\ 389\\ 365\\ 317\\ 262\\ 276\\ 238\\ 203\\ 208\\ 199\\ 300\\ 331 \end{array}$	$\begin{array}{c} 376\\ 386\\ 390\\ 412\\ 487\\ 448\\ 383\\ 357\\ 312.5\\ 262\\ 279\\ 225\\ 202\\ 205\\ 203\\ 314\\ 345\\ \end{array}$	$\begin{array}{r} 375\\ 386\\ 390\\ 420\\ 480\\ 429\\ 379\\ 348\\ 297\\ 263\\ 274\\ 231\\ 201\\ 203\\ 211\\ 325\\ 350\\ \end{array}$	$\begin{array}{r} 374\\ 386\\ 392\\ 424\\ 493.5\\ 417\\ 371\\ 348\\ 288\\ 265\\ 270\\ 239\\ 206\\ 200\\ 215\\ 320\\ 362\\ \end{array}$	$\begin{array}{c} 374\\ 387\\ 394\\ 422\\ 498\\ 407\\ 368\\ 350\\ 280\\ 266\\ 265\\ 235\\ 211\\ 195\\ 220\\ 320\\ 369 \end{array}$	11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 2 23 3	$\begin{array}{c} 377.3\\ 383.9\\ 390.9\\ 405.3\\ 464.8\\ 464.7\\ 388.5\\ 361.9\\ 314.8\\ 264.0\\ 271.1\\ 242.9\\ 202.7\end{array}$

fean ocal ime.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean local time.	Hourly means
		F	ern R	ock Ot	serva	tory,	February	14 and	1 15, 188	54.	•	
4 ^h	1		304ª	303ª	304ª	303d	307ª	311d	316d	324d	5 ^h	(307. ^d
5	331d	339d	343	347	350	352	355	358	359	360	6	349.4
6	362	362	365	369	372	380	387	396	401	410	7	380.4
7	393	398	398	401	417	449	440	435	440	440	8	421.]
8	435	434	428	420	420	412	405	408	413	422	9	419.
9	439	450	470	478	487	486	486	494	482	465	10	473.
10	462	458	451	443	438	432	426	431	443	457	11	444.
11	472	483	494	493	491	487	483	477	458	436	12.	477.
12	434	414	410	409	410	407	406	408	413	419	13	413.
13	428	441	452	456	459	462	473	464	465	462	14	456.
14	458	454	450	449	447	446	. 458	473	478	481	15	459.
15	486	489	491	492	490	492	494	494	490	485	16	490.
16	478	470	468	460	452	444	434	430	428	420	17	448.
17	416	420	414	414	409	404	401	399	396	394	18	406.
18	391	376	376	377	378	392	391	366	359	356	19	376.
19	349	344	338	320	312	334	340	336	329	329	20	333.
20	331	339	350	356	359	354	349	345 .	331	317	21	343.
21	296	292	289	292	292	291	289	287	284	278	22	289.
22	275	273	258 .	246	244	238	234	228	223	218	23	243.
23	212	208	211	180	160	138	146	136	132	129	0	165.
0	131	144	159	171	181	192	203	211	218	226	1	183.
1	236	244	245	246	247	257	269	252	236	238	2	247.
2	241	242	240	243	247	254	249	249	251	254	3	247.
3	257	266	278	292	316	322	316	311	319	332	4	300.
4	331	351	360								Mean	360.
	1	1		1		1						}
	1	ı F	'ern R	ock Ol	oserva	tory,	February	7 17 and	1 18, 18	54.	•	1
		F	'ern R	ock Ot	oserva	tory,	February			1		
<u>4</u> h	1 190d							193 ^d	193 ^d	194 ^d	4 ^h	1894
4 ^h 5	190 ^d	184 ^d	172 ^d	172 ^d	169 ^d	172 ^d	181ª	193 ^d 188	193 ^d 196	194 ^d 198	. 5	
5	193	184 ^d 183	172 ^d 185	172 ^d 188	169 ^d 180	172 ^d .	181ª 185	193 ^d 188 195	193 ^d 196 207	194 ^d 198 208	· 5 6	190.
5 6	193 208	184^{d} 183 230	172 ^d 185 258	172 ^d 188 298	169 ^d 180 296	172 ^d 182 286	181 ^d 185 272	193 ^d 188 195 271	193 ^d 196 207 270	194 ^d 198 208 270	· 5 6 7	190. 265.
5 6 7	193 208 265	$ 184^{d} \\ 183 \\ 230 \\ 258 $	$ 172^{d} \\ 185 \\ 258 \\ 252 $	$ 172^{d} \\ 188 \\ 298 \\ 244 $	169 ^a 180 296 237	172 ^d 182 286 230	181ª 185 272 227	$ 193^{d} \\ 188 \\ 195 \\ 271 \\ 225 $	193 ^d 196 207 270 226	194 ^d 198 208 270 228	· 5 6 7 8	190. 265. 239.
5 6 7 8	$ 193 \\ 208 \\ 265 \\ 232 $	$ 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 $	172 ^d 185 258 252 238	$ 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 $	169 ^d 180 296 237 249	$ 172^{d} \\ 182 \\ 286 \\ 230 \\ 255 $	181 ^a 185 272 227 260	193 ^d 188 195 271 225 260	193 ^d 196 207 270 226 261	194 ^d 198 208 270 228 262	· 5 6 7 8 9	190. 265. 239. 249.
5 6 7 8 9	193 208 265 232 262	$ 184^{d} \\ 183 \\ 230 \\ 258 $	$ 172^{d} \\ 185 \\ 258 \\ 252 $	$ 172^{d} 188 298 244 242 268 $	169 ^d 180 296 237 249 273	172 ^d 182 286 230	181ª 185 272 227	$ 193^{d} \\ 188 \\ 195 \\ 271 \\ 225 $	193 ^d 196 207 270 226	194 ^d 198 208 270 228 262 300	· 5 6 7 8	190. 265. 239. 249. 275.
5 6 7 8	$ 193 \\ 208 \\ 265 \\ 232 $	$ 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 $	$ \begin{array}{r} 172^{d} \\ 185 \\ 258 \\ 252 \\ 238 \\ 265 \\ \end{array} $	$ 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 $	169 ^d 180 296 237 249	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	181 ^d 185 272 227 260 279	193 ^d 188 195 271 225 260 281	193 ^d 196 207 270 226 261 291	194 ^d 198 208 270 228 262	· 5 6 7 8 9 10	190. 265. 239. 249. 275. 260.
5 6 7 8 9 10 11	193 208 265 232 262 302	184 ^d 183 230 258 235 263 300	$ \begin{array}{r} 172^{d} \\ 185 \\ 258 \\ 252 \\ 238 \\ 265 \\ 280 \\ \end{array} $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ^d 180 296 237 249 273 260	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	181 ^a 185 272 227 260 279 242	193 ^d 188 195 271 225 260 281 236	193 ^d 196 207 270 226 261 291 228.5	194 ^d 198 208 270 228 262 300 237	· 5 6 7 8 9 10 11	190. 265. 239. 249. 275. 260. 235.
5 6 7 8 9 10 11 12	$ \begin{array}{r} 193 \\ 208 \\ 265 \\ 232 \\ 262 \\ 302 \\ 241 \\ \end{array} $	$ 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 $	$ \begin{array}{r} 172^{d} \\ 185 \\ 258 \\ 252 \\ 238 \\ 265 \\ 280 \\ 245 \\ \end{array} $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ^d 180 296 237 249 273 260 236	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	181 ^a 185 272 227 260 279 242 232	$ \begin{array}{r} 193^{d} \\ 188 \\ 195 \\ 271 \\ 225 \\ 260 \\ 281 \\ 236 \\ 230 \\ \end{array} $	193 ^d 196 207 270 226 261 291 228.5 229	194 ^d 198 208 270 228 262 300 237 227.8	· 5 6 7 8 9 10 11 12	190. 265. 239. 249. 275. 260. 235. 237.
5 6 7 8 9 10 11 12 13	193 208 265 232 262 302 241 225	$ 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 $	$ \begin{array}{r} 172^{d} \\ 185 \\ 258 \\ 252 \\ 238 \\ 265 \\ 280 \\ 245 \\ 240 \\ \end{array} $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	$169^{d} \\ 180 \\ 296 \\ 237 \\ 249 \\ 273 \\ 260 \\ 236 \\ 242$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	181 ^d 185 272 227 260 279 242 232 236	$ 193^{d} \\ 188 \\ 195 \\ 271 \\ 225 \\ 260 \\ 281 \\ 236 \\ 230 \\ 230 $	193 ^d 196 207 270 226 261 291 228.5 229 247	$ \begin{array}{ } 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ \end{array} $	· 5 6 7 8 9 10 11 12 13	190. 265. 239. 249. 275. 260. 235. 237. 242.
5 6 7 8 9 10 11 12 13 14	193 208 265 232 262 302 241 225 261	184 ^d 183 230 258 235 263 300 247.5 222 248	$ \begin{array}{r} 172^{d} \\ 185 \\ 258 \\ 252 \\ 238 \\ 265 \\ 280 \\ 245 \\ 240 \\ 240 \\ \end{array} $	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ^d 180 296 237 249 273 260 236 242 233	172 ^d 182 286 230 255 276 249 231 239 237	181 ^d 185 272 227 260 279 242 232 236 250	193 ^d 188 195 271 225 260 281 236 230 230 244	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	194 ^d 198 208 270 228 262 300 237 227.8 253 240 231 247	$ \begin{array}{c} 5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ \end{array} $	190. 265. 239. 249. 275. 260. 235. 237. 242. 237.
5 6 7 8 9 10 11 12 13 14 15	193 208 265 232 262 302 241 225 261 238	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \end{array}$	172^{d} 185 258 252 238 265 280 245 240 240 235	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ^d 180 296 237 249 273 260 236 242 233 243	172 ^d 182 286 230 255 276 249 231 239 237 242	181 ^d 185 272 227 260 279 242 232 236 250 240.5	193 ^d 188 195 271 225 260 281 236 230 230 244 237	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238.
5 6 7 8 9 10 11 12 13 14 15 16	193 208 265 232 262 302 241 225 261 238 229	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \\ 229.5 \\ 251 \\ 220 \end{array}$	172^{d} 185 258 252 238 265 240 245 240 235 234 250 223	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 239 245 232	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 238 242 235	181 ^d 185 272 227 260 279 242 232 236 250 240.5 240 237 237	193 ^d 188 195 271 225 260 281 236 230 230 244 237 241 233 238	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 241 \\ 240 \\ \end{array}$. 5 6 7 8 9 10 11 12 13 14 15 16 17 18	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231.
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 17 \\ 10 \\ 17 \\ 10 \\ 10 \\ 10 \\ 10$	193 208 265 232 262 302 241 225 261 238 229 249	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \\ 229.5 \\ 251 \end{array}$	172^{d} 185 258 252 238 265 240 240 235 234 250	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 239 245	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242	181 ^d 185 272 227 260 279 242 232 236 250 240.5 240 237 237 233	193 ^d 188 195 271 225 260 281 236 230 230 244 237 241 233	193 ^d 196 207 270 226 261 291 228.5 229 247 242 234 243 228 239 - 234	194 ^d 198 208 270 228 262 300 237 227.8 253 240 231 247 223 240 237	. 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	193 208 265 232 262 302 241 225 261 238 229 249 218 235 240	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \\ 229.5 \\ 251 \\ 220 \\ 232 \\ 234 \end{array}$	172 ^d 185 258 252 238 265 280 245 240 240 235 234 250 223 230 228	$\begin{array}{c c} 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 \\ 268 \\ 273 \\ 240 \\ 238 \\ 231 \\ 238 \\ 239.5 \\ 247 \\ 228 \\ 233 \\ 220 \end{array}$	169 ^d 180 296 237 249 273 260 236 242 233 243 243 243 239 245 232 235 204	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 238 242 235 237 166	$\begin{array}{c c} 181^{d} \\ 185 \\ 272 \\ 227 \\ 260 \\ 279 \\ 242 \\ 232 \\ 236 \\ 250 \\ 240.5 \\ 240 \\ 237 \\ 237 \\ 233 \\ 164 \end{array}$	193 ^d 188 195 271 225 260 281 236 230 230 244 237 241 233 238 228 147	193 ^d 196 207 270 226 261 291 228.5 229 247 242 234 242 234 243 228 239 - 234 130	194 ^d 198 208 270 228 262 300 237 227.8 253 240 231 247 223 240 237 152	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233. 188.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20	193 208 265 232 262 302 241 225 261 238 229 249 249 218 235	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \\ 229.5 \\ 251 \\ 220 \\ 232 \\ 234 \\ 188 \end{array}$	172 ^d 185 258 252 238 265 280 245 240 240 240 235 234 250 223 230 228 206	$\begin{array}{c c} 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 \\ 268 \\ 273 \\ 240 \\ 238 \\ 231 \\ 238 \\ 239.5 \\ 247 \\ 228 \\ 233 \\ 220 \\ 230 \end{array}$	169 ^d 180 296 237 249 273 260 236 242 233 243 243 239 245 232 235 204 256	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 238 242 235 237 166 250	$\begin{array}{c c} 181^{d} \\ 185 \\ 272 \\ 227 \\ 260 \\ 279 \\ 242 \\ 232 \\ 236 \\ 250 \\ 240.5 \\ 240.5 \\ 240 \\ 237 \\ 233 \\ 164 \\ 241 \\ \end{array}$	193 ^d 188 195 271 225 260 281 236 230 234 237 241 233 238 228 147 236	193 ^d 196 207 270 226 261 291 228.5 229 247 242 234 243 228 239 - 234 130 226	194^{d} 198 208 270 228 262 300 237 227.8 253 240 231 247 223 240 237 152 217	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233. 188. 222.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	193 208 265 232 262 302 241 225 261 238 229 249 218 235 240 179 218	$\begin{array}{c c} 184^{d} \\ 183 \\ 230 \\ 258 \\ 235 \\ 263 \\ 300 \\ 247.5 \\ 222 \\ 248 \\ 236 \\ 229.5 \\ 251 \\ 220 \\ 232 \\ 234 \\ 188 \\ 221 \end{array}$	172 ⁴ 185 258 252 238 265 280 245 240 245 234 250 223 234 250 223 230 228 206 224	$\begin{array}{c c} 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 \\ 268 \\ 273 \\ 240 \\ 238 \\ 239 \\ 239 \\ 547 \\ 228 \\ 233 \\ 220 \\ 230 \\ 221 \end{array}$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 239 245 232 235 204 256 217	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 238 242 235 237 166 250 208	$\begin{array}{c c} 181^{d} \\ 185 \\ 272 \\ 227 \\ 260 \\ 279 \\ 242 \\ 232 \\ 236 \\ 250 \\ 240.5 \\ 240 \\ 237 \\ 237 \\ 233 \\ 164 \\ 241 \\ 221 \\ \end{array}$	193 ^d 188 195 271 225 260 281 236 230 241 233 238 238 238 228 147 236 237	193^{d} 196 207 270 226 261 291 228.5 229 247 242 234 243 2234 243 2234 234 243 2234 234 243 224 234 243 224 234 243 224 234 243 224 234 243 224 234 243 224 234 243 224 234 243 224 234 243 224 244	194^{d} 198 208 270 228 262 300 237 227.8 253 240 231 247 223 240 237 152 217 245	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 100 \\ & 111 \\ & 122 \\ & 133 \\ & 144 \\ & 155 \\ & 166 \\ & 177 \\ & 188 \\ & 199 \\ & 200 \\ & 211 \\ & 222 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 242. 238. 242. 231. 233. 188. 222. 225.
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 $	193 208 265 232 262 302 241 225 261 238 229 249 218 235 240 179 218 244	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ⁴ 185 258 252 238 265 280 245 240 240 235 234 250 223 230 228 206 224 254	$\begin{array}{c c} 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 \\ 268 \\ 273 \\ 240 \\ 238 \\ 239.5 \\ 247 \\ 228 \\ 239.5 \\ 247 \\ 228 \\ 233 \\ 220 \\ 230 \\ 221 \\ 250 \end{array}$	169 ⁴ 180 296 237 249 273 260 236 242 233 242 233 243 239 245 232 235 204 256 217 247	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 235 237 242 238 242 238 242 238 242 238 242 238 242 238 242 238 244	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 238 228 147 236 237 241	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 100 \\ & 111 \\ & 122 \\ & 133 \\ & 144 \\ & 155 \\ & 166 \\ & 177 \\ & 188 \\ & 199 \\ & 200 \\ & 211 \\ & 222 \\ & 233 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233. 188. 222. 225. 245.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	$\begin{array}{c} 193\\ 208\\ 265\\ 232\\ 262\\ 302\\ 241\\ 225\\ 261\\ 238\\ 229\\ 249\\ 218\\ 235\\ 240\\ 179\\ 218\\ 244\\ 240\\ \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ⁴ 185 258 252 238 265 280 245 240 240 235 234 250 223 230 228 206 224 254 252	$\begin{array}{c c} 172^{d} \\ 188 \\ 298 \\ 244 \\ 242 \\ 268 \\ 273 \\ 240 \\ 238 \\ 239.5 \\ 247 \\ 228 \\ 239.5 \\ 247 \\ 228 \\ 230 \\ 220 \\ 230 \\ 221 \\ 250 \\ 247.5 \\ \end{array}$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 239 243 239 243 239 243 239 245 232 235 204 256 217 247 238	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 235 237 242 238 242 235 237 166 250 208 244 227	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 233 238 228 147 236 237 241 219	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 231. 231. 231. 231. 232. 245. 245.
5 6 7 8 9 10 11 12 3 14 15 16 17 18 19 221 22 23 0	$\begin{array}{c} 193\\ 208\\ 265\\ 232\\ 262\\ 302\\ 241\\ 225\\ 261\\ 238\\ 229\\ 249\\ 218\\ 235\\ 240\\ 179\\ 218\\ 244\\ 240\\ 214\\ \end{array}$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172^{d} 185 258 252 238 265 240 240 240 235 234 250 228 206 224 254 252 216	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 243 243 243 243 243 243 243	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 235 237 238 242 238 242 235 237 166 250 208 244 227 232	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 233 238 228 147 236 237 241 219 240	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \\ 255 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \\ & 1 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233. 188. 2922. 225. 245. 232. 230.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ⁴ 185 258 252 238 265 280 245 240 245 240 235 234 250 223 230 228 206 224 254 252 216 180*	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 243 243 239 245 232 235 204 256 217 247 238 226 187	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 235 237 166 250 208 244 227 232 184	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 233 238 228 147 236 237 241 219 240 177	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \\ 255 \\ 174 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \\ & 1 \\ & 2 \end{array}$	190. 265. 239. 249. 275. 260. 235. 237. 242. 237. 238. 240. 231. 233. 188. 292. 225. 245. 232. 230. 198.
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 9 20 21 22 22 3 0 1 2		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ⁴ 185 258 252 238 265 280 245 240 240 235 234 250 223 230 223 230 228 206 224 254 252 216 180* 156	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	169 ^d 180 296 237 249 273 260 236 242 233 243 243 239 245 235 204 256 217 247 238 226 187 144	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 238 228 147 236 237 241 219 240 177 147	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \\ 255 \\ 174 \\ 151 \\ \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \\ & 1 \\ & 2 \\ & 3 \end{array}$	$\begin{array}{c} 190.\\ 265.\\ 239.\\ 249.\\ 275.\\ 260.\\ 235.\\ 237.\\ 242.\\ 237.\\ 238.\\ 240.\\ 231.\\ 233.\\ 188.\\ 222.\\ 245.\\ 245.\\ 232.\\ 230.\\ 198.\\ 152.\\ \end{array}$
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 2 3	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ^d 185 258 252 238 265 280 245 240 240 235 234 250 223 230 228 206 224 254 252 224 254 252 216 180* 156 161	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	169 ⁴ 180 296 237 249 273 260 236 242 233 243 243 243 239 245 232 235 204 256 217 247 238 226 187	172 ^d 182 286 230 255 276 249 231 239 237 242 238 242 235 237 166 250 208 244 227 232 184	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 233 238 228 147 236 237 241 219 240 177	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \\ 255 \\ 174 \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \\ & 1 \\ & 2 \end{array}$	$\begin{array}{c} 190.\\ 265.\\ 239.\\ 249.\\ 275.\\ 260.\\ 235.\\ 237.\\ 242.\\ 237.\\ 238.\\ 240.\\ 231.\\ 233.\\ 188.\\ 222.\\ 245.\\ 245.\\ 232.\\ 230.\\ 198.\\ 152.\\ \end{array}$
5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 2		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	172 ⁴ 185 258 252 238 265 280 245 240 240 235 234 250 223 230 223 230 228 206 224 254 252 216 180* 156	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	169 ^d 180 296 237 249 273 260 236 242 233 243 243 239 245 235 204 256 217 247 238 226 187 144	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	193^{d} 188 195 271 225 260 281 236 230 244 237 241 238 228 147 236 237 241 219 240 177 147	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{c} 194^{d} \\ 198 \\ 208 \\ 270 \\ 228 \\ 262 \\ 300 \\ 237 \\ 227.8 \\ 253 \\ 240 \\ 231 \\ 247 \\ 223 \\ 240 \\ 237 \\ 152 \\ 217 \\ 245 \\ 240 \\ 214 \\ 255 \\ 174 \\ 151 \\ \end{array}$	$\begin{array}{c} & 5 \\ & 6 \\ & 7 \\ & 8 \\ & 9 \\ & 10 \\ & 11 \\ & 12 \\ & 13 \\ & 14 \\ & 15 \\ & 16 \\ & 17 \\ & 18 \\ & 19 \\ & 20 \\ & 21 \\ & 22 \\ & 23 \\ & 0 \\ & 1 \\ & 2 \\ & 3 \end{array}$	182 ^d 190. 265. 239. 249. 275. 260. 235. 237. 238. 242. 237. 238. 242. 237. 238. 242. 231. 233. 188. 222. 230. 198. 152. 183.

Increase of seale readings corresponds to a movement of the north end of the magnet to the east.

Nore.-The mean in brackets includes two interpolated values.

* A sudden change of 90^d occurring at 6^h 30^m chronometer time (Greenwich time nearly).

time.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean local time.	Hourl means
		F	'ern R	ock O	bserva	tory,	February	7 21 and	1 22, 18	54.		1
		554	- Ale	the				270ª	269ª	268ª	4 ^h	1.19
4 ^h	268d	268d	273ª	276ª	271ª	260d	252d	252	252	252	5	262ª.
5	252	253	256	256	.253	254	256	257	258	260	6	255.5
6	261	263	263	265	267	267	268	269	271	273	7.	266.7
7	274	275	276	277	280	282	286	291	296	301	8	283.8
8	302	302	303	303	302	302	301	302	301	299	9	301.
9	296	293	290	289	287	286	284	283	283	283.5	10	287.4
10	282.5	280.5	278.5	276	274	274	274	279	284	287	11	278.9
11	288	289	290	294 .	297	299	300	296	294	293	12	294.0
12	292	292	290	287	284	281	276	276	275	280	13	283.3
13	285	287	290	293	297	290	282	280	278	276	14	288.3
14	276	278	282	282	284	285	287	287	287	288	15	283.0
15	288	288	289	290	293	293	294	294	296	296	16	292.1
16	295	295	293	292	291	291	293	290	287	283	17	291.0
17	280	278	275	272	271	268	267	266	265	263	18	270.
18	261	260	258	255	254	255	257	.260	262	263	19	258.
19	264	262	259	260	261	261	260.5	260	259	256	20	260.9
20	251	244	240	242	230	218	216	212	205	203	21	226.
21	206	210	216	221	223	224	230	237	250	250	22	226.
22	250	250	254	257	258	262	260	260	261	263	23	257.
23	261	260	260	258	260	261	262	262	262	262	0	260.8
0	262	262	262	262	263	263	262	261	261	260	1	261.
1	259	259	258	257	258	259	259	260	261	263	2	259.3
2	264	266	269	271	273	275	277	280	278	274	3	272.
3	274	275	278	290	294	304	293	286	282	280	4	285.0
				1			1	-				
4	283	282	279	276	and the second second	and the second second			1.2.2.2.2.2.2			
4	283		279 n Roc		ervato	ry, Fe	bruary 2	8 and I	fareh 1,	1854.	Mean	271.9
4	283				ervato	p ry , Fe	bruary 2		1	1	1	271.
		Fer	n Roc	k Obs				220ª	220ª	219 ^d	1 4 ^h	
4 ^h	218 ^d	Fer 216 ^d	n Roc 213 ^d	k Obse 2074	200ª	191ª	183ª	220 ^d 179	220 ^d 180	219 ^d 182	4 ^h 5	1 196 ^d .
4 ^h 5	218 ^d 184	Fer 216 ^d 186	n Roc 213 ^d 189	k Obse 207 ^d 191	200 ^d 192	191 ^a 193	183 ^d 193	220 ^d 179 192	220 ^d 180 193	219 ^d 182 193	4 ^h 5 6	196 ^d .
4 ^h 5 6	218 ^d 184 195	Fer 216 ^d 186 198	n Roc 213 ^d 189 202	k Obse 207 ⁴ 191 210	200 ^d 192 219	191 ^d 193 227	183 ^d 193 230	220 ^d 179 192 244	220 ^d 180 193 256	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7	196 ^d . 190. 224.
4 ^h 5 6 7	218 ^d 184 195 272	Fer 216 ^d 186 198 274	n Roc 213 ^d 189 202 280	k Obse 207 ^d 191 210 278	$200^{d} \\ 192 \\ 219 \\ 242$	191 ^d 193 227 226	183 ^d 193 230 220	$220^{d} \\ 179 \\ 192 \\ 244 \\ 250$	220 ^d 180 193 256 300	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8	196 ^d . 190.0 224.1 266.9
4 ^h 5 6 7 8	218 ^d 184 195 272 344	Fer 216 ^d 186 198 274 333	n Roc 213 ^d 189 202 280 321	k Obse 207 ^d 191 210 278 310	$200^{d} \\ 192 \\ 219 \\ 242 \\ 306$	191 ^d 193 227 226 322	183 ^d 193 230 220 335	$ \begin{array}{r} 220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \end{array} $	220 ^d 180 193 256 300 350	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9	196 ^d . 190. 224. 266. 332.
4 ^h 5 6 7 8 9	$218^{d} \\ 184 \\ 195 \\ 272 \\ 344 \\ 353$	Fer 216 ^d 186 198 274 333 352	n Roc 213 ⁴ 189 202 280 321 350	k Obse 207 ^d 191 210 278 310 355	$200^{4} \\ 192 \\ 219 \\ 242 \\ 306 \\ 368$	191 ⁴ 193 227 226 322 365	183 ^d 193 230 220 335 360	$220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10	196 ^d . 190.4 224.2 266.5 332.4 361.6
4 ^h 5 6 7 8 9 10	218 ^d 184 195 272 344 353 374	Fer 216 ^d 186 198 274 333 352 378	n Roc 213 ^d 189 202 280 321 350 399	k Obse 207 ^d 191 210 278 310 355 402	$200^{4} \\ 192 \\ 219 \\ 242 \\ 306 \\ 368 \\ 408$	$ \begin{array}{c c} 191^{4} \\ 193 \\ 227 \\ 226 \\ 322 \\ 365 \\ 404 \\ \end{array} $	183 ^d 193 230 220 335 360 398	$220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394$	220 ^d 180 193 256 300 350 371 390	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11	196 ^d . 190.(224.) 266.9 332.4 361.6 394.'
4 ^h 5 6 7 8 9 10 11	218 ^d 184 195 272 344 353 374 398	Fer 216 ^d 186 198 274 333 352 378 396	n Roc 213 ^d 189 202 280 321 350 399 397	k Obse 207 ^d 191 210 278 310 355 402 402	$200^{4} \\ 192 \\ 219 \\ 242 \\ 306 \\ 368 \\ 408 \\ 405 \\ $	191 ^d 193 227 226 322 365 404 408	183 ^d 193 230 220 335 360 398 407	$220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394 \\ 421$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11 12	196 ^d . 190.(224.) 266.9 332.4 361.(394.) 411.(
4 ^h 5 6 7 8 9 10 11 12	218 ^d 184 195 272 344 353 374 398 452	Fer 216 ^d 186 198 274 333 352 378 396 476	n Roc 213 ^d 189 202 280 321 350 399 397 484	k Obse 207 ^d 191 210 278 310 355 402 402 483	$200^{4} \\ 192 \\ 219 \\ 242 \\ 306 \\ 368 \\ 408 \\ 405 \\ 450 \\ 450 \\ $	$ \begin{array}{c c} 191^{4} \\ 193 \\ 227 \\ 226 \\ 322 \\ 365 \\ 404 \\ \end{array} $	183 ⁴ 193 230 220 335 360 398 407 418	$220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11	196 ^d . 190.0 224.2 266.5 332.4 361.0 394.2 411.0 437.5
4 ^h 5 6 7 8 9 10 11 12 13	218 ^d 184 195 272 344 353 374 398 452 372	Fer 216 ^d 186 198 274 333 352 378 396 476 363	n Roc 213 ^d 189 202 280 321 350 399 397 484 354	k Obse 2074 191 210 278 310 355 402 402 483 343	200^{4} 192 219 242 306 368 408 405 450 337	191 ⁴ 193 227 226 322 365 404 408 438 343	183 ⁴ 193 230 220 335 360 398 407 418 347	220^{4} 179 192 244 250 341 370 394 421 400 352	220 ^d 180 193 256 300 350 371 390 436 390 357	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11 12 13 14	196 ^d . 190.0 224.2 266.5 332.4 361.0 394.2 411.0 437.5 353.5
4 ^h 5 6 7 8 9 10 11 12 13 14	218 ^d 184 195 272 344 353 374 398 452	Fer 216 ^d 186 198 274 333 352 378 396 476 363 355	n Roc 213 ^d 189 202 280 321 350 399 397 484 354 354 340	k Obsev 207 ^d 191 210 278 310 355 402 402 483	$200^{4} \\ 192 \\ 219 \\ 242 \\ 306 \\ 368 \\ 408 \\ 405 \\ 450 \\ 450 \\ $	191 ^d 193 227 226 322 365 404 408 438	183 ⁴ 193 230 220 335 360 398 407 418	$220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394 \\ 421 \\ 400$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11 11 12 13	196 ⁴ . 190.4 224.2 266.5 332.4 361.6 394.7 411.6 437.5 353.5 335.6
4 ^h 5 6 7 8 9 10 11 12 13	218 ^d 184 195 272 344 353 374 398 452 372 372 372 331	Fer 216 ^d 186 198 274 333 352 378 396 476 363 355 327	n Roc 213 ^d 189 202 280 321 350 399 397 484 354	k Obse 207 ⁴ 191 210 278 310 355 402 402 483 343 324 324	200 ^d 192 219 242 306 368 405 450 337 315 322	191 ⁴ 193 227 226 322 365 404 408 438 343 320 325	$\begin{array}{c c} 183^{4} \\ 193 \\ 230 \\ 220 \\ 335 \\ 360 \\ 398 \\ 407 \\ 418 \\ 347 \\ 326 \end{array}$	$\begin{array}{c} 220^{d} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394 \\ 421 \\ 400 \\ 352 \\ 330 \end{array}$	220 ⁴ 180 193 256 300 350 371 390 436 390 357 333	$\begin{array}{c} 219^{d} \\ 182 \\ 193 \\ 260 \\ 320 \\ 362 \\ 372 \\ 400 \\ 440 \\ 381 \\ 364 \\ 335 \\ 314 \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15	196 ^d . 190.4 224.3 266.5 332.4 361.6 394.4 411.6 437.5 353.5 335.6 321.7
4 ^h 5 6 7 8 9 10 11 12 13 14 15 16	218 ^d 184 195 272 344 353 374 398 452 372 372 372 331 326	Fer 216 ^d 186 198 274 333 352 378 396 476 363 355 327 338	n Roc 213 ^d 189 202 280 321 350 399 397 484 354 354 354 340 325 346	k Obse 207 ^d 191 210 278 310 355 402 402 483 343 343 324 324 363	200 ^d 192 219 242 306 368 408 405 450 337 315 322 362	191 ⁴ 193 227 226 322 365 404 408 438 343 320 325 356	$\begin{array}{c c} 183^{4} \\ 193 \\ 230 \\ 220 \\ 335 \\ 360 \\ 398 \\ 407 \\ 418 \\ 347 \\ 326 \\ 314 \end{array}$	$\begin{array}{c} 220^{d} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394 \\ 421 \\ 400 \\ 352 \\ 330 \\ 320 \end{array}$	220 ⁴ 180 193 256 300 350 371 390 436 390 357 333 315	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16	196 ⁴ . 190., 224. 266.; 332. 361.6 394. ² 411.0 437.5 353.5 335.0 321. ² 346.5
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4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17	218 ^d 184 195 272 344 353 374 398 452 372 372 372 331 326 325	Fer 216 ^d 186 198 274 333 352 378 396 476 363 355 327 338	n Roc 213 ^d 189 202 280 321 350 399 397 484 354 354 354 354 340 325 346 324	k Obsevent and the second state of the second	200 ^d 192 219 242 306 368 408 405 450 337 315 322 362 316	191 ^d 193 227 226 322 365 404 408 438 343 320 325 356 324	$183^{d} \\ 193 \\ 230 \\ 220 \\ 335 \\ 360 \\ 398 \\ 407 \\ 418 \\ 347 \\ 326 \\ 314 \\ 348 \\ 312$	$\begin{array}{c} 220^{4} \\ 179 \\ 192 \\ 244 \\ 250 \\ 341 \\ 370 \\ 394 \\ 421 \\ 400 \\ 352 \\ 330 \\ 352 \\ 330 \\ 342 \\ 310 \end{array}$	220 ⁴ 180 193 256 300 350 371 390 436 390 436 390 436 357 333 315 342 318	$\begin{array}{c} 219^{4} \\ 182 \\ 193 \\ 260 \\ 320 \\ 362 \\ 372 \\ 400 \\ 440 \\ 381 \\ 364 \\ 335 \\ 314 \\ 339 \\ 322 \end{array}$	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18	1964. 190.4 224. 266.9 332.4 361.6 394. ² 411.6 437.9 335.6 335.6 321.7 346.9 319.1 315.8
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local time.	36m.	42m.	48m.	54m.	00m.	06m.	12m.	18m.	24m.	30m.	Mean local time.	Hourl; means
			Fern	Rock	Observ	vatory	, March	n 3 and	4, 1854.			
							•	250ª	247ª	246d	4 ^h	
4h	248d	249ª	240d	238d	242d	245d	248 ^d	250	260	265	5	248ª.
5	258	269	281	284	380	279	277 .	274	275	277	6	275.4
6	280.5	279	272.5	275	270	280	286	290	298	296	7	282.
7	283	311	315	332	329	326	321	329	347	349	8	324.5
8	356	356	360	352	347	346	330	302	291	_283	9	332.
9	287	290	282	286	275	264	265	267	269	270	10	275.
10	272	274	276	278	280	282	285	287	290	292	11.	281.
11	295	298	302	306	313	318	322	325	327	329	12	313.
12	330	337	345	349	352	350	348	345	343	336	13	343.
13	325	321	313	302	295	299	308	314	309	302	14	308.
14	297	294	288	292	286	284	280	276	272	285	15	285.
15	291	294	291	289	282	276	268	264	260	258	16	277.
16	257	257	256	258	259	260	262	260	258	258	17	258.
17	257	255	251	244.5	238	230	220	205	190	172	18 19	226. 151.
18	152	144	133	134 .	136	140	143	160	174	$198 \\ 177$	20	197.
19	209	216	210	205	201	195	190	186	181 193	199	20	178.
20	173	$\frac{170}{200}$	167 194	164 188	171 183	178 178	$\frac{184}{172}$	189 170	169	164	22	182.
21 22	206 152	160	154	156	153	155	157	154	150	150	23	154.
22	152	176	195	184	155	160	125	131	131	134	.0	154.
20	135	137.5	155	179	195	184	187	200	197.5	192	1	176.
1	195	200	190	185	182	179	150	136	150	156	2	172.
2	173	190	200	206	217	204	196	190	186	183	3	194.
3	189	192	199	204	209	216	222	229	234	243	4	213.
4	249	251	254	257							1	
-												
											Mean	242.0
				Rock	Obser	vatorv	, Marel	h 7 and	8, 1854.		Mean	242.0
				Rock	Obser [.]	vatory	, Marc	h 7 and	8, 1854.		1	242.0
4.	0104		Fern						190 ^d	202ª	4 ^h	1
4 ^h	218 ^d	223ª	Fern 213 ^d	218 ^d	2281	224ª	221d	231ª	190 ^d 230	202 ^d 235	4 ^h 5	224 ^d .
5	242	223d 243	Fern 213 ^d 246	218 ^d 247	228 ¹ 251	224 ^d 270	221ª 275	231 ^d 275	190 ^d 230 274	202 ^d 235 274	4 ^h 5 6	224 ^d . 259.
5 6	242 269	223 ^d 243 261	Fern 213 ^d 246 268	218 ^d 247 260	228 ¹ 251 273	224 ^d 270 270	221 ^d 275 269	231 ^d 275 255	190 ^d 230 274 268	202 ^d 235 274 271	4 ^h 5 6 7	224 ^d 259. 266.
5 6 7	242 269 275	223 ^d 243 261 271	Fern 213 ^d 246 268 279	218 ^d 247 260 284	228 ¹ 251 273 278	224 ^d 270 270 269	221 ^d 275 269 281	231 ^d 275 255 282	190 ^d 230 274 268 281	202 ^d 235 274 271 286	4 ^h 5 6 7 8	224 ^d 259. 266. 278.
5 6 7 8	242 269 275 292	223 ^d 243 261 271 304	Fern 213 ^d 246 268 279 294	218 ^d 247 260 284 302	228 ¹ 251 273 278 303	224 ^d 270 270 269 312	221 ^d 275 269 281 306	231 ^d 275 255 282 299	190 ^d 230 274 268 281 297	202 ^d 235 274 271 286 293	4 ^h 5 6 7 8 9	224 ^d 259. 266. 278. 300.
5 6 7 8 9	242 269 275 292 284	223 ^d 243 261 271 304 288	Fern 213 ^d 246 268 279 294 286	$218^{d} \\ 247 \\ 260 \\ 284 \\ 302 \\ 287 \\$	228 ¹ 251 273 278 303 291	224 ^d 270 270 269 312 294	221 ^d 275 269 281 306 300	231 ^d 275 255 282 299 305	190 ^d 230 274 268 281 297 298	202 ^d 235 274 271 286 293 290	4 ^h 5 6 7 8 9 10	224 ^d , 259, 266, 278, 300, 292.
5 6 7 8 9 10	242 269 275 292 284 287	223 ^d 243 261 271 304 288 280	Fern 213 ^d 246 268 279 294 286 276	218 ^d 247 260 284 302 287 287 270	$228^{1} \\ 251 \\ 273 \\ 278 \\ 303 \\ 291 \\ 277$	224 ^d 270 270 269 312 294 280	221 ^d 275 269 281 306 300 286	231 ^d 275 255 282 299 305 281	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 278 \end{array} $	202 ^d 235 274 271 286 293 290 273	4 ^h 5 6 7 8 9 10 11	224 ^d , 259, 266, 278, 300, 292, 278,
5 6 7 8 9 10 11	242 269 275 292 284 287 269	223 ^d 243 261 271 304 288 280 272	Fern 213 ^d 246 268 279 294 286 276 267	$218^{d} \\ 247 \\ 260 \\ 284 \\ 302 \\ 287 \\ 270 \\ 200 \\ $	$228^{1} \\ 251 \\ 273 \\ 278 \\ 303 \\ 291 \\ 277 \\ 272$	$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	221 ^d 275 269 281 306 300 286 267	231 ^d 275 255 282 299 305 281 268	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 272 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280	4 ^h 5 6 7 8 9 10 11 12	224 ^d 259. 266. 278. 300. 292. 278. 271.
5 6 7 8 9 10 11 12	242 269 275 292 284 287 269 273	223d 243 261 271 304 288 280 272 279	Fern 2134 246 268 279 294 286 276 267 284	$218^{d} \\ 247 \\ 260 \\ 284 \\ 302 \\ 287 \\ 270 \\ 270 \\ 270 \\ 290 \\$	$228^{1} \\ 251 \\ 273 \\ 278 \\ 303 \\ 291 \\ 277 \\ 272 \\ 289$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	221 ^d 275 269 281 306 300 286 267 294	231 ^d 275 255 282 299 305 281 268 291	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 278 \\ 272 \\ 283 \end{array} $	$202^{d} \\ 235 \\ 274 \\ 271 \\ 286 \\ 293 \\ 290 \\ 273 \\ 280 \\ 274 \\ $	4 ^h 5 6 7 8 9 10 11	224 ^d 259. 266. 278. 300. 292. 278. 271. 284.
5 6 7 8 9 10 11 12 13	242 269 275 292 284 287 269 273 290	223d 243 261 271 304 288 280 272 279 288	Fern 213 ^d 246 268 279 294 286 276 267 284 285	218 ^d 247 260 284 302 287 270 270 270 290 282	228 ¹ 251 273 278 303 291 277 272 289 283	224 ^d 270 270 269 312 294 280 274 291 291	221 ^d 275 269 281 306 300 286 267 294 297	231 ^d 275 255 282 299 305 281 268 291 300	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 272 \\ 283 \\ 296 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280	4 ^h 5 6 7 8 9 10 11 12 13	224 ^d , 259, 266, 278, 300, 292, 278, 271, 284, 290,
5 6 7 8 9 10 11 12 13 14	242 269 275 292 284 287 269 273 290 285	223d 243 261 271 304 288 280 272 279	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281	218 ^d 247 260 284 302 287 270 270 290 282 284	$228^{1} \\ 251 \\ 273 \\ 278 \\ 303 \\ 291 \\ 277 \\ 272 \\ 289$	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$	221 ^d 275 269 281 306 300 286 267 294	231 ^d 275 255 282 299 305 281 268 291	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 278 \\ 272 \\ 283 \end{array} $	202 ^d 235 274 271 286 293 290 273 280 274 291	4 ^h 5 6 7 8 9 10 11 12 13 14	224 ^d , 259, 266, 278, 300, 292, 278, 271, 284, 290, 285,
5 6 7 8 9 10 11 12 13 14 15	242 269 275 292 284 287 269 273 290 285 281	223d 243 261 271 304 288 280 272 279 288 279 288 278 282	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285	218 ^d 247 260 284 302 287 270 270 290 282 284 288	2281 251 273 278 303 291 277 272 289 283 298 298 290	224 ^d 270 269 312 294 280 274 291 291 291 291 292	221 ⁴ 275 269 281 306 300 286 267 294 297 289 295	231 ^d 275 255 282 299 305 281 268 291 300 286 297	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 272 \\ 283 \\ 296 \\ 284 \end{array} $	202 ^d 235 274 271 286 293 290 273 280 273 280 274 291 283	4 ^h 5 6 7 8 9 10 11 11 12 13 14 15	224 ^d 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290.
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 16 \\ 16 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10$	242 269 275 292 284 287 269 273 290 285 281 299	223d 243 261 271 304 288 280 272 279 288 279 288 278	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302	218 ^d 247 260 284 302 287 270 270 290 282 284	2281 251 273 278 303 291 277 272 289 283 298	224 ^d 270 269 312 294 280 274 291 291 291	221 ^d 275 269 281 306 300 286 267 294 297 289	231 ⁴ 275 255 282 299 305 281 268 291 300 286	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 278 \\ 272 \\ 283 \\ 296 \\ 284 \\ 298 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280 273 280 274 291 283 298	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16	224 ⁴ 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290.
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$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21$	$\begin{array}{c} 242\\ 269\\ 275\\ 292\\ 284\\ 287\\ 269\\ 273\\ 290\\ 285\\ 281\\ 299\\ 292\\ 269\\ 275\\ 264\\ 280\\ \end{array}$	223d 243 261 271 304 288 280 279 279 288 279 288 278 282 300 296 264 272 276 278	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 297 256 264 270 285	2281 251 273 278 303 291 277 272 289 283 298 290 291 295 260 270 264 287	$\begin{array}{c c} 224^{a^{-}}\\ 270\\ 270\\ 269\\ 312\\ 294\\ 280\\ 274\\ 291\\ 291\\ 291\\ 292\\ 285\\ 293\\ 255\\ 268\\ 260\\ 274\\ \end{array}$	221 ⁴ 275 269 281 306 300 286 267 294 297 289 295 280 289 258 258 270 268 291	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 272 \\ 283 \\ 296 \\ 284 \\ 298 \\ 281 \\ 266 \\ 271 \\ 284 \\ 295 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280 273 280 274 291 283 298 288 275 270 268 286 291	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	224 ^d . 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290. 290. 290. 290. 290. 290. 290
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 $	$\begin{array}{c} 242\\ 269\\ 275\\ 292\\ 284\\ 287\\ 269\\ 273\\ 290\\ 285\\ 281\\ 299\\ 299\\ 299\\ 269\\ 275\\ 264\\ 280\\ 284\\ \end{array}$	223d 243 261 271 304 288 280 272 279 288 278 288 282 300 296 264 272 276 278 276 278 276	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 297 256 264 270 285 268	2281 251 273 278 303 291 277 272 289 283 298 290 291 295 260 270 264 287 263	$\begin{array}{c c} 224^{a} \\ 270 \\ 270 \\ 269 \\ 312 \\ 294 \\ 280 \\ 274 \\ 291 \\ 291 \\ 291 \\ 292 \\ 285 \\ 293 \\ 255 \\ 268 \\ 260 \\ 274 \\ 257 \\ \end{array}$	221 ⁴ 275 269 281 306 300 286 267 294 297 289 295 280 289 258 270 268 291 264	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 272 \\ 283 \\ 296 \\ 284 \\ 298 \\ 283 \\ 281 \\ 266 \\ 271 \\ 284 \\ 295 \\ 286 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 288 275 270 268 286 291 293	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23	224 ^d 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290. 290. 290. 290. 290. 290. 290
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\$	$\begin{array}{c} 242\\ 269\\ 275\\ 292\\ 284\\ 287\\ 269\\ 273\\ 290\\ 285\\ 281\\ 299\\ 292\\ 269\\ 275\\ 264\\ 280\\ 284\\ 300\\ \end{array}$	223d 243 261 271 304 288 280 272 279 288 278 282 300 296 264 272 276 278 276 278 276 299	Fern 213d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274 287	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 297 256 264 270 285 268 285	2281 251 273 278 303 291 277 272 289 283 298 299 299 299 295 260 270 264 287 263 281	$\begin{array}{c} 224^{a^{-}}\\ 270\\ 270\\ 269\\ 312\\ 294\\ 280\\ 274\\ 291\\ 291\\ 291\\ 292\\ 285\\ 293\\ 255\\ 268\\ 260\\ 274\\ 257\\ 274\\ \end{array}$	221 ⁴ 275 269 281 306 300 286 267 294 297 289 295 289 295 289 258 270 268 291 264 278	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271 271	$ \begin{array}{r} 190^{d} \\ 230 \\ 274 \\ 268 \\ 281 \\ 297 \\ 298 \\ 272 \\ 283 \\ 296 \\ 284 \\ 298 \\ 283 \\ 281 \\ 266 \\ 271 \\ 284 \\ 295 \\ 286 \\ 267 \\ \end{array} $	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 275 270 268 286 291 293 265	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0	224 ^d . 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290. 261. 290. 261. 269. 273. 285. 285. 285. 285. 285. 280.
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$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 221 \\ 222 \\ 23 \\ 0 \\ 1$	242 269 275 292 284 287 269 273 290 285 281 299 292 269 275 264 280 284 300 261 252	223d 243 261 271 304 288 280 272 279 288 278 282 300 296 264 272 276 278 276 278 276 279 246 252	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274 287 252 250	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 256 264 270 285 268 285 245 250	2281 251 273 278 303 291 277 272 289 283 298 299 295 260 270 264 287 263 281 247 249	$\begin{array}{c} 224^{d} \\ 270 \\ 270 \\ 269 \\ 312 \\ 294 \\ 280 \\ 274 \\ 291 \\ 291 \\ 291 \\ 291 \\ 292 \\ 285 \\ 293 \\ 255 \\ 268 \\ 260 \\ 274 \\ 257 \\ 274 \\ 243 \\ 250 \\ \end{array}$	2214 275 269 281 306 300 286 267 294 297 289 295 280 289 258 270 268 291 264 278 291 264 278 242 252	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271 271 271 246 255	$\begin{array}{c} 190^{d}\\ 230\\ 274\\ 268\\ 281\\ 297\\ 298\\ 278\\ 272\\ 283\\ 296\\ 284\\ 298\\ 283\\ 281\\ 266\\ 271\\ 284\\ 295\\ 286\\ 267\\ 250\\ 256\\ \end{array}$	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 288 274 298 298 275 270 268 286 291 293 265 252 258	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 2	224 ^d . 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290. 290. 290. 290. 261. 269. 273. 285. 273. 280. 248. 252.
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2$	$\begin{array}{c} 242\\ 269\\ 275\\ 292\\ 284\\ 287\\ 269\\ 273\\ 290\\ 285\\ 281\\ 299\\ 292\\ 269\\ 275\\ 264\\ 280\\ 284\\ 300\\ 261\\ 252\\ 260\\ \end{array}$	223d 243 261 271 304 288 280 272 279 288 278 282 300 296 264 272 276 276 278 276 278 276 279 246 252 265	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274 287 252 250 270	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 256 264 270 285 268 285 245	2281 251 273 278 303 291 277 272 289 283 298 299 293 299 295 260 270 264 287 263 281 247	$\begin{array}{c} 224^{d} \\ 270 \\ 270 \\ 269 \\ 312 \\ 294 \\ 280 \\ 274 \\ 291 \\ 291 \\ 291 \\ 291 \\ 292 \\ 285 \\ 293 \\ 255 \\ 268 \\ 260 \\ 274 \\ 257 \\ 274 \\ 243 \\ 250 \\ 276 \end{array}$	2214 275 269 281 306 300 286 267 294 297 289 295 280 289 258 270 268 291 264 278 242 252 276	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271 271 271 246 255 280	190^{d} 230 274 268 281 297 298 278 272 283 296 284 298 283 281 266 271 284 295 286 267 250 256 285	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 288 275 270 268 286 291 293 265 252 258 280	4 ^h 5 6 7 8 9 10 11 11 12 13 14 15 16 17 18 19 20 21 22 22 23 0 1 22 23 0 1 2 23 3	224 ^d 259. 266. 278. 300. 292. 271. 284. 290. 285. 290. 290. 290. 290. 290. 290. 285. 290. 285. 273. 285. 273. 280. 248. 273.
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 221 \\ 222 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \\ 3 \\ 3 \\ 3 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5 \\ 5$	$\begin{array}{c} 242\\ 269\\ 275\\ 292\\ 284\\ 287\\ 269\\ 273\\ 290\\ 285\\ 281\\ 299\\ 292\\ 269\\ 275\\ 264\\ 280\\ 284\\ 300\\ 261\\ 252\\ 260\\ 285\\ \end{array}$	223d 243 261 271 304 288 280 272 279 288 279 288 279 288 279 288 279 288 279 296 264 272 276 276 276 279 246 252 265 284	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274 287 252 250 270 274	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 297 256 264 270 285 268 285 245 250 272	2281 251 273 278 303 291 277 272 289 283 298 290 291 295 260 270 264 287 263 281 247 249 275	$\begin{array}{c} 224^{d} \\ 270 \\ 270 \\ 269 \\ 312 \\ 294 \\ 280 \\ 274 \\ 291 \\ 291 \\ 291 \\ 291 \\ 292 \\ 285 \\ 293 \\ 255 \\ 268 \\ 260 \\ 274 \\ 257 \\ 274 \\ 243 \\ 250 \\ \end{array}$	2214 275 269 281 306 300 286 267 294 297 289 295 280 289 258 270 268 291 264 278 291 264 278 242 252	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271 271 271 246 255	$\begin{array}{c} 190^{d}\\ 230\\ 274\\ 268\\ 281\\ 297\\ 298\\ 278\\ 272\\ 283\\ 296\\ 284\\ 298\\ 283\\ 281\\ 266\\ 271\\ 284\\ 295\\ 286\\ 267\\ 250\\ 256\\ \end{array}$	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 288 274 298 298 275 270 268 286 291 293 265 252 258	4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 1 22 23 0 1 2 23 3 4	224 ⁴ 259. 266. 278. 300. 292. 278. 271. 284. 290. 285. 290. 290. 290. 290. 290. 290. 290. 290
$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2$	242 269 275 292 284 287 269 273 290 285 281 299 292 269 275 264 280 284 300 261 252 260	223d 243 261 271 304 288 280 272 279 288 278 282 300 296 264 272 276 276 278 276 278 276 279 246 252 265	Fern 213 ^d 246 268 279 294 286 276 267 284 285 281 285 302 299 260 277 278 281 274 287 252 250 270	218 ^d 247 260 284 302 287 270 270 290 282 284 288 297 256 264 270 285 268 285 245 250	2281 251 273 278 303 291 277 272 289 283 298 299 295 260 270 264 287 263 281 247 249	$\begin{array}{c} 224^{d} \\ 270 \\ 270 \\ 269 \\ 312 \\ 294 \\ 280 \\ 274 \\ 291 \\ 291 \\ 291 \\ 291 \\ 292 \\ 285 \\ 293 \\ 255 \\ 268 \\ 260 \\ 274 \\ 257 \\ 274 \\ 243 \\ 250 \\ 276 \end{array}$	2214 275 269 281 306 300 286 267 294 297 289 295 280 289 258 270 268 291 264 278 242 252 276	231 ^d 275 255 282 299 305 281 268 291 300 286 297 278 287 260 259 282 297 271 271 271 246 255 280	190^{d} 230 274 268 281 297 298 278 272 283 296 284 298 283 281 266 271 284 295 286 267 250 256 285	202 ^d 235 274 271 286 293 290 273 280 274 291 283 298 288 275 270 268 286 291 293 265 252 258 280	4 ^h 5 6 7 8 9 10 11 11 12 13 14 15 16 17 18 19 20 21 22 22 23 0 1 22 23 3	242.0 224 ^d . 259.' 266 278.' 278.' 278.' 278.' 271.' 284.' 290.' 285.' 290.' 297.' 290.' 297.' 290.' 297.' 290.' 290.' 297.' 297.' 297.' 290.' 297.' 297.' 297.' 290.' 297.' 290.' 297.

Increase of scale readings corresponds to a movement of the north end of the magnet to the east.

NOTE.-The mean in brackets includes two interpolated values.

Diurnal Range of the Declination.—The diurnal range being an index to the magnitude of the diurnal excursions, is best presented before the examination of the diurnal inequality. The following table contains the highest and lowest scale readings in the hourly series, and the maximum and minimum values observed, together with the corresponding ranges. One division of scale = 0'.80.

DATE.	Le mbla	IN HOURLY	r series.	OBSE	RVED.	RANGE.		
1854.		Highest.	Lowest.	Maximum.	Minimum.	In hourly series.	Total observed.	
January 1	0-11	309d.8	· 253d.5	314 ^d .0	241ª.0	56 ^d .3	73ª.0	
- 41	13-14	368.4	242.3	378.0	212.0	126.1	166.0	
"	18-19	357.9	109.7	369.0	85.0	248.2	284.0	
** *	24-25	367.4	293.3	373.0	282.0	74.1	91.0	
11 9	27-28	385.4	307.3	389.5	302.0	78.1	87.5	
"	31-32	387.9	319.4	440.0	278.0	68.5	162.0	
February	3-4	433.1	268.6	457.0	258.0	164.5	199.0	
. <i>u</i>	7-8	391.2	279.7	396.0	266.5	111.5	119.5	
"	0-11	464.8	202.7	504.0	195.0	262.1	309.0	
"	4-15	490.3	165.8	494.0	129.0	324.5	365.0	
"	17-18	275.8	152.6	302.0	130.0	123.2	172.0	
"	21-22	301.7	226.1	304.0	203.0	75.6	101.0	
	24-25	531.3	321.4	558.5	268.0	209.9	290.5	
March	0-1	437.2	190.6	484.0	179.0	246.6	305.0	
"	3-4	343.5	151.4	360.0	125.0	192.1	235.0	
66	7-8	300.2	224.1	312.0	190.0	76.1	122.0	
"	22-23	290.5	238.8	304.0	228.0	51.7	76.0	

DAILY RANGE OF THE DECLINATION.

The mean diurnal total range observed during the above period becomes $2^{\circ} 28'.6$, and the maximum diurnal range observed took place on the 14-15 February, and amounted to $4^{\circ} 52'.0$. For comparison with similar quantities at other high latitude stations we may take Lake Athabasca, where the greatest range in any one day between October, 1843, and February, 1844, was $2^{\circ} 35'$, it happened October 16, 1843; at Fort Simpson the maximum range was $7^{\circ} 27'$, observed on the 16th of April, 1844, in a series of observations extending over April and May, 1844. The mean diurnal range during January and February, 1844, at Lake Athabasca, was 31'.4, and the mean range at Fort Simpson in April and May of that year was $1^{\circ} 12'$, these two quantities, however, were taken from the hourly series.

If we classify the ranges according to this magnitude we obtain the following results :---

Daily	range	less than	1°					1
"	48	between	1 and	2°			. 2	6
"	"	"	2 aud	3				4
"	66	"	3 and	4	•			3
66	"	"	4 and	õ				3
66	" {	greater than		5		10.0		0

The diurnal range in the winter months, January, February, and March, when compared with its annual fluctuation, is probably below the mean value of the year.

Diurnal Inequality of the Declination.—The following table contains the hourly means of all observations at the Winter quarters, between January 10 and March 23, 1854. The remaining observations on term-days at a later season have been excluded on account of their isolation. The above period includes the coldest season of the year, and during more than one-half of the period the sun was below the horizon.

The hourly means were made out separately for each month, the general mean includes seventeen values for each of the twenty-four hours. In January we have complete observations on six days, in February on seven, and in March on four days. The table also contains the monthly means, and all numbers are expressed in scale divisions (one division = 0'.80).

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Abstract of Hourly Means during the months of January, February, and March, 1854, observed at Fern Rock Magnetic Observatory.

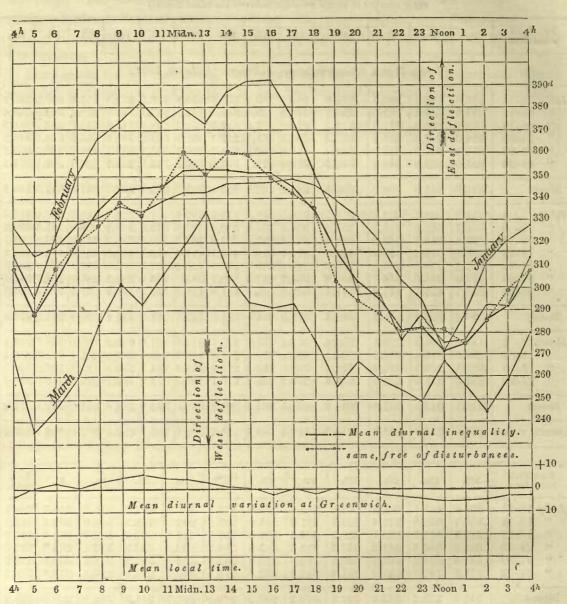
(The readings are given in scale divisions; the values taken from the term-day observations embrace the same number of single readings between the same times.)

Fern Rock mean time.	5h.	6h.	7h.	8h.	9h.	10h.	11h.	12h.	13h.	14h.	15h.	16h.	17h.
		Fern	Rock	Obser	vatory	, Janu	ary and	March	n, 1854	4.			
Jan'y 10-11	296.0	292.1	286.6	278.9	284.7	288.1	297.0	299.8	308.5	309.8	3 307.		5 296.7
" 13–14	311.9	321.1	331.0	343.7		335.1			342.1			-	5 368.4
" 18–19	308.2	316.9	317.3	313.3		321.8			338.4				3 357.1
" 24-25 " 97 98	319.3	347.8	359.7	367.4		361.2			355.2			5 344.0	
21-20	313.4	307.3	325.9	323.4		322.9			335.1			3 348.1	1 .
" 31–32	335.0	322.2	353.2	362.5		372.1			373.8			1 369.1	374.
Means	313.9	317.9	329.0	331.5	336.2	333.6	339.1	343.3	342.2	346.7	347.	2 347.5	5 349.
Feb'y 3- 4		*362.1		*(373.5		368.6			407.1			5 396.0	
" 7-8	315.7	322.5	341.9	351.4		355.0		370.8	372.8	391.2	2 378.	6 345.4	1 336.
" 10–11	293.6	354.1	362.9	381.8				383.9					
" 14-15	(307.0)	349.4	380.4	421.1		473.7			413.0				3 448.
. 11-10	182.2	190.6	265.9	239.2					237.2			1	240.
21-44	262.4	255.5	266.7	283.8		287.4			283.3				291.
. " 24–25	344.7	429.6	461.2	514.1	531.8	526.4	491.8	498.3	498.2	496.2	501.	2 512.4	1 320.
Means	294.6	323.4	350.9	366.4	373.5	381.5	371.3	379.7	371.8	387.6	390.	7 391.3	3 375.
March 0- 1	196.9	190.6	224.1	266.2	332.4	361.6	394.7	411.0	437.2	353.2	335.	0 321.7	346.
" 3- 4	248.5	275.4	282.7	324.2	332.3	275.5	281.6		343.5			4 277.8	3 258.
" 7- 8	224.1	259.7	266.4	278.6	300.2	292.3	278.8		284.8			9 290.6	5 2 9 0.
" 22–23	261.3	246.3	258.5	258.6		238.8	270.1		274.3			8 269.0	3 269.
Means	232.7	243.0	257.9	281.9	301.5	292.1	306.3	319.0	334.9	304.8	291.	8 289.8	3 291.
General means	286.9	000 F	001.0	334.2	040.0	040 5		050.0	OFO L		050	0 050 1	010
General means	200.9	302.5	321.3	334 , 2	343.3	343.5	344.6	332.6	352.7	353.5	352.	0 352.1	346.
Fern Rock mean time.	280.9	302.5 19h.	321.3	21h.	22h.	23h.	Noon.	352.6	352.7 2h		352.0 3h.	4h.	Daily means
Fern Rock mean time.	18h.	19h.	20h.	21h.	22h.	23h.	Noon. Oh.	1h.	2h		3h.	4h.	Daily means
Fern Rock mean time. Jan'y 10–11	18h. 292.6	19h. 267.1	20h. 271.9	21h. 269.0	22h.	23h. 255.8	Noon. 0h. 272.3	1h. 257.0	2h	.	3h. 76.3	4h. 298.7	Daily means 284.
Fern Rock mean time. Jan'y 10-11 "13-14	18h. 292.6 335.7	19h. 267.1 325.6	20h. 271.9 276.4	21h. 269.0 269.4	22h. 253.5 277.0	23h. 255.8 267.0	Noon. 0h. 272.3 262.3	1h. 257.0 242.3	2h 0 267 3 278	7.9 2 3.8 2	3h. 76.3 98.2	4h. 298.7 305.9	Daily means 284. 317.0
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19	18h. 292.6 335.7 347.7	19h. 267.1 325.6 327.9	20h. 271.9 276.4 348.1	21h. 269.0 269.4 336.3	22h. 253.5 277.0 306.4	23h. 255.8 267.0 236.2	Noon. 0h. 272.3 262.3 -109.7	1h. 257. 242. 246.	2h 0 267 3 278 6 289	7.9 2 3.8 2 9.3 3	3h. 76.3 98.2 33.1	4h. 298.7 305.9 321.3	Daily means 284.' 317. 313.
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25	18h. 292.6 335.7 347.7 338.8	19h. 267.1 325.6 327.9 346.4	20h. 271.9 276.4 348.1 347.2	21h. 269.0 269.4 336.3 313.3	22h. 253.5 277.0 306.4 299.2	23h. 255.8 267.0 236.2 315.5	Noon. 0h. 272.3 262.3 -109.7 310.3	1h. 257. 242. 246. 293.	2h 0 267 3 278 6 289 3 309	7.9 2 3.8 2 9.3 3 2.9 3	3h. 76.3 98.2 33.1 13.1	4h. 298.7 305.9 321.3 314.3	Daily means 284. ² 317. 313. 337.
Fern Rock mean time. Jan'y 10-11 "13-14 "18-19 "24-25	18h. 292.6 335.7 347.7	19h. 267.1 325.6 327.9	20h. 271.9 276.4 348.1	21h. 269.0 269.4 336.3	22h. 253.5 277.0 306.4	23h. 255.8 267.0 236.2	Noon. 0h. 272.3 262.3 -109.7	1h. 257. 242. 246. 293. 339.	2h 0 267 3 278 6 289 3 309 8 357	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3	3h. 76.3 98.2 33.1	4h. 298.7 305.9 321.3	Daily means 284.' 317.' 313.' 337.' 342.'
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28	18h. 292.6 335.7 347.7 338.8 385.4	19h. 267.1 325.6 327.9 346.4 381.2	20h. 271.9 276.4 348.1 347.2 362.0	21h. 269.0 269.4 336.3 313.3 356.8	22h. 253.5 277.0 306.4 299.2 363.8	23h. 255.8 267.0 236.2 315.5 363.3	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8	1h. 257. 242. 246. 293. 339. 340.	2h 0 265 3 278 6 289 3 302 8 355 9 372	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3	3h. 76.3 98.2 33.1 13.1 48.2	4h. 298.7 305.9 321.3 314.3 348.8	Daily means 284.' 317. 313.' 337. 342. 362.'
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2	Noon. 0h. 272.3 262.3 ·109.7 310.3 342.8 322.4 270.0	1h. 257. 242. 246. 293. 339. 340. 286.	2h 0 267 3 278 6 289 3 309 8 357 9 379 7 311	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9	4h. 298.7 305.9 321.3 314.3 348.8 378.8 378.8 328.0	Daily means 284.' 317. 313. 337. 342. 362. 326.8
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2	19h. 267.1 325.6 327.9 346.4 381.2 387.2	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4	1h. 257. 242. 246. 293. 339. 340. 286. 339.	2h 0 267 3 278 6 289 3 309 8 357 9 379 7 311 6 335	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3	3h. 776.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0	Daily means 284.' 317.0 313.9 337.0 342.9 362.9 326.8 326.8
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3- 4	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 239.2 361.8 288.6	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 -319.9	1h. 257. 242. 293. 339. 340. 286. 339.	2h 0 267 3 278 6 289 3 302 8 357 9 379 7 311 6 337 7 332	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 7.5 3 2.9 3	3h. 776.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 006.7	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5	Daily mean 284.' 317.' 313.' 337.' 342.' 362.' 326.' 326.' 358.' 332.'
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3- 4 " 7- 8	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.2	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 -319.9 208.3	1h. 257.1 242.2 246.1 293.3 339.1 340.1 286.1 339.1 339.1 286.1 230.1 286.2 339.1 205.1	2h 0 267 8 278 6 289 8 357 9 379 7 311 6 337 7 332 8 281	7.9 2 8.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 7.5 3 2.9 3 1.1 3	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 609.8 606.7 36.2	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0	Daily means 284. ² 317. 313.9 337. 342.9 362.9 326.8 326.8 358. 332.8 337.9
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 -319.9	1h. 257.4 242.5 246.4 293.3 339.4 340.5 286.6 339.4 286.7 339.4 10.4 205.5 183.4	2h 0 267 3 278 6 289 3 309 8 357 9 379 7 311 6 335 7 332 3 281 6 245	7.9 2 8.8 2 9.3 3 2.9 3 2.4 3 1.5 3 1.5 3 2.9 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.7 3 1.7 3 1.1 3 7.0 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 006.7 36.2 247.0	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0	Daily means 284.2 317. 313.2 337. 326.3 326.3 326.3 358. 332. 337. 360.2
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.2 289.0	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 -319.9 208.3 165.8	1h. 257.0 242.1 246.1 293.1 339.1 340.1 286.1 339.1 340.1 286.1 339.1 183.1 230.1	2h 0 267 3 278 6 289 3 309 8 357 9 379 7 311 6 335 7 332 3 281 6 243 1 198	7.9 2 3.8 2 9.3 3 2.9 3 2.4 3 1.5 3 1.5 3 2.9 3 1.5 3 1.5 3 1.7 3 1.1 3 7.0 2 3.1 1	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 609.8 606.7 36.2	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0 300.9	Daily mean 284.2 317. 313.3 337. 342. 326.3 326.3 326.3 358. 332.3 337. 360.2 226.1
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2 233.4	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 309.2 301.6 242.2 289.0 225.6	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 245.0 257.5	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 -319.9 208.3 165.8 232.3	1h. 257.0 242.1 246.1 293.1 339.1 340.1 286.1 339.1 11.1 286.1 286.2 339.1 11.1 286.2 339.1 286.3 286.4 286.5 339.1 286.1 286.2 339.1 286.3 286.4 339.1 286.5 339.1 286.1 286.2 286.3 39.1 29.1 286.1	2h 0 267 8 278 6 289 8 357 9 372 7 311 6 335 7 331 6 335 7 331 8 255 8 357 8 3577 8 357 8 357 8 3577 8 35777 8 357777 8 35777 8 357777 8 357777 8 357777 8 357777 8 35777777777777777777777777777777777777	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 7.5 3 1.5 3 1.5 3 1.5 3 1.1 3 7.0 2 8.1 1 9.3 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 09.8 06.7 36.2 447.0 52.6	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0 300.9 183.3	Daily mean 284.2 317. 313.3 337. 342. 326.3 326.3 326.3 358. 332.3 358. 332.3 360.2 226.2 271.2
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2 233.4 258.5	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 309.2 301.6 242.9 289.0 225.6 226.7	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 245.0 257.5	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 319.9 208.3 165.8 232.3 260.8	1h. 257. 242. 242. 243. 339. 340. 286. 339. 310. 205 183. 261. 378.	2h 0 267 8 278 6 289 8 357 9 379 7 311 6 337 7 332 8 259 7 37 8 259 7 37	7.9 2 3.8 2 9.3 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.1 3 3.1 1 3.3 2 7.7 4	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 09.8 06.7 36.2 447.0 52.6 272.7	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0 300.9 183.3 285.6	Daily means 284.2 317.0 313.9 337.1 342.9 362.9 326.8 332.6 358. 332.6 358. 332.6 358. 332.6 358. 332.6 358. 342.9 358. 342.9 358. 342.9 358.1 326.2 358.1 342.9 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 358.1 357.1 356.1 357.1 3
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22 " 24-25	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5 492.4 350.1	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2 233.4 258.5 494.0 332.5	20h. 271.9 276.4 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2 448.1 296.6	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1 433.8 295.6	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.9 289.0 225.6 226.7 321.4 273.7	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 243.7 245.0 257.5 401.2 285.6	Noon. 0h. 272.3 262.3 ·109.7 310.3 342.8 322.4 270.0 329.4 ·109.7 310.3 342.8 322.4 270.0 329.4 ·319.9 208.3 165.8 232.3 260.8 (389.9) 272.3	1h. 257.0 242.1 242.1 246.1 293.1 339.1 340.2 286.2 339.1 339.1 340.2 286.2 339.1 339.1 339.2 339.1 339.1 339.2 339.1 339.2 339.1 339.1 339.2 339.1 339.2 339.1 339.1 339.2 339.1 339.2 339.1 339.2 339.1 339.2 339.1 339.2 339.1 339.2 339.2 339.2 339.3 339.1 339.1 339.2 310.2 310.3 378.1 378.1 <td>2h 0 267 8 278 6 289 3 305 9 379 7 311 6 335 7 311 6 335 7 311 6 335 7 311 8 259 7 37 8 290</td> <td>7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.7 3 1.1 3 2.9 3 3.1 1 9.3 2 7.7 4 0.5 2</td> <td>3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 09.8 06.7 33.2.47.0 52.6 72.7 007.7 290.4</td> <td>4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 304.0 304.0 304.0 304.0 304.0 304.0 305.6 443.7 314.4</td> <td>Daily means 284.2 317.0 313.2 337.0 342.2 362.2 326.3 326.3 326.3 326.2 337.2 360.2 271.2 454.3 334.1</td>	2h 0 267 8 278 6 289 3 305 9 379 7 311 6 335 7 311 6 335 7 311 6 335 7 311 8 259 7 37 8 290	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.7 3 1.1 3 2.9 3 3.1 1 9.3 2 7.7 4 0.5 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 09.8 06.7 33.2.47.0 52.6 72.7 007.7 290.4	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 304.0 304.0 304.0 304.0 304.0 304.0 305.6 443.7 314.4	Daily means 284.2 317.0 313.2 337.0 342.2 362.2 326.3 326.3 326.3 326.2 337.2 360.2 271.2 454.3 334.1
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22 " 24-25 Means	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5 492.4	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2 233.5 494.0	20h. 271.9 276.4 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2 448.1 296.6 310.7	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1 433.8 295.6 301.4	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.9 289.0 225.6 226.7 321.4 273.7 285.3	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 243.7 245.0 257.5 401.2 285.6 280.6	Noon. 0h. 272.3 262.3 ·109.7 310.3 342.8 322.4 270.0 329.4 319.9 208.3 165.8 232.3 260.8 (389.9 272.3 338.9	1h. 257. 242. 242. 246. 293. 339. 340. 286. 339. 340. 286. 339. 340. 286. 339. 310. 205. 183. 230. 261. 378. 272. 306.	2h 0 265 3 278 6 289 3 305 8 355 9 375 7 311 6 335 7 311 6 335 7 311 6 335 7 355 8 259 7 37 8 259 8 357 8 357 8 357 8 259 8 357 8 259 8 357 8 259 8 357 8 259 8 357 8 357	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 7.5 3 2.4 3 1.5 3 7.5 3 1.5 3 7.5 3 2.9 3 1.1 3 2 3 1 1 9.3 2 7.7 4 0.5 2 1.1 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 06.7 336.2 447.0 52.6 72.7 290.4 290.4	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 304.0 304.0 304.0 304.0 304.0 305.1 305.9 314.3 328.6 443.7 314.4 308.4	Daily means 284.5 317.0 313.9 337.0 342.9 362.9 326.8 358.0 326.8 358.0 326.9 358.0 326.9 358.0 326.9 358.0 326.9 358.0 334.0 334.0 334.0 311.3
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22 " 24-25 Means March 0-1	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5 492.4 350.1 319.1	19h. 267.1 325.6 327.9 346.4 387.2 239.2 361.8 288.6 314.8 376.2 233.4 258.5 494.0 332.5 315.8 151.4	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2 448.1 296.6 310.7 197.0	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1 433.8 295.6 301.4 178.8	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.2 289.0 225.6 226.7 321.4 273.7 285.3 182.4	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 245.0 257.5 401.2 285.6 280.6 154.3	Noon. 0h. 272.3 262.3 ·109.7 310.3 342.8 322.4 270.0 329.4 319.9 208.3 165.8 232.3 260.8 (389.9 272.3 338.9 154.7	1h. 257. 242. 246. 293. 339. 340. 286. 339. 340. 286. 339. 340. 286. 339. 310. 205. 183. 230. 261. 378. 272. 306. 176.	2h 0 265 3 278 6 289 3 302 8 357 9 372 7 311 6 335 7 311 6 335 7 311 6 335 7 352 8 255 7 37 8 290 8 290 8 261 2 175	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 2.9 3 1.1 3 2.5 2 1.1 2 2.3 1	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 06.7 336.2 447.0 52.6 72.7 390.4 272.7 94.5	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0 304.0 321.5 362.0 300.9 183.3 285.6 443.7 314.4 308.4 213.7	Daily means 284.2 317.0 313.2 337.0 342.2 326.2 326.2 326.2 358. 332.2 358. 332.2 358. 332.2 358. 334.2 334.2 334.2 334.2 334.2
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22 " 24-25 Means March 0-1 " 3-4	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5 492.4 350.1 319.1 226.2	19h. 267.1 325.6 327.9 346.4 381.2 387.2 239.2 361.8 288.6 314.8 376.2 233.4 258.5 494.0 332.5 315.8	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2 448.1 296.6 310.7 197.0 269.4	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1 433.8 295.6 301.4	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.9 289.0 225.6 226.7 321.4 273.7 285.3	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 243.7 245.0 257.5 401.2 285.6 280.6	Noon. 0h. 272.3 262.3 ·109.7 310.3 342.8 322.4 270.0 329.4 319.9 208.3 165.8 232.3 260.8 (389.9 272.3 338.9	1h. 257. 242. 246. 293. 339. 340. 286. 339. 340. 286. 339. 340. 286. 339. 310. 205. 183. 230. 261. 378. 272. 306. 176. 248.	2h 0 265 3 278 6 289 3 302 8 357 9 372 7 311 6 335 7 312 6 245 7 377 8 290 8 265 7 377 8 290 8 266 2 172 4 255	7.9 2 3.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.7 3 2.9 3 1.1 3 2.7 4 0.5 2 1.1 2 2.3 1 2.4 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 06.7 336.2 447.0 52.6 72.7 390.4 272.7 94.5	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 304.0 304.0 304.0 304.0 304.0 305.1 305.9 314.3 328.6 443.7 314.4 308.4	Daily means 284.2 317.4 313.3 337.4 362.2 326.3 326.3 326.3 326.3 326.4 326.4 326.4 337.4 360.4 226.4 271.1 454.4 334.4 311.2 454.2 334.4
Fern Rock mean time. Jan'y 10-11 " 13-14 " 18-19 " 24-25 " 27-28 " 31-32 Means Feb'y 3-4 " 7-8 " 10-11 " 14-15 " 17-18 " 21-22 " 24-25 Means March 0-1 " 3-4 " 7-8	18h. 292.6 335.7 347.7 338.8 385.4 375.3 345.9 376.2 311.7 361.9 406.7 231.0 270.5 492.4 350.1 319.1 226.2 290.4	19h. 267.1 325.6 327.9 346.4 387.2 239.2 361.8 288.6 314.8 376.2 233.4 258.5 494.0 332.5 315.8 151.4 261.8	20h. 271.9 276.4 348.1 347.2 362.0 387.9 332.3 302.8 279.7 264.0 333.1 188.5 260.2 448.1 296.6 310.7 197.0 269.4	21h. 269.0 269.4 336.3 313.3 356.8 381.4 321.0 268.6 303.9 271.1 343.1 222.9 226.1 433.8 295.6 301.4 178.8 273.2	22h. 253.5 277.0 306.4 299.2 363.8 319.4 303.2 309.2 301.6 242.9 289.0 225.6 226.7 321.4 273.7 285.3 182.4 285.9	23h. 255.8 267.0 236.2 315.5 363.3 333.5 295.2 346.3 302.9 202.7 243.7 245.0 257.5 401.2 285.6 280.6 154.3 273.6	Noon. 0h. 272.3 262.3 -109.7 310.3 342.8 322.4 270.0 329.4 319.9 208.3 165.8 232.3 260.8 (389.9 272.3 338.9 154.7 380.7	1h. 257.4 242.5 246.4 293.3 339.4 340.5 286.7 286.7 286.7 339.4 286.7 339.4 286.7 339.4 286.7 339.4 339.4 339.4 286.7 339.4 286.7 339.4 339.4 339.4 339.4 339.4 339.4 339.4 339.4 339.4 339.4 339.4 330.5 261.3 378.8 272.8 306.176.6 248.2 287.2	2h 0 267 8 278 6 289 3 302 8 357 9 372 7 311 6 337 7 311 6 337 7 311 6 247 1 198 8 259 7 37' 8 290 8 261 2 172 4 255 0 24'	7.9 2 8.8 2 9.3 3 2.9 3 7.5 3 2.4 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.5 3 1.7 3 2.9 3 1.1 3 2.3 1 2.3 1 2.3 1 2.3 1 2.3 1 2.4 2 2.3 1 2.4 2 7.3 2	3h. 76.3 98.2 33.1 13.1 48.2 56.4 20.9 009.8 06.7 336.2 447.0 52.6 72.7 900.4 272.7 94.5 273.9	4h. 298.7 305.9 321.3 314.3 348.8 378.8 328.0 304.0 321.5 362.0 300.9 183.3 285.6 443.7 314.4 308.4 213.7 264.3)	Daily means 284.2 317.0 313.2 337.0 342.2 326.2 326.2 326.2 358. 332.2 358. 332.2 358. 332.2 358. 334.2 334.2 334.2 334.2 334.2

Figures between brackets () are means derived from less that ten readings.

* These four values were observed on the 4th at the hours indicated.

MEAN MONTHLY GURVES OF THE DIURNAL CHANGES OF THE MAGNETIC DECLINATION AT VAN RENSSELAER HARBOR, 1854.



AND SIMULTANEOUS MEAN DIURNAL VARIATION AT GREENWICH.

The irregularities in the daily curves compared on succeeding days are very considerable, as may be seen by glancing the eye over the last column of the preceding table, headed "daily means." No observations on account of disturbances have been excluded from the table, and the following mean diurnal inequality, therefore, contains their full effect. Comparing each hourly mean in the last horizontal line of the above table with the general mean, the following figures represent the resulting diurnal inequality of the declination during the first three months of the year 1854. For the sake of comparison the diurnal inequality observed at Greenwich during the same seventeen days has been made out and is given in the last column.

MEAN DIURNAL INEQUALITY OF DECLINATION DURING SEVENTEEN DAYS IN JANUARY, FFBRUARY, AND MARCH, 1854, AT VAN RENSSELAER HARBOR, AND AT GREENWICH DURING THE SAME DAYS; EXPRESSED IN MINUTES OF ARC.

Local mean time.	Van Rensselaer.	Green- wich.	Local mean time.	Van Rensselaer.	Green- wich.	Local mean time.	Van Rensselaer.	Green- wich.	Local mean time.	Van Rensselaer.	Green- wich.
5 ^h 6 7 8	+24'.3 +11.8 - 3.2 -13.5	$ \begin{array}{r} -0.'5 \\ -2.5 \\ -1.6 \\ -3.9 \end{array} $	11 ^h Midn. 13 14	$-21'.8 \\ -28.2 \\ -28.3 \\ -29.0$	$-4'.5 \\ -4.1 \\ -3.1 \\ -0.8$	17 ^h 18 19 20	$ \begin{array}{r} -23'.1 \\ -10.5 \\ + 0.8 \\ + 12.2 \\ \end{array} $	-0'.3 +0.6 -0.4 +0.5	23 ^h Noon 1 2	+29'.6 +37.8 +35.0 +26.3	+3'.5 +5.8 +5.8 +5.0
9 10	-20.8 -21.0	-3.9 -4.5 -5.1	$\begin{vmatrix} 14\\15\\16\end{vmatrix}$	-27.8 -27.8 -27.8	-0.3 +0.5	20 21 22	+12.2 +17.4 +30.6	+0.3 +1.0 +2.3	3 4	+20.3 +21.2 + 7.0	+3.9 +2.6

A negative sign indicates a deflection to the east, a positive one a deflection to the west of the mean position.

The diurnal inequality at the two stations presents in general the same characteristic features, namely, the principal deflection to the west shortly after noon, and the opposite eastern position about midnight; in regard to the diurnal inequality, therefore, the motion of the magnet at Van Rensselaer Harbor follows in general the same law as recognized in lower geographical latitudes.

The extreme westerly position is attained at noon; after this hour the westerly declination diminishes gradually, with an exception of a period of opposite motion of very limited range between the hours of four and five. The easterly extreme is reached two hours after midnight. Whether the small irregularity just noticed, producing apparently a secondary minimum and maximum, is real or only cansed by the accidental deviations of the few observations under discussion, it is not easy to decide with certainty. The motion from 14 hours to 24 hours is performed with great uniformity. Thus, while the diurnal motion agrees with that observed at Lake Athabasca, Fort Simpson, Sitka, Toronto, etc., it shows no trace of that marked deviation observed at Reikiavik, in Iceland, or at Fort Confidence. In 1824 (June), at the Whalefish islands the maximum westerly deviation happened about a quarter past one o'clock P. M.; the time of the maximum eastern deflection was not determined. At Port Bowen the maximum westerly variation appears to have occurred between the hours of 10 A. M. and 1 P. M., the mean result being 11^h 49^m; the greatest deflection of the north end of the needle to the eastward took place between 8 P. M. and 2 A. M., the mean hour being 10 P. M. These observations were made during January, February, March, and April, 1825.

The range of the mean diurnal inequality is 1° 06'.8, when it is at Greenwich during the same time 10'.9.

Analysis of Disturbances of the Declination.—The declination at the commencement and end of the observations appears to have remained nearly the same; the daily and monthly means indicate at first a gradual decrease of westerly declination, which motion, however, is speedily overcome in the month of March. No further attention need be paid to this circumstance in the following discussion of the disturbances, and of their effect upon the diurnal inequality.

The mean disturbance for each of the 24 hours has been obtained by comparing the monthly mean with each hourly reading; let Δ equal this difference, n the

number of hourly readings (equal to 17), and *m* the mean disturbance, then $m = \pm \sqrt{\frac{\Sigma \Delta^2}{n-1}}$. This quantity is analogous to the mean error of an observation. In the following comparisons we must always bear in mind that the observations for the present discussion are rather limited, and that the comparisons with results at Lake Athabasca and Fort Simpson are of a date nearly ten years earlier. This interval is perhaps favorable to the comparison.

At Van Rensselaer Harbor the mean disturbance force is greater than at either place just named, and pretty regular during two well-marked periods, as shown by the following table:—

TABLE OF THE MEAN DISTURBANCE OF THE DECLINATION AT VAN RENSSELAER HARBOR, TAKEN WITHOUT REGARD TO DIRECTION, FOR EACH OF THE OBSERVATION HOURS, AND EXPRESSED IN MINUTES OF ARC.

5h.	6h.	7h.	8h.	9h.	10h.	11h.	Midn.	13h.•	14h.	15h.	16h.
± 31'	41	37	47	49	50	46	52	51	47	50	$\pm 53'$
					1		Constant of the	Canal Sec			
LT CATTON											
17h.	18h.	19h.	20h.	21h.	22h.	23h.	Noon.	1h.	2h.	3h.	4h.

Local Mean Time.

The disturbing force is least during the day (if such an expression is admissible in this case), from 10 A. M. to 7 P. M., and greater and equally regular during the hours of the night (?), from 8 P. M. to 8 or 9 A. M. At Lake Athabasca the hours of least disturbance are between 9 A. M. and 7 P. M., and at Fort Simpson from 10 A. M. to 7 P. M. Captain Lefroy, in his discussion of the disturbances of the declination remarks: "There are indications in each of the three curves (for Lake Athabasca, Toronto and Sitka) of a small increase in the mean disturbance about noon." At Van Rensselaer Harbor we find the maximum disturbance at this very hour preceded and followed by quite small values; this circumstance certainly deserves our particular attention. Further coincidences of the disturbing force can be noticed at 5 P. M., at which hour at Van Rensselaer, Lake Athabasca, and Sitka the minimum disturbance has been observed. At Fort Simpson, in April and May, 1844, the mean disturbance was but one-fourth of that observed in January, February and March at Van Rensselaer, and the ratio of the minimum to the maximum value was 5.6 and 2.0 at the two places respectively.

By adding the squares of the differences for each hour of the day and month, we find the mean monthly disturbance by the formula $\sqrt{\frac{[\Sigma \Delta^2]}{N-24}}$. The mean disturbance for each month is as follows:—

In January, 1	854					$\pm 30'$
In February,	"	o to Take	 			± 65
In March,	"				•	± 40

¹ Principally due to a very large disturbance.

The month of February was, therefore, that of the maximum amount of disturbance. At Lake Athabasca the greatest mean disturbance occurred in January (from observations between October and February inclusive). At Toronto,¹ on the contrary, the months of January and June are those of least disturbance. It is quite possible that at Van Rensselaer the above values are surpassed in other months of the year, yet relatively February contains the greatest mean disturbance during the period of observations.

Hitherto the recognition and separation of the disturbed observations have been effected by an arbitrary process of fixing upon a certain deviation from the mean as the greatest allowable departure, and regarding all observations beyond this limit as disturbances. In the present case, I have sought to introduce a more definite idea by the application of Pierce's criterion for the rejection of doubtful observations,² or what is equivalent—for the recognition of the disturbances—they following a different law from the general one. The average mean deviation of the readings composing an hourly mean I find = $\pm 46'$, and for 17 values $x^2 = 4.55$; hence readings deviating from the mean more than 1° 38' or 123d are to be recognized as disturbances.

The table of hourly readings contains 23 such values, or one disturbed observation for every 18 ordinary readings. In the five years of hourly observations ending June 30, 1848, at Toronto, the disturbances averaged one in 17 of the whole body. Excluding the above 23 values from the mean, the diurnal inequality freed of the disturbances undergoes no material change, as shown by the following table:—

5h.	6h.	7h.	8h.	9h.	10h.	11h.	Midn.	13h.	14h.	15h.	16h.
+ 23'.7	+6.0	-3.8	-9.3	-16.4	-12.5	-22.5	-34.7	-27.3	35.1	-34.1	
Blees	n Minister			er (es al)	and mail	Zonto. 1	all q		6,985	15 16	1211
17h.	18h.	19h.	20h.	21h.	22h.	23h.	Noon.	lh.	2h.	3h.	4b.
-20'.1		+9.0	+19.0	+23.3	+30.0	+ 29.0	+29.2	+34.4	+25.7	+13.6	+ 6'.9

The maximum west deflection is displaced from noon to one o'clock. The general mean changed from 317.3^{d} to 316.5^{d} , and the range of the mean inequality from 1° 06'.8 to 1° 09'.5. Eleven deflections were towards the east and twelve towards the west. The limited number of observations renders it necessary to conclude the foregoing examination of the disturbances.

Aurora Borealis.—In connection with the disturbances, a short notice of the auroral displays witnessed at the winter quarters will here find an appropriate place. In conformity with the supposed periodicity of this phenomenon, as recognized by Prof. Olmstead, no brilliant and complete auroras have been seen; with an exception of a very few, they may all be placed in his fourth class, to which the most simple forms of appearances have been referred. The aurora of October 24, 1854,

¹ See Vol. III. of the Magnetical and Meteorological Observations at Toronto, Canada. Discussion by Major-General E. Sabine. London, 1857.

² See Gould's Astronomical Journal, Nos. 45 and 83.

at 9 P. M. (see first volume of the Narrative), appears to have been one of the more conspicuous displays. A full record of the rest will be found in the 8th volume of the Smithsonian Contributions to Knowledge, in the collection made by Peter Force, Esq. There are 19 in number. The following statement is given in a foot-note: "The processes have no apparent connection with the magnetic dip, and in *no* case did the needle of our unifilar indicate disturbance."

Term-day Observations for Change of Magnetic Declination.—These observations were made at the following dates: January 18–19, February 24–25, March 22–23, April 19–20, May 26–27, and June 21–22, 1854. The readings are given in the following tables:—

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Böttingen nean time.	0m.	06m.	12m.	18m.	24m.	30m.	36m.	42m.	48m.	54m.	Fern mean (to (
	Crown	Fer	n Roci	k Obse	rvato	rv. Jan	uary 18	and 19.	1854.	PEL IT	ndLa	ind
e out hay	1						than in			1		
10 ^h	305d	305d	305d	307ª	308d	312 ^d	311 ^d .8			312 ^d .5		37 ^m .
11	311.2	313	314	315.8	318.5	317	317	319.7	320.5	322.5	5	••
12	320	314.8	315	315.7	317	320	321	320	316	314	6	
$\frac{13}{14}$	311 320	307 322	309 319	311 316	313 320	315 320	$\begin{array}{c} 317\\ 322 \end{array}$	$\frac{318}{318}$.	$\begin{array}{c} 317\\ 320 \end{array}$	315 322	78	
14	320	323	323.3	322.3	320	319	320	320	325	325	9	"
16	329	329	330	330	327	336	350	366	367	369	10	**
17	362	354	353	347	347	346	346	341	337	334	11	**
18	330	332	335	338	338	340	342	343.5	342	344	12	66
19	344	346.5	345	344	344	345	346	346.5	347	345	13	"
20	346	345	345.5	345	348	347.5	349	351.5	351.5	349.5	14	
21	349	354	359	363.5	359.5	351	350	351	350.8	351	15	66 66
22	356	358	359	361.5	361	355	352.3	$\begin{array}{c} 357.8\\ 340\end{array}$	$\frac{358}{332}$	$\begin{array}{c} 360.5\\ 335 \end{array}$	16 17	"
$23 \\ 0$	360.5 336	358 333	$355 \\ 330.5$	$\begin{array}{c} 351.5\\ 326\end{array}$	350 320	$\frac{349}{320}$	$\begin{array}{c} 346\\ 323 \end{array}$	340 226	332 328	337	18	
1	343	352	350.5	346	340	348	353	357	349	343	19	
	337	332	328	324	332	336	340	343	346	345	20	**
$\frac{2}{3}$	342	339	329	320	313	300	292	284	277.5	268	21	66
4	251	244.5	240.5	250	261	254	243	230	235	155	22	
5	115	90	89	96	88	85	105	129	145	155	23	**
6	163	180	193	220	254	290	291	307	298	270	0.	"
7	268	254	240	266	289	297	320	318	320	321	1	**
8	336	336	336	331	337	337	337	330	327	324	2	**
	1					910	316	316	316	314	3	66
9	314	326	332	338	323	318	010	010	010	011		"
	314 312	$\frac{326}{310}$.	332	338	525	510	510	010	010	011	4	"
9 10		310									4	66
9 10	312	310 commen	nces with	h readin	gs 304 ^d	, 303 ^d ,	and 304	^d , at 9 ^h	42 ^m , 48		4	"
9 10	312	310 commen	nces with	h readin	gs 304 ^d rvator	, 303 ^d , y, Feb		^d , at 9 ^h and 25	42 ^m , 48		4	
9 10 T	312 he series	310 commen	nces with n Rocl Readi	h readin c Obse ngs tako	gs 304 ^d rvator en 2 ^m 15	, 303 ^d , y , Feb	and 304 ruary 24 r than in	^d , at 9 ^h 4 and 25 adicated.	42 ^m , 48 5, 1854.	^m , and !	4 54 ^m .	
9 10 T 10 ^h	al2 he series 312	310 commen Ferr	nces with n Rock Readi 329d	h readin x Obse ngs take 338 ^d	gs 304 ^d rvator en 2 ^m 15 341 ^d .5	, 303 ^d , y , Feb ^s earlier 319 ^d .5	and 304 ruary 24 r than in 342 ^d	^d , at 9 ^h and 25 adicated.	42 ^m , 48 5, 1854. 377 ^d	^m , and t	4 54 ^m .	37 ^m .
9 10 T 10 ^h 11	312 he series 312 ^d 408	310 commen Ferr 322 ^d 411	nces with Readi 329d 405	h readin c Obse ngs take 338 ^d 418	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437	, 303 ^d , y , Feb ^s earlier 319 ^d .5 445	and 304 ruary 24 r than in 342 ^d 445	^d , at 9 ^h 4 and 25 adicated. 359 ^d 447	42 ^m , 48 , 1854. 377 ^d 441	^m , and 4 407 ^d 439	4 54 ^m . 4 ^h 5	
9 10 T 10 ^h 11 12	312 he series 312 ^d 408 438	310 commen Ferr 322 ^d 411 438	nces with Readi 329d 405 440	h readin c Obse ngs take 338 ^d 418 432	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460	, 303 ^d , y , Feb ^s earlier 319 ^d .5 445 482	and 304 ruary 24 r than in 342 ^d 445 477	^d , at 9 ^h 4 and 25 adicated. 359 ^d 447 471	42 ^m , 48 5, 1854. 377 ^d 441 480	^m , and 4 407 ^d 439 494	4 54 ^m .	37 ^m .
9 10 T 10 ^h 11	312 he series 312 ^d 408 438 490	310 commen Ferr 322 ^d 411 438 493	nces with Readi 329 ^d 405 440 506	h readin ngs tako 338 ^d 418 432 520	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509	and 304 ruary 24 r than in 342 ^d 445 477 519	^d , at 9 ^h and 25 adicated. 359 ^d 447 471 531	42 ^m , 48 5, 1854. 377 ^d 441 480 530	^{2m} , and (407 ^d 439 494 527.5	4 54 ^m . 4 ^h 5	37m. "
9 10 T 10 ^h 11 12 13	312 he series 312 ^d 408 438	310 commen Ferr 322 ^d 411 438	nces with Readi 329d 405 440	h readin c Obse ngs take 338 ^d 418 432	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460	, 303 ^d , y , Feb ^s earlier 319 ^d .5 445 482 509 511	and 304 ruary 24 r than in 342 ^d 445 477 519 521	^d , at 9 ^h 4 and 25 dicated. 359 ^d 447 471 531 532	42 ^m , 48 5, 1854. 377 ^d 441 480	^m , and 4 407 ^d 439 494 527.5 535	4 54 ^m . 4 ^h 5 6 7	37m.
9 10 T 10 ^h 11 12 13 14 15 16	312 he series 312 ^d 408 438 490 541 532 510	310 commen Ferr 322d 411 438 493 558.5 529 508	nces with a Rock Readi 329 ^d 405 440 506 532 527 506	h readin c Obse ngs taka 418 432 520 527 528 504	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493	, 303 ^d , :y , Feb 319 ⁴ .5 445 482 509 511 542 483	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446	^d , at 9 ^h 4 and 25 dicated. 359 ^d 447 471 531 532 521 470	42 ^m , 48 5, 1854. 377 ⁴ 441 480 530 538 516 503	^m , and 4 407 ^d 439 494 527.5 535 513 495	4 54 ^m . 4 ^h 5 6 7 8 9 10	37m
9 10 T 10 ^h 11 12 13 14 15 16 17	312 he series 312 ^d 408 438 490 541 532 510 490	310 commen Ferr 322d 411 438 493 558.5 529 508 493	nces with Readi 329 ^d 405 440 506 532 527 506 496	h readin c Obse ngs take 338 ^d 418 432 520 527 528 504 498	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500	, 303 ^d , :y , Feb 319 ⁴ .5 445 482 509 511 542 483 502	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500	^d , at 9 ^h 4 and 25 dicated. 359 ^d 447 471 531 532 521 470 500	42 ^m , 48 5, 1854. 377 ⁴ 441 480 530 538 516 503 501	^m , and 4 407 ^d 439 494 527.5 535 513 495 503	4 54 ^m . 4 ^h 5 6 7 8 9 10 11	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18	312 he series 312 ⁴ 408 438 490 541 532 510 490 503	310 commen Ferr 322d 411 438 493 558.5 529 508 493 502	nces with Readi 329 ^d 405 440 506 532 527 506 496 502	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 530.5 500 503	, 303 ^d , y, Feb ³ earlier 319 ^d .5 445 482 509 511 542 483 502 500	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494	and 25 dicated. 359d 447 471 531 532 521 470 500 490	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 494	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12	37m
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19	312 he series 312 ⁴ 408 438 490 541 532 510 490 503 496	310 commen Ferr 322d 411 438 493 558.5 529 508 493 502 495	nces with Readi 329 ^d 405 440 502 527 506 496 502 495	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488	, 303 ^d , y , Feb ³ earlier 319 ^d .5 445 482 509 511 542 483 502 500 499	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506	and 25 dicated. 359d 447 471 532 521 470 500 490 498	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 494 501 -	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20	312 he series 312 ⁴ 408 438 490 541 532 510 490 503 496 514	310 commen Fern 322d 411 438 493 558.5 529 508 493 502 495 509	nces with Readi 329 ^d 405 440 502 532 527 506 496 502 495 502	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 498 502 492 506	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501	and 304 ruary 24 r than in 342 ^d 445 477 519 521 521 521 521 521 526 446 500 494 506 491	and 25 dicated. 359d 447 471 531 532 521 470 500 490 498 490	42 ^m , 48 5, 1854. 377 ^d 441 480 538 516 503 501 492 492 492	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 495 503 494 501 498	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21	312 he series 312 ^d 408 438 438 490 541 532 510 490 503 496 514 504	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509	nces with Readi 329 ^d 405 440 502 496 502 496 502 495 502 502 517	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 498 502 492 506 516	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512	and 304 ruary 24 r than in 342 ^d 445 477 519 521 521 521 521 526 446 500 494 506 491 511	and 25 dicated. 359d 447 471 531 532 521 470 500 490 498 490 512	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 492 512	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 495 503 494 501 498 517	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22	312 he series 3124 408 438 490 541 532 510 490 503 496 514 504 521	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 529	nces with Readi 329 ^d 405 440 506 532 527 506 496 502 496 502 495 502 517 535	h readin ngs taka 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514 529	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508	and 304 ruary 24 r than in 342 ^d 445 477 519 521 521 521 521 526 446 500 494 506 491 511 510	and 25 dicated. 359d 447 471 531 532 521 470 500 490 498 490 512 516	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 512 514	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 495 501 498 517 510	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23	312 he series 312 ⁴ 408 438 490 541 532 510 490 503 496 514 504 521 511	310 commen Ferr 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 529 509 529 507	nces with Readi 329 ^d 405 440 506 532 527 506 502 496 502 495 502 502 517 535 490	h readin ngs taka 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 506 494 506 491 511 510 488	and 25 dicated. 359d 447 471 531 532 521 470 500 490 498 490 512 516 488	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 512 514 486	^m , and 4 407 ^d 439 494 527.5 535 513 494 503 494 501 498 517 510 485	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0	312 he series 312 ⁴ 408 438 490 541 532 510 490 503 490 503 496 514 504 521 511 502	310 commen Ferr 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 529 507 499	nces with Readi 329 ^d 405 440 506 532 527 506 532 527 506 502 496 502 496 502 517 535 490 496	h readin ngs taka 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499	a, at 9 ^h and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 512 514 486 484	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 494 501 498 517 510 485 475.	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	312 he series 312 ⁴ 408 438 490 541 532 510 490 503 496 514 504 521 511	310 commen Ferr 322 ^d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 509 509 509 509 5	nces with Readi 329 ^d 405 440 506 532 527 506 496 502 496 502 517 535 490 496 440	h readin ngs taka 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496 442	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451	a, at 9 ^h and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 512 516 488 500 457	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 512 514 486 484 456	m, and 4 407d 439 494 527.5 535 503 494 501 495 517 510 485 475 449	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	312 he series 312 ^d 408 438 490 541 532 510 490 503 496 514 504 521 511 502 456 445 370	310 commen Ferr 322 ^d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 509 509 509 509 5	nces with Readi 329 ^d 405 440 506 532 527 506 532 527 506 502 496 502 496 502 517 535 490 496	h readin a Obse ngs taka 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289	gs 304 ^d rvator en 2 ^m 15 341 ^d .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499	a, at 9 ^h and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500	42 ^m , 48 5, 1854. 377 ^d 441 480 530 538 516 503 501 492 492 492 512 514 486 484	^m , and 4 407 ^d 439 494 527.5 535 513 495 503 494 501 498 517 510 485 475.	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19	37m.
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 4	312 he series 3124 408 438 490 541 532 510 490 503 496 514 504 514 504 514 504 511 511 511 502 456 445 370 390	310 commen Ferri 3224 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 509 509 509 509 5	nces with Readi 3294 405 440 506 532 527 506 496 502 495 502 495 502 495 502 495 490 496 440 425 284 415	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 503 483 500 503 488 509 514 529 489 496 442 427 268 405	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 500 494 500 494 511 510 488 499 451 449	a, at 9 ^h a and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492 492 512 514 484 456 484 456 440 360 401	^m , and 4 407 ^d 439 494 527.5 513 495 503 494 501 498 517 510 498 517 510 498 517 510 498 417 375 401	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22	37m
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 4	312 he series 3124 408 438 490 541 532 510 490 503 496 514 504 514 504 514 504 511 511 502 456 445 370 390 404	310 commen Ferri 3224 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 509 509 509 509 5	nces with Readi 329 ^d 405 440 502 527 506 496 502 495 502 517 535 490 496 440 425 284 415 390	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408 375	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 514 529 489 496 442 427 268 405 370	, 303 ^d , y, Feb ^s earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404 372	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451 449 326 392	a, at 9 ^h a and 25 dicated. 359 ^d 447 471 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396 393	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492 492 512 514 486 484 486 484 456 440 360 401 403	^m , and 4 407 ^d 439 494 527.5 513 495 503 494 501 498 517 510 498 517 510 498 517 510 498 417 375 401 402.	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21	37m
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 22 5 6	312 he series 312 408 438 438 490 541 532 510 490 503 496 514 504 521 511 502 456 445 370 390 404 402	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 509 509 509 509 5	nces with Readi 3294 405 440 502 496 502 496 502 495 502 517 535 490 496 440 425 284 415 390 390	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408 375 374	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496 442 427 268 405 370 370	303 ^d , y, Feb e earlier 319 ^d .5 445 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404 372 358	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451 449 326 392 355	a, at 9 ^h a and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396 393 370	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492 492 512 514 486 484 486 484 456 440 360 401 403 381	^m , and 4 407 ^d 439 494 527.5 535 503 495 503 494 501 498 517 510 498 517 510 485 475 475 417 375 401 402 380	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0	37m
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 3 4 5 6 7	312 he series 312 408 438 438 490 541 532 510 490 503 496 514 504 521 511 502 456 445 370 390 404 402 376	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 529 507 499 448 400 408 407 377	nces with Readi 3294 405 440 502 496 502 496 502 496 502 495 502 517 535 490 495 502 517 535 490 495 284 415 390 390 379	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408 375 374 380	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496 442 427 268 405 370 382.5	303 ^d , y, Feb a earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404 372 358 365	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451 449 326 392 355 370	a, at 9 ^h a and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396 393 370 373	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492 492 512 514 486 484 486 484 456 440 360 401 403 381 380	^m , and 4 407 ^d 439 494 527.5 535 503 495 503 494 501 498 517 510 485 475 498 517 510 485 475 449 417 375 401 402 380 395	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	37m
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 3 4 5 6 7 8	312 he series 312 408 438 438 490 541 532 510 490 503 496 514 504 521 511 502 456 445 370 390 404 402 376 381	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 529 507 499 448 440 312 400 408 407 377 385	nces with Readi 329 ^d 405 440 502 496 502 495 502 517 535 490 495 502 517 535 490 496 440 425 284 415 390 379 372	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408 375 374 380 386	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496 442 427 268 405 370 382.5 398	, 303 ^d , y, Feb ³ earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404 372 358 365 406	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451 449 326 392 355 370 435	a, at 9 ^h a, at 9 ^h dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396 393 370 373 437	42 ^m , 48 5, 1854. 377 ^d 441 480 538 516 503 501 492 492 512 514 486 484 456 484 456 440 360 401 403 381 380 438	^m , and 4 407 ^d 439 494 527.5 535 503 495 503 494 501 498 517 510 485 475 401 402 380 395 439	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 2 2 23 0 1 2	37m. 4 4 4 4 4 4 4 4 4 4 4 4 4
9 10 T 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 3 4 5 6 7	312 he series 312 408 438 438 490 541 532 510 490 503 496 514 504 521 511 502 456 445 370 390 404 402 376	310 comment Ferri 322d 411 438 493 558.5 529 508 493 502 495 509 509 509 509 509 529 507 499 448 400 408 407 377	nces with Readi 3294 405 440 502 496 502 496 502 496 502 495 502 517 535 490 495 502 517 535 490 495 284 415 390 390 379	h readin ngs tak 338 ^d 418 432 520 527 528 504 498 502 492 506 516 536 491 489 435 412 289 408 375 374 380	gs 304 ⁴ rvator en 2 ^m 15 341 ⁴ .5 437 460 516 518 530.5 493 500 503 488 509 514 529 489 496 442 427 268 405 370 382.5	303 ^d , y, Feb a earlier 319 ^d .5 445 482 509 511 542 483 502 500 499 501 512 508 489 500 447 438 298 404 372 358 365	and 304 ruary 24 r than in 342 ^d 445 477 519 521 526 446 500 494 506 491 511 510 488 499 451 449 326 392 355 370	a, at 9 ^h a and 25 dicated. 359 ^d 447 471 531 532 521 470 500 490 498 490 512 516 488 500 457 445 332 396 393 370 373	42 ^m , 48 5, 1854. 377 ⁴ 441 480 538 516 503 501 492 492 492 512 514 486 484 486 484 456 440 360 401 403 381 380	^m , and 4 407 ^d 439 494 527.5 535 503 495 503 494 501 498 517 510 485 475 498 517 510 485 475 449 417 375 401 402 380 395	4 54 ^m . 4 ^h 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	37m

TERM-DAY OBSERVATIONS FOR CHANGES OF MAGNETIC DECLINATION AT VAN RENSSELAER HARBOR, 1854.

Value of a seale division 0'.80.

Increase of scale readings denotes a movement of the north end of the magnet to the cast.

nean time.	0m.	06m.	12m.	18m.	24m.	30m.	36m.	42m.	48m.	54m.	Fern mean (to (time.
		Fe						and 23, 1	1854.	1.1.1.31	•	
		1	Readin	ngs take	n 1 ^m 34	^s earlier	than in	dicated.	-			
10 ^h	269ª	262ª	265 ^d	272ª	285ª	295ª	250ª	232d	228 ^d	255 ^d		87m.
11	240	261	243	246	232	228	236	260	259	258	5	66
12	258	256	254	256	258	258	259	260	263	263	6	66
13	262	253	258	264	263	267	265	256	251	247	7	**
14	235	237	239	239	240	244	243	247	245	240	8	"
15	240	238	239	237	234	233	234	237	245	251	9	**
16	268	265	267	279	280	277	272	264	260	269	10	66
17	275	279	277	282	279	280	282	284	283	282	11	66
18	281	280	278	277	275	273	272	270	269	268	12	66
19	269	268	268	268	267	267	268	266.5	264	262	13	"
20	261	261	262	261	261	258	258	259	262	265	14	**
21	269	267	266	264	264.5	262	269	273	278	284	15	66
22	283	282	278.5	275	270.5	263	265	260	260	261	16	66
23	260	257	256	250	253	256	248	250	257	263	17	**
0	272	280	283	285	292	288	289	287	290	294	18	66
1	300	302	291	290	292	283	277	273	271	1	19	**
2	-	-	-	-		280	284	278	271	269	20	66
3	267	267	263	255	248	247	252	249	248	251	21	**
4	260	265	274	292	296	295	298	298	297	295	22	66
5	291	290	290	293	292	294.5	291	292	288	290	23	"
6	293	291	291	290	294	295	290	281	276	269	0	**
7	264	252	250	249	242	239	235	242	252	248.5	1	66
8	246	245	243	242	240	239	241	244	250	258	2	66
9	270	282	284	286.5	288	292	297	300	304	302	3	66
10	301	300	299		1/1 33						4	\$ \$
-	ANS:	T.e						nd 20, 1 ndieatcd.				
10 ^h	_				-						12.0	37 ^m .
10		-						-		-		
11	-	_	Ξ		_	I	_	· ·	-	_	5	66
11 12		=	Ξ	-			-	- - -			5 6	66 66
11 12 13	-	-		1 1 1	1111		I I I	- -			5 6 7	66 66 66
11 12 13 14				1111					-		5 6 7 8	66 66 66 66
11 12 13 14 15	-	-	1111		Ξ	1111	_	- -	1111		5 6 7 8 9	22 25 25 25 25
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ \end{array} $		1111	=	 272 ^d	 271 ^d	 275 ^d	273 ^d	- - - - 272 ^d .5	 278 ^d	 	5 6 7 8 9 10	22 22 22 22 22 22 22 22
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ \end{array} $	289 ^d	299 ^d	 298 ^d	312	 271 ^d 310	275 ^d 305	273 ^d 301	296	278 ^d 299	282 ^d 262	5 6 7 8 9 10 11	22 22 22 22 22 22 22 22 22 22 22 22 22
11 12 13 14 15 16 17 18	289 ^d 271	299 ^d 287	298 ^d 294	$\begin{array}{c} 312\\ 290 \end{array}$	271 ^d 310 289	275 ^d 305 286	273 ^d 301 280	296 268	278 ^d 299 254	282 ^d 262 230	5 6 7 8 9 10 11 12	22 22 22 22 22 22 22 22 22 22 22 22 22
11 12 13 14 15 16 17 18 19	289 ^d 271 236		298 ^d 294 245	$312 \\ 290 \\ 242$	271 ^d 310 289 239		273 ^d 301 280 229	296 268 230	278 ^d 299 254 242	282 ^d 262 230 256	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13$	22 24 25 25 25 25 25 25 25 25 25
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ \end{array} $	289 ^d 271 236 265	299 ^d 287 250 262	298 ^d 294 245 260	312 290 242 256	271 ^d 310 289 239 252	275 ^d 305 286 234 247	273 ^d 301 280 229 243	296 268 230 236	278 ^d 299 254 242 231	282 ^d 262 230 256 228	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14$	11 11 11 11 11 11 11 11 11 11 11 11 11
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ \end{array} $	289 ^d 271 236 265 225	299 ^d 287 250 262 224	298 ^d 294 245 260 230	$\begin{array}{c} 312 \\ 290 \\ 242 \\ 256 \\ 236 \end{array}$	271 ^d 310 289 239 252 229	$ \begin{array}{c}$	$ \begin{array}{r}$	296 268 230 236 233	278 ^d 299 254 242 231 230	282 ^d 262 230 256 228 227	5 6 7 9 10 11 12 13 14 15	** ** ** ** ** ** ** ** ** ** ** **
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ \end{array} $	289 ^d 271 236 265 225 226	299 ^d 287 250 262 224 222	298 ^d 294 245 260 230 218	$\begin{array}{c} 312 \\ 290 \\ 242 \\ 256 \\ 236 \\ 215 \end{array}$	271 ^d 310 289 239 252 229 213	$ \begin{array}{c}$	$ \begin{array}{c} 273^{d} \\ 301 \\ 280 \\ 229 \\ 243 \\ 231 \\ 187 \end{array} $	296 268 230 236 233 183	278 ^d 299 254 242 231 230 190	282 ^d 262 230 256 228 227 187	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 16 \\ 16 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10$	** ** ** ** ** ** ** ** ** ** **
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ \end{array} $	$ \begin{array}{c}$	299 ^d 287 250 262 224 222 182	298 ^d 294 245 260 230 218 194	312 290 242 256 236 215 220	271 ^d 310 289 239 252 229 213 221	275 ^d 305 286 234 247 226 189 223	273 ^d 301 280 229 243 231 187 218	296 268 230 236 233 183 220	278 ^d 299 254 242 231 230 190 222	282 ^d 262 230 256 228 227 187 225	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 16 \\ 17 \\ 16 \\ 17 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10$	
11 12 13 14 15 16 17 18 19 20 21 22 23 0	289 ^d 271 236 265 225 226 184 231	299 ^d 287 250 262 224 222 182 236	298 ^d 294 245 260 230 218 194 242	312 290 242 256 236 215 220 236	271 ^d 310 289 239 252 229 213 221 238		273 ^d 301 280 229 243 231 187 218 235	296 268 230 236 233 183 220 224			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 18 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10$	
11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	289 ^d 271 236 265 225 226 184 231 194	299 ^d 287 250 262 224 222 182 236 190	298 ^d 294 245 260 230 218 194 242 187	312 290 242 256 236 215 220 236 184	271 ^d 310 289 239 252 229 213 221 238 181		273 ^d 301 280 229 243 231 187 218 235 178	296 268 230 236 233 183 220 224 178			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 19 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10$	
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175	299 ^d 287 250 262 224 222 182 236 190 208	298 ^d 294 245 260 230 218 194 242 187 236	312 290 242 256 236 215 220 236 184 242	271 ^d 310 289 239 252 229 213 221 221 238 181 212		273 ^d 301 280 229 243 231 187 218 235 178 202	296 268 230 236 233 183 220 224 178 190			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 $	
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175 194		298 ^d 294 245 260 230 218 194 242 187 236 199	312 290 242 256 236 215 220 236 184 242 200	271 ^d 310 289 252 229 213 221 238 181 212 210		273 ^d 301 280 229 243 231 187 218 235 178 202 180	296 268 230 236 233 183 220 224 178 190 175			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21$	
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175 194 140		298 ^d 294 245 260 230 218 194 242 187 236 199 139	312 290 242 256 236 215 220 236 184 242 200 148	271 ^d 310 289 239 252 229 213 221 238 181 212 210 147		273 ^d 301 280 229 243 231 187 218 235 178 202 180 164	296 268 230 236 233 183 220 224 178 190 175 152			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 $	
$ \begin{array}{r} 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1 \\ 2 \\ 3 \\ 4 \\ 5 \\ 5 \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175 194 140 107		298 ^d 294 245 260 230 218 194 242 187 236 199 139 116	$\begin{array}{c} 312\\ 290\\ 242\\ 256\\ 236\\ 215\\ 220\\ 236\\ 184\\ 242\\ 200\\ 148\\ 136 \end{array}$	271 ^d 310 289 252 229 213 221 238 181 212 210		273 ^d 301 280 229 243 231 187 218 235 178 202 180 164 130	296 268 230 236 233 183 220 224 178 190 175 152 120			$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 23 \\ 23 \\ 23 \\ 23 \\ 23$	
$ \begin{array}{c} 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175 194 140 107 +62		298 ^d 294 245 260 230 218 194 242 187 236 199 139 116 + 30	312 290 242 256 236 215 220 236 184 242 200 148 136 +32	271 ^d 310 289 239 252 229 213 221 238 181 212 210 147 145 		273 ^d 301 280 229 243 231 187 218 235 178 202 180 164 130 -4	$\begin{array}{c} 296\\ 268\\ 230\\ 236\\ 233\\ 183\\ 220\\ 224\\ 178\\ 190\\ 175\\ 152\\ 120\\ -7\end{array}$		$\begin{array}{c} - \\ - \\ 282^{d} \\ 262 \\ 230 \\ 256 \\ 228 \\ 227 \\ 187 \\ 225 \\ 203 \\ 164 \\ 193 \\ 152 \\ 121 \\ 63 \\ + 8 \end{array}$	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 0 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 $	
$ \begin{array}{c} 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ 7\\ \end{array} $	$\begin{array}{c} \\ \\ \\ 289^{d} \\ 271 \\ 236 \\ 265 \\ 225 \\ 226 \\ 184 \\ 231 \\ 194 \\ 175 \\ 194 \\ 140 \\ 107 \\ +62 \\ +30 \end{array}$			$\begin{array}{c} 312\\ 290\\ 242\\ 256\\ 236\\ 215\\ 220\\ 236\\ 184\\ 242\\ 200\\ 148\\ 136\\ +32\\ +12 \end{array}$			$\begin{array}{c}$	$\begin{array}{c} 296\\ 268\\ 230\\ 236\\ 233\\ 183\\ 220\\ 224\\ 178\\ 190\\ 175\\ 152\\ 120\\ -7\\ -2 \end{array}$		$\begin{array}{c} - \\ - \\ 282^{d} \\ 262 \\ 230 \\ 256 \\ 228 \\ 227 \\ 187 \\ 225 \\ 203 \\ 164 \\ 193 \\ 152 \\ 121 \\ 63 \\ + 8 \\ + 58 \end{array}$	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 1$	
$ \begin{array}{c} 11\\ 12\\ 13\\ 14\\ 15\\ 16\\ 17\\ 18\\ 19\\ 20\\ 21\\ 22\\ 23\\ 0\\ 1\\ 2\\ 3\\ 4\\ 5\\ 6\\ \end{array} $	289 ^d 271 236 265 225 226 184 231 194 175 194 140 107 +62		298 ^d 294 245 260 230 218 194 242 187 236 199 139 116 + 30	312 290 242 256 236 215 220 236 184 242 200 148 136 +32	271 ^d 310 289 239 252 229 213 221 238 181 212 210 147 145 		273 ^d 301 280 229 243 231 187 218 235 178 202 180 164 130 -4	$\begin{array}{c} 296\\ 268\\ 230\\ 236\\ 233\\ 183\\ 220\\ 224\\ 178\\ 190\\ 175\\ 152\\ 120\\ -7\end{array}$		$\begin{array}{c} - \\ - \\ 282^{d} \\ 262 \\ 230 \\ 256 \\ 228 \\ 227 \\ 187 \\ 225 \\ 203 \\ 164 \\ 193 \\ 152 \\ 121 \\ 63 \\ + 8 \end{array}$	$5 \\ 6 \\ 7 \\ 8 \\ 9 \\ 10 \\ 11 \\ 12 \\ 13 \\ 14 \\ 15 \\ 16 \\ 17 \\ 18 \\ 19 \\ 20 \\ 21 \\ 22 \\ 23 \\ 0 \\ 0 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 \\ 10 $	

Value of a scale division 0'.80.

74 122

Increase of scale readings denotes a movement of the north end of the magnet to the east.

¹ Watch stopped.

löttingen lean time.	0m.	06m.	12m.	18m.	24m.	30m.	36m.	42m.	48m.	54m.	Fern Rock mean time (to 0m.)
(mund					1. M. 11		- 00		054	0.20	al reality
		F.e		ck Obs							
toh	0111	0193	0503	0001	0504	280ª	279d	276ª	292d	304 ^d	4h 37m
10 ^h 11	244 ^d 330	243 ^d 345	258 ^d 357	262 ^d 365	278 ^d 372	369	365	360	364	368	5 "
12	360	355	345	342	312	348	341	333	330	338	6 "
13	349	356	364	359	354	351	355	360	381	395	7 .00
14	403	413	411	408	400	389	395	400.	407	410	8 "
15	414	423	428	436	442	443	442	438	436	433	9 "
16	435	434	440	450	476	490	520	555	570	575	10 "
17	593	600	575	548	533	523	516	506	498	492	11 "
18	485	482	479	477	477	476	475	475	477	480	12 "
19	483	487	493	495	488	495	527	552	568	587	13 "
20 -	595	612	624	630	633	631	625	620	612	604	14 "
21	599	603	609	612	615	626	633	635	644	650	15 "
22	663	667	665	661	658	659	653	646	640	637	16 "
23	639	641	632	618	595	590	583	572	559	541	17 "
0	543	545	546	546	544	540	537	536	535	537	10
1	538	525	523	539	527	520	515	513	480	479 571	19 " 20 "
$\frac{2}{3}$	487	493 553	498 537	503	506 495	509 489	509 486	533 488	562 496	510	20 "
3 4	573 512	510	507	517	495	489	480	488	490	487	22 "
5	486	485	483	484	480	477	476	476	477	463	23 "
6	449	443	442	440	441	443	447	454	463	470	0 "
7	478	483	487	489	488	483	471	459	457	446	1 "
	435	447	460	468	475	490	487	478	485	491	2 "
8			1		533	535	534	515	500	-	3 "
8		513	525	1 230	1 000						
9 10	493	spondir	ng to 9 ^h	24 ^m , 30	ale readi) ^m , 36 ^m ,	ings 280 42 ^m , 43	d, 271 ^d 8 ^m , and	54 ^m res	pectivel		4 ") ^d , corre-
9 10 Observ	493 — vations	commene spondir	ce at 9 ^h ng to 9 ^h ern Ro	24 ^m , sc 24 ^m , 30	ale readi) ^m , 36 ^m , servat	ings 280 42 ^m , 43	d, 271 ^d 8 ^m , and	54 ^m res	pectivel		*) ^d , corre-
9 10 Observ Rea	493 — vations	commena spondin F e	ce at 9 ^h ng to 9 ^h ern Ro	24 ^m , sc 24 ^m , 30	ale readi) ^m , 36 ^m , servat	ings 280 42 ^m , 43	d, 271 ^d 8 ^m , and	54 ^m res	pectivel	y. pended,	*) ^d , corre- I. 7.) ¹
9 10 Observ Rea 10 ^h	493 vations dings ta	commena spondin Fe tken 1 ^m	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear	24 ^m , sc 24 ^m , 30 ock Ob lier than	ale readi) ^m , 36 ^m , servat	 42 ^m , 43 cory, J ed.	une 21 a	54 ^m res and 22, (Mag	pectivel	y. pended, 295ª	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m
9 10 Observ Rea 10 ^h 11	493 vations dings ta	commend spondin Fe sken 1 ^m	$\frac{1}{2}$	24 ^m , sc 24 ^m , 30 ock Ob lier than 302 ^d	ale readi) ^m , 36 ^m , servat indicat	angs 280 42 ^m , 43 cory, J ed.) ^d , 271 ^d 8 ^m , and une 21 a 312 ^d	54 ^m res and 22, (Mag 313 ^d	pectivel 1854. gnet susp 313 ^d	y. pended, 295 ^d 314	$\frac{ }{ }^{4}, \text{ corre-}$ I. 7.) ¹ $\frac{ }{ }^{4h} 37^{m}_{5}$
9 10 Observ Rea 10 ^h 11 12	493 vations dings ta 297 ^d 315	commend spondin Fe ken 1 ^m 299 ^d 315	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 	24 ^m , sc 24 ^m , 30 ock Ob lier than 302 ^d 314	ale readi) ^m , 36 ^m , serval indicat 305 ^d 313	ings 280 42 ^m , 43 cory, J ed.	ad, 271 ^d 8 ^m , and une 21 a 312 ^d 310	54 ^m res and 22, (Mag 313 ^d 316	pectivel 1854. gnet susp 313 ^d 325	y. pended, 295 ^d 314 333	$ \begin{vmatrix} * \\ 0^{d}, \text{ corre} \\ \textbf{I. 7.} \\ 1. 7. \\ 1 \\ 4^{h} 37^{m} \\ 5 \\ 6 \\ 6 \\ \end{array} $
9 10 Observ Rea 10 ^h 11 12 13	493 vations dings ta 297d 315 337	commend spondin Fe kken 1 ^m 299d 315 340	cc at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344	24 ^m , sc 24 ^m , 3(ock Ob lier than 302 ^d 314 347	ale read) ^m , 36 ^m , servat 1 indicat 305 ^d 313 351	ings 280 42 ^m , 41 cory, J ed.	a, 271 a 3 ^m , and une 21 a 312 ^d 310 350	54 ^m res and 22, (Mag 313 ^d 316 350	pectivel 1854. gnet susj 313 ^d 325 351	y. pended, 295 ^d 314 333 352	$ \frac{1}{4^{h} 37^{m}}$ $ \frac{4^{h} 37^{m}}{5 }$ $ \frac{6}{7} $
9 10 Observ Rea 10 ^h 11 12 13 14	493 vations dings ta 297 ^d 315 337 348	commend spondin Fe kken 1 ^m 299d 315 340 346	cc at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343	24 ^m , sc 24 ^m , 3(ock Ob lier than 302d 314 347 337	ale read) ^m , 36 ^m , servat a indicat	ings 280 42 ^m , 4 cory, J ed. 309d 312 352 334	a ^d , 271 ^d 3 ^m , and une 21 a 312 ^d 310 350 338	54 ^m res and 22, (Mag 313 ^d 316 350 348	pectivel 1854. gnet susp 313 ^d 325 351 350	y. pended, 295 ^d 314 333 352 355	$ \frac{1}{2} \\ \frac{1}{2} $
9 10 Observ Rea 10 ^h 11 12 13 14 15	493 vations dings ta 297d 315 337	commend spondin Fe kken 1 ^m : 299d 315 340 346 355	cc at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344	24 ^m , sc 24 ^m , 3(ock Ob lier than 302 ^d 314 347 337 364	ale read) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366	ings 280 42 ^m , 41 cory, J ed. 309d 312 352 334 374	a ^d , 271 ^d 3 ^m , and une 21 a 312 ^d 310 350 338 374	54 ^m res and 22, (Mag 313 ^d 316 350 348 374	pectivel 1854. gnet susj 313 ^d 325 351 350 373	y. 295 ^d 314 333 352 355 367	$ \frac{1}{2} \\ \frac{1}{2} $
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17	493 vations dings ta 297 ^d 315 337 348 354	commend spondin Fe iken 1 ^m 299d 315 340 346 355 367 385	cc at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358	24 ^m , sc 24 ^m , 3(ock Ob lier than 302 ^d 314 347 337	ale read) ^m , 36 ^m , servat a indicat	ings 280 42 ^m , 4 cory, J ed. 309d 312 352 334	a ^d , 271 ^d 3 ^m , and une 21 a 312 ^d 310 350 338	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384	pectivel: 1854. gnet susj 3134 325 351 350 373 378 383	y. pended, 2954 314 333 352 355 367 383 384	$ \frac{1}{2} \\ \frac{1}{2} $
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18	493 vations dings ta 297 ^d 315 337 348 354 366 384 387	commend spondin Fe tken 1 ^m 2994 315 340 345 355 367 385 385 384	cc at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 343 358 366 379 385	24 ^m , se 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 364 370 379 382	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 381 386	ad, 271 a 3 ^m , and une 21 a 312 a 310 350 338 374 377 383 386	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 382	pectivel: 1854. (net sus) 313 ⁴ 325 351 350 373 378 383 385	y. pended, 295 ⁴ 314 333 352 355 367 383 384 384 387	$ \frac{4}{10} \frac{3}{10} \frac{4}{10} \frac{3}{10} \frac{3}{10} \frac{4}{10} \frac{3}{10} \frac{3}{10}$
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19	493 vations dings ta 297 ^d 315 337 348 354 366 384 387 384	commend spondin Fe tken 1 ^m 2994 315 340 345 340 345 367 385 367 385 384 382	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 364 370 379 382 385	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 381 386 386	ad, 271 ad 3 ^m , and une 21 a 312 ad 310 350 338 374 377 383 386 387	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 382 390	pectivel 1854. (net sus) 313 ⁴ 325 351 350 373 378 383 385 392	y. pended, 314 333 352 355 367 383 384 384 387 396	1 * 1. 7.)1 4h 37m 5 * 6 * 7 * 9 * 10 * 11 * 12 * 13 **
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20	493 vations dings tr 297 ^d 315 337 348 354 366 384 387 384 400	commend spondin Fe ken 1 ^m 299d 315 340 346 355 367 385 385 384 382 402	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 337 364 370 379 382 385 396	ale readi) ^m , 36 ^m , servat a indicat 305 ⁴ 313 351 333 366 373 379 384 387 394	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 374 381 386 386 394	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 382 390 376	pectivel 1854. rnet susj 313 ⁴ 325 351 350 378 383 385 392 384	y. pended, 295 ^d 314 333 352 355 367 383 384 384 384 387 396 394	1 *) ^d , corre- 1 I. 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 9 " 10 " 11 " 12 " 13 " 14 "
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21	493 vations dings tr 297 ^d 315 337 348 354 364 384 387 384 400 390	commend spondin Fe ken 1 ^m 299 ^d 315 340 346 355 367 385 367 385 385 385 385 385 385 385 385 385 385	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 364 370 379 382 385 396 381	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 379	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 386 386 386 386 394 370	ad, 271 d 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 387 388 386 387 388 364	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 377 384 382 390 376 368	pectivel: 1854. rnet sus; 313 ^d 325 351 350 378 378 383 385 392 384 372	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370	1 *) ^d , corre- 1 I. 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 10 " 11 " 12 " 13 " 14 " 15 "
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22	493 vations dings tr 297 ^a 315 337 348 354 364 384 386 384 400 390 367	commend spondin Fe ken 1 ^m 299 ^d 315 340 346 355 367 385 385 385 385 385 385 385 385 385 385	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 364 370 379 382 385 396 381 355	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 379 357	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361	ad, 271 d 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 387 388 364 367	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 377 384 390 376 368 369	pectivel: 1854. rnet susj 313 ^d 325 351 350 378 383 385 385 392 384 372 367	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364	I. 7.) ¹ 4 ^h 37 ^m 5 ["] 6 ["] 7 ["] 8 ["] 10 ["] 11 ["] 12 ["] 13 ["] 14 ["] 15 ["] 16 ["]
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23	493 vations dings tr 297 ⁴ 315 337 348 354 364 387 384 400 390 367 364	commend spondin Fe ken 1 ^m 299 ^d 315 340 346 355 367 385 385 385 385 385 385 385 385 385 385	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 364 370 379 382 385 385 396 381 355 355	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 357 350	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 386 394 370 361 350	ad, 271 d 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 383 387 383 386 387 388 364 367 352	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 377 384 390 376 368 369 355	pectivel: 1854. rnet susj 313 ^d 325 351 350 373 378 385 392 384 372 367 359	y. pended, 295 ^a 314 333 352 355 367 383 384 387 396 394 370 364 362	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m 5 6 7 8 9 10 11 12 13 14 15 16 17
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0	493 vations dings tr 297 ⁴ 315 337 348 354 366 384 400 390 367 364 363	commend spondin Fe iken 1 ^m 299 ^d 315 340 346 355 367 385 385 385 385 385 385 385 385 385 385	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 337 364 370 379 382 385 396 381 355 355 355 369	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 379 357 350 367	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368	ad, 271 d 8 ^m , and une 21 s 312 ^d 310 350 338 374 377 383 386 387 388 364 367 352 370	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 390 376 368 369 355 363	pectivel: 1854. rnet susj 313 ^d 325 351 350 373 378 383 383 383 392 384 372 367 359 355	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364 362 351	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m 5 6 7 8 9 10 11 12 13 14 15 16 17 18
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	493 vations dings tr 297 ^d 315 337 348 354 366 384 387 364 363 348	commend spondin Fe iken 1 ^m : 299d 315 340 346 355 367 385 384 382 402 383 363 363 363 363 363 363 363 363 343	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 385 385 385 385 385 361 370 337	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 337 364 370 379 382 385 396 381 355 355 355 369 335	ale readi) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 379 357 350 367 333	ings 280 42 ^m , 43 cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368 329	ad, 271 d 8 ^m , and une 21 s 312 ^d 310 350 338 374 377 383 386 387 388 364 367 352 370 330	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 382 390 376 368 369 355 363 331	pectivel: 1854. gnet susj 313 ^d 325 351 350 373 378 383 383 383 392 384 372 367 359 355 331	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364 362 351 328	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m 5 6 7 6 7 10 11 12 13 14 15 16 17 18 19
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	493 vations dings tr 297 ^d 315 337 348 354 366 384 387 384 382 384 382 348 322	commend spondin Fe kken 1 ^m ; 299d 315 340 346 355 367 385 384 382 402 383 363 363 363 363 363 363 313	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370 337 320	24 ^m , sc 24 ^m , 30 24 ^m , 30 00k Ob lier than 302 ^d 314 347 337 364 370 379 382 385 396 381 355 355 355 355 355 369 335 322	ale read) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 357 350 357 350 367 333 325	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368 329 327	ad, 271 ad 8 ^m , and une 21 a 312 ^d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 328	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 374 377 384 382 390 376 368 369 355 363 331 328	pectivel. 1854. gnet susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364 362 351 328 324	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m 5 6 7 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0	493 vations dings tr 297 ^d 315 337 348 354 366 384 387 364 363 348	commend spondin Fe iken 1 ^m : 299d 315 340 346 355 367 385 384 382 402 383 363 363 363 363 363 363 363 363 343	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 385 385 385 385 385 361 370 337	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 337 364 370 379 382 385 396 381 355 355 355 369 335	ale read) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 357 350 367 357 350 367 323	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368 329 327 323	ad, 271 d 8 ^m , and une 21 a 312d 310 350 338 374 377 383 386 387 388 364 367 352 370 328 322	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 382 390 376 368 369 355 363 331	pectivel: 1854. gnet susj 313 ^d 325 351 350 373 378 383 383 383 392 384 372 367 359 355 331	y. 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364 364 364 364 364 364 328 324 331	*) ^d , corre- I. 7.) ¹ 4 ^h 37 ^m 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1	493 vations dings tr 297 ^d 315 337 348 354 366 384 387 384 400 390 367 363 348 322 322	commend spondin Fe tken 1 ^m 2994 315 340 345 355 367 385 363 363 363 363 363 363 363 363 363 318 318 318 318 315 316	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370 387 320 319	24 ^m , sc 24 ^m , 30 Dock Ob lier than 302 ^d 314 347 367 367 379 382 385 396 381 355 355 355 369 335 355 322 322 322 330 317	ale read) ^m , 36 ^m , servat a indicat 305 ^d 313 351 333 366 373 379 384 387 394 357 350 357 350 367 333 325	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 881 386 386 394 370 361 350 361 350 361 350 361 350 327 323 326 321	ad, 271 ad 8 ^m , and une 21 a 312 ^d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 328	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 374 377 384 382 390 376 368 369 355 363 331 328 324	pectivel: 1854. gnet susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326 326	y. pended, 295 ⁴ 314 333 352 355 367 383 384 384 387 396 394 370 364 362 351 324 318 308	1 * 0 ^d , corre- * 1 7.1° 4 ^h 37 ^m 5 5 * 6 * 7 * 6 * 7 * 10 * 11 * 12 * 13 * 14 * 15 * 16 * 17 * 18 * 19 * 20 * 21 **
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 22 5 6	493 vations dings tr 297 ^d 315 337 348 354 366 384 366 384 387 384 400 390 367 364 363 348 322 326 312 306	commend spondin Fe tken 1 ^m 2994 315 340 345 355 367 385 363 363 363 363 363 363 363 363 363 36	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 	24 ^m , se 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 367 367 379 382 385 396 381 355 355 355 369 335 355 322 322 322 330 317 316	ale readi)m, 36m, servat a indicat 3054 313 351 333 366 373 379 384 387 394 379 357 350 367 350 367 350 367 325 325 323 326 323 318	ings 280 42 ^m , 4 cory, J ed.	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 364 367 352 370 328 322 319 317 304	54 ^m res and 22, (Mag 313 ^d 316 350 348 377 384 376 368 369 355 363 328 324 318 310 303	pectivel 1854. met susj 3134 325 351 350 378 383 385 392 384 372 367 359 355 331 326 326 318 312 312	y. pended, 295 ⁴ 314 333 352 355 367 383 384 384 387 396 394 370 364 362 351 328 324 331 318 308 290	1 *) ^d , corre- 1 I. 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 9 " 10 " 11 " 12 " 13 " 14 " 15 " 16 " 17 " 18 " 20 " 21 " 22 " 23 " 0 "
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 5 6 7	493 vations dings tr 297 ^d 315 337 348 354 366 384 366 384 366 384 366 384 366 384 366 384 366 384 322 326 312 306 291	commend spondin Fre ken 1 ^m 299d 315 340 345 355 367 385 384 382 402 383 363 363 363 363 363 363 363 363 363	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370 385 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 382 358 361 370 385 383 400 382 358 361 370 385 385 385 385 385 385 385 361 370 385 385 385 385 385 385 385 385 385 385	24 ^m , sc 24 ^m , sc 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 367 379 382 385 396 381 355 355 355 369 335 322 322 330 317 316 286	ale readi pm, 36m, servat a indicat 3054 313 351 333 366 373 379 384 379 357 350 367 357 350 367 325 323 326 323 326 323 326	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 394 370 361 350 368 329 327 323 326 321 323 283	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 322 319 317 304 275	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 382 390 376 368 369 355 363 321 324 318 310 303 281	pectivel: 1854. rnet susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326 326 318 312 283	y. pended, 295 ^d 314 333 352 355 367 383 384 384 387 396 394 370 364 362 351 328 324 331 318 308 290 288	1 *)d, corre- 1 1 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 9 " 10 " 12 " 13 " 14 " 15 " 16 " 17 " 18 " 20 " 21 " 22 " 0 " 1 "
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 2 2 3 4 5 6 7 8	493 vations dings tr 297 ^d 315 337 348 354 364 384 400 390 367 364 363 348 322 326 312 306 291 289	commend spondin Fe ken 1 ^m , 299d 315 340 345 355 367 385 384 385 363 363 363 363 363 363 363 363 363 36	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370 385 358 361 370 382 358 361 370 337 320 319 334 318 316 286 292	24 ^m , sc 24 ^m , sc 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 364 370 379 382 385 396 381 355 355 369 335 355 369 335 322 322 330 317 316 286 289	ale readi pm, 36m, servat a indicat 3054 313 351 333 366 373 379 384 379 357 350 367 357 350 367 325 325 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 327 357 357 357 357 357 357 357 35	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368 329 327 323 326 321 323 223 223	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 328 322 319 317 304 275 297	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 374 377 382 390 376 368 369 355 363 331 328 324 318 310 303 281 298	pectivel 1854. rnet susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326 326 318 312 283 302	y. pended, 295 ^d 314 333 352 355 367 383 384 384 387 396 394 370 364 362 351 328 324 331 318 308 290 288 304	1 *) ^d , corre- 1 I. 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 9 " 10 " 11 " 12 " 13 " 14 " 15 " 16 " 17 " 18 " 20 " 21 " 22 " 0 " 1 " 22 " 0 " 22 " 0 " 1 " 2 "
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 1 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 22 23 0 1 5 5 6 7 7 8 9	493 vations dings tr 297d 315 337 348 354 364 387 384 400 390 367 364 363 348 322 326 312 306 291 289 304	commend spondin Fe ken 1 ^m 299d 315 340 346 355 367 385 385 385 385 385 385 385 385 385 385	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 360 379 385 383 400 382 358 361 370 385 358 361 370 387 320 319 334 318 316 286 292 313	24 ^m , sc 24 ^m , sc 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 364 370 379 382 385 385 385 385 385 385 385 385 385 385	ale read ale read pm, 36m, servat 305 ⁴ 313 351 333 366 373 379 357 350 367 359 367 350 367 325 323 325 325	ings 280 42 ^m , 4 cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 394 370 361 350 368 329 327 323 326 321 323 223 323 223 303	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 328 322 319 317 304 275 297 295	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 374 377 384 370 376 368 369 355 363 331 328 324 318 310 303 281 298 290	pectivel: 1854. rate susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326 326 318 312 312 283 302 282	y. pended, 295 ^d 314 333 352 355 367 383 384 387 396 394 370 364 362 351 328 324 331 318 308 290 288 304 273	1 *) ^d , corre-
9 10 Observ Rea 10 ^h 11 12 13 14 15 16 17 18 19 20 21 22 23 0 1 22 23 0 1 22 23 0 1 22 3 4 5 6 7 8	493 vations dings tr 297 ^d 315 337 348 354 364 384 400 390 367 364 363 348 322 326 312 306 291 289	commend spondin Fe ken 1 ^m , 299d 315 340 345 355 367 385 384 385 363 363 363 363 363 363 363 363 363 36	ce at 9 ^h ng to 9 ^h ern Rc 34 ^s ear 300 ^d 314 344 343 358 366 379 385 383 400 382 358 361 370 385 358 361 370 382 358 361 370 337 320 319 334 318 316 286 292	24 ^m , sc 24 ^m , sc 24 ^m , 30 Deck Ob lier than 302 ^d 314 347 364 370 379 382 385 396 381 355 355 369 335 355 369 335 322 322 330 317 316 286 289	ale readi pm, 36m, servat a indicat 3054 313 351 333 366 373 379 384 379 357 350 367 357 350 367 325 325 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 325 326 327 357 357 357 357 357 357 357 35	ings 280 42 ^m , 4: cory, J ed. 309 ^d 312 352 334 374 377 381 386 386 386 394 370 361 350 368 329 327 323 326 321 323 223 223	ad, 271 ad 8 ^m , and une 21 a 312 d 310 350 338 374 377 383 386 387 388 364 367 352 370 330 328 322 319 317 304 275 297	54 ^m res and 22, (Mag 313 ^d 316 350 348 374 377 384 374 377 382 390 376 368 369 355 363 331 328 324 318 310 303 281 298	pectivel 1854. rnet susj 313 ^d 325 351 350 373 378 383 385 392 384 372 367 359 355 331 326 326 318 312 283 302	y. pended, 295 ^d 314 333 352 355 367 383 384 384 387 396 394 370 364 362 351 328 324 331 318 308 290 288 304	1 *) ^d , corre- 1 I. 7.) ¹ 4 ^h 37 ^m 5 " 6 " 7 " 8 " 9 " 10 " 11 " 12 " 13 " 14 " 15 " 16 " 17 " 18 " 20 " 21 " 22 " 0 " 1 " 22 " 0 " 22 " 0 " 1 " 2 "

¹ This magnet I. 7 was undoubtedly used on all previous occasions. Mark reads on circle 338° 22', circle reads 314° 12'.

CHANGES OF THE MAGNETIC DECLINATION

The results of the preceding tables have been thrown into curves, to which the corresponding readings at Greenwich and Washington have been added.¹ These readings have all been referred to the same scale, and thus present at a glance the great difference in the magnitude of the diurnal motion as well as that of the disturbances. The Greenwich observations were taken by means of photography; the Washington corresponding observations were also obtained by means of Brooke's automatic photographic registration, and have as yet only been published in the 6th volume of the Astronomical Expedition to Chili, under the direction of Lieut. Gilliss, U. S. N.; Washington, D. C., 1856.

For the Greenwich curves the zero line corresponds to 22° west declination. A remarkable absence of disturbances of any magnitude as well as a small diurnal range of motion at the time of the vernal equinox, is shown by the March curves both for Van Rensselaer and Greenwich.

There appear to be some disturbances common to both places, and if these indications should not be accidental they are of an opposite character, that is, a magnetic east deflection is presenting itself as a magnetic west deflection at the other station, and vice versa. For this the reader may examine hours 17 and $5\frac{1}{2}$ of the curve for January 18 and 19, hours from 6 to 8, April 20th, and one or two other less striking cases. The needle at Van Rensselaer Harbor actually points with its north end to the south of the astronomical west, and its meridional component of the direction is pointing in a southern or opposite direction to the same component at Greenwich or Washington.

Absolute Declination.—The magnetic declination at Van Rensselaer Harbor was determined on three occasions in the summer of 1854. Two different magnets were used.

Determinati	on of June 9th. Magne	et A 68, m	nirror fa	eing magn	etie north.	we als		
Position.	Circle reads.		ircle read		1	P. C	ircle rea	
	Mark.	Magnetic	meridian	(south).	The second second		Mar	k.
L	338° 06′	I.	316°	01'	1 200	I.	338°	02′
	06'			00	110			01
II.	338 00	II.	315	57		II.	338	05
	337 59			56				04
Means	338 02.8		315	58.5			338	03.0
	The second second second	at 6	h 35m (Green. t.	1			
	Mean reading on mark					. 338	3° 03′	
	Astronomical bearing (]			1.		. 9	3 29]	e.
	Reading of meridian (N	N.) .				. 24	1 34	
	Magnetie meridian (N.)	100.00	•	終い物		. 13	5 59	
	Declination			 north) at	 1h 59m D		8° 35'	0
			W. (01	north) at	1. 0.2. 1	· ML. 10	Car tim	0.

mination of June 9th Magnet A 68 mirror facing magnetic north.

¹ See accompanying plates 1 and 2.

24 .

D

Determinati	ion of	June 14.	Magnet I.	10.	Mirror	facir	ng m	agnet	ie no:	rth.			
	Mar	k.	1 1	lagnet	ic south	merid	ian.					Marl	k.
• I.	338°	09'	de Tru	I.	317	° 10	1			I		338°	04'
		08			at	5 ^h 1	2m (dr. t.					02
II.	338	05				09				II		338	09
		04	-	II.	317	02							08
						01							
Means	338	06.5										338	05.8
					317	05.	.5						
			1								0000	0.01	
		0		•	•	•	•	•	•	•	3380		
	Astro	nomical h	earing (N.)	•		•	•	•	•	•	93	29 E	•
	Dondi	nor of tru	a maridian								244	27	
		0	e meridian		•	•	•	•	•	•			
	Readi	ng of ma	gnetic merid	ian	•	•	•	• .	•	•	137	05	
	Declin	ation									107°	39/	
	LOUIII		in the t				W.	at Oh	29m	Р. М			

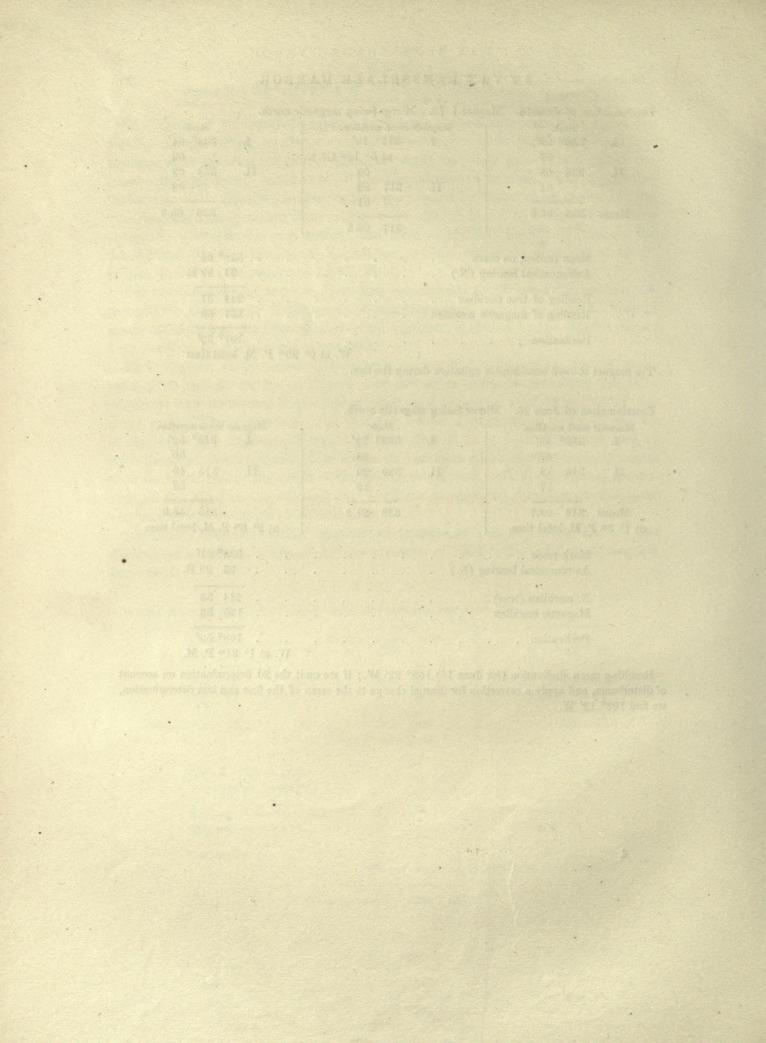
The magnet showed considerable agitation during the day.

Determination of June 26. Mirror facing magnetic north.

4

Magnetic	sonth m	eridian.	1		Ma	rk.		1		Mag	netic se	onth n	neridian.
I.	315°	49'		I.	338	24'				I		315°	52'
		47				23							50
II.	316	18		II.	338	20				II		315	40
		17				19							38
Means	316	02.7	12.1		338	21.5					. :	315	45.0
at 1 ^h 3 ^m]	P. M. 1	ocal time.	1						at	2 ^h	0 ^m P.	M. 1	ocal time
	Mark	reads .									338°	21'	
	Astron	iomical bearing	ng (N.)	•	·	•	•	•	•	•	93	29 I	E.
	N. mer	ridian (true)									244	52	
	Magne	tie meridian	••	•		•		•			135	53	
	Deelin	ation .									108°		
									W. :	at 1 ¹	1 31m	P. N	ſ.

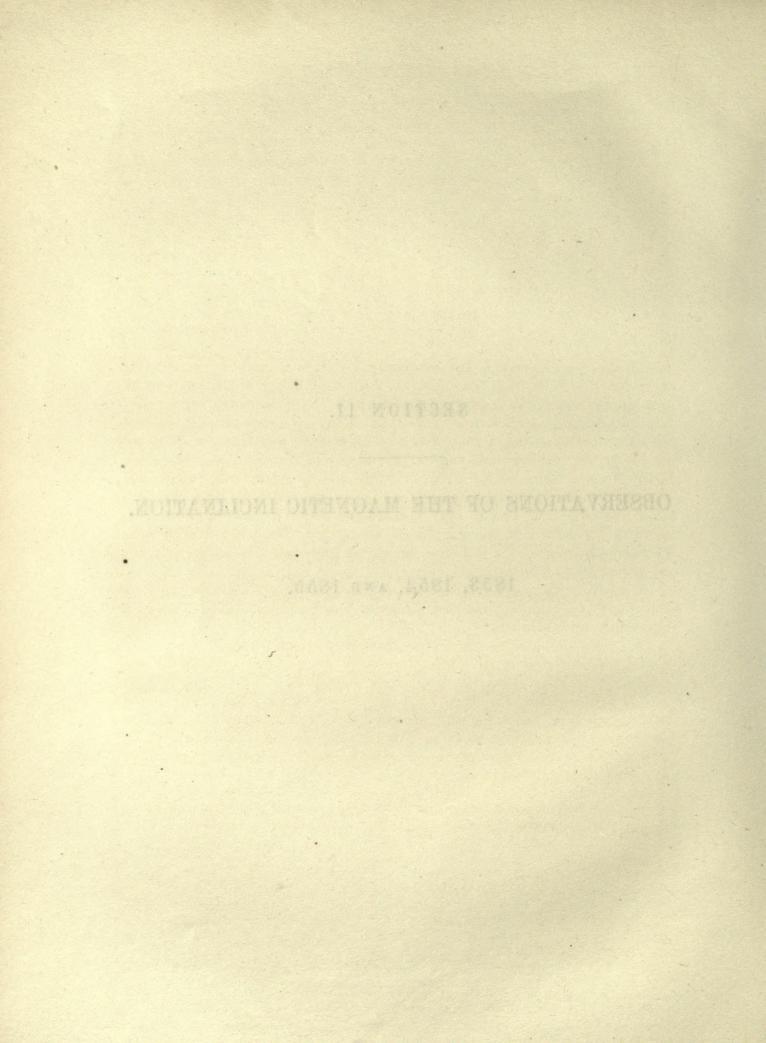
Resulting mean declination (for June 16) 108° 22' W.; if we omit the 2d determination on account of disturbance, and apply a correction for diurnal change to the mean of the first and last determination, we find 108° 12' W.



SECTION II.

OBSERVATIONS OF THE MAGNETIC INCLINATION.

1853, 1854, AND 1855.



SECTION II.

MAGNETIC INCLINATION.

Instrument and Remarks.—The observations for dip were made by Mr. Sonntag by means of a Barrow dip circle received from Prof. Henry, of the Smithsonian Institution, through the courtesy of Col. Sabine. The inclinometer was supplied with Lloyd needles, for determining the total intensity, but unfortunately the complete record of these observations could not be recovered; the absence of the record for determining the constants necessary for their reduction being wanted, no use could be made of these observations, even for relative intensity at Saikatle and Marshall Bay, and the partial results given in Appendix XV., vol. II. of the Narrative, must, therefore, remain fruitless for the present. There is likewise a deficiency in the record of the dip observations at Van Rensselaer Harbor after February 23, 1854; the results, however, are all preserved in the Appendix just mentioned.

In regard to the index error of the dipping needles, we can only make an approximate comparison. The observations at New York, where the dip has been represented by the formula

 $I = 72^{\circ}.69 - 0.00491 (t - 1845) + 0.00114 (t - 1845)^{2}$

with a probable error of any single observation¹ of $\pm 3'.3$, would apparently produce a correction to needle 1 of -9', and to needle 2 of -14', the changes, however, from one station to another in the immediate vicinity of the city are much greater, and these quantities may, therefore, as well indicate local deviation as index error. The polarity of the needles has been reversed at each station, the effect of this operation upon the resulting dip is somewhat irregular, and will be found exhibited in tabular form.

¹ See Coast Survey Report of 1856, p. 240. The formula includes dip observations taken between December, 1822, and August, 1855 (exclusive of the observations of the present expedition).

MAGNETIC INCLINATION

STAT	tion No. I. NEW Y	ORK, AT MR. RUTHERFOR	D'S OBSERVATORY.
	Latitude 40° 43'.8	. Longitude 73° 58'.9.	W. of G.
-			
			•

May 18, 1853. 4 ^h P. M. Needle No. 2. Poles direct. Magnetic meridian reads 248° 10'.								
	CIRCLE	EAST.			CIRCLE	WEST.	A STATE	
Face	east.	Face	west.	Face	east.	Face west.		
72° 57' 72 56	$72^{\circ} 37'$ 72 35	73 [°] 08' 73 05	$ \begin{array}{r} $	$72^{\circ}51'$ 72 54	$ \begin{array}{r} $	72° 53′ 72 56	$73^{\circ} 25'$ 73 29	
72 56.5 72 36.0 73 06.5 73 25.5 72 52.5 72 53.0 72 54.5 73 27. 72 46.2 73 16.0 72 52.7 73 10.7 73 01.1 73 01.4								
Balting and	le ca desi	Ne	edle No. 2.	Poles revers	ed.	All here is	o moner of	
CIRCLE WEST. CIRCLE EAST.								
Face	west.	Face	east.	Face	west.	Face	east.	
$72^{\circ}08'$ 72 10	$72^{\circ} 16' 72 18$	72° 17' 72 30	$\begin{array}{r} & & \\ & & \\ & 73^{\circ} \ 17' \\ & 73 \ 30 \end{array}$	73 [°] 20' 73 19	72° 38' 72 36	73 [°] 00' 73 00	73° 05' 73 06	
72 09.0 72 17.0 72 23.5 73 23.5 73 19.5 72 72 13.0 72 53.5 72 58.2 72 58.2 72 33.2 72 46.8 72 46.8						73 00.0 73 00.5	73 05.5 02.8	
May 18, 18	353. 22 ^h 30 ¹	^m . Needle	No. 2. Pole	es reversed.	Magnetic me	eridian reads	248° 10′.	
	CIRCLE	EAST.			CIRCLI	C WEST.	leal publicant	
Face	east.	Face	west.	Face east. Face west.				
73° 07′ 73 03	$ \begin{array}{r} $	72° 42' 72 40	$ \begin{array}{r} b \\ 72^{\circ} 44' \\ 72 47 $	72° 50' 72 54	$\begin{array}{c} & & \\ & & \\ & 73^{\circ} \ 11' \\ & 73. \ 13 \end{array}$	72° 37' 72 40	$ \begin{array}{r} \delta \\ 72^{\circ} 37' \\ 72 34 \end{array} $	
73 05.0 73 1	73 27.0 16.0 72 5		72 45.5 43.2		73 12.0 02.0 72	72 38.5 72 49.5	72 35.5 37.0	
			. 72	54.6				
		N	eedle No. 2.	Poles direc	·t.			
	CIRCLE	WEST.			CIRCL	E EAST.		
Face	west.	Face	east.	Face	west.	Face	east.	
$72^{\circ}52'$ 7255	$72^{\circ} 51'$ 72 55	$72^{\circ}49'$ 72 52	$ \begin{array}{r} $	$73^{\circ}37'$ 73 34	$ \begin{array}{r} $	$72^{\circ}58'$ 7257	$\begin{array}{r} $	
72 53.5 72 5	72 53.0 53.2 72 {	72	72 56.5 53.5 73 (42.5		73 18.5 08.0	

AT MR. RUTHERFORD'S OBSERVATORY.

May 20,	, 1853. 4 ^h .	N	leedle No. 1.	Poles diree	et.		2	
	CIRCLE	EAST.			CIRCLE	t west.	Party	
Face	east.	Face	west.	Face east. Face west.			west.	
$71^{\circ}37'$ 71 34	⁸ 72° 00' 71 59	75° 55' 75 52	$ \begin{array}{c} \delta \\ 76^{\circ} 22' \\ 76 21 \end{array} $				74° 04′ 74 06	
71 35.5	71 59.5	75 53.5 76	76 21.5 07.5	5 73 12.0 73 03.0 73 43.0 74 05.0 73 07.5 73 54.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0 56.0				
	73 (57.5	. 73	44.1	73	30.7	1100 SH	
Needle No. 1. Poles reversed.								
	CIRCLE	WEST.			CIRCLI	E EAST.		
Face	west.	Face	east.	Face west. Face east.			east.	
69° 58' 70 00	$ \begin{array}{c} \frac{\delta}{70^{\circ} \ 10'} \\ 70^{\circ} \ 13 \end{array} $	73° 17' 73 16	$72^{\circ}52'$ 72 55	72° 32′ 72 30	73° 08' 73 06	72 [°] 56′ 72 53	73° 09' 73 06	
69 59.0 70	69 59.0 70 11.5 73 16.5 72 53.5 72 31.0 73 07.0 72 54.5 73 07.5 70 05.2 73 05.0 72 49.0 73 01.0 71 35.1 72 15.1 72 55.0							
May 20,	1853.	N	feedle No. 1.	Poles direc	it.			
	CIRCLE	EAST.			CIRCLE	WEST.		
Face	east.	Face	west.	Face east. Face west.				
71° 48′ 71 45	72° 03' 72 01	74° 18' 74 17	$\begin{array}{r} & & & \\ & 74^{\circ} & 48' \\ & 74 & 45 \end{array}$	72° 38' 72 40	$\begin{array}{r} ^{b}\\72^{\circ}\ 33'\\72\ 35\end{array}$	74°26' 74 29	$\begin{array}{r} & & & \\ & 74^\circ \ 27' \\ & 74 \ 31 \end{array}$	
71 46.5 71 {	54.2	74 17.5 -74 3.1		72 39.0 72 72		74 27.5 74 1 32.3		
	Pro Ste	212 28	73	22.7	14.00			
C DI C	as	Ne	edle No. 1.	Poles revers	ed.	10	-	
	CIRCLE	EAST.	AN		CIRCLE	WEST.		
Face	west.	Face	east.	Face	west.	Face east.		
$72^{\circ} \frac{a}{47'}$ 72 45	73° 21' 73 19	73° 13′ 73 11	73° 32' 73 30	69 [°] 55' 69 59	$ \begin{array}{r} b \\ 69^{\circ} 48' \\ 69 51 \end{array} $	$72^{\circ}24'$ 72 28	72° 27' 72 29	
72 46.0 73 (73 20.0 03.0 73 1	73	4	69	69 49.5 53.2 71	72 5		
13.25 BEE	212 415	142 24	72	11.2	2.32 21 3	6.12 Ja	4 70 12	

MAGNETIC INCLINATION

June 29, 1853.	Needle No. 2. Poles re-	versed. Meridian reads 1	06° 01′.				
CIRCLE	EAST.	- CIRCLI	WEST.				
Face east.	Face west.	Face east.	Face west.				
80° 07' 80° 05' 80 11 80 07	a b 82° 08' 81° 59' 82 08 81 58	80° 28′ 80° 36′ 80 25 80 34	a 80° 30' 80 28 80° 50' 80 49				
80 09.0 80 06.0 80 07.5	82 03.3	80 30.7	80 39.2				
81 05.4 80 50.2							
and a second	Needle No. 2.	Poles direct.					
CIRCLI	EAST.	CIRCLE	WEST.				
Face east.	Face west.	Face east.	Face west.				
a b 80° 47′ 80° 38′ 80 46 80 41	a b 80° 28' 80° 29' 80 28 80 29	a b 80° 13' 80° 24' 80 10 80 22	^a 80° 42′ 80 40 80 39				
80 43.0							
00	80						

STATION NO. II. FISKERNAES, FLAGSTAFF NEAR THE GOVERNOR'S HOUSE. Latitude 63° 05'.3. Longitude 50° 34'4. W. of G.

STATION NO. III. FISKERNAES HARBOR, ON A SMALL ISLAND ON THE NORTH SIDE OF HARBOR.

July 1, 1853. Needle No. 2. Poles direct. Meridian reads 150° 22'.								
CIRCLE	CIRCLE	EAST.						
Face west.	Face east.	Face west.	Face east.					
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	79°54′ 80°03′ 7957 8006	a b 81° 59' 82° 05' 81 59 82 03	80° 53' 79° 49' 80 50 79 51					
82 25.5 83 02.5 79 55.5 80 04.5 81 59.0 82 04.0 80 51.5 79 50.0 82 44.0 80 00.0 82 01.5 80 20.7 81 22.0 81 16.6 81 11.1								
	Needle No. 2.							
CIRCLE	WEST.	CIRCL	E EAST.					
Face east.	Face west.	Face east.	Face west.					
a b 81° 07' 81° 23' 81 11 81 23	a b 79° 52' 80° 00' 79 55 80 02	a 80° 49' 80 46 80° 52' 80 58	79° 54′ 79° 54′ 79 53 79 53					
81 09.0 81 23.0 81 16.0 80	79 53.5 79 53.5 79 53.5 22.3							

STATION NO. IV. SAIKATLE, ISLAND SOUTH FROM SUKKERTOPPEN. (Latitude and longitude not determined.)

The magnetic station was on a small bay on the southeast side of the island, and is covered with water at high tide. The Lloyd needles only were used.

.

STATION NO. V.	SUKKERTOPPEN, IN THE GARDEN NEAR THE GOVERNOR'S HOU	ISE.
	(Latitude and longitude not determined.)	
T. 1. 0. 1000		

CIRCLE WEST.				W OXING	CIRCLI	E EAST.		
Face east. Face west.				Face e	east.	Face west.		
80° 30'	80° 43'	81° 15′	81° 48'	80° 46'	80° 30'	81°20'	81° 20'	
80 28	80 46	81 15	81 45	80 46	80° 33	81 20	81 21	
80 29.0	80 44.5	81 15.0	81 46.5	80 46.0	80 31,5	81 20.0	81 20.5	
80 8	6.7	81	30.7	80 3	8.8	81	20.2	

	Needle No. 2.	Poles direct.				
CIRCLI	WEST.	CIRCLE EAST.				
Face east.	Face west.	Face east. Face west.				
a 81° 30' 81° 28' 82° 25' 82° 25' 82° 24'	a b b b c <thc< th=""> <thc< th=""> <thc< th=""> <thc< th=""></thc<></thc<></thc<></thc<>	a b 80° 53' 80° 42' 80 57 80 45	79° 31' 79° 04' 79 34 79 05			
81 29.0 82 24.5 81 56.7 81	80 15.5 80 38.5 80 27.0 11.8 80 2	80 55.0 80 43.5 80 49.2 80 6	79 32.5 79 04.5 79 18.5 93.8			

5 5 6 5 St - ----

MAGNETIC INCLINATION

July 19,	1853.	Needle No.	2. Poles dire	ect. Magne	tic meridian	0° 33′.	
	CIRCLE	EAST.	all the same	. Ital	· CIRCLI	E WEST.	
Face	east.	Face	west.	Face	east.	Fac	e west.
$\begin{array}{r} & a \\ 82^{\circ} 35' \\ 82 34 \end{array}$	$\begin{array}{r} $	83° 16' 83 14	83° 19' 83 17	82° 38' 82 40		83° 44′ 83 47	$ \begin{array}{c c} & & & \\ & & 83^{\circ} & 44' \\ & & 83 & 47 \end{array} $
82 34.5 82 3		83	83 18.0 16.5	82 39.0 82	40.5	83	
	82 5	8.0	83 ()5.5	83	13.0	
		Ne	edle No. 2.	Poles reverse	ed.		
(and	CIRCLE	EAST.			CIRCLE	WEST.	
Face	east.	Face	west.	Face	east.	Face	west.
$83^{\circ} \frac{15'}{15'}$ 83 14	83° 14' 83 12	83° 11' 83 10	<i>b</i> 83° 30′ 83 28	a 83° 30' 83 30	$ \begin{array}{r} b \\ 83^{\circ} 19' \\ 83 21 \end{array} $	$82^{\circ}14'$ 82 17	$82^{\circ}23'$ 82 25
83 14.5 83 1	3.7	83 10.5 83 6.7		83 30.0 83 9	83 20.0 25.0 82		
	00 1		83 0	4.5			- Contraction
	N	eedle No. 2.	Poles direct	t. Meridian	reads 0° 33'		
and the second	CIRCLE	EAST.			CIRCLE	WEST.	
Face	east.	Face	west.	Face	east.	Face	west.
83° ^a 10' 83 08	$\begin{array}{r} & & & \\ & 83^{\circ} & 02' \\ & 83 & 01 \end{array}$	81° 30' 81 30	$81^{\circ} 35'$ $81 34$	82° 22' 82 23	82° 27' 82 29	83° 28' 83 29	$83^{\circ} 41'_{83}$
83 09.0 83 0	5.2	81 3	81 34.5 32.2	82 22.5 82 5	25.2	83	83 42.5 35.5
ine serie	82 1	8.7	82 3	39.5 •	83	00.3	
		Ne	edle No. 2.	Poles reverse	ed.		
	CIRCLE	EAST.			. CIRCLE	WEST.	
Face	east.	Face	west.	Face	east.	Face	west.
	83° 20' 83 19		^b 82° 52' 82 49	83° 03' 83 05	83° 19' 83 20	^{<i>a</i>} 82 [°] 30′ 82 32	82° 32' 82 34
	16.7	82	82 50.5 53.3	83 04.0 83	11.7	82 3	82 33.0 32.0
	83 (0.6	82 5	58.4	82 (1.8	

STATION NO. VI. PROVEN, GROUND NEAR THE GOVERNOR'S HOUSE. Latitude 72° 25'.9. Longitude 55° 25' (both approximate).

AT UPERNAVIK.

LE EAST. •	CIRCL	E WEST.
Face west.	Face east.	Face west.
	x 83° 13' 83° 16 83° 33' 83° 36'	$\begin{array}{ c c c c c c c c c c c c c c c c c c c$
84 20.5	83 24.5	84 00.0 84 13.0 84 06.5 45.5
		1010
Needle No. 2	. Poles reversed.	Wetteren College
LE EAST.	CIRCI	JE WEST.
Face west.	Face east.	Face west.
' 83° 22' 83° 20 83 20 . 83 18	2 83° 33' 83° 44' 83 34 83 45	a b 83° 40' 83° 28' 83 42 83 30
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0 83 33.5 83 44.5 83 39.0	83 41.0 83 29.0 83 35.0
3'))	Face west. B' $84^{\circ} 22'$ $84^{\circ} 21'$ 84 21 84 18 1.5 84 21.5 84 19. 84 20.5 3 30.7 8. Needle No. 2 CLE EAST. Face west. O' $83^{\circ} 22'$ $83^{\circ} 20'$ $83^{\circ} 20'$ 83 20 83 18	Face west. Face east. S' $\frac{a}{84}^{\circ} 22'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 21'$ $83^{\circ} 13'$ $83^{\circ} 33'$ S' $84^{\circ} 21'$ $84^{\circ} 18$ $83^{\circ} 13'$ $83^{\circ} 34.5$ '' S' $84^{\circ} 20.5$ $83^{\circ} 21'$ $83^{\circ} 21'$ $83^{\circ} 33'$ '' S' $83^{\circ} 22'$ $83^{\circ} 20'$ $83^{\circ} 33'$ $83^{\circ} 44'$ '' $83^{\circ} 20'$ $83^{\circ} 18$ $83^{\circ} 34'$ $83^{\circ} 45'$

STATION NO. VII. UPERNAVIK, STATION IN GARDEN NEAR THE GOVERNOR'S HOUSE. (Latitude and longitude not determined.)

STATION NO. VIII. BEDEVILLED REACH, FORCE BAY. STATION HALF A MILE EAST OF ANCHORAGE(?). Latitude 78° 34'.5. Longitude 71° 33'.6.

	CIRCLE	EAST.			CIRCLE	E WEST.	1 - A MAR
Face	east.	Face	west.	Face	east.	Face	west.
^a 84° 54′ 84 48	$ \begin{array}{r} \delta \\ 85^{\circ} \ 03' \\ 84 \ 59 \end{array} $	86° 12' 86 17	86° 35' 86 30	84° 16' 84 14	^b 84° 17' 84 14	86° 18' 86 19	86° 02' 86 04
84 51.0 84 5	85 01.0 56.0 85 3	86	86 32.5 23.5	84 15.0 84		86 18.5 86 1	86 03.0 10.7

Face east.
85° 44' 85° 43' 85 40 85 39
85 42.0 85 41.0 85 41.5
5

STATION NO. IX. NEAR MARSHALL BAY. Latitude 78° 52'. Longitude 69° 01'.¹

The observations on September 3d, 1853, were made with the Lloyd needle, No. 1, Box B. The dip by the statical needle is 85° 26', and the resulting corrected dip 84° 49'. See Narrative, vol. I. p. 99.

STATION NO. X. VAN RENSSELAER HARBOR, WINTER QUARTERS. MAGNETIC OBSERVATORY ON FERN ROCK.

Latitude 78° 37'. Longitude 70° 40'. W. of G.

	CIRCLE	WEST.	1		CIRCL	E EAST.	
Face	east.	Face	west.	Face	east.	Face	west.
83° 05' 83 05	83° 02' 83 03	83° 48' 83 47	85° 06' 85 05	82° 53' 82 47	82° 30' 82 26	85° 16' 85 10	85° 22' 85 17
83 05.0 83 (83 47.5 84	and the second se	82 50.0 82 :		85 13.0 85 57.6	85 19.5 16.2
	83 4	1.61	83 5	51.3	00		
		Ne		01.3 Poles reverse	ed.	E EAST.	1. CH19
Face	CIRCLE	Ne west.			ed.	E EAST.	west.
	CIRCLE	Ne west.	edle No. 2.	Poles reverse	ed.	E EAST.	west.

² Erroneously given 67° 01' in the Narrative, vol. II. p. 431; the date should also be changed as given above.

22

February	7 16, 1854:	Needle	No. 2. Pole	es direet. M	eridian reads	69° 30′.	
	CIRCLE	WEST.		in their ai	CIRCL	E EAST.	
Face	west.	Face	east.	Face	west.	Face	east.
85° 38' 85 38	$\begin{array}{c c} & & \\ & 86^{\circ} & 02' \\ & 86 & 02 \end{array}$	^a 84° 41' 84 41	^b 84° 30' 84 28	85° 24' 85 23	85° 38' 85 39	83° 51' 83 56	83° 44' 83 44
85 38.0 85 5	•	84 41.0 84 1 12.5		85	31.0		83 44.0 48.7
II K		Ne	edle No. 2.	Poles revers	ed.	abi magnet	11.2 A.75
	CIRCLE	WEST.			CIRCL	E EAST.	
Face	west.	Face	east.	Face	west.	Face	e east.
84° 28' 84 30	$ \begin{array}{r} b \\ 84^{\circ} 25' \\ 84 23 \end{array} $	84° 53' 84 52	84° 49' 84 49	84° 35' 84 36	^b 84° 33' 84 33	85 [°] 11′ 85 13	85° 38′ 85 38
84 29.0 84 1			84 49.0 50.7		84 33.0 34.2 84	85 2	
February	7 23, 1854. CIRCLE	In the second	84 - No. 2. Pole			eridian 67° 3 s west.	5′.
Face	east.	Face	west.	Face	east.	Face	west.
85° 30' 85 26	85° 35' 85 30	85°11' 85 06	$ 85^{\circ} 14' 85 10 $	85 [°] 06' 85 08	85° 04' 85 07	84° 26' 84 27	$ \begin{array}{r} b \\ 84^{\circ} 12' \\ 84 14 $
85 28.0 85 5	85 32.5 30.2 85 2	85 08.5 85 80.2	85 12.0 10.2 85 (85	06.2		84 13.0 19.8
		N	eedle No. 2.		t.		
	CIRCLE				-	WEST.	
Face	east.	Face	west.	Face	east.		west.
84° 27' 84 24	84° 08' 84° 04	85° 01' 84 57		^a 84° 28' 84 29	^b 84° 12' 84 14	85° 06' 85 07	85° 13' 85 15
84 25.5 84 1	84 06.0 15.7 84 4	85			84 13.0 20.7	85	
	04 9	14.0			84 -	10.4	

37.

No. of station.	Locality.	. Date.	No. of needle.	DI Pole direct.	P. Pole reversed.	Difference for change of polarity.	Mean and resulting dip.
I. "	New York eity	May 18, 1853	22	73° 01'.4 73 09.3	72° 46'.8 72 54.6	+14'.6 +14.7	72° 54′.1 72 61.9
			$\frac{2}{1}$	73 44.1	72 15.1	+89.0	72 59.6
"	** **	May 20, "	1	73 22.7	72 11.2	+71.5	72 47.0
II.	Fiskernaes	June 29, "	2	80 32.3	80 50.2	-17.9	80 41.3
III.	Fiskernaes Harbor	July 1, "	2	81 16.6	80 29.4	+47.2	80 53.0
IV.	Saikatle	July 9, "	Ll.	(Approx			80 56.0
V.	Sukkertoppen	July 9, "	2	80 37.8	81 01.6	-23.8	80 49.7
VI.	Proven	July 19, "	2	83 05.5	83 04.5	+ 1.0	83 05.0 82 57.0
**	44	11 11	2	82 39.5	82 58.4	-18.9	82 49.0)
VII.	Upernavik	July 22, "	2	83 38.1	83 45.0	- 6.9	83 41.5
VIII.	Bedevilled Reach	Aug. 12, "	2	85 26.3	84 49.7	+36.6	85 08.0
IX.	Marshall Bay	Sept. 3, "	Ll.	(Approx	imate.)	-	84 49.0
X.	Fern Rock Obser-		1.00		121-1		
1.0	vatory, Van Rens-	200 M	1.200		72		
	selaer Harbor	Jan. 26, 1854		83 51.3	85 08.0	-76.7	84 29.7
"	11 11	Feb. 16, "	2	84 56.2	84 49.1	+ 7.1	84 52.6
"		Feb. 23, "	2	84 44.0	85 01.6	-17.6	84 52.8
**	<i>u u</i>	March 2, "	2	-		-	84 49.0 84 45.8
"	11 11	June 10, "	2				84 41.2
"	<i>u u</i>	11 11	2				84 51.0
	<i>u u</i>	April 24, 1855	2	(12	sets.)		84 48.7
"	<i>u u</i>	May 20, "	2				84 35.6 /

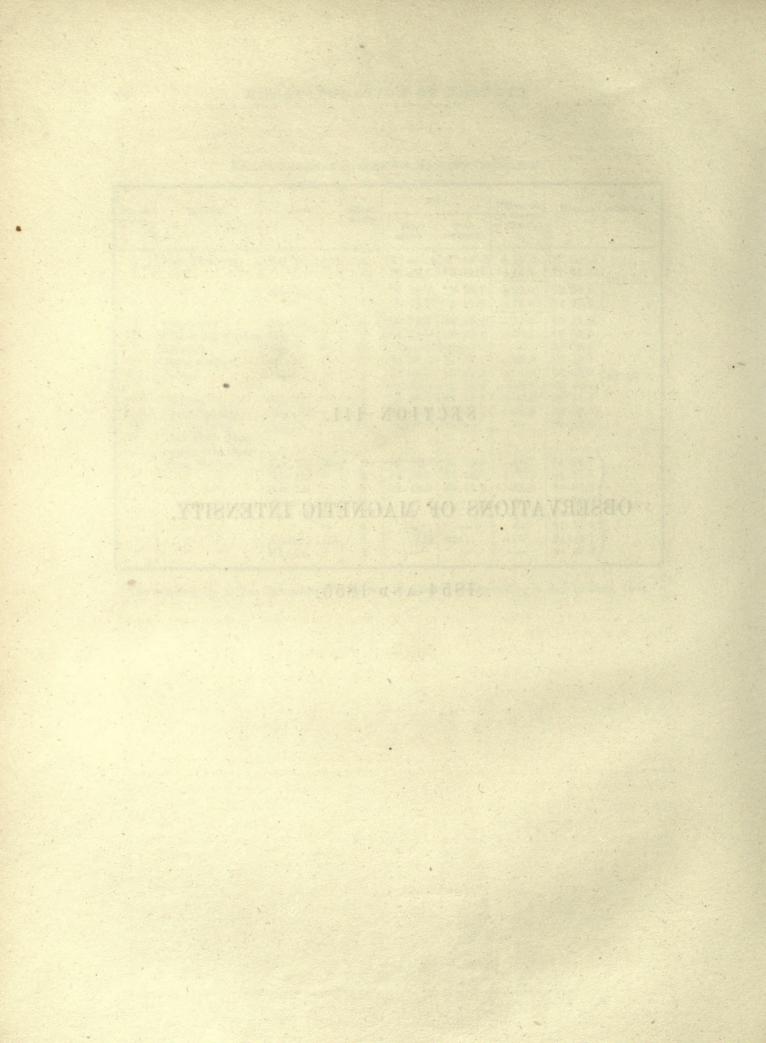
RECAPITULATION OF RESULTS FOR MAGNETIC INCLINATION.

The resulting dip at Van Rensselaer Harbor may be taken as corresponding in time to June, 1854.

SECTION III.

OBSERVATIONS OF MAGNETIC INTENSITY.

1854 AND 1855.



SECTION III.

OBSERVATIONS AND DISCUSSION OF THE MAGNETIC INTENSITY.

THE instrument used (a unifilar magnetometer) has already been described. For the determination of the intensity, the long magnet A. 67 has exclusively been used for oscillations and deflections. The effect of the torsion in the suspension was found so small that it was neglected. The vibrations have been observed in sets of two, one containing the readings of the chronometer when the magnet was moving in the direction of the scale readings, and the other when the magnet was moving in the opposite direction.¹ A mean time pocket chronometer was generally used for noting the time, and its rate was too small to affect sensibly the duration of a single vibration. In the deflections, the magnets were always kept at right angles to one another; the distance of the middle of the deflecting magnet, A. 67, from the suspended magnet, is given by a scale divided into feet and decimals of a foot.² The observations were made by Mr. A. Sonntag. At Van Rensselaer Harbor the observations extend over the time from January, 1854, to May, 1855. Two other stations were occupied, one in June, 1855, at Hakluyt Island, the other in July, on the coast between Parker Snow Point and Cape York, at the return of the party.

The necessary constants have been determined at Washington, D.C.

6

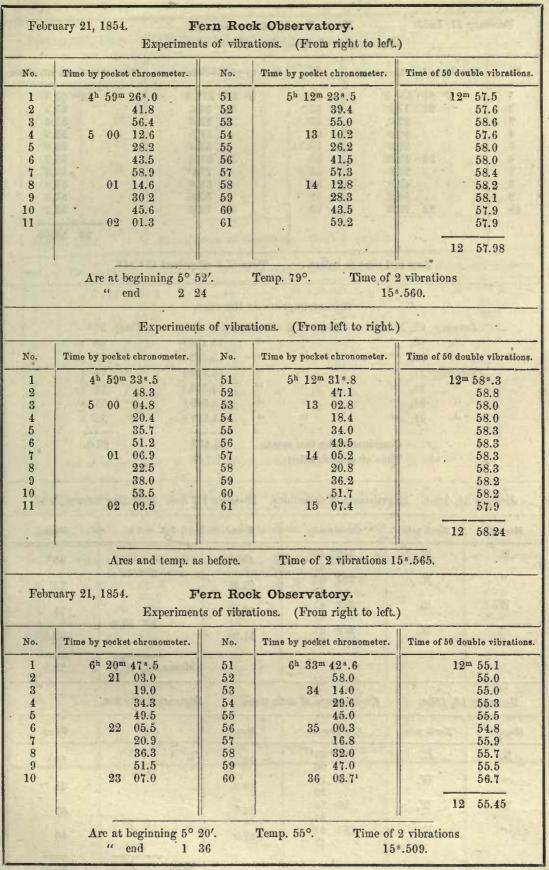
Magnet A. 67 is nearly three inches in length, the two other magnets, I. 7 and I. 10, are somewhat shorter.

S ANTIPE DATE OF THE REAL PROPERTY OF THE REAL PROP

¹ The vibrations given in the Narrative, vol. II., Appendix, No. XV., pp. 431-434, are, therefore, double vibrations, and should have been noted as such.

² By some inadvertence, Appendix No. XV. of vol. II. of the Narrative contains the distances ex-, pressed in inches; it should have been given in feet and decimals, thus, 13 inches should be 1.3 feet, and 9 inches should read 0.9 feet.

No.	Time by pocket chronometer.	No.	Time by pocket chronometer.	Time of 45 double vibration
1	5h 58m 37s.3	46	6h 10m 10s.8	11 ^m 33 ^s .5
2	52.9	47	26.3	33.4
3	59 08.0	48	41.4	33.4
4	23.8	49	57.0	33.2
5	38.7	50	11 12.7	34.0 33.5
6	54.5 6 00 09.9	51 52	28.0 43.3	33.4
4 5 6 7 8 9	- 25.9	53	58.4	32.5
9	40.2	54 .	12 14.0	33.8
10	55.8	55	29.6	• 33.8
				Mean 11 ^m 33 ^s .45
Janin	ary 18, 1854. F	28 s from lef ern Roc	14 t to right could not be obser ok Observatory.	we in the alterna
No.	Experimen	ts of vibr	ations. (From right to left) Time of 50 double vibratio
				12 ^m 54.5
$\frac{1}{2}$	5h 30m 43s.0 58.8	51 52	5 ^h 43 ^m 37 ^s .5 53.8	12 ^m 54.5 55.0
	31 · 14.0	53	44 08.8	54.8
3 4	29.3	54	23.9	54.6
5	44.4	55	39.8	55.4
6	32 00.0	56	• 54.0	54.0 55.5
7 8	15.3 31.5	57 58	45 10.8 25.8	54.3
9	46.5	59	41.8	55.3
10	33 02.0	60	57.0	55.0
11	18.1	61	46 12.5 _	54.5
	And the second second second		en altree faches in he	
	Are at beginning 4° " end 1	40'. 12	•	2 vibrations 5 [*] .496.
Janr			ock Observatory. rations. (From left to right	l.)
No.	Time by pooket chronometer.	No.	Time by pocket chronometer.	
1	5h 30m 50s.8	51	5h 43m 46s.7	12m 55s.9
2	31 06.7	52	44 02.0	55.3
3 4	22.0 36.9	53 54	18.4 32.7	55.8
4 5	52.9	55	49.0	56.1
6	32 08.0	56	45 04.8	56.8
7	23.8	57	20.0	56.2
8 9	39.2	58	35.3	56.1 56.2
9 10	54.8 33 10.3	59 60	51.0 46 07.0	56.7
11	26.0	61	22.2	56.2
		1	the second se	1



¹ Corrected by 10^s.

No.	Time by pocket chrone	ometer. No.	Time by pocket ch	ronometer.	'ime of 50 douhle vi	bratio
1	6h 20m 55s.2	51	6h 33m 51		12 ^m 55.8	2
2	21 11.0	52	34 06		55.5	
3	27.0	53	22		55.6	
4 .	42.0	54	37		55.5	5
5 6 7 8 9	57.5	55	53		55.9	
6	22 13.3	56	35 08		55.3	
8	29.0 43.8	57 58	25		56.0 55.8	
9	59.2	. 59	55		56.3	
10	23 15.3	60	36 12		• 56.7	
	a				12 55.8	34
engri	Arcs and	time as before.	Time of 2 vib	orations 15 ^s .5	17.	
		Drach Dymyrr	ATION OF RESULTS			
	January 17, 1854		2 vibrations 15 ^s .4	1	emp. 50°	
-	" 18, "	"	" 15.49		" 68)	
	" 18, "	"	" 15.59	~	" 68 }	
	February 21, "	"	" 15.50		" 79)	
	" 21, "		" 15.56		" 79 }	
	" 21, "	**	" 15.50		· 55)	
	" 21, "	"	" 15.51	<u> </u>	· 55 }	
	21,	6 212	10.01			
		abination by two			63.0	
Januar		e of one vibration	n 7.74		63.0	67
Januar Magnet.	y 31, 1854. Expe		n 7.74	9	cting magnet A	
	y 31, 1854. Expe	eriments of deflect	n 7.74 ions. Distance 1.	9 3 feet. Deflec Diff. or 2 u	eting magnet A 	p
Magnet. E.	y 31, 1854. Expe	criments of deflect Circle reads. 318° 40' 41 287 57 57	n 7.74 ions. Distance 1.	9 3 feet. Deflec	eting magnet A 	p
Magnet. E. " W.	y 31, 1854. Expe	criments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47	n 7.74 ions. Distance 1. 	9 3 feet. Deflec Diff. or 2 u	eting magnet A 	p
Magnet. E. 	y 31, 1854. Expe	criments of deflect Circle reads. 318° 40' 41 287 57 57 288 47	n 7.74 ions. Distance 1. 	9 3 feet. Deflec Diff. or 2 u 30° 4	eting magnet A 	p
Magnet. E. " W.	y 31, 1854. Expe	criments of deflect: Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37	n 7.74 ions. Distance 1. 	9 3 feet. Deflec Diff. or 2 u 30° 4	cting magnet A 	p
Magnet. E. " W.	y 31, 1854. Expe	criments of deflect: Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5	cting magnet A Tem 43'.5 68° 73 75 60.0 72.5 6.7 72.1	p
Magnet. E. " W. " Februar Magnet.	y 31, 1854. Expe North pole. W. E. E. W. W. Y 13, 1854. North pole.	criments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 37 Experiments of c Circle reads.	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4	cting magnet A Tem 43'.5 68° 73 75 60.0 72.5 6.7 72.1	p
Magnet. E. " W. " Februar Magnet. E.	y 31, 1854. Expe North pole. W. E. E. W. Y 13, 1854. North pole. E.	eriments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 Experiments of c Circle reads. 162° 07' 06	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0 leflections. I	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4 Distance 0.97 2 u.	cting magnet A Tem 43'.5 73 75 73 75 72.5 6.7 72.1 5 feet. Tem 5 feet. Tem	р. 5 1
Magnet. E. " W. " Februar Magnet. E. "	y 31, 1854. Expe North pole. W. E. E. W. Ty 13, 1854. North pole. E. W.	eriments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 Experiments of c Circle reads. 162° 07' 06 83 10 10	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0 leflections. I <u>Mean.</u>	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4 Distance 0.974	cting magnet A Tem 43'.5 73 75 73 75 72.5 6.7 72.1 5 feet. Tem 5 feet. Tem	р. 5 1
Magnet. E. " W. " Februar Magnet. E.	y 31, 1854. Expe North pole. W. E. E. W. Ty 13, 1854. North pole. E. W. W. W.	eriments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 37 Experiments of c Circle reads. 162° 07' 06 83 10 10 86 24 24	n 7.74 ions. Distance 1. Mean. 40'.5 57.0 47.0 37.0 deflections. I Mean. 06'.5 10.0 24.0	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4 Distance 0.97 2 u.	cting magnet A . Tem 43'.5 68° 43'.5 73 50.0 72.5 6.7 72.1 5 feet. Temp 6'.5 61 3.0 65	р. 5 1
Magnet. E. " W. " Februar Magnet. E. " W.	y 31, 1854. Expe North pole. W. E. E. W. Ty 13, 1854. North pole. E. W.	eriments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 Experiments of c Circle reads. 162° 07' 06 83 10 10 86 24	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0 deflections. I <u>Mean.</u> 06'.5 10.0	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4 Distance 0.974 2 u. 78° 5	Cting magnet A Tem 43'.5 68° 43'.5 73 50.0 72.5 6.7 72.1 5 feet. Tem 6'.5 61 65 61	р. 5 1
Magnet. E. " W. " Februar Magnet. E. " W.	y 31, 1854. Expe North pole. W. E. E. W. Ty 13, 1854. North pole. E. W. W. W.	eriments of deflect Circle reads. 318° 40' 41 287 57 57 288 47 47 319 37 37 S7 Experiments of c Circle reads. 162° 07' 06 83 10 10 86 24 24 164 47	n 7.74 ions. Distance 1. <u>Mean.</u> 40'.5 57.0 47.0 37.0 deflections. I <u>Mean.</u> 06'.5 10.0 24.0 47.0	9 3 feet. Deflec Diff. or 2 u 30° 4 30 5 Means 30 4 Distance 0.974 2 u. 78° 5	Cting magnet A Tem 43'.5 73 43'.5 73 50.0 72.5 6.7 72.1 5 feet. Tem 50° 61 65 61 65 66	p

-	et. North pole.	Circle reads.	Mean.	2 u.	Temp.
E.	E.	140° 54'.5	54'.5	0.100-20.	58°
"	W.	54.5 109 58	58.5	30° 56'.0	58
W.	W.	$\begin{array}{c} 59\\110&31\end{array}$	31.5		58
"	• E.	32 141 15	15.0	30 43.5	56
		15		30 49.7	57.5
June	7, 1854. E	xperiments of vil	brations. (Left to right	ght.)	The second
No.	Time by chronometer 2	721. No.	Time by chronometer	2721. Time of 4	15 double vibration
1	3h 04m 34s.2	46	3h 16m 02s.5	•	11 ^m 28 ^s .3
2	49.4	47	17.8		$\begin{array}{c} 28 \\ 28.0 \end{array}$
3 4	20.3	48 49	33.0 48.3	The second	28.0
5	35.8	50	17 03.6	212	27.8
6	51.1	51	19.0		27.9
6 7	06 06.3	52	34.2	0 10	27.9
8	21.8	53	49.4		27.6
9	36.9	54	18 04.8	10 20 20	27.9
10	52.1	55	20.0	E I	27.9
	and the second sec	1		-	
	Ano of bosinging 69	01 M amm	1.000 ///		11 27.97
	te of mean time chron	48 ometer 2721 (sho experiments of vil		left.)	5 ^s .288.
June	" end 2 te of mean time chron 7, 1854. E	48 ometer 2721 (sho experiments of vil	owing nearly Greenwi brations. (Right to Time by chronometer	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. 5 double vibration
June No. 1 2	" end 2 te of mean time chron 7, 1854. F Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6'	48 ometer 2721 (sho experiments of vil 2721. No. 46 47	brations. (Right to Time by chronometer 3 ^h 16 ^m 10 ^s .2 25.5	ch time), about left.)	5 ^s .288. 2 ^s .0 losing.
June No.	" end 2 te of mean time chron 7, 1854. F Time by chronometer 3 ^h 04 ^m 42 [*] .3	48 ometer 2721 (sho experiments of vil 2721. No. 46	bwing nearly Greenwi brations. (Right to Time by chronometer 3 ^h 16 ^m 10 ^s .2	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. 5 double vibration 11 ^m 27 ^s .9 27.9 28.1
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1	48 ometer 2721 (sho experiments of vil 2721. No. 46 47	brations. (Right to Time by chronometer 3 ^h 16 ^m 10 ^s .2 25.5 40.8 56.0	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. 5 double vibration 11 ^m 27 ^s .9 27.9 28.1
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. F Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1 43.3	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50	brations. (Right to Time by chronometer 3 ^h 16 ^m 10 ^s .2 25.5 40.8 56.0 17 11.2	ch time), about left.)	5*.288. 2*.0 losing. 5 double vibration 11 ^m 27*.9 27.9
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1 43.3 58.8	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50 51	bwing nearly Greenwi brations. (Right to Time by chronometer $3^{h} 16^{m} 10^{s} . 2$ 25.5 40.8 56.0 17 $11.226.5$	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. 5 double vibration. 11 ^m 27 ^s .9 27.9 28.1 27.9
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1 43.3 58.8 06 13.8	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50 51 52	Description Contraction of the second s	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. 5 double vibration 11 ^m 27 ^s .9 27.9 28.1 27.9 28.1 27.9 28.1
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1 43.3 58.8 06 13.8 29.2	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50 51 52 53	Description Contraction of the second s	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. ⁵ double vibration: 11 ^m 27 ^s .9 27.9 27.9 27.9 27.9 27.7 28.1 27.9 27.7 28.1 28.2
June No. 1 2 3 4 5 6 7 8 9	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 [*] .3 57.6' 05 12.7 28.1 43.3 58.8 06 13.8 29.2 44.4	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50 51 51 52 53 54	brations. (Right to Time by chronometer 3 ^h 16 ^m 10 ^s .2 25.5 40.8 56.0 17 11.2 26.5 41.9 57.4 18 12.5	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. ⁵ double vibration: 11 ^m 27 ^s .9 27.9 27.9 27.9 27.9 27.7 28.1 27.9 27.7 28.1 28.2 28.1
June No. 1 2 3 4	" end 2 te of mean time chron 7, 1854. E Time by chronometer 3 ^h 04 ^m 42 ^s .3 57.6' 05 12.7 28.1 43.3 58.8 06 13.8 29.2	48 ometer 2721 (sho experiments of vil 2721. No. 46 47 48 49 50 51 52 53	Description Contraction of the second s	ch time), about left.)	5 ^s .288. 2 ^s .0 losing. ⁵ double vibration: 11 ^m 27 ^s .9 27.9 27.9 27.9 27.9 27.7 28.1 27.9 27.7 28.1 28.2

No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 45 double vibration
1	3h 22m 08s.0	46	3h 33m 37s.0	11 ^m 29 ^s .0
2	23.3	47	52.3	29.0
3	38.5	48	34 07.6	29.1
4	53.8	49	23.0	29.2
4 . 5 6	23 09.2	50	38.2	29.0
6	24.5	51	53.7	29.2
7	39.7	52	35 09.0	29.3
8	55.0	53	24.5	29.5
9	24 10.3	54	39.6	29.3
10	25.7	55	54.9	29.2
	Si Singan		Carrier Contention	11 29.18
Tuno	Arc at beginning 6° 8'. " end 2 48 7, 1854. Experime	Temp ents of vib		prations 15 [*] .315.
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 45 double vibration
1	3h 22m 16s.0	46	$3^{h} 33^{m} 45^{s}.0$	11 ^m 29 ^s .0
2	$\begin{array}{c} 31.2\\ 46.3 \end{array}$	47	$\begin{array}{ccc} 34 & 00.2 \\ & 15.5 \end{array}$	29.0
3 4 5 6	46.3 23 01.8	48 49	15.5 30.9	29.2 29.1
4 5	23 01.8	49 50	46.3	29.1
6	32.3	51	35 01.5	29.2
7	47.8	52	16.8	29.0
8	24 . 03.1	53	32.2	29.1
9	18.3	54	47.3	29.0
10	. 33.3	55	36 02.5	29.2
	Arcs and temp. as	hafara	Time of 2 vibrations 1	11 29.11
June		•	rations. (Left to right.)	
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 54 double vibratio
1	8h 12m 39s.1	55	8h 26m 30s.7	13 ^m 51 ^s .6
2	. 54.5	56	46.0	51.5
3	13 09.8	57	27 01.5	51.7
4	25.1	58	17.0	51.9
5	40.3	59	32.2	51.9
4 5 6 7	56.0	60	47.8	51.8
7	14 11.3	61	28 03:2	51.9
8	$\begin{array}{c} 26.5 \\ 42.1 \end{array}$	62	18.8	52.3
9 10	42.1 57.5	63 64	. 34.0 49.3	51.9 51.8
	01.0	04	47.0	
10				13 51.83

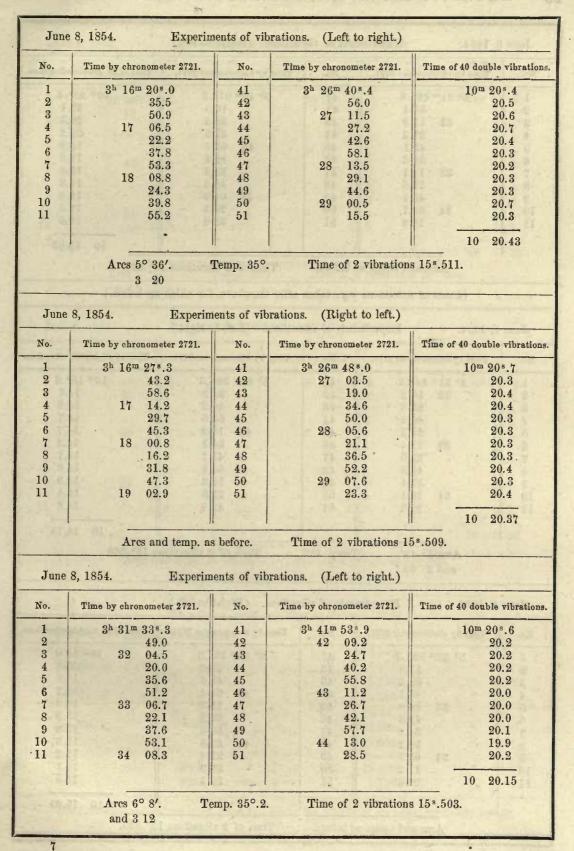
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 54 double vibrations
1	8h 12m 46s.8	. 55	8h 26m 38s.5	13 ^m 51 ^s .7
2	13 02.0	56	54.0	52.0
3	17.2	57	27 09.3	52.1
4	. 32.6	58	24.8	52.2
4 5	48.1	59	40.3	52.2
6	14 03.3	60	55.7	52.4
7 8	18.7	61	28 11.1	52.4
8	34.0	62	26.4	52.4
9	49.5	63	41.9	52.4
10	15 05.0	64	57.4	52.4
			a monteout	13 52.22
	Ares and time as l	before.	Time of 2 vibrations 15	5 ⁸ .412.
June	7, 1854. Experim	ents of vit	prations. (Left to right.)	1
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 50 double vibration
1	8h 35m 17s.1	51	8h 48m 07s.8	12m 50s.7
2	32.2	52	23.1	50.9
3	48.0	53	38.6	50.6
4 5 6	36 03.3	54	54.0	50.7
0 C	19.0 34.3	55 56	49 09.3	50.3 50.5
6 7	49.6	56 57	$\begin{array}{r} 24.8 \\ 40.1 \end{array}$	50.5
8	37 05.1	58	55.6	50.5
9	20.6	59	50 10.9	50.3
10	36.2	60	26.3	50.1
11	• 51.5	61	41.6	50.1
-			and and a	12 50.47
		'emp. 35°.	Time of 2 vibration	s 15 ^s .409.
	3 12			
-		ents of vil	1	11
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 50 double vibration
1	8h 35m 24s.7	51	8h 48m 15s.2	12 ^m 50 ^s .5
2 3	40.0	52 52	30.7	50.7
а 4	$\begin{array}{c} 55.2\\ 36 10.8\end{array}$	$\begin{array}{c} 53 \\ 54 \end{array}$	46.0	50.8
5	26.2	54 55	49 01.3 16.8	50.5 50.6
6	42.0	56	. 32.2	50.0
7	57.2	57	47.7	50.5
8	37 12.7	58	. 50 03.0	50.3
9	28.3	59	18.7	50.4
10	43.8	60	33.8	50.0
11	59.0	61	49.2	50.2
				12 50.43

		RECAPITULAT	TION OF I	Result	s, J	UNE 7, 1854.	- andratu 1
* Set No. 1.	Time of	2 vibrations				. 15*.288	Temp. 33°
						15.288	" 33
Set No. 2.	"	"				. 15.315	" 33
						15.313	" 33
Set No. 3.	"	"				. 15.403	" 35
						15.412	" 35
Set No. 4.	66	"				. 15.409	" 35
						15.409	" 35
June 7, 1854	ŧ.	Mean .				. 15.355	+ 34.0
		Time of 1	ribration			. 7.678	

Magnet.	North pole.	Circle reads.	Mean.	2 u.	Temp.
W.	E.	374° 16′.3 15.0	15'.7	1000 01/ 0	36°.2
" .	W. '	265 55.0 54.0	54.5	108° 21′.2	38.0
W.	W.	260 58.0 55.5	56.7	105 000	36.0
"	E.	368 31.0 30.0	30.5	107 33.8	34.0

Experiments of deflections. Distance 1.3 feet.						
Magnet.	North pole.	Circle reads.	Mean.	2 u.	Temp.	
E.	E.	331° 33′.0 31.0	32'.0		34°.5	
"	W.	300 34.0 33.0	33.5	30° 58′.5	34.3	
W.	W.	301 01.0 00.0	00.5	31 35.5	35.8	
66	E.	332 37.0 35.0	36.0	01 00.0	35.0	
-		a state and		Means 31 17.0	34.9	

These two sets of deflections were observed between the second and third set of the preceding vibrations.



	8, 1854. Experin	nents of vib	rations. (Right to left.)	
No.	Time by ohronometer 2721.	No.	Time by chronometer 2721.	Time of 40 double vibrations
1	3h 31m 40s.8	41	3h 42m 01s.2	10 ^m 20 ^s .4
2	56.4	42	16.5	20.1
3	32 11.9	43	32.2	20.3
4	27.3	44	47.5	20.2
5	43.1	45	43 03.0	19.9
6	58.6	46	18.4	19.8
. 7	33 14.1	47	33.9	19.8
8	29.6	. 48	49.4	19.8
9	45.1	49	44 04.9	19.8
10	34 00.7	50	20.3	19.6
11	16.2	51	35.8	19.6
				10 19.93
	Ares and temp. a	li hefere	Time of 2 vibrations	
			after the above, for which	
June	8, 1854. — Experin	nents of vib	rations. (Left to right.)	1
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 40 double vibration
1	8h 31m 54s.3	41	8h 42m 09s.5	10 ^m 15 ^s .2
2	32 10.2	42	24.9	10 10 .2
3	25.3	43	40.2	14.9
4	40.8	44	55.5	14.7
5	56.2	45	43 10.9	14.7
6	33 11.4	46	26.2	14.8
7.	27.0	47	41.7	14.7
8	42.3	48	56.9	14.6
9	57.4	49	12.3	14.9
10	34 13.1	50	27.5	14.4
11	28.3	51	42.9	14.6
-				10 14.75
	Arcs 6° 48'. and 2 08	Temp. 35°.	Time of 2 vibration	ns 15 ^s .369.
June		nents of vib	rations. (Right to left.)	Along & Chile
No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 40 double vibration
1	8h 32m 02s.3	41	8h 42m 18s.3	10 ^m 16.0
2	17.8	42	33.6	15.8
3	33.2	43	49.0	15.8
4	48.7	44	43 04.4	15.7
5	33 04.0	45	19.9	15.9
6	19.3	46	35.2	15.9
7	34.8	47	50.6	15.8
8	50.2	48	44 06.0	15.8
9	34 05.5	49	21.4	15.9
10	21.2	50	36.9	15.7
11	36.8	51	52.3	15.5
	and the second s	11		
	The second second	1.000	and the second	10 15.80

No.	Time by chronometer 2721.	No.	Time by chronometer 2721.	Time of 40 donble vibration
1	, 8h 48m 52s.0	41	8h 59m 04s.6	10 ^m 12 ^s .6
2	49 07.3	42	19.7	12.4
3	23.0	43	35.3	12.3
4	38.2	44	50.5	12.3
3 4 5 6 7 8 9	53.4 50 08.9	45	9 00 05.8 21.1	12.4
7	24.3	46 47	36.3	12.2 12.0
8	39.6	48	51.6	12.0
	54.7	49	1 07.0	12.3
10	51 10.1	50	22.2	12.1
11	25.3	51	37.5	12.2
	Ares 6° 56'.	Temp. 35°.	Time of 2 vibrations	s 15°.306.
	and 3 20			Department in handle
June	8, 1854. Experim	nents of vibra	ations. (Right to left.)	
No.	Time by ohronometer 2721.	No.	Time by chronometer 2721.	Time of 40 double vibration
1	8h 48m 59s.8	41	8h 59m 12s.0	10 ^m 12 ^s .2
2	49 15.1	42	27.5	12.4
3	30.3	43	42.8	12.5
4 5	$\begin{array}{r} 45.8\\50 & 01.1\end{array}$	44 45	58.0 9 00 13.4	12.2 12.3
6	16.3	40 46	9 00 13.4 28.6	12.3
7	31.8	47	43.9	12.5
8	47.2	48	59.3	12.1
9	51 02.2	49	01 14.6	12.4
10 11	17.8 33.0	50 51	29.9	12.1
11	00.0	51	45.3	12.3
	Sie wander		3.3D-1	10 12.26
	Arcs and temp. a	as before.	Time of 2 vibrations 1	5*.306.
	Daily re	te of chronom	meter 2721, losing 1 ^s .0.	
	RECAPIT	TULATION OF	Results, June 8, 1854.	
Set	t No. 1. Time of 2 vibrat	ions .	15*.511	Temp. 35°
			15.509	" 35
Se	t No. 2. " "	1000	15.503	" 35.2
			15.498	" 35.2
Se	t No. 3. """"		15.369	" 35
			15.395	" 35
C.	t No. 4. " "	·	15.306	" 35
De			15.306	" 35
De				
De	Means	5	15.425	35.0

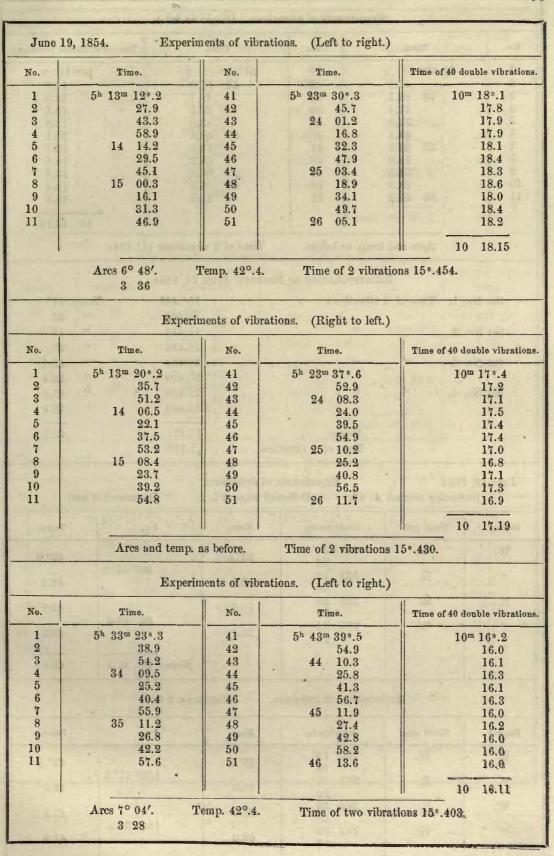
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June 8, 1: De	854. flecting magnet		of deflections. ed magnet I. 1		3 feet.
Magnet.	North pole.	Circle reads.	Mean.	2 n.	Temp.
W.	E.	329° 46'	45'.5		36°.7
"	W.	$\begin{array}{r} 45\\298&36\end{array}$	35.0	31° 10′.5	87.7
E.	W.	34 298 08		00 0 00	1
**	E.	06 329 41	07.0	31 33.5	37.0
		40	40.5	E and	36.2
				Means 31 22.0	36.9
	Exp	eriments of deflection	ıs. Dista	ance 0.9 feet.	
Magnet.	North pole.	Circle reads.	Mean.	2 u.	Temp.
E.	E.	365° 52′.5	51′.7	minora.	37°.2
"	W.	51.0 254 54	53.5	· 110° 58′.2	36.6
W.	W.	$\begin{array}{r} 53\\262 \ 30\end{array}$	29.0		37.0
"	E.	28 369 08	. 07.0	106 38.0	37.0
		06	01.0		
				Means 108 48.1	36.9
Experiments of deflections. Distance				ance 0.9 feet.	
Magnet.	North pole.	Circle reads.	Mean.	2 u.	Temp.
W.	E.	369° 08'.0 06.5	07'.2		37°.2
"	W.	262 20 18	19.0	106° 48'.2	37.0
E.	w.	254 41	40.5	Contraction of the	37.6
<i>u</i> .	E.	40 364 48.0	47.2	110 06.7	36.6
		46.5	11.2	Basker	
			1. S. 1. S.	Means 108 27.4	.37.1
Experiments of deflections. Distance 1.3 fcet.					
Magnet.	North pole.	Circle reads.	Mean.	2 n.	Temp.
E.	E.	328° 52′ 52	52'.0		36°.0
"	W.	297 23 22	22.5	31° 29′.5	35.2
W.	W.	298 03	02.5		36.3
"	E.	$ \begin{array}{r} 02 \\ 329 \\ 13 \\ 12 \end{array} $	13.0	31 10.5	37.0
	and the second s	13	Rec LIAIH	Means 31 20.0	36.1
			7	1.10000 20.0	00.1

June 19, 1854. Experiments of deflections.							
	Deflecting magnet .		ted magnet I. 7		nce 0.9 feet.		
Magnet.	North pole.	Circle reads.	Mean.	2 u.	Temp.		
W.	W.	268° 50' 49	49'.5		40°.6		
" ,	E.	$\begin{array}{ccc} 376 & 23 \\ & 22 \end{array}$	22.5	107° 3	41.6		
E.	E.	$\begin{array}{ccc} 373 & \overline{05} \\ 04 \end{array}$	04.5	100.0	. 41.2		
"	W	$\begin{array}{ccc} 267 & 00 \\ 266 & 59 \end{array}$	59.5	106 0	41.2		
				Means 106	49.0 41.1		
213	Experiments of deflections. Distance 1.3 feet.						
Magnet	. North pole.	Circle reads.	Mean.	2 u.	Temp.		
E.	W.	. 303° 38′ 37	37'.5		40°.8		
"	E.	334 21 20	20.5	30° 4	41.0		
W.	E.	$\begin{array}{r} 20\\334 46\\46\end{array}$	46.0		43.5		
u	W.	304 04 03	03.5	30 4	43.0		
				Means 30	42.7 42.1		
June 19, 1854. Experiments of vibrations. (Left to right.)							
No.	Time.1	No.	Time.	Ti	ime of 40 double vibrations.		
1 .	4 ^h 33 ^m 20 ^s .1 35.3	41 42	4h 43m 38	*.6 4.0	10 ^m 18 ^s .5 18.7		
3	51.0	43	44 0	0.5	18.5		
4 5	$\begin{array}{rrr} 34 & 06.5 \\ & 21.9 \end{array}$	44 45		5.0 0.4	18.5 18.5		
6	37.3	46	54	5.9	18.6		
7	52.8	47	45 1	1.2	18.4		
89	35 08.3	48		3.6	18.3		
10	23.8 39.3	49 50		2.1	18.3 18.4		
11	54.9	51		3.0	18.1		
			- mail		10 18.44		
	Arcs 7° 28'. and 3 44	Temp. 43°.	Time of	2 vibrations 1			

¹ Number of chronometer not stated.

June	19, 1854. Exper	iments of vib	rations. (Right to left.)
No.	Time.	No.	Time.	Time of 40 double vibrations.
1	4h 33m 28s.2	41	4h 43m 46s.8	10 ^m 18 ^s .6
2	43.4	42	44 02.3	18.9
3	59.0	43	17.8	18.8
4	34 14.3	44	33.2	18.9
3 4 5 6 7 8	29.9 45.3	45	48.6	18,7
0 17	35 00.9	46 47	$\begin{array}{ccc} 45 & 04.2 \\ & 19.5 \end{array}$	18.9
8	16.3	48	19.5 35.1	, 18.6 18.8
9	31.9	49	50.4	18.5
10	47.2	50	46 05.8	18.6
11	36 02.8	51	21.4	18.6
	a set and man			
	l	<u> </u>		10 18.72
	Arcs and temp.	as before.	Time of 2 vibrations	s 15 ^s .463.
	Experi	ments of vibra	ations. (Left to right.)	and and a state of
No.	Time.	No.	Time.	Time of 40 double vibrations.
1	4h 50m 26s.2	41	5 ^h 00 ^m 44 ^s .0	10m 17s.8
2	41.8	42	59.3	17.5
3	57.3	43	01 14.8	17.5
4	51 12.9	44	30.3	17.4
5 6	28.2	45	45.9	17.7
6	43.5	46	02 01.3	17.8
7	59.1 $52 14.5$	47 48	16.7	17.6
9	29.9	40	32.2 47.7	17.7 17.8
10	45.4	50	03 03.2	17.8
11	53 01.0	51	18.8	17.8
	1000 555	11 - 1		10 17.67
	Arcs 6° 56'.	Temp. 43°.	Time of 2 vibration	ons 15 ^s .442.
	and 4 00			
	Experi	ments of vibr	ations. (Right to left.)	and the second
No.	Time.	No.	Time.	Time of 40 double vibrations.
1	4h 50m 34s.1	41	5h 00m 51 .6	10 ^m 17 ^s .5
2	49.5	42	01 07.1	17.6
3	51 04.9	43	22.4	17.5
4	20.3	44	37.9	17.6
5 6	35.9	45	53.4	17.5
6	51.2	46	02 08.9	17.7
7	52 06.9	47	24.3	17.4
8 9	22.2	48	. 39.6	17.4
9 10	37.8 53.1	49 50	$\begin{array}{c} 55.0\\03 10.3\end{array}$	17.2
10	53 08.6	51	$\begin{array}{ccc} 03 & 10.3 \\ & 25.8 \end{array}$	17.2
11	00 00.0	01	20.0	11.2
				10 17.44
	Arcs and temp.	as before.	Time of 2 vibrations	158.436.
				and the second



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No. Time. No. Time. Time of 40 double vibration 1 5b 33m 31*2 41 41 44 02.8 10m 16*.0 3 34 02.1 43 18.1 16.0 16.0 4 17.4 44 33.5 16.0 16.0 5 33.0 45 40.0 16.0 16.0 6 48.4 46 45.0 16.1 16.1 7 35.03.7 47 19.8 16.1 16.1 8 13.0 48 35.2 16.2 16.3 10 34.5 49 50.6 16.3 16.4 11 26 05.2 51 21.3 10.16.15 Arcs and temp. as before. Time of 2 vibrations 15*.404. 43 Set No. 1. Time of 2 vibrations 15*.461 Tomp. 43° Set No. 2. " " 15.433 42.4 42.4 Set No. 3. " " 15.433 42.4		and the second	Experiments of vibra	tions. (Righ	t to left.)	- also		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	No.	Time.	No.	Time.	Time of	40 double vibrations.		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	1	5h 33m 31s.2	41	5h 43m 47	15.2	10 ^m 16 ^s .0		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$								
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$								
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	45							
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$	6							
$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	7					16.1		
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$								
11 36 05.2 51 21.3 16.1 Item of 2 vibrations 15*.404 RECATTULATION OF RESULTS, JUNE 19, 1854. Set No. 1. Time of 2 vibrations 15*.461 Tomp. 43° Set No. 1. Time of 2 vibrations 15*.461 Tomp. 43° Set No. 1. Time of 2 vibrations 15*.461 Tomp. 43° Set No. 2. " " 15*.461 Tomp. 43° Set No. 2. " " Set No. 2. " " Set No. 3. " 15.461 Tomp. 43° Set No. 3. " 15.461 Tomp. 43° Set No. 3. " 15.463 " 43 Set No. 4. " Set No. 4. " Set No. 4. Set No. 4. <td colspan="2" s<="" td=""><td></td><td></td><td></td><td></td><td></td><td></td></td>	<td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
$\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$								
Time of 2 vibrations $15^{*}.404.$ RECAPTULATION OF RESULTS, JUNE 19, 1854. Set No. 1. Time of 2 vibrations 15*.461 Temp. 43° Set No. 2. " "	1. 1.							
RECAPTIVLATION OF RESULTS, JUNE 19, 1854. Set No. 1. Time of 2 vibrations 15**461 Temp. 43° Set No. 2. " 15.463 " 43 Set No. 2. " 15.442 " 43 Set No. 3. " 15.442 " 43 Set No. 3. " 15.442 " 43 Set No. 3. " 15.454 " 42.4 Set No. 3. " 15.454 " 42.4 Set No. 4. " 15.454 " 42.4 Set No. 4. " 15.430 " 42.4 Set No. 4. " 15.430 " 42.4 Means 15.430 " 42.4 Means Time of 1 vibration T. Time of 1 vibration Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Means 2 n. Temp. W. 298° 54' 53'.5 30° 53'.0 W. 298° 54' 53'.5 30° 53'.0 W. 298° 54' 53'.5 30° 53'.0 4	1		11 1	m :	11	10 16.15		
Set No. 1. Time of 2 vibrations 15*.461 Temp. 43° Set No. 2. """ 15.463 "43 Set No. 3. """ 15.436 "43 Set No. 3. """ 15.436 "43 Set No. 3. """ 15.436 "42.4 Set No. 3. """ 15.430 "42.4 Set No. 4. """ 15.430 "42.4 Set No. 4. """ 15.437 42.7 Time of 1 vibration 7.718 42.7 Jane 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54′ 53′.5 30° 53′.0 42.2 E. 829 47 46.5 42.2 43.2 "W. 298° 30 29.5 30 50.0 42.2 "W. 298 30 29.5 30 50.0 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 E. W. 259° 19′		Arcs and temp. as before. Time of 2 vibrations 15 [*] .404.						
Set No. 2. " " 15.463 " 43 Set No. 2. " " 15.463 " 43 Set No. 3. " " 15.436 " 42.4 Set No. 3. " " . 15.430 " 42.4 Set No. 4. " . . 15.430 " 42.4 Set No. 4. " . . 15.437 42.4 15.437 42.4 42.4 42.4 42.4 .		F	ECAPITULATION OF R	RESULTS, JUNI	s 19, 1854.			
$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	Se	t No. 1. Time of S	2 vibrations .		158.461	Temp. 43°		
Set No. 2. 15.436 43 Set No. 3. " 15.436 43 Set No. 3. " 15.436 42.4 15.430 "42.4 15.430 42.4 Set No. 4. " 15.403 "42.4 Set No. 4. " . 15.403 "42.4 Means . 15.437 42.7 Time of 1 vibration . 7.718 42.7 June 19, 1854. Experiments of deflections. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. 298° 54' 53'.5 30° 53'.0 42°.0 "E. 329 47 46.5 43.2 "W. 298 30 29.5 30 50.0 43.2 "W. 298 30 29.5 43.2 42.4 Lexperiments of deflection. Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'/5 106° 11'.5 42°					15.463	" 43		
Set No. 3. " " . . 15.454 " 42.4 Set No. 4. " . . 15.403 " 42.4 Set No. 4. " . . 15.403 " 42.4 Set No. 4. " . . 15.403 " 42.4 Set No. 4. " " . . 15.403 " 42.4 Means 15.403 " 42.4 Means . <	Se	t No. 2. "			15.442	" 43		
Set No. 4. " " 15.430 " 42.4 Set No. 4. " " . 15.403 " 42.4 Means . . 15.403 " 42.4 Means . . 15.437 42.4 Means . . 15.437 42.7 Time of 1 vibration . 7.718 42.7 June 19, 1854. Experiments of deflections. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54' 53'.5 30° 53'.0 42°.0 " E. 329 47 46.5 46.5 42.2 E. E. 329 20 19.5 30 50.0 42.0 " W. 298 30 29.5 . 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 106° 11'.5 42.0	Sec. Sec.				15.436	" 43		
Set No. 4. " " . . 15.403 " 42.4 Means . . 15.404 " 42.4 Means . . . 15.437 42.7 Time of 1 vibration . . 7.718 42.7 Jnne 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. 298° 54′ 53′.5 30° 53′.0 42°.0 " E. 329 47 46.5 42.2 E. E. 329 20 19.5 30 50.0 42.2 " W. 298 30 29.5 43.2 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19′ 18′.5 106° 11′.5 42°.2 " E. 365 31 30.0 106° 11′.5 42.0	Se	t No. 3. "	"		15.454	" 42.4		
Bet NO. 4. 10.403 12.4 Means 15.404 42.4 Means 15.437 42.7 Time of 1 vibration 7.718 42.7 June 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Means 2 15.437 42.7 W. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54′ 53′.5 30° 53′.0 42°.0 " E. 329 47 46.5 30° 53′.0 42.2 E. E. 329 20 19.5 30 50.0 42.2 " W. 298 30 29.5 30 50.0 42.0 " W. 298 30 29.5 42.0 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19′ 18′.5 106° 11′.5 42°.2 " E. 365 31 30.0	P				15.430	" 42.4		
Means . 15.437 42.7 June 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54' 53'.5 30° 53'.0 42°.0 W. W. 298° 54' 53'.5 30° 53'.0 42.2 E. 329 47 46.5 42.2 42.2 E. 329 47 46.5 42.2 43.2 W. 298 30 29.5 30 50.0 42.2 W. 298 30 29.5 42.4 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 Experiments of deflection. Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 106° 11'.5 42°.2 W. 259° 19' 18'.5 30.0 106° 11'.5 42.0	Se	t No. 4. "	"		15.403			
Time of 1 vibration . 7.718 Time of 1 vibration . 7.718 Jnne 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54' 53'.5 30° 53'.0 42°.0 " E. 329 47 46.5 30° 53'.0 42.2 E. E. 329 20 19.5 30 50.0 42.2 " W. 298 30 29.5 30 50.0 42.0 Means 30 51.5 42.4 Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 106° 11'.5 42°.2 " E. 365 31 30.0 106° 11'.5 42.0	1.000				15.404	" 42.4		
Time of 1 vibration . 7.718 Time of 1 vibration . 7.718 Jnne 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54' 53'.5 30° 53'.0 42°.0 " E. 329 47 46.5 30° 53'.0 42.2 E. E. 329 20 19.5 30 50.0 42.2 " W. 298 30 29.5 30 50.0 42.0 Means 30 51.5 42.4 Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 106° 11'.5 42°.2 " E. 365 31 30.0 106° 11'.5 42.0	1.000		Y		15 105	10 5		
Image 19, 1854. Experiments of deflections. Deflecting magnet A. 67. Deflected magnet I. 7. Distance 1.3 feet. Magnet. North pole. Circle reads. Mean. 2 n. Temp. W. W. 298° 54' 53'.5 30° 53'.0 42°.0 "W. W. 298° 54' 53'.5 30° 53'.0 42°.0 "E. 329 47 46.5 46.5 42.2 E. 329 20 19.5 30 50.0 42.0 "W. 298 30 29.5 30 50.0 42.0 Experiments of deflection. Distance 0.9 feet. Means 30 51.5 42.4 Experiments of deflection. Distance 0.9 feet. Temp. E. W. 259° 19' 18'.5 106° 11'.5 42°.2 "E. W. 259° 19' 18'.5 106° 11'.5 42°.2 E. S65 31 30.0 106° 11'.5 42.0				• • •		42.1		
W. W. $298^{\circ} 54'_{53}$ $53'.5$ $30^{\circ} 53'.0$ $42^{\circ}.0$ " E. $329 47$ 46.5 $30^{\circ} 53'.0$ 42.2 E. E. $329 20$ 19.5 $30 50.0$ 43.2 " W. $298 30$ 29.5 $30 50.0$ 42.0 " W. $298 30$ 29.5 $30 50.0$ 42.0 L $298 30$ 29.5 $30 51.5$ 42.4 Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. $2 u$. Temp. E. W. $259^{\circ} 19'$ $18'.5$ $106^{\circ} 11'.5$ $42^{\circ}.2$ " E. $365 31$ 30.0 $106^{\circ} 11'.5$ 42.0		Deflecting magnet	A. 67. Deflect	ted magnet I.	7. Distance 1.	1		
" E. 329 47 46.5 30° $53'.0$ $42'.0$ E. E. 329 20 19.5 30 50.0 43.2 " W. 298 30 29.5 30 50.0 42.0 " W. 298 30 29.5 30 51.5 42.0 L. . . . Distance 0.9 feet. 42.4 Magnet. North pole. Circle reads. Mean. $2u$. Temp. E. W. 259° $18'.5$ 106° $11'.5$ 42.0 Magnet. North pole. Circle reads. Mean. $2u$. Temp. E. W. 259° $19'$ $18'.5$ 106° $11'.5$ $42^{\circ}.2$ " E. 365 31 30.0 106° $11'.5$ 42.0	Magne			Mean.	2 n.	Temp.		
" E. $329 47$ 46 46.5 $30^{\circ} 53'.0$ 42.2 E. E. $329 20$ 19 19.5 $298 30$ 29 $30 50.0$ 43.2 42.0 " W. $298 30$ 29 29.5 $30 50.0$ 42.0 	W.	W.		53'.5		42°.0		
E. E. $329 \ 20 \ 19 \ 19 \ 19 \ 298 \ 30 \ 29 \ 29 \ 29 \ 29 \ 29 \ 29 \ 29 \ 2$	u	E.			30° 53'.0	10.0		
"W. $\frac{19}{298} \frac{19}{30}$ $\frac{13.3}{29.5}$ $\frac{30}{30} \frac{50.0}{42.0}$ "W. $\frac{298}{29}$ $\frac{29.5}{29.5}$ $\frac{30}{15.5}$ $\frac{42.0}{42.4}$ Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. $2u.$ Temp. E. W. 259° $18'.5$ 106° $11'.5$ $42^{\circ}.2$ "E. W. 259° $18'.5$ 106° $11'.5$ 42.0			46	46.5		42.2		
"W. 298 30 29 29.5 30 50.0 42.0 Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18 18'.5 . 106° 11'.5 42.0 "E. W. 259° 19' 29 30.0 . 106° 11'.5 42.0	E.	E.		19.5		43.2		
Means 30 51.5 42.4 Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 42.9 42°.2 " E. 365 31 30.0 106° 11'.5 42.0	"	W.	298 30	29.5	30 50.0	42.0		
Experiments of deflection. Distance 0.9 feet. Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18'.5 42°.2 " E. 365 31 30.0 42°.2			29					
Magnet. North pole. Circle reads. Mean. 2 u. Temp. E. W. 259° 19' 18 18'.5 42°.2 42°.2 " E. 365 31 29 30.0 106° 11'.5 42.0				•	Means 30 51.5	42.4		
E. W. 259° 19' 18 365 31 29 $18'.5$ 30.0 \cdot 106° 11'.5 $42^{\circ}.2$ 42.0		Ex	periments of deflectio	n. Dist	ance 0.9 feet.			
" E. $18 \\ 365 \\ 29 \\ 29 \\ 30.0 \\ 30.0 \\ 30.0 \\ 30.0 \\ 30.0 \\ 30.0 \\ 30.0 \\ 42.0 \\ 42.0 \\ 42.0 \\ 42.0 \\ 30.0 \\ 3$	Magne	t. North pole.	Circle reads.	Mean.	2 u.	Temp.		
" E. 365 31 30.0 \cdot 106° $11'.5$ 42.0	E.	W.		18'.5		42°.2		
29 30.0 42.0		E			· 106° 11'.5			
	1.000		29	30.0	1 1 1 1 2	42.0		
W. E. 369 39 385 43.2	W.	E.	369 39	38.5	State State	43.2		
106 30.5		W			106 30.5			
W. 203 09 08.0 41.8	and the			08.0		41.8		
		-						
Means 106 21.0 42.3					Means 106 21.0	42.3		

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Magnet	t. North pole.	Circle reads.	Means.	2 n.	Temp.
W.	W.	264° 10'	09'.5		38°.0
65	E.	$\begin{array}{c} 09\\ 369 42 \end{array}$		105° 32'.0	
17		41	41.5	a take of	38.0
E.	E.	$ \begin{array}{r} 365 & 00 \\ 364 & 59 \end{array} $	59.5	105 10.0	38.0
"	W.	$\begin{array}{ccc} 259 & 50 \\ & 49 \end{array}$	49.5	105 10.0	38.0
		10		Means 105 21.0	38.0
	Exp	eriments of defle	ection. Dist	ance 1.3 feet.	
Magnet	. North pole.	Circle reads.	Means.	2 u.	Temp.
E.	W.	298° 37'	36'.5		38°.5
"	E.	$\begin{array}{r} 36\\329 21\end{array}$	21.0	30° 44′.5	38.6
W.	E.	21 330 13	1 1 21 31	I LI SAL	
"		12	12.5	30 31.0	40.3
	W.	$\begin{array}{rrr} 299 & 42 \\ & 41 \end{array}$	41.5		40.0
				Means 30 37.7	. 39.4
June	24, 1854. E	experiments of v	ribrations. (Left	to right.)	
To.	Time by chronometer	264. No.	Time by chrono	meter 264. Time of 40	donble vibratio
1	4h 21m 34s.3	41	4h 31m 53		0m 19s.0
23	$\begin{array}{r} 49.6\\ 22 05.2\end{array}$	42 43		8.8	19.2 19.0
4	20.7	44		9.6	18.9
5	36.3	45		5.0	18.7
67	51.8	46		0.4	18.6
8	23 07.3 22.8	47 48		1.8	19.0 19.0
9	38.4	49		7.2	18.8
0	53.8	50		2.5	18.7
1	24 09.1	51	2	8.0	18.9
- [1	10 18.89
	Arcs 6° 16'.	Temp. 41°	.2. Time of	2 vibrations 15 ^s .472.	

No.	Time by chronometer 264.	No.	Time by chronometer 264.	Time of 40 double vibration
1	4h 21m 41s.8	41	4h 31m 59s.0	10 ^m 17 ^s .2
2	57.1	42	32 14.3	17.2
	22 12.6	43	29.2	16.6
3 4 5	28.2	44	. 44.4	16.2
5	43.4	45	59.5	16.1
6 7	59.0	46	33 14.9	15.9
7	23 14.3	47	30.3	16.0
8	29.8	48	45.8	16.0
9	45.2	49	34 01.0	15.8
10	24 00.8	50	16.3	15.5 15.4
11	16.2	51	31.6	10.4
-		-	Sand a Strand of	10 16.17
	Arcs and temp. as	s before.	Time of 2 vibrations	158.404.
T			brations. (Left to right.)	A LEAST AND AND A
June			1	11
No.	Time by ohronometer 264.	No.	Time by chronometer 264.	Time of 40 double vibration
1	4h 40m 31s.1	41	4 ^h 50 ^m 46 ^s .0	10 ^m 14 ^s .9
2	46.5	42	51 01.3	14.8
3	41 02.0	43	. 16.8	14.8
2 3 4 5 6 7	17.4	44	32.0	14.6
5	32.8	45	. 47.5	14.7
6	48.2	46	52 02.8 18.1	14.6
0	42 03.5 18.9	47 48	33.4	14.5
89	34.3	40	48.8	14.5
10	49.8	50	53 04.1	14.3
îi	43 05.1	51	19.4	14.3
int) in the	and the set of second		and the second real of the second	10 14.60
				and the second second
	Arcs 5° 52'. T and 3 20	emp. 41°.	2. Time of 2 vibratio	ons 15 ^s .365.
			24	Carl Carl Carlos Carl
Jnne		ents of vi	brations. (Right to left.)	1
No.	Time by chronometer 264.	No.	Time by chronometer 264.	Time of 40 double vibration
1	4h 40m 38s.8	41	4h 50m 53s.8	10 ^m 15 ^s .0
2	54.2	42	51 09.2	15.0
3	41 09.5	43	24.6	15.1
4 5	24.9	44	40.0	15.1
5	40.2	45	55.4 52 10.8	15.2 15.0
6	55.8	46	52 10.8 26.2	15.0
17	42 11.1 26.3	48 47	41.6	15.1
6 7		41	57.0	15.1
8	410			
8 9	41.9 57.2		53 12.3	15.1
8	41.9 57.2 43 12.6	50 51	53 12.3 27.8	15.1 15.2

58

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AT VAN RENSSELAER HARBOR.

1 2 3 4 5 6 7	5 ^h 03 ^m 29 ^s .3 44.9			Time of 40 double vibration	
2 3 4 5 6		41	5 ^h 15 ^m 44 ^s .5	10 ^m 15.2	
3 4 5 6	44.7	42	59.5	10 10.2	
4 5 6	04 00.3	43	14 15.1	14.8	
5 6	15.6	44	30.4	14.8	
67	31.0	45	45.9	14.9	
7	46.4	46	15 01.3	14.9	
	05 01.8	47	16.8	15.0	
8	17.1	48	32.2	15.1	
9	32.3	49	47.7	15.4	
10	47.8	50	16 02.9	15.1	
11	06 03.2	51	18.2	15.0	
				10 14.982	
June 2	aud 3 28	emp. 41°.	2. Time of 2 vibratio prations. (Right to left.)	The second second	
No.	Time by chronometer 264.	Time by chronometer 264.	Time of 40 double vibrations.		
1	5h 03m 37s.1	41	5 ^h 13 ^m 52 ^s .0	10 ^m 14.9	
2	52.4	42	14 07.6	15.2	
3	04 07.8	~ 43	23.0	15.2	
4	23.2	44	38.3	15.1	
5	38.4 *	45	53.8	15.4	
6	53.8	46	15 09.1	15.3	
7	05 09.3	47	24.5	15.2	
8	24.5	48	39.9	15.4	
9	40.0	49	55.2	15.2	
10	55.0	50	16 10.6	15.6	
11	06 10.8	51	26.0	15.2	
				10 15.24	
Sett	Arcs and temp. as	before.	Time of 2 vibrations 1	5*.381.	
June 2	4, 1854. Experime	ents of vib	rations. (Left to right.)		
No.	Time by chronometer 264.	No.	Time by chronometer 264.	Time of 40 double vibrations.	
1	5h 18m 388.3	41	5h 28m 54s.8	10m 16*.5	
2	54.0	42	29 10.1	16.1	
3	19 09.3	43	25.3	16.0	
3 4 5 6	24.9	44	40.8	15.9	
5	40.3	45	56.2	15.9	
6	55.7	46	30 11.6	15.9	
0	20 11.2	47	27.0	15.8	
7 8 9	26.7	48	42.4	15.7	
	42.2 57.5	49 50	57.8 31 13.1	15.6 15.6	
10	21 12.9	50	28.7	15.6	
	21 12.5	01	20.1	10.0	
	-)2'te 5%			10 15.89	

59

MAGNETIC INTENSITY, FERN ROCK OBSERVATORY

		the second second			1		
No.	Time by chrone	ometer 264.	No.	Time by chronom	eter 264.	Time of 40	double vibrations
1	5 ^h 18 ^m 4		41	5h 29m 024		1	0m 16s.5
2		01.9	42	18		Shi Tri ti	16.1
3		17.2	43	33		200 - 200-	16.4
4 5		82.8 48.2	44 45	49 30 04			16.2
3 4 5 6		03.6	40	50 04 19			$\begin{array}{c} 16.0 \\ 16.1 \end{array}$
7		19.0	47	35			16.0
8		34.3	48	50			16.1
9	4	49.7	49	31 05	.8		16.1
10		05.1	50	. 21			16.4
11		20.6	51	. 36	.8	-10- Pit	16.2
					25.7%		10 16.19
	Ares	and temp. a	s hefore	Time of 2 vi	brations 1		
		and temp. a					
	•	RECAPITO	LATION OF	RESULTS, JUNE	24, 1854.		
Set N	o. 1. Time	of 2 vibratio	ons .		158.472	Ten	np. 41°.2
					15.404		41.2
Set N	0. 2.	"			15.365	6	41.2
					15.378		41.2
Set N	0: 3.		TEATING .		15.375		41.2
			1. 1. P. 1. P. 1.	*	15.381		41.2
Set N	o 4				15.397	6	41.2
Det 1	0. 1.				15.405		
				- And	10.400		41.2 .
		Mean			15.397		41.2
4.01		Time of	1 vibration		7.699		
June 24	1054						
				of deflections.			
	, 1804. Deflecting ma			of deflections. ected magnet I. 7	. D	istance 1.3	feet.
	Deflecting ma	ignet A. 67.			. D	1	
Magnet.	Deflecting ma	ignet A. 67. le. Cir	Defi cle reads.	ected magnet I. 7		1	feet. Temp.
	Deflecting ma	ignet A. 67. le. Cir	Defl cle reads. 00° 17'	ected magnet I. 7		1	
Magnet.	North po W.	agnet A. 67.	Defl cele reads. 00° 17' 15	Means.	2	1	Temp. 44°.2
Magnet. W.	Deflecting ma	agnet A. 67.	Defl rele reads. 00° 17' 15 30 29	Means.	2	u.	Temp.
Magnet. W.	North po W.	agnet A. 67.	Defl cele reads. 00° 17' 15	ected magnet I. 7 <u>Means.</u> 16'.0 28.0	2	u.	Temp. 44°.2 43.0
Magnet. W. " E.	Deflecting ma	agnet A. 67.	Defi rele reads. 00° 17' 15 30 29 27 30 41 40	Means.	2	u. 30° 12′.0	Temp. 44°.2
Magnet. W.	Deflecting ma	agnet A. 67.	Defl rele reads. 00° 17' 15 30 29 27 30 41 40 00 04	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5	2	u.	Temp. 44°.2 43.0 42.2
Magnet. W. " E.	Deflecting ma	agnet A. 67.	Defi rele reads. 00° 17' 15 30 29 27 30 41 40	ected magnet I. 7 <u>Means.</u> 16'.0 28.0	2	u. 30° 12′.0	Temp. 44°.2 43.0
Magnet. W. " E.	Deflecting ma	agnet A. 67.	Defl rele reads. 00° 17' 15 30 29 27 30 41 40 00 04	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5	2 3 3	u. 30° 12′.0 30 37.0	Temp. 44°.2 43.0 42.2 42.4
Magnet. W. " E.	Deflecting ma	agnet A. 67.	Defl rele reads. 00° 17' 15 30 29 27 30 41 40 00 04	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5	2	u. 30° 12′.0 30 37.0	Temp. 44°.2 43.0 42.2
Magnet. W. " E.	Deflecting ma	agnet A. 67.	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5	2 3 3	u. 30° 12′.0 30 37.0 30 24.5	Temp. 44°.2 43.0 42.2 42.4
Magnet. W. " E. "	Deflecting ma	Ignet A. 67. Ie. Cir 3 3 3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 ss of deflect:	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista	2 3 Means 3 nce 0.9 fee	u. 30° 12′.0 30 37.0 30 24.5 st.	Temp. 44°.2 43.0 42.2 42.4 42.9
Magnet. W. (1 E. (1) Magnet.	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 4 3 5 5 6 Cir 1 3 3 3 3 3 3 3 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 es of deflecti rele reads.	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5	2 3 Means 3 nce 0.9 fee	u. 30° 12′.0 30 37.0 30 24.5	Temp. 44°.2 43.0 42.2 42.4
Magnet. W. " E. "	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 4 3 5 5 6 Cir 1 3 3 3 3 3 3 3 3 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 es of deflect. rele reads. 61° 24'	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista	2 3 3 Means 3 nce 0.9 fee 2	u. 30° 12′.0 30 37.0 30 24.5 st. u.	Temp. 44°.2 43.0 42.2 42.4 42.9
Magnet. W. (1 E. (1) Magnet.	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 4 3 3 4 3 5 4 5 5 6 7 2	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 ets of deflect: rele reads. 61° 24' 22	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista <u>Means.</u> 23'.0	2 3 3 Means 3 nce 0.9 fee 2	u. 30° 12′.0 30 37.0 30 24.5 st.	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4
Magnet. W. " E. " Magnet. E.	Deflecting ma	egnet A. 67. le. Cir 3: 3: 3: 3: 3: 3: 3: 4: 3: 4: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 es of deflect: rele reads. 61° 24' 22 67 31	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista <u>Means.</u>	2 3 3 Means 3 nce 0.9 fee 2	u. 30° 12′.0 30 37.0 30 24.5 st. u.	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp.
Magnet. W. (1) E. (1) Magnet. E. (1)	Deflecting ma	egnet A. 67. le. Cir 3: 3: 3: 3: 3: 3: 3: 4: 3: 4: 5: 5: 5: 5: 5: 5: 5: 5: 5: 5	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 cs of deflect: rele reads. 61° 24' 22 67 31 30	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista <u>Means.</u> 23'.0 30.5	2 3 3 Means 3 nce 0.9 fee 2	u. 30° 12′.0 30 37.0 30 24.5 st. u.	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4 41.0
Magnet. W. " E. " Magnet. E. " W.	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 3 3 4 3 3 4 3 3 4 5 5 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 rele reads. 61° 24' 22 67 31 30 73 07 05	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista <u>Means.</u> 23'.0	2 3 3 Means 3 nce 0.9 fee 2 1(u. 30° 12'.0 30 37.0 30 24.5 et. u. 06° 07'.5	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4
Magnet. W. (1) E. (1) Magnet. E. (1)	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 3 3 4 3 3 4 3 3 4 5 5 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 es of deflect: rele reads. 61° 24' 22 67 31 30 73 07 05 64 02	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 03.5 ions. Dista <u>Means.</u> 23'.0 30.5 06.0	2 3 3 Means 3 nce 0.9 fee 2 1(u. 30° 12′.0 30 37.0 30 24.5 st. u.	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4 41.0 42.4
Magnet. W. " E. " Magnet. E. " W.	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 3 3 4 3 3 4 3 3 4 5 5 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 rele reads. 61° 24' 22 67 31 30 73 07 05	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 ions. Dista <u>Means.</u> 23'.0 30.5	2 3 3 Means 3 nce 0.9 fee 2 1(u. 30° 12'.0 30 37.0 30 24.5 et. u. 06° 07'.5	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4 41.0
Magnet. W. (' E. (' Magnet. E. (' W.	Deflecting ma	egnet A. 67. le. Cir 3 3 3 3 3 3 3 4 3 3 4 3 3 4 5 5 6 6 7 1 1 1 1 1 1 1 1 1 1 1 1 1	Defi rele reads. 00° 17' 15 30 29 27 30 41 40 00 04 03 es of deflect: rele reads. 61° 24' 22 67 31 30 73 07 05 64 02	ected magnet I. 7 <u>Means.</u> 16'.0 28.0 40.5 03.5 03.5 ions. Dista <u>Means.</u> 23'.0 30.5 06.0	2 3 3 Means 3 nce 0.9 fee 2 1(u. 30° 12'.0 30 37.0 30 24.5 34. u. 06° 07'.5 09 04.5	Temp. 44°.2 43.0 42.2 42.4 42.9 Temp. 41.4 41.0 42.4

60

The detail record of the observations of deflections and vibrations at Van Rensselaer Harbor, in May, 1855, and of the vibrations at Hakluyt Island, and near Cape York, in June and July, 1855, could not be found; the results, however, are preserved in Appendix No. XV. of the Narrative (vol. II.), and are herewith subjoined.

SYNOPSIS OF	RESULTS OF	VIBRATIONS AND DURING TH	DEFLECTIONS, IE YEARS 1854	VAN [®] Rensselae	R HARBOR
			5.94.1	1.1.1	1
D		m: 0			Dit

Date.		Temp.'s observed.	Time of 1 vibration.	Mean adopted. T.	Corresponding temp. t_1 .	Angle of deflection. u.	Distance in feet. r.
1854. January " " February " " "	17 18 18 31 13 21 21 21 21 21 27	$50^{\circ}.0$ 68.0 72.1 60.5 79.0 79.0 55.0 55.0 57.5	7*.705 7.748 7.761 7.780 7.782 7.755 7.758	78.749	63°.0	15° 23'.3 39 20.0 15 24.8	1.3 0.975 1.3
June " " " " " "	7777777777777	33.0 33.0 33.0 33.0 35.0 36.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0 35.0	7.6447.6447.6577.6567.7027.7027.7067.7057.704	7.678	34.0	53 58.7 15 38.5	0.9 1.3
June " " " " " " " " " " " " "	8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	$\begin{array}{c} & 35.0 \\ & 35.0 \\ & 35.2 \\ & 35.2 \\ & 36.9 \\ & 36.9 \\ & 37.1 \\ & 36.1 \\ & 35.0 \\ & 35.0 \\ & 35.0 \\ & 35.0 \\ & 35.0 \\ \end{array}$	7.755 7.754 7.752 7.749 7.685 7.697 7.653 7.653	7.712	35.0	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1.3 0.9 0.9 1.3
June " " " " " " " "	19 19 19 19 19 19 19 19 19 19 19	$\begin{array}{r} 41.1\\ 42.1\\ 43.0\\ 43.0\\ 43.0\\ 43.0\\ 42.4\\ 42.4\\ 42.4\\ 42.4\\ 42.4\\ 42.4\\ 42.4\\ 42.3\end{array}$	7.730 7.731 7.721 7.718 7.727 7.715 7.715 7.702 7.702	} 7.718	42.7	53 24.5 15 21.3 15 25.7 53 10.5	0.9 1.3 1.3 0.9

62 MAGNETIC INTENSITY, FERN ROCK OBSERVATORY.

Dat	е.	Temp.'s observed.	Time of 1 vibration.	Mean adopted. T.	Corresponding temp. t ₁ .	Angle of deflection. u.	Distance in feet. . r.
185- June " "	4. 24 24 24 24 24 24 24 24 24	$38^{\circ}.0$ 39.4 41.2 41.2 41.2 41.2 41.2	7.736 7.702 7.683 7.689			52° 40′.5 15 18.8	0.9 1.3
66 66 66 66 66	24 24 24 24 24 24 24 24	$\begin{array}{c} 41.2 \\ 41.2 \\ 41.2 \\ 41.2 \\ 42.9 \\ 41.6 \end{array}$	7.688 7.690 7.698 7.702	} 7.699	41°.2	15 12.3 53 48.0	1.3 0.9
1855 May " " "	5. 16 16 16 16 16 16	17.0 19.3 17.0 17.0 22.0 19.0	7.448 7.416 7.384 7.371	7.405	19.3	$ \begin{array}{r} 14 & 37.1 \\ 50 & 50.7 \end{array} $	1.3 0.9
May "	17 17 17 17 17	23.0 23.0 23.0 23.0 23.0	7.394 7.388	} 7.391	23.0	49 59.8 14 32.6	0.9 1.3
May "	18 18 18 18	15.0 15.0 27.0 27.0 27.0	7.383 7.385	} 7.384	15.0	$\begin{array}{ccc}14&23.2\\48&00.8\end{array}$	$1.3\\0.9$
May " "	19 19 19 19 19 19	28.0 28.5 28.0 27.0 27.0	7.407 7.413 7.396	} 7.405	28.2	49 00.7 14 36.7	0.9 1.3

Abstract of Observations of Vibrations at Hakluyt Island.

	App	rox.	lat. 77° 23'.	Approx. long.	72° 30' W. of Gr.	
1855.	June	21.	33°.3			
	44	21.	33.3	7.026	78.026	33°.5
	**	21.	33.8	7.033)		

Abstract of Observations of Vibrations at a station in Lat. 76° 03' and long. 68° 00' W. of Gr., on the coast between Parker Snow's Point and Cape York.

1855.	July 19.	40°.0	6 . 475		
	" 19.	41.5	6.489	68.495	40°.5
	" 19.	• 41.2	6.544	0400	20.02
	" 19.	39.5	6.474		

DETERMINATION OF THE MOMENT OF INERTIA OF MAGNET A. 67. (With stirrup and mirror attached.)

No determination of the moment of inertia of magnet A. 67 having been made by the expedition, it became necessary to determine the same afterwards. The following observations for this purpose were made by myself at the Coast Survey Office, Washington, D. C.

Mean time chronometer Kessels 1285. March 18, 1858. Mean local time by Time by obronometer 1285. 18 vibrations. No. of 20 vibrations. No of vibrations. chronometer 1285. vibrations. 9h 31m 10s.7 10h 28m 51s.3 0 0 Im 21s.7 1m 13ª.2 20 32 32.4 18 30 04.5 21.6 13.5 40 33 54.0 36 31 18.0 21.1 13.0 32 31.0 54 60 35 15.1 21.4 13.8 80 36 36.5 72 33 44.8 21.5 13.1 34 90 57.9 100 37 58.0 Mean 1 13.32 Mean 1 21.47 Arc 234^d and 328^d Temp. 71°.0. Temp. 71°.8. (Rate of chronometer too small 1 vibration=4*.073 to affect the result.) 1 vibration = $4^{\circ}.073$. 242 318

After adjusting the instrument and suspending A. 67, the following experiments of vibrations were made:—

The mirror was below the magnet in these two sets; in the following four sets it was above.

Magnet suspended with inertia ring Z, of the following dimensions: Outer diameter 2.322 inches; inner diameter 1.837 inches; thickness 0.188 inches at 69°; weight 648.937 grains: hence $K_1 = \frac{1}{2} (r^2 + r_1^2) w = 4.936$ (in feet and grains), $lg K_1 = 0.69338$.

		Vibrations	with ring.				
No. of vibrations.	Time by chronometer 1285.	20 vibrations.	No. of vibrations.	Time by chronometer 1285.	20 vibrations.		
0 20 40 60 80 100	$\begin{array}{c} 12^{h} \ 34^{m} \ 06^{*}.0 \\ 36 \ 32.2 \\ 38 \ 58.8 \\ 41 \ 24.1 \\ 43 \ 49.6 \\ 46 \ 15.4 \end{array}$	$ \begin{array}{r} 2^m \ 26^{8} . 2 \\ 26.6 \\ 25.3 \\ 25.5 \\ 25.8 \\ \end{array} $ 2 25.88	0 20 40 60 80 100	$\begin{array}{c} 12^{h} \ 48^{m} \ 13^{s}.6\\ 50 \ 39.5\\ 53 \ 05.3\\ 55 \ 31.5\\ 58 \ 00.4\\ 13 \ 00 \ 26.6\end{array}$	2 ^m 25 ^s .9 25.8 26.2 28.9 ¹ 26.2 2 26.02		
Arc 190 228		pp. 75°. bration 7°.294. Vibrations v	Arc 229 ^d - 321 ^d 239 - 301 1 vibration = 7 ^s .301 without ring.				
No. of vibrations.	Time by chronometer 1285.	20 vibrations.	No. of vibrations.	Time by chronometer 1285.	20 vibrations.		
0 20 40 60 80 100	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	- 1 ^m 21 ^s .3 21.3 21.5 21.1 21.9	0 20 40 60 80 100	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	1 ^m 21 ^s .4 20.9 21.5 21.4 21.1		
Are	2984 -2304	1 21.42 Temp. 76°.			1 21.26		
	pration 4 ⁸ .071.	Towhere	TRUE E	1 vibration $= 4^{s}$.	063.		

¹ Omitted, disturbed by a current of air.

MOMENT OF INERTIA OF MAGNET A. 67.

	Observation	ns for torsion.	dinne singe	un Analis S	
Torsion oircle.	Scale readings.	Mean.		Diff.	
74° 164 344 74	$\begin{array}{c c} & 248 \\ \hline & 304 \\ 361 \\ \hline & 234 \\ 11 \\ \hline & 428 \\ 190 \\ \hline & 370 \end{array}$	276 297 220 280	7	21ª 77 60	
2.01.91	For torsion	with ring use	31' = 3	39 ^d for 90°	
' March 19, 1858	3. Vibrations without r	ing. (Mirror above.)	111 10		
No. of vibrations.	Time by chronometer 1285.	20 vibrations.			
0 20 40 60 80	$\begin{array}{r} 9^{h} \ 23^{m} \ 31^{s}.9 \\ 24 \ 53.1 \\ 26 \ 14.3 \\ 27 \ 35.5 \\ 28 \ 56.9 \end{array}$	$ 1^m 21^s.2 \\ 21.2 \\ 21.2 \\ 21.2 \\ 21.4 \\ 21.1 $	T	emp. 75°.	
100	30 18.0	1 21.22	1 vibra	tion= $4^{s}.061$.	
(artisty Bright and	Vibration	s with ring.	118.440	little of a B	
No. of vibrations.	Time by chronometer 1285.	20 vibrations.	The Section	16.6 - 1 - 1	
$ \begin{array}{r} 0 \\ 20 \\ 40 \\ 60 \\ 80 \\ 80 \end{array} $	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	2 ^m 26*.3 26.4 25.8 25.6			
1 C		2 26.02	1 vibra	$tion = 7^*.301.$	
	Recapitular	ION OF RESULTS.	1.	- g -	
March 18, 1858 """""""""""""""""""""""""""""""""""	" with " " " " " " " withont "	4*.073 4.073 4.073 4.071 4.063 4.063 4.061	7*.294 7.301 7,301	Temp. 71°.8 " 71.0 " 75.0 " 75.0 " 76.0 " 76.0 " 75.0 " 75.0	
-there as	Mean by combination	. $T=4.069$ at 74°.0	$T_i = 7.299$ at 75°.0		

The moment of inertia of the magnet (with appendages) K becomes for the temp. 69° (and corrected for torsion)

$$K = K_1 \left(\frac{T^2}{T_1^2 - T^2} \right) = 2.220$$
 and $lg K = 0.34631$.

Using 0.0000068 for the coefficient of dilatation for 1° Fahr., the above lg K for different temperatures becomes:

For 62°,
$$lg K = 0.34628$$
 and $lg \pi^2 K = 1.34058$
" 32, " 0.34609 " = 1.34039 (CHAS. A. S.

MAGNETIC INTENSITY, FERN ROCK OBSERVATORY.

The value of the induction coefficient

9

$$P = -\frac{r^2 r_1^{\,5} \sin . \, u_1 - r_1^{\,2} r^5 \sin . \, u}{r_1^{\,5} \sin . \, u_1 - r^5 \sin . \, u}$$

may be put in the following convenient form-

P =		$-r^2$	<u>σ</u>	· e ³	wł	iere	σ	_	$\frac{\sin. u^1}{\sin. u}$	and	e=	r	
			σ—	· \$ ⁵					sin. u		2	r ₁	•
We find : J	June	7,	1854	ŀ							. I	· ==	-0.007
	"	8,	66										-0.003
	66	8,	66										-0.006
	"	19,	**										+0.009
	"	19,	"										
	46	24,	"										-0.001
	"	24,	"									1	+0.033]
	-		1855	5	•	•						ł	+0.035 }
	"	17,	"		•			•				l	+0.039]
	"	18,	"			•			•				-0.011
	66	19,	**		•	5.							-0.011

If we take the indiscriminate mean of the above values we find P = +0.007, and if we reject the three values marked by brackets, P = -0.004; the latter value is probably nearer the truth than the first one, but both are so small that they may be neglected in the computation of the intensity.

In the absence of observations, the temperature coefficient for the magnetic moment or q may be assumed = 0.0003, a value found for other magnets of the same magnetic moment and size; with but three exceptions, the temperature corrections are small.

After correcting for difference of temperature, the following results for magnetic moment m and horizontal intensity X have been computed by the formulæ

$$\frac{m}{X} = \frac{1}{2} r^3 \sin u \text{ and } m X = \frac{\pi^2 k}{T^2}.$$

66 MAGNETIC INTENSITY, FERN ROCK OBSERVATORY.

Date.	$lg.\frac{m}{X}.$	lg.m X.	m.	X.
1854.				
Jan. 31	9.46463	9.56091	0.326	1.117
Feb. 13	9.46795	9.56243	0.327	1.115
" 27	9.46532	9.56282	0.327	1.119
June 7	9.46954	9.56964	0.330	1.122
·· 7	9.47155	9.56980	0.331	1.120
" 8.	9.47268	9.56583	0.330	1.113
" 8	9.47184	9.56583	0.330	1.114
44 8 44 8	9.47091	9.56581	0.330	1.115
" 8	9.47223	9.56593	0.330	1.114 .
" 19	9.46636	9.56570	0.328	1.121
" 19	9.46371	9.56556	0.327	1.124
" 19	9.46574	9.56552	0.328	1.122
" 19	9.46504	9.56553	9.328	1.123
" 24	9.46218	9.56801	0.327	1.130
" 24	9.46256	9.56782	0.328	1.129
" 24	9.45956	9.56737	0.326	1.133
" 24	9.46855	9.56754	0.330	1.121
1855.	and the line of	sult then die 50	B THE STRENG ST	
May 16	9.44285	9.60156	0.332	1.200
" 16	9.45125	9.60156	0.336	1.189
" 17	9.44593	9.60293	0.334	1.198
" 17	9.44065	9.60293	0.332	1.206
" 18	9.43607	9.60219	0.331	1.210
" 18	9.43286	9.60219	0.329	1.215
" 19	9.43956	9.60148	0.332	1.205
" 19	9.44266	· 9.60148	0.332	1.200
all when the second	Mean va	lue of $m = 0.330$ at $t =$	= 36°.1	Lots or promptin

TABLE OF RESULTS OF $log. \frac{m}{X}$, log. m X, of m the Magnetic Moment of Magnet A. 67, and of the Horizontal Intensity X, at Van Rensselaer Harbor.

RECAPITULATION OF VALUES OF X.

January	31,	1854					X=1.117
February	20,	"					1.117
June	15,	"					1.121
May	18, 1	1855		•			1.203
Mea	n eor	respor	nding to	Jun	e, 1854		1.139

Taking the above value 1.139 for the mean horizontal force during the whole period, and multiplying it by sec. 84° 45'.8, the total force at Van Rensselaer Harbor during the same period becomes $\phi = 12.479$.

By means of the known value of m the horizontal intensity at the stations Hakluyt Island and coast near Cape York has been computed as follows:—

Hakluyt Island, June 21, 1855		X =	=1.344
Coast near Cape York, July 19,	1855	X	1.573

¹ I redetermined m at Washington, D. C., in March, 1858, and found it equal to 0.311, exhibiting but a small loss of magnetism during nearly four years.

DIURNAL CHANGES OF THE MAGNETIC DECLINATION ON TERM-DAYS.

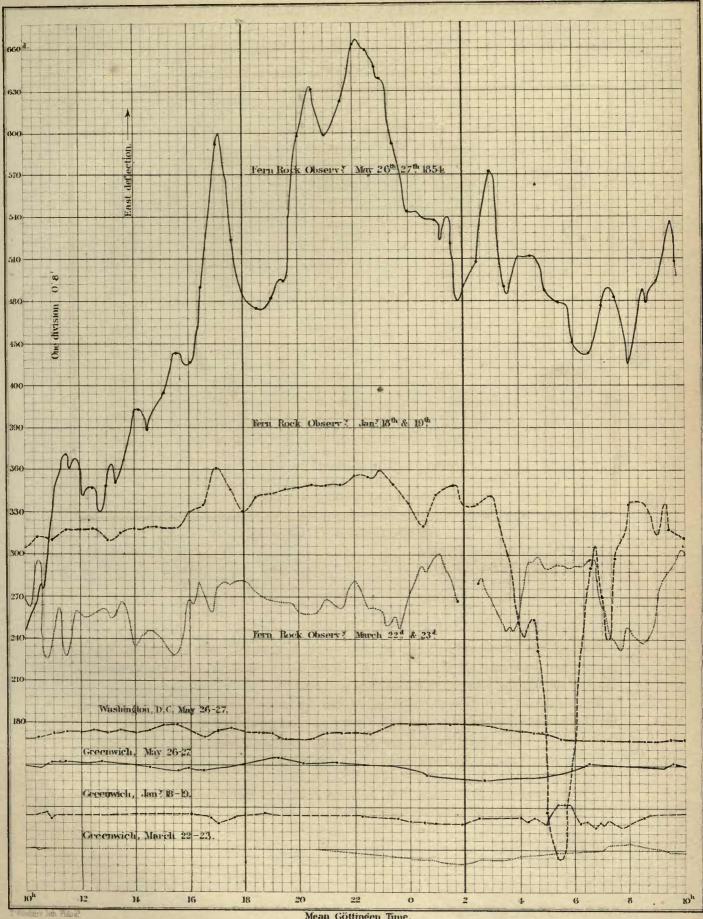
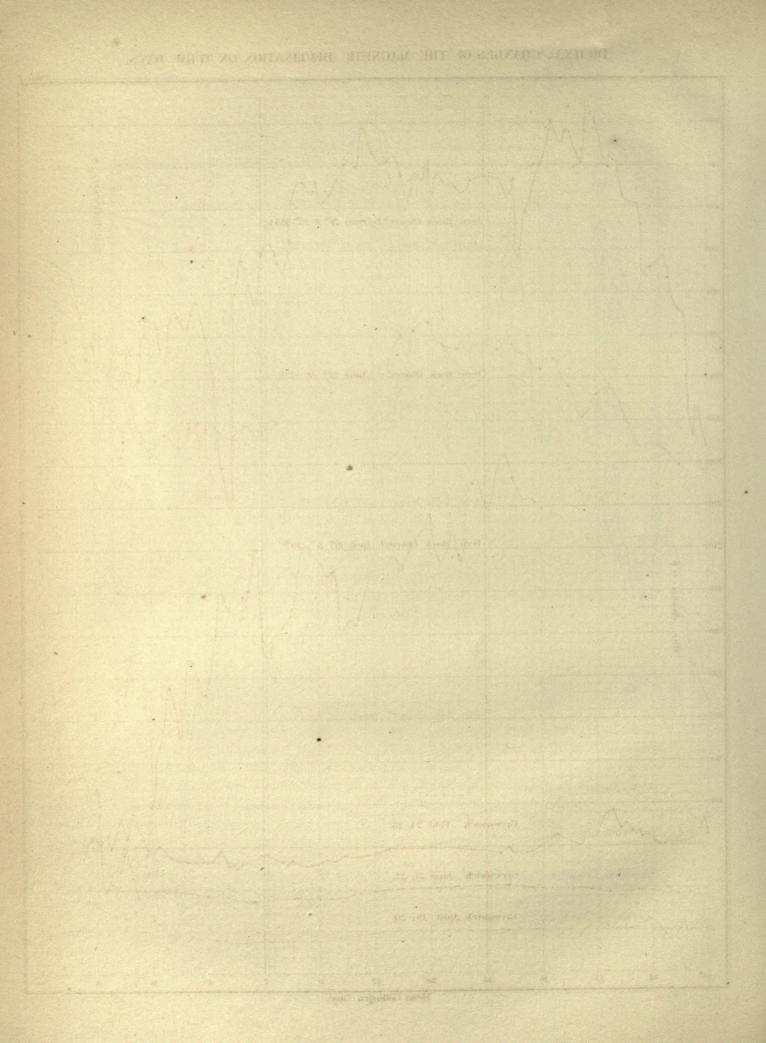
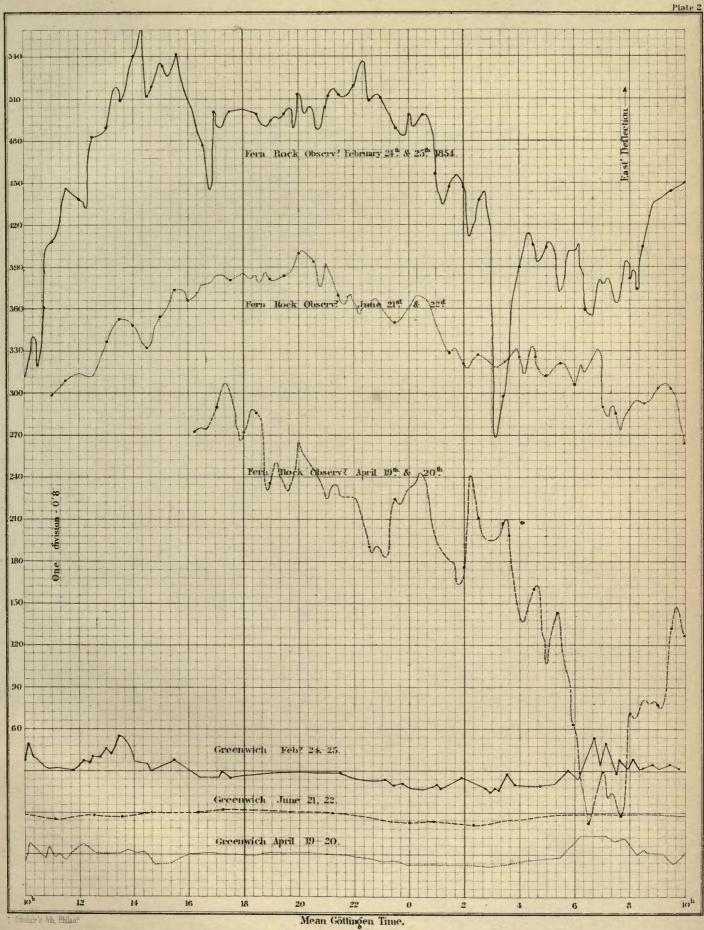


Plate 1

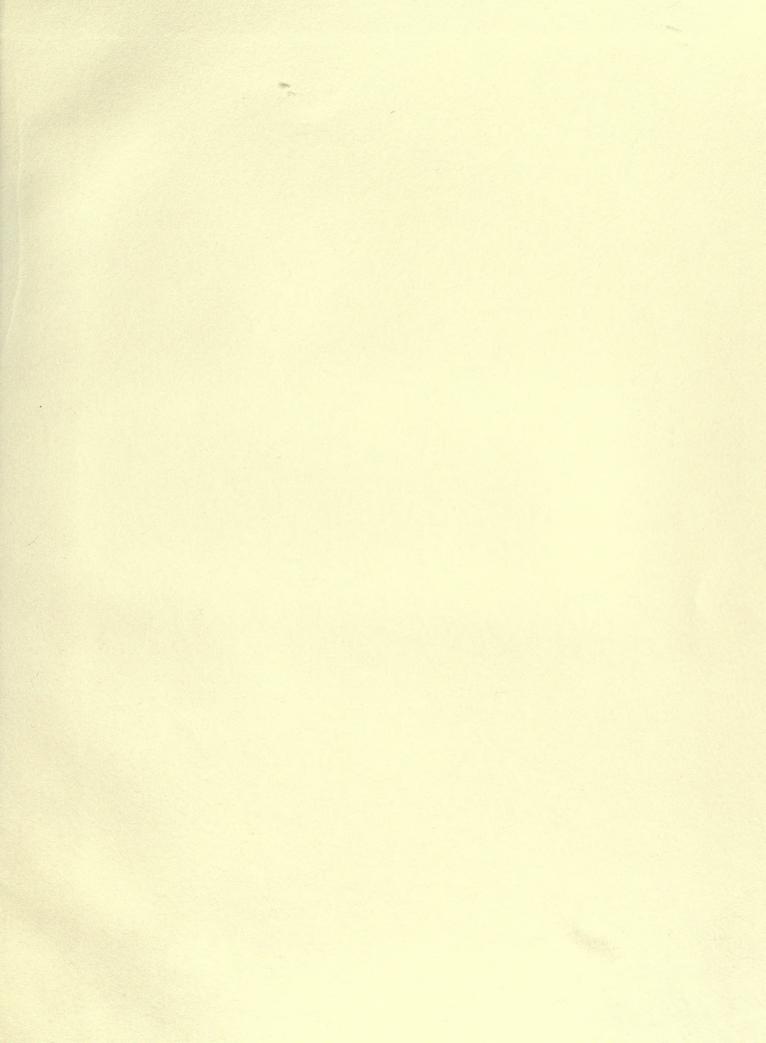
Mean Göttingen Time.



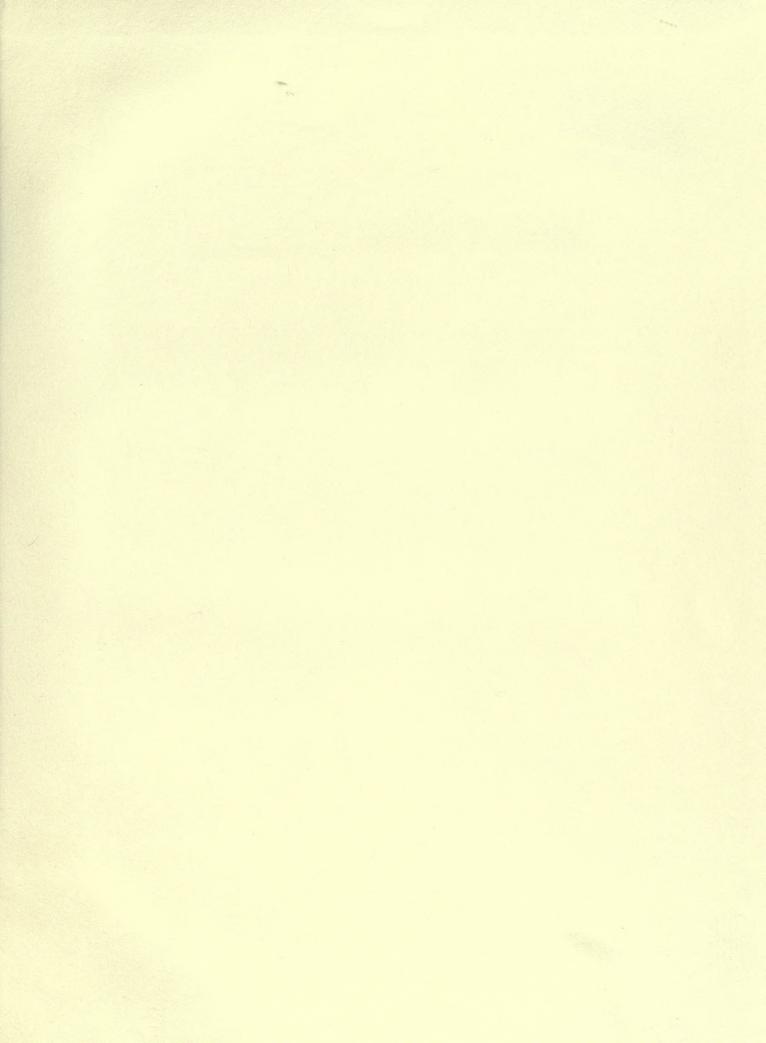
DIURNAL CHANGES OF THE MAGNETIC DECLINATION ON TERM-DAYS.











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