GOVERNMENT OBSERVATORY, BOMBAY.

COLABA MAGNETIC DATA,

1846 to 1905.

PART II.

THE PHENOMENON AND ITS DISCUSSION.

MAGNETIC OBSERVATIONS

MADE AT THE

GOVERNMENT OBSERVATORY, BOMBAY,

FOR THE PERIOD

1846 to 1905

AND

THEIR DISCUSSION

BY

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PART II.

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TABLE OF CONTENTS.

Colaba Magnetic Record (1846—1905).

PART II.

Magnetic Phenomena and their Discussion.

CHAPTER I.

HORIZONTAL FORCE AND ITS SECULAR AND ANNUAL VARIATIONS.

1. Secular Variations.

	PARAGRAPH
Enumeration and explanation of the data derived from different instruments available for discussion ...	291
Data derived from absolute observations accepted as correct	292
Derivation of the theoretical curve of the secular variation of H	293
Extension of the theoretical curve backwards from 1871 to 1847	294
In addition to the influence of the great secular period, the annual means of H appear to be subject to the oscillations of the 11-year period whatever be the theoretical curve adopted, low values of force obtaining during disturbed years of maximum sun-spot epoch and high values during the minimum	295
Mean annual changes derived from observed values are hence subject to correction	*id.*
Comparison of the secular changes on quiet-days and all-days	296
Representation of the annual means by a repeating curve not possible	297
Change of sun-spot number from 0 to 100 corresponds to a range of about 60γ in the annual values of H	298
This range is contracted in case of quiet-days, the mean annual values of which always stand higher than those of all-days throughout all years	299
Annual means of H derived independently from H. F. magnetograph	300
The maximum of the great secular period reached at 1895·4	301

2. Annual Inequality.

Annual inequality of H subject to the influence of the 11-year period	302
Evidence of the reality of the phenomenon of annual inequality	303
Results of the Fourier analysis of the annual inequality	304
Comparison of the inequalities determined from absolute observations with those derived from the H. F. magnetograph	305
Comparison of the annual inequality of H with that of ground temperature	306
Annual inequality of H derived independently from the Grubb's H. F. magnetometer, also exhibits the typical character of the curve	307

CHAPTER II.

DECLINATION, ITS SECULAR AND ANNUAL VARIATIONS.

1. Secular Variation.

Enumeration and explanation of the data available for discussion	308
Derivation of the theoretical curve for the secular variation of D	309
Constants in the formula representing the theoretical curve	310
Explanation of figures 1, 2 and 3, plate X	311
The influence of the 11-year disturbance on the annual means of D though not convincingly exhibited, may still be strongly suspected showing increase of easterly declination during maximum spot epoch and decrease during the minimum	312
The maximum of the great secular period in D reached at 1879·2	313
The secular variation of the resultant force in the horizontal plain (figure 11, plate X) indicates a maximum about 1895	314

2. Annual Inequality.

Annual inequality of D though minute is well marked and persistant. Its amplitude is appreciably influenced by the 11-year period	315
Result of the Fourier analysis of the annual inequality	316
In the annual inequality derived from D magnetograph the semi-annual term is the dominant feature ...	317
The resemblance in the general character of the inequalities derived from the absolute observations and D magnetograph scarcely allows of any serious doubt as to the reality of the phenomenon ...	318
The general run of the inequality derived from Grubb's magnetometer is also similar to those mentioned above	319
General runs of the annual inequality at Bombay and some other places	320
Tendency for D to be westerly in summer months and easterly in winter	321

CHAPTER III.

INCLINATION AND ITS SECULAR AND ANNUAL VARIATION.

1. Secular Variation.

	PARAGRAPH
The observations of Inclination from 1846 to 1867 are considered unreliable and are at best very rough measures of the values of I	322
The behaviour of the dip circle is unsatisfactory from 1872 to 1887	323
The suspicion of its unsatifactory behaviour necessitated fresh adjustments in 1877, 1881 and 1887 when breaks in the continuity of the series are indicated	324
Observations from 1888 to 1905 are reliable and give accordant results when compared with three other dip circles received from England	325
Derivation of the theoretical curve for the secular variation of I	*id.*
Examination of the behaviour of the instrument between 1873 and 1887 by means of this theoretical curve	326
The examination shows that during the period considered, the dip circle was incapable not only to measure absolute I but (contrary to view expressed in volume for 1891-1892) it failed as a variation instrument also	327
The behaviour of the Colaba dip circle indicates the absolute necessity of the duplication of all such work at important observatories by two independent sets of instruments	328
The theoretical curve indicates the maximum of I to have been probably passed about 1858—a result supported to a certain extent by the rough values of I available for the older period	329
The process for correcting the observed absolute values of I to the mean of the day	330
Reference to the curve derived by the combination of the annual values of D and I	331

2. Annual Inequality.

Determination of the annual inequality of I. Whether corrected or uncorrected to the mean of the day, the results practically appear to be the same	332
The annual inequality of I is subject to the influence of the 11-year period	333
Reference to the similarity in the run of the annual inequalities of Inclination and Vertical Force ...	334

CHAPTER IV.

VERTICAL FORCE AND ITS SECULAR AND ANNUAL VARIATION.

1. Secular Variation.

Reference to the data available for examination and their derivation	335
The secular march of V is fairly parallel to that of I	*id.*
Annual values of I from 1868 to 1873	336
Derivation of the theoretical curve for the secular variation of V	*id.*
The theoretical curve indicates a turning point about 1854	*id.*
The theoretical curves of H, D, I and V may be accepted fairly approximately to represent the conditions of the secular growth in the different elements at Colaba for the periods considered	337
Reference to the vector curve derived by the combination of the annual values of H and V	338
The annual values of V are subject to the influence of the 11-year period disturbance, low values of force being indicated during the maximum spot epoch and high values during the minimum	339

2. Annual Inequality.

Results of the Fourier analysis of the annual inequality of V	340
The results of the Fourier analysis indicate the influence of the 11-year period also on the amplitudes of the annual inequalities of V	341

CHAPTER V.

DIURNAL INEQUALITY OF HORIZONTAL FORCE.

1. General Remarks.

Data available for discussion	342
Explanation of the tables of diurnal inequality	343
The time of maximum is constant throughout the year but the time of minimum appears to depend upon the season	344
The time of minimum during maximum and minimum sun-spot periods	345
Higher values of H connote quiet conditions and the steadiness in the time of maximum is probably maintained by this factor	346
The single irregularity which strikes the eye in the general sweep of the curves is the one which occurs at about 6 or 7 A.M. in the month of September which seems to be associated with quiet rather than disturbed conditions	347

2. Seasonal Changes in the Diurnal Inequality.

Two methods of examining the seasonal changes in the diurnal inequality	348
Seasonal changes in H when compared with those of D and V are irregular and unsteady and hence difficult to follow and interpret	*id.*

	PARAGRAPH
Seasonal disturbance of March and April inverse to that of December and January	349
The examination in detail of some general features noted in the curves of the excess seasonal inequalities	350
Seasonal variation of each hourly ordinate of diurnal inequality	351
The day hours are more disturbed and their seasonal progression is not the same for all hours; night hours are quiet, their progression is similar throughout all hours and is inverse of that of day hours ...	*id.*
Results of the Fourier analysis of the seasonal progression in the ordinates representing the typical solar hours, and the average night hour	352
The coincidence in the times of occurrence of the maxima in the former and minima in the latter is notably close	353
The progression of the solar hour ordinates nearly the same as that of the summed ranges	354
Annual variation of the range and summed ranges	355
The dominant feature is the abrupt rise from January to April, and a slow fall thereafter to December ...	*id.*
Results of the Fourier analysis of the annual variations of summed ranges of H	356

3. Secular Changes in the Diurnal Inequality.

The ranges and the summed ranges are subject to the influence of the 11-year period	357
The annual inequality of the summed ranges also subject to the influence of the 11-year period as shown by the Fourier co-efficients where the amplitudes vary, but not the phase angles	358
The influence of the 11-year period on the ranges may be considered to be made up of (1) a steady factor connoting a regular and uniform periodic phenomenon which is independent of (2) effects of storms and disturbances which are transitory and more or less discontinuous	359
The excess diurnal inequalities of each year over the average year, and of each month of groups of maximum and minimum sun-spot years over the average months are of the same character as the original diurnal inequalities. They serve to indicate the correct progression of the 11-year disturbance	360
The transition epochs or dates of attainment of the average value are more or less definitely marked and almost all occur at intervals of about 5·5 years	361
The prolongation of this interval between 1850 and 1858, and between 1897·0 and 1904·5 and its possible interpretation	362
Reference to the determination of the true normal diurnal inequality	363
Disturbing effects of the *great unknown period* are roughly indicated by the excesses of the inequalities of the five 11-year cylces considered over the average inequality of 55 years	*id.*
The excess seasonal inequalities discussed in paragraph 348 are subject to the influence of the 11-year period, their amplitudes becoming larger during maximum spot years and contracted in the minimum	364
The annual variation of each hourly ordinate (paragraph 351) is also subject to a similar influence ...	365

4. Fourier Co-efficients of the Diurnal Inequality.

The derivation of the Fourier co-efficients of the diurnal inequality	366
Sums of squares of residuals after the elimination of the sum of the first four components are small ...	367
Difference in the results when the amplitude P and the time of the first maximum μ are derived by averaging the individual values or by analysing the average diurnal inequality	368
Ratios of the amplitudes of the several orders in the yearly inequality	369
The phase angle of the first component shows a later culmination to maximum in groups of maximum sun-pot years, and earlier in the minimum	*id.*
Annual variations of the amplitudes of the harmonic components are almost similar to those of the range or summed ranges	372
In the case of H the seasonal effect seems to be on the average about the same as the secular ...	*id.*
Reference to plates 25 to 28 where the results of the Fourier analysis are charted for ready reference ...	371
In the case of H, the division of the year into winter and summer months is somewhat unsatisfactory ...	*id.*

5. Eye-observation Series, 1848—1872.

Data derived from the older series of the Grubb's H. F. magnetometer give practically identical results...	372
The secular effects on the seasonal changes are however more prominently brought out here owing to these years being more disturbed by the secular effects	373
Summary of the various points discussed in this chapter	374

CHAPTER VI.

Diurnal Inequality : Declination.

1. General Remarks.

Data discussed	375
The diurnal inequality of D shows a double wave in 24 hours	*id.*
The inequalities for eight months (March to October) are alone significant, the inequality of the remaining winter months being minute and uncertain	376
The time of maximum occurs at 12 noon while the time of minimum which occurs at 7 hours in the summer months shifts to a later hour in winter	*id.*
These times are not appreciably affected by secular disturbances	*id.*
The secular effects on the diurnal inequality of D are small	*id.*

PARAGRAPH

2. Seasonal Changes in the Diurnal Inequality.

The seasonal excess inequalities are more regular in D than in H 377
They show the greatest positive or increasing effect in August or September and negative or decreasing effect in December or January, transition epochs being indicated about March and October ... *id.*
Examination of the annual variation of the hourly ordinates of diurnal inequality and the Fourier analysis of the variations of typical hours 378
Annual variation of the diurnal range or summed range 379
The variation shows larger amplitudes in summer months and smaller during winter months ... *id.*
Results of Fourier analysis indicate the predominance of the first component and the comparative insignificance of the other two ... ... *id.*

3. Secular Changes in the Diurnal Inequality.

The annual inequality is subject to the influence of the 11-year period, the first component being the principle one affected 380
In the case of D the seasonal change contrary to conditions in H is much greater than the secular ... 381
The difference of the annual inequalities of ranges at times of maximum and minimum sun-spot years is not similar in its run to the original inequality as in H, during the 33 years considered ... *id.*
The results of the first 22 years however where the secular effects are great, do disclose this parallelism. *id.*
Determination of the normal diurnal inequality and the effect of the great secular period on the five 11-year average inequalities 382
Excess diurnal inequalities of each year over the average year, and of each month of groups of maximum and minimum spot years over the average months are of the same character as the original diurnal inequality and show the incidence of 11-year disturbance on this element 383
Seasonal change in the diurnal inequality waxes and wanes in maximum and minimum sun-spot epochs. 384
This secular effect is however better marked and less irregular in the first 22 years (1850 to 1871) than in the later magnetograph record, owing to the heavier incidence of the effects of the great unknown period ... ... *id.*
Seasonal progression of each hourly ordinate gives similar results 385

4. Fourier Co-efficients of the Diurnal Inequality.

Harmonic analysis of the diurnal inequality of D carried to the fourth order 386
Sums of squares of residuals after the elemination of first four orders are relatively greater in winter months and require careful consideration ... ... *id.*
In case of D, the average amplitudes and phase angles differ considerably from the values derived from the analysis of the average diurnal inequalities 387
Examination of the seasonal changes in the amplitudes and phase angles 388
Doubts as to the acceptance of the co-efficients as connoting a definite phenomenon for the winter months. 389
Reference to the annual variations of the monthly means and the diurnal ranges of pressure of vapour both of which show as in D, a dislocation or change of condition from February to March and October to November 390
The seasonal progression of the amplitudes of the first three components of D is similar in each case to that of range or summed range but that of the fourth, as in V, discloses a semi-annual pulse and is thus differentiated from the former three 391

5. Eye-observation Series, 1848—1872.

The record derived from the Grubb's D magnetometer for the earlier period 1847 to 1872 gives practically the same results as those mentioned above except in regard to the incidence of the secular effects which are greater in the earlier period 392
Summary of the various points discussed in this chapter 393
The difference curve obtained from the annual variations of summed ranges at times of maximum and minimum sun-spot years which is not parallel to the original inequality in the results of later 33 years, is shown to be parallel in the results of the earlier 22 years where the secular effects are greater. 394
The probable existence of one single common exciting cause controlling the normal diurnal inequality in its daily, seasonal, 11-year, and the larger period changes 395

CHAPTER VII.

Diurnal Variation: Vertical Force.

1. General Remarks.

Data for V available from 1873 to 1905 396
Inequalities of V not so strongly pronounced as those of H 397
The general run is similar to that of D though the suppression during winter months is not so pronouncedly marked. The morning and the afternoon maxima attain equal significance ... *id.*
Neglecting the minor fluctuations during night hours, the V inequality is inverse to that of H ... *id.*
The seasonal change in the year in V is larger than the secular from maximum to minimum spot epoch, as in D 398
The ranges clearly show the fluctuations of the 11-year period ... ... *id.*
The average inequalities of the three 11-year cycles do not however show the influence of the great unknown period a result probably due to the omission of the year 1872 of great magnetic activity... *id.*

PARAGRAPH

2. Seasonal Changes in the Diurnal Inequality.

The seasonal excess inequalities show a maximum positive or increasing disturbance in September and negative or decreasing disturbance in December, the transition epochs being about March and October 399
Annual variation of each hourly ordinate of the diurnal inequality 400
The 6 hour variation is inverse to that of 9 and 10 hours; both these hours denote maximum disturbance effects, while the night hours from 6 P.M. to 4 A.M. are quiet ... ... *id.*
Annual variations of range and summed range indicate smaller values in winter and larger values in summer 401
Results of the Fourier analysis of the annual inequality of summed ranges, ranges, ordinate at 6 hour, and mean ordinate at 9 and 10 hours for average conditions and for groups of maximum and minimum spot years ... ... *id.*
Parallelism between the inequalities of maximum and minimum spot years and their difference curve is exhibited by all the above results except by the summed ranges ... ... *id.*
Comparison of the seasonal progression of the summed ranges of V and H ... ... *id.*

3. Secular Changes in the Diurnal Inequality.

The excess diurnal inequalities of V of each year over that of the average year of the period, and of each month of groups of maximum and minimum sun-spot years over those of the average months, are in general parallel to the original diurnal inequality and indicate the progression of the 11-year period disturbance 402
Here too as in H and D the periodic seasonal changes in the diurnal wave wax and wane owing to the influence of 11-year secular effects. The results however are not quite accordant owing to the feeble incidence of the 11-year period on this element 403
Summary of the more important results indicated in this chapter 404

4. Fourier Co-efficients of the Diurnal Inequality.

Harmonic analysis of the diurnal inequality 405
In case of the record of the V. F. No. 1 instrument the analysis is restricted to the average results only *id.*
Sums of squares of residuals after the elimination of the sum of the first four components show relatively large errors in winter months 406
The amplitudes of the four components during the average year and during winter and summer compared. 407
Fourier analysis of the annual variation of the four components 408
The fourth component shows a well marked semi-annual trem, the annual term being suppressed; this feature as in D, differentiates its behaviour from the first three components ... ... *id.*
The influence of the 11-year period disturbance is fairly well marked in the first, third and the fourth components but not in the second ... ... *id.*
The phase angles in contrast with those of D are fairly steady ... ... *id.*
A tendency for low values of μ is observed about the equinoxes while opposite conditions obtain about July and December 409
The sudden dislocations in the values of μ noticed in D between February and March and October and November are not prominently indicated in V ... ... *id.*
Under the influence of the 11-year period disturbance the maximum of the first component occurs later in maximum spot years and earlier in the minimum 410
The other three components do not appreciably show any influence of this kind ... ... *id.*

CHAPTER VIII.

Diurnal Inequality of Inclination.

Usual process of derivation of the diurnal inequality of I 411
Formula for the determination of the diurnal inequality of I directly from that of H and V 412
Data for I, on account of the unreliability of the dip circle in the earlier period, advisedly restricted to the period 1894 to 1904 413
The inequality of I closely follows that of V 414
The minimum at 11 A.M. is practically constant throughout all the months 415
The seasonal progression is the same as that in V 416
As in H, D, and V, the general run of the curves representing the secular, periodic seasonal and the secular seasonal effects is parallel to the curve of the original diurnal inequality 417
Harmonic analysis of the diurnal inequality 418
Unlike the results in V, the first component is the more pronounced, the second and the third being about $\frac{2}{3}$ and $\frac{1}{3}$ of the first component ... ... *id.*
The seasonal fluctuations in the phase angle μ are smaller than in V ... ... *id.*
The secular change in the value of the phase angle μ, of the first component indicates a shift of about 45 minutes as the years pass from minimum to maximum conditions, the phase angles in the two cases being respectively 347° and 358° ... ... *id.*

CHAPTER IX.

Vector Diagrams indicating Diurnal Changes in Magnetic Forces in Different Planes.

Vector diagrams denoting the magnitude and direction of the resultant force in any one given plane ... 419

PARAGRAPH

Necessity for resolving δH and δD in two fixed directions, *viz.* astronomical N-S and E-W ... 420
Under conditions obtaining at Colaba during the period 1872—1904 the variations of H and D may be regarded as practically the same as those of N and E 421
The yearly vector diagrams exhibit the effect of the sun-spot period 422
Disregarding the night hours the average yearly diagrams are more or less symmetrical about the astronomical meridian ... ... *id.*
The changes from month to month are far more irregular and larger in magnitude than those from year to year 423
Vector diagrams as a whole fail to exhibit the parallelism of the secular and seasonal effects to the original diurnal inequality which has been noted to prevail in the several magnetic elements when treated singly 424
This failure due to the secular and seasonal disturbance not affecting each element proportionally ... 425
The relative activity of H and D in their secular and seasonal progression may be roughly measured by the ratios of the summed ranges of their diurnal variations 426
Vector diagrams derived by the combination of δV and δD are much more symmetrical and regular than those of δH and δD 427
The secular and seasonal effects on diagrams derived from δV and δE do not seem to be so disproportionally affected as those from δD and δH 428
The ratios of the summed ranges of V and D representing their relative activities almost eliminate the 11-year period 429
Reference to the vector diagrams derived by the combination of δI and δD (in arc) 429a

CHAPTER X.

MAGNETIC DISTURBANCES.

1. Horizontal Force.

The frequency and incidence of magnetic storms controlled by some periodic action 430
The classification of days (from 10^h to 10^h) into days denominated as calm, small, moderate, great and very great disturbance ; the suffix " a " to each class denotes intermediate conditions of activity ... 431
The consecutive differences of daily means furnish a measure of the disturbance factor incident on each day 432
The range and the mean absolute value of the day, are treated independently 433
The magnetic disturbances almost always cause a heavy fall in the daily mean of H 434
The return to normal conditions is not so rapid as the effects of the initial disturbance ... ... *id.*
The mean value of the month is not the most probable value ... ... *id.*
In the general march of the phenomenon, a high daily mean and reduced amplitudes of the variations denote quiet conditions ... ... *id.*
This phenomenon is reversed during disturbed conditions ... ... *id.*
Separation of disturbances which lower the value of the daily mean by 50γ and more 435
The limit of 50γ, though arbitrary, divides the disturbances broadly into two classes ... ... *id.*
These disturbances exhibit the influence of the 11-year period in the frequency of their incidence ... 436
In their seasonal incidence a pronounced prevalence of the semi-annual period is indicated ... *id.*
This prevalence of the semi-annual period in disturbances is also shown in the annual variation of the summed differences (variability) of the daily means of H ... ... *id.*
Reference to a list of all disturbances, large and small, with their times of commencement, range of movement, etc. 437
The determination of exact time of commencement not possible except in case of X disturbances ... 438
The times of maximum and minimum turning points can however be determined and give useful information ... ... *id.*
There is a feeble tendency for the times of commencement of X disturbances to crowd more about noon hours but this may be regarded as fortuitous 439
The times of occurrence of the maximum and minimum turning points and their frequency in all hours of the day give results which are in close agreement with those derived from actual disturbance diurnal variations referred to in paragraph 441 ... ... *id.*
An average X disturbance is characterised by (1) a small initial jerky rise, (2) a large rapid fall for about 10 or 11 hours after the commencement, and (3) a slow and laboured rise back to normal conditions as indicated by a large progressive change in 24 hours 440
The diurnal variation of H on days of X disturbances indicates a maximum at 10 or 11 A.M. a sudden drop to minimum which occurs at about 7 P.M. and a slow rise thereafter for the next 15 or 16 hours of the day. This apparently suggests that during disturbances the diurnal variations are accentuated in amplitude 441
As the number of disturbances is 113 accidental irregularities may be expected to be almost eliminated... *id.*
Majority of X disturbances commence almost simultaneously all over the earth and apart from effects of local diurnal wave their progression may be similar at all other stations 442
In case of all disturbances the determination of the exact time of commencement is uncertain ... 443
Its distribution however during the day indicates a decided relation to the position of the sun ... *id.*
For the purposes of derivation of the disturbance diurnal variations only large disturbances referred to in paragraph 435 are advisedly considered 444
Except in regard to the jerky beginning all large disturbances show a progression practically the same as that of the X disturbances ... ... *id.*

PARAGRAPH

The diurnal variation on days of large disturbances when corrected for the usual diurnal inequality at times of maximum spot epoch gives the truly typical disturbance variation 445
This disturbance variation is similar whether derived from X disturbances or from all large disturbances *id.*
The typical disturbance variation shows a maximum at sunrise, a slow fall to minimum which occurs at sunset and a slow rise thereafter till sunrise ... ... *id.*
This result is confirmed by the older record (1846 to 1872) when the disturbances were determined by separating values according to the method adopted by General Sabine ... ... *id.*
Discussion restricted to the first 24 hours only after the commencement of a storm, as the character of its progression on the second day is quite different 446
On the second day of the storm the disturbance effects indicate an almost uniform slow rise of the daily mean to normal conditions ... ... *id.*
The diurnal variation on a second day is contracted in range ... ... *id.*
The first day is characterised by a large negative aperiodic change and the second day by a positive aperiodic change which, though large, is not quite as large as the former ... ... *id.*
A month is on the average made up of (1) a day of heavy disturbance with a large negative aperiodic change, (2) a disturbed day immediately following the first with a large positive aperiodic change, (3) a large number of days of small disturbance with small positive or negative aperiodic changes, and (4) a few quiet days with a positive change of about 4γ 447
In minimum sun-spot years quiet days may have negative aperiodic change as disturbance days are scanty and may take up the position of disturbed days relatively to other still quieter days ... 448
Reference to the similarity in the run of the curves of the typical disturbance diurnal inequality and the excess diurnal inequality of all days over quiet days, that is the disturbance inquality involved in the average all-day ... ... *id.*
By taking the differences between the all-day and quiet-day inequalities for each month and eliminating from them the smooth disturbance inequality for the year we obtain the irregularities for each month; taking the sums without regard to signs for each hour the disturbance intensity of each hour may be determined 449
This disturbance intensity curve shows a relation to the position of the sun and is useful in explaining the same relation observed in case of all small and large disturbances in paragraph 443 ... *id.*
Comparison of the progression of some seven selected disturbances at Kew, Pavlovsk, Bombay and Batavia 450
More often than not the movements are synchronous and coincident in time; occasionally they are opposite in run ... ... *id.*
The subsequent progress of the storm is modified by an accentuated local diurnal wave ... ...
Comparison of the progression of (the average of the seven) disturbances at Kew and Colaba ... *id.*
The comparison shows that, apart from the aperiodic change which may be different at different places, the progression of an average disturbance appears to be made up of (1) a common pulse which commences everywhere simultaneously, takes about 10 or 11 hours to attain its maximum effect and slowly creeps back to normal conditions, and (2) an accentuated diurnal wave depending at any place upon the position of the sun ... ... *id.*

2. Magnetic Disturbances: Declination.

Disturbances in Declination though very feebly marked do appear to connote a true phenomenon having a regular progression 451
The character curve of the average disturbance in D is inverse to that in H, the easterly movement in D corresponding to a fall in the value of H 452
The crude disturbance curve appears to be roughly similar to the actual diurnal inequality as in H ... 453
The similarity of the curves of the true disturbance diurnal variation and of the difference inequality derived from all-day and the quiet-day variations convinces one that they indicate a real phenomenon. 454

3. Magnetic Disturbances: Vertical Force.

Disturbances affect V very feebly and need a passing reference 455
Description of the diurnal progression of disturbance variation in V ... ... *id.*
Whether the detailed progression connotes a true phenomenon it is difficult to say ... ... *id.*
On an average disturbance day at Colaba H falls by 80γ in 24 hours while V rises by 4·2γ. In the secular disturbance from minimum spot to maximum spot epoch, both H and V fall heavily ... 456

4. Disturbances 1846 to 1872.

The above results are in general confirmed by the records of the earlier years 1846—1872 discussed in the appendices to the Observatory volume 1879 to 1882 where the selection of disturbances is made by separating values according to the method adopted by General Sabine 457

CHAPTER XI.

QUIET DAYS FOR THE PERIOD 1894 TO 1905 AND THEIR COMPARISON WITH THE CORRESPONDING DATA OF ALL DAYS.

1. Horizontal Force: Absolute Phenomenon.

The average values of the mean diurnal variability of all days 458
Rough numerical values for the mean diurnal variability of quiet days and their comparison with similar all-day data 459

PARAGRAPH

The mean quiet-day is distinguished by an increase of secular force of 2γ per day on an average of 11 years which increases to 5γ in 1894 and diminishes to 1γ in 1901 460
Mean departures of the daily means of all-days and quiet-days from their corresponding monthly values compared ... ... *id.*
Quiet-days selected by the Astronomer Royal 461
Examination of the results if they are affected by the process of selection ... ... *id.*
Their epoch not always coincident with that of the mean of the month ... ... *id.*
Comparison of the monthly means of H as determined from quiet-days and all-days shows the influence of the 11-year period as much on the former as on the latter 462
Quiet-day mean however stands always higher, the difference being greater in maximum spot years than in the minimum ... ... *id.*
In the selection of days an additional factor as regards the absolute value should be considered ... 463
In view of some uncertainty due to the above causes, other results from the locally selected quiet days are supplemented 464
The excess secular and annual variations derived from these sets of quiet-days less the result of all-days are practically the same, but the absolute values from locally selected days throughout stand higher than the Astronomer Royal's quiet-days ... ... *id.*
This shows that a fairly broad zone of quiet-days exists ... ... *id.*
Another result derived from *all* quiet-days is practically identical with the one derived from the Astronomer Royal's quiet-days 465
Comparison of the departures of the absolute value on quiet-days from the mean value of the month, and from that of the preceding day 466
The above results indicate that in quiet-days when compared with all-days (1) the absolute value of H stands higher and (2) that the influence of the 11-year period disturbance to which quiet-days also are subject is to contract the range of oscillation 467
The annual variation of H is practically the same whether derived from quiet-days or all-days ... 468
The small difference noted seems however to be associated with the incidence of storms and disturbances on the all-day variation ... ... *id.*

2. Horizontal Force: Diurnal Variation.

Explanation of the tables and plates of the data collected 469
Remarks about the magnitude and the mode of application of the aperiodic correction 470
The supposition that the secular change progresses uniformly throughout the 24 hours is admittedly empirical and needs investigation 471
The question is examined to a limited extent by considering the data of the years 1900-1901 which are the least disturbed ... ... *id.*
Two pairs of quiet-days are selected for each month, the days in each pair falling almost always within 48 hours of each other; one day in the pair has a large positive and the other a large negative aperiodic change in 24 hours. The difference of the diurnal variations for these two sets of days allows the progression of the aperiodic element to be exhibited through the 24 hours 472
The result shows that the aperiodic element grows during a quiet-day much more actively during the day hours than during the night hours and more so during the day hours before noon than after noon ... 473
These results are confirmed by considering the day from 10^h to 10^h instead of from 0^h to 0^h as attempted before 474
Reference to the residual diurnal variation contained in the above results 475
The actual progression of the secular change from day to day exhibited by taking overlapping means of 24 hourly values for the month of June 1900 476
Results derived from the above data also tend to indicate a similar progression of the aperiodic element. 477
The above results if accepted as correct show that a close relation may not improbably exist between the phenomenon of this progression of the aperiodic element and the difference between the diurnal variations of quiet-days and all-days 478
The hourly means of H for June 1900 and July 1894 show how the phenomenon actually progresses from day to day during (1) a typically quiet month and (2) a disturbed month 479
They show the difficulty of selecting the best 5 quiet days especially when the field is so large as in June 1900 ... ... *id.*
Consideration of the question whether the aperiodic element derived from single hours of any one set of quiet-days can be relied upon to furnish a definite measure of the quiet conditions of a duration of 24 hours and also whether its annual and secular variations can be accepted as connoting real phenomena 480
The secular and annual variations of the aperiodic element from 0^h to 24^h determined from Astronomer Royal's quiet-days and from locally selected days are somewhat discordant ... ... *id.*
The same derived from *all* quiet-days where the vitiating effects due to selective methods are reduced to a minimum are also dissimilar 481
A similar want of accordance is noted when the element is determined from 10^h to 10^h ... ... *id.*
It is difficult therefore to accept the element as a specific indicator of physical phenomenon connected generally with a duration of 24 quiet hours ... ... *id.*
The quiet-day diurnal variation is just appreciably smaller in range than the corresponding all-day variation. 482
The non-periodic range however on quiet-days is decidedly smaller than that derived from all-days, the difference being greater in maximum spot years and less in the minimum 483
The *median* range stands lower by 4γ and the quiet-day range lower by 8γ than the all-day range ... 484
This question more fully examined in Chapter XIII ... ... *id.*

PARAGRAPH

The result shows that quiet days are almost always associated with smaller amplitudes of variations which is in accordance with similar inferences arrived at in respect of the annual and secular variations 485
A general summary of the phenomenon of the average diurnal variations on quiet days 486
The peculiar movement prominent in the September curve (*vide* paragraph 347) is more emphasised in quiet conditions 487
Considering the Fourier co-efficients of the quiet-day and all-day variations, no significantly large difference is found to exist in the amplitudes and phases of the various components except that the phase angle of the first component falls invariably earlier in the all-day results 488
This therefore constitutes the real intrinsic difference between the two variations 489
The curve due to this shift in the phase of the first component has its time of maximum shifted by about a quarter of a wave length ... ... *id.*
This curve practically measures the *whole* difference between the diurnal variations of quiet-days and all-days 490
The above conclusion which relates to the average of the period 1894—1904 is also applicable to single years such as 1894 491
The phase angle of this difference curve is nearly the same as that derived from the true disturbance variation shown in figure 12, second set, plate 73 ... ... *id.*
The amplitudes of the excess diurnal variations (all-days less quiet-days) which denote the average effects of storms and disturbances are subject to the influence of the 11-year period disturbance . 492
The semi-annual pulse in the seasonal march is feebly marked ... ... *id.*
The excess diurnal variations for each single month of the eleven years 1894 to 1904 indicate the disturbance effects of storms during any single month whenever incident ... ... *id.*
Accepting the inference drawn from the above discussion, we may take it as correct that the disturbance effect due to storms, etc., in the average result of the year is incident purely as a phase disturbance which affects mainly, if not solely, the first component of the quiet-day variation and induces an *early* culmination to maximum in that component. The variation thus modified constitutes then the all-day variation 493
Examining the secular progression in the values of the phase angles (μ_1) of the first component from year to year, the effect of the 11-year disturbance is to induce a *later* culmination to maximum in years of maximum sun spots and an *earlier* culmination in years of minimum spots 494
This is true whether the results are derived from quiet days or from all days ... . *id.*
Thus the diurnal variation of maximum spot years is distinguished from that of the minimum by a large increase in the amplitude and a later culmination to maximum during the day ... 495
The first affects the four harmonic components almost equally, the second affects principally the phase angle of the first component alone ... ... *id.*
For convenience of discussion these two factors are considered independently ... ... *id.*
Determination of factors or ratios to the average which measure the increase in the amplitudes ... 496
Preferably ratios derived from summed ranges are accepted 497
The average yearly diurnal variation multiplied by these factors for each year gives the theoretical variations and the differences of these from the original inequalities give the phase disturbance factor and roughly indicate the extent to which the yearly diurnal variations conform to the assumed law of the *uniform* expansion or contraction of the amplitude indicated by the adopted co-efficients 498
This whole difference curve is practically reproduced by considering the curve of the first component alone with its original and shifted phases ... ... *ib.*
The result illustrated by considering the years 1894 and 1901 499
When all-day results are examined the same law prevails throughout the period of 33 years ... 500
As the effect of storms induces an earlier culmination to maximum in the phase angle of the first component while the secular phase disturbance factor shifts the time of maximum to a later hour during the day during maximum spot years, any direct connection between them becomes obscure and difficult to explain 501
Some plausible explanation of this phenomenon 502
Connection between the disturbance effects and the secular phase factor 503
The phenomenon is capable of some better interpretation 504
The diurnal inequality may be supposed to be made up of a principal portion which varies with the 11-year period affecting the amplitudes solely, and another minor portion the curve of which is similar in form to that of the phase disturbance factor which however does *not* vary with the 11-year period ... ... *id.*
In the treatment in paragraph 498 by multiplying the average diurnal variation composed as it is of these two parts, by the different factors of reduction for each year we introduce a fictitious inequality of the same character as the minor portion referred to above, varying with the 11-year period. The residual curves hence bring out this fictitious inequality which is called the phase disturbance factor waxing and waning with the 11-year period ... ... *id.*
The character of this phase factor inequality appears to have some resemblance to that of the diurnal inequality of vapour pressure at Bombay ... ... *id.*
Determination of some such constant inequality which does not vary with the 11-year period ... 505
Subtracting this constant inequality from the diurnal variations of each year and the average year we get fresh inequalities the amplitudes of which vary solely with the 11-year period 506
The average inequality of 11 years thus corrected may also be multiplied by the factors or ratios to the average and the theoretical inequalities derived for each year and finally the differences between these modified and the original inequalities derived for examination ... ... *id.*

PARAGRAPH

These differences are fairly small and irregular and thus serve to indicate the appropriateness of the assumptions made 506
The above results are equally effectively derivable from the all-day data also 507

3. Declination: Absolute Phenomenon.

Declination and Vertical Force are not much perturbed at Colaba even during the incidence of greatest of storms and no detailed discussion of these elements is therefore attempted ... 508
Comparison of the unequal effects of the 11-year period on the variability figures of D and H ... 509
The various data collected show the feebleness of the 11-year period disturbance on D 510
Westerly elongation of the needle connotes quiet and easterly elongation connotes disturbed conditions in absolute values of D 511
The average difference in the absolute values of D for quiet-days and all-days which is 3″, increases in years of maximum spot to 9″ and decreases in those of minimum spot epoch to 1″ ... ... *id.*
The annual variations of D from quiet-days and all-days are practically similar 512

4. Declination: Diurnal Variation.

Description of the tables wherein the data for the diurnal variations of D are collected 513
The differences in the diurnal variations of quiet days and all days are small and uncertain ... 514
The true disturbance variation of D (figure 12, third set, plate 73) is not in general agreement with this difference curve ... ... *id.*
Examination of this difference curve for the year 1894 ... ... *id.*
No appreciable difference is noted in the periodic ranges of all-days and quiet-days 515
However when aperiodic ranges are examined the average range on all-days is just appreciably larger than that on quiet days ... ... *id.*
Examining the Fourier co-efficients of the diurnal inequality on quiet-days and all-days it appears that the amplitudes of quiet days during 1894 are larger than those of all day 516
From the reduction of the amplitudes in all-days it appears that the disturbance variation must have a character which if anything is inverse to that of the original inequality which thus reduces the amplitudes ... ... *id.*
Comparison of the character of the disturbance inequality and the secular phase factor inequality for 1894 517
The phase angles of the first component are reversed and are closely accordant as in H results ... *id.*

5. Vertical Force: Absolute Phenomenon.

Comparison of the absolute values of Vertical Force on quiet-days and all-days gives uncertain results . 518

6. Vertical Force: Diurnal Variation.

The difference inequalities between the quiet-day and all-day variations are small and uncertain ... 519
The true disturbance variation (figure 12, set 4, plate 73) when analysed shows a character which is inverse to that of H ... ... *id.*
Examination of the harmonic co-efficients of the diurnal inequality of V on quiet days and their comparison with those of all-day 520

CHAPTER XII.

THE INFLUENCE OF THE MOON ON THE DIURNAL VARIATIONS OF MAGNETIC ELEMENTS.

The difficulty of separating the true lunar effect, which is very small, from the much larger solar variations 521
Reference to the conclusions arrived at by Chambers in the Philosophical Transactions of the Royal Society, Vol. 178-A, pages 1 43 522
Reference to the results derived by Figee from the Batavia Records of 12 years—1883 to 1894 ... *id.*
The data discussed by Chambers were derived from the earlier record (1846 to 1872) by instruments noted in Part I of this volume as defective in certain respects 523
The old data refer to two elements H and D only ... ... *id.*
The data discussed in this chapter refer to all the three elements H, D and V and are derived from the later magnetograph record ... ... *id.*
Description of the process of the derivation of the lunar diurnal inequality after the elimination of the average solar diurnal variation ... ... *id.*
Apart from the question of the explanation of the phenomenon, it is clear that the older results are confirmed in a general way by those derived from the magnetograph series 524
The average lunar diurnal variation for the complete period of a lunation indicates an almost perfect semi-diurnal pulse in all the three elements D, V and H ... ... *id.*
The maxima in D and V occur almost an hour after the upper and lower meridian passage of the moon ... ... *id.*
The maxima in H fall earlier by about 3 hours ... ... *id.*
Examination in detail of the way in which this average lunar diurnal wave changes from phase to phase throughout the eight phases of the moon considered and how this effect cuts out in a complete lunation 525

PARAGRAPH

The luni-solar variation may be regarded to be made up of the average lunar-variation of a constant type which for each element passes through a cycle of wave like changes of amplitude in each phase of a complete lunation 526
An explanation of this phenomenon illustrated by D results ... ... *id.*
Reference to the real existence of a true lunar diurnal variation and its possible explanation ... 527
Separation of lunar diurnal variation in groups of maximum and minimum sun-spot years shows greater fluctuations in the former than in the latter at least in the partial phase results ... ... *id.*
Derivation of the lunar diurnal variations for complete lunations for D, V and H from the data of the quiet years 1900 and 1901 528
Reference to the adoption of a different method of treatment and its explanation ... ... *id.*
The average lunar diurnal variations derived by this method are precisely similar to those derived by the previous laborious process ... ... *id.*
The results moreover show a seasonal progression in D, and V, which has a general resemblance to the similar progression in the case of the solar diurnal variations 529
But while in the seasonal progression the curves of D and V reverse in character, those of H are only reduced in amplitude ... ... *id.*
Data for the quarter May to July derived for nine years confirm this characteristic in the seasonal progression of the lunar diurnal variations of H 530

CHAPTER XIII.

The Absolute Phenomenon from Day to Day.

1. Daily Means of Horizontal Force.

Reference to the data considered 531
Examination of the position which the average day, the quiet-day, and the 'median' day occupy as regards their absolute mean daily values during an average month 532
Reference to the way in which this position is shifted under the influence of the 11-year period ... *id.*
The position of the zone of quiet days in 1894, 1901 and the average condition of 11 years ... 533
The greatest departure of the daily mean from the mean monthly value, falls to occur on quiet days when the departure is positive and on disturbed days when it is negative 534
Summary of the analysis of the series of the daily means and daily ranges, showing in different ways the relation which obtains between the two kinds of days, namely the *quiet* and the *all*-day ... 535
Classification of days into eight different groups in which the departures of the daily means lie between certain fixed limits 536
Examination of the laws which determine the secular progression of days in each of the above classes as regards the frequency of their occurrence and the intensity of their disturbance ... ... *id.*
Examination of the daily means (1894—1905) for the detection of any period very near to the rotation period of the sun 537
Method adopted to arrange the data for the determination of the periods of 27·00 days, 27·25 days and 27·50 days ... ... *id.*
Out of these three periods, the existence of the 27·00-day period is more probable ... ... *id.*
The inspection and analysis of the variation of the 27·00-day period show the greater predominance of the 13·5-day period ... ... *id.*
The persistence with which the variation is indicated in the individual results of every two years considered separately evidences the reality of the phenomenon 538
The frequency of occurrence of quiet days (1882 – 1905) also shows the existence of this period ... 539
The daily ranges when treated exactly like the daily means also indicate the existence of this periodicity. 540
Out of the 13·5-day and the 27-day periods the former is presumably the more effective and significant of the two 541
Explanation of the points of difference noted in the curves of the daily means and the daily ranges ... 542
Examination of the annual variations of the frequency of occurrence of days of any one of the eight classes (C, Ca, S, Sa, M, Ma, V, VG) given in table 381 543
Reference to the relation which these annual variations bear to the annual variation of absolute force (paragraph 303) and to the disturbance annual variation (paragraph 468) ... ... *id.*
On the average, out of 100 days 39 days are calm, 54 days are days of small disturbance and 7 days are days of larger disturbance 544
Reference to the probability of the existence of the 14-month (427-day) period in the magnetic phenomenon answering to the small precessional movement of the axis of our earth 545
Arrangement of the monthly means of 28 years in rows of 14 months indicates the variation of this periodicity which is about equal in magnitude to the annual variation of absolute force 546
Examination of the summed ranges of H, the summed differences of daily means and the non-periodic diurnal ranges of H for this period 547
The general run of all the four curves is similar ... ... *id.*
Reference to the 'interference' effect of this period on the intensity of the annual variation of H for different years ... ... *id.*

2. Daily Means of Declination.

No examination in detail is attempted here as the D element is little perturbed even during the incidence of greatest of storms. Full data are given however for investigation if necessary ... 548

PARAGRAPH.

The daily means of Declination (1898-1899) indicate the existence of the 13·5-day period ... 548
The existence of the 13·5-day period is thus noted in the daily means of H, in the daily ranges of H, in the frequency of occurrence of quiet days and in the daily means of Declination and one is therefore forced to conclude that the results are not fortuitous and that in all probability we are dealing with a real phenomenon ... ... *id.*

CHAPTER XIV.

RELATION OF TERRESTRIAL MAGNETISM TO SOLAR SPOTS AND METEOROLOGICAL PHENOMENON.

1. Relation to Solar Spots.

Discussion restricted to sun-spot numbers published by Wolf and Wolfer 549
While magnetic data are admittedly correct the solar data lack that completeness so essential for critical comparison ... ... *id.*
Enumeration of the data examined in the chapter 550
The frequency of occurrence of quiet days (C and Ca), of days of small disturbance (S and Sa) and days of greater disturbance (M to VG), for each year when charted show a general resemblance to the curve of sun-spot numbers, the curve for quiet days being of course inverted 551
The finer fluctuations however noted in these curves as also in the curve of the intensity of the annual variations of H are absent from the sun-spot curve ... ... *id.*
Grouping of the consecutive differences of daily means of H into 8 convenient divisions each having an upper and a lower limit 552
Examination of the variations in the 11-year period of the frequency of occurrence and the intensity of disturbance of days of each of these classes ... ... *id.*
The disturbances whose frequency and intensity follow the law of the 11-year period are those which lower the value of the daily mean by 30γ and more from that of the preceding day ... ... *id.*
Separation of the dates of such disturbances for comparison with sun-spot data which are also subject to the same period variaton ... ... *id.*
The occurrence of these disturbances indicates the existence in them of the 27·0-day or more correctly 13·5-day period 553
Grouping of the consecutive differences of sun-spot numbers into 8 divisions similar to those referred to in paragraph 552. Their comparison fails to exhibit any close relation between the solar and the magnetic phenomena 554
The mean annual values of H are subject to a perturbation effect whose dominant feature is the sweep of the 11-year period, but the minor movements have no corresponding fluctuations in the spot curve . 555
Rough numerical relation between the perturbation effects of the absolute series, and the spot curve ... *id*
The examination of the data enumerated in paragraph 550 make two initial points at issue fairly clear, *viz.*, (1) that the smooth periodic parts of the phenomena exhibit decidedly close though not precisely exact parallel conditions, and (2) that the aperiodic parts of the two series show widely dissimilar progressions, and it is difficult, if not impossible, to discern any common relation between the two 556
Enumeration of the general characteristics in the 11-year period sweep disclosed by the smoothed summed ranges of H 557
Rough attempt to determine the principal periodicities observed in the summed range curve of H ... 558
In the Colaba data of 60 years the application of the harmonic analysis indicates the probable existence of a period very near to one of 11·3 years as the amplitudes of seven periods ranging from 11·0 to 11·5 years become greatest at that point 559
The elimination of this period by taking overlapping means of 136 monthly values brings out the effects of the larger period which suggest the existence rather of the period of 68 years or more than one of 35 years 560
Twoways of further examination of the data, *viz.*, (1) the method of application of the harmonic analysis which takes account of one principal period and considers the other periods as being multiples or sub-multiples of the 11-year period, or (2) the method which considers the 11-year period as independent of the other larger period and attempts to derive a theoretical curve by compounding the two curves representing two distinct phenomena 561
Results of the harmonic analysis for the assumed period of 68 years and its sub-multiples... ... 562
Periods connoting probable real periodicities are 1, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{6}$ and $\frac{1}{12}$ of 68 years ... ... *id.*
The theoretical curve derived by summing up the results of these five components when compared with the observed shows large residual errors ... ... *id.*
Explanation of the procedure adopted for the rough application of the second method referred to above ... 563
The theoretical curve derived by the application of this method though open to criticism, when compared with the observed curve leaves relatively smaller residual errors and justifies the adoption of this method ... ... *id.*
Even in the results of the harmonic analysis if the results of the three periods (68·0, 22·7 and 13·6) be *compounded* with those of the two periods (11·3 and 5·7) by takin g the products of the ordinates of the latter and the factors or ratios to the mean derived from the former better results are apparently secured than those obtained by the usual method ... ... *id.*
Reference to the probable existence of a period of about 8 years 564
Constants of the formula $R = a + bS$ where R and S respectively represent the magnetic summed ranges of H and solar spot numbers 565
Difference between the theoretical curve so derived and the observed curve discloses the probable existence of a period of about 5 years ... ... *id.*

PARAGRAPH

Application of the second method referred to in paragraph 561 to the solar spot numbers 566
Three corresponding series of the range figures and the spot numbers derived by the application of the second method, *viz.* (1) calculated values, (2) average 11-year values, (3) smoothed 11-year means, equated by the formula $R = a + bS$ ... ... *id.*
The residual curves tend to show that the probability is apparently greater for the inherent differences to lie in the oscillations of the larger period and its sub-periods than in the dominant 11-year period curves ... ... *id.*
No definite and clear case of a relation of direct cause and effect established by the above examination. 567
The effect of the 11-year period disturbance on the different elements H, D and V are distinctly different. 568
Equality of the ratios of the absolute values of V and H and of their summed ranges 569
Examination and comparison of the influence of the 11-year period on these ratios 570
Comparison of the summed ranges of D and V with those of H by numerical relations and examination of the departures ... ... *id.*
The examination of the ratios of the summed ranges of D to those of H, and of V to those of H and D. Probable prevalence of abnormal values about the years which have been known to be meteorologically abnormal 571

2. Relation to Meteorological Phenomenon.

General remarks 572
The question examined by considering (1) secular changes, (2) annual variation and (3) diurnal inequalities ... ... *id.*
The existence of the influence of the 11-year period on the annual values of absolute temperature barometric pressure and pressure of vapour 573
Its influence, however, does not constitute that markedly characteristic feature so conspicuously presented by the magnetic phenomenon generally ... ... *id.*
The periodic and the non-periodic ranges of temperature do not show the influence of this period definitely as in the case of the latter, the record of the earlier years 1848 to 1872 shows an inverse and that of the later years 1873—1905 a direct variation with the sun-spot numbers and the results are thus conflicting 574
This seems to be due to the almost equal incidence of the 11-year disturbance effect on the maximum and minimum temperature series which by themselves severally indicate the influence of this period . *id.*
In the case of barometric pressure while the absolute values do, the periodic ranges and the abnormals do not, show the influence of the period 575
The fluctuation in the ground temperature series similar to those in air temperature and suspected to show 11-year oscillations 576
The intensity of the annual variations of ground temperature at different depths show some influence of this period (remarks in paragraph 306, subject to this correction) ... ... *id.*
The influence of the large (unknown) period is clearly seen in the temperature series, ground temperature series, non-periodic ranges of temperature, but is more forcibly apparent in the absolute values of the barometric pressure 577
Similarity in the run of the smoothed 11-year means of Barometric pressure and the summed ranges of H. *id.*
Reference to the prevalence of biennial (or thereabout) movements in the magnetical as well as meteorological elements 578
The examination of the Fourier co-efficients of the annual and the semi-annual terms 579
References to the points of similarity in the phase angles of the annual and semi-annual terms of the magnetic and meteorological phenomena ... . *id.*
Examination of the relative importance of the annual and the semi-annual terms in the magnetic and meteorological elements 580
Reference to the degree to which these relations are probably modified by terrestrial causes both in the magnetic and in the meteorological phenomena ... ... *id.*
Examination of the general resemblance noted in the curves of the diurnal variations of the magnetic elements D, V and H and of the meteorological elements.—temperature, barometric pressure and pressure of vapour 581
A similar comparison made by considering the amplitudes and phases of the Fourier co-efficients ... 582
Comparison of the seasonal changes in the diurnal inequalities of the magnetic and meteorological elements. 583

CHAPTER XV.

On some Typical Movements in Magnetograms suspected to be associated with Seismic Phenomenon.

Some indirect relation between seismic and magnetic phenomena not inconceivable 584
Reference to the existence of the 14-month period in the magnetic elements, in the variation of our latitudes and in the earthquake record 585
Seismic and magnetic disturbances are not incident concurrently but on the average, earthquakes usually fall on the quiet side of the average magnetic all-day 586
Differences in the types of quiet days 587
The nature of diurnal inequality and aperiodic changes on quiet days which fall coincident with the occurrence of seismic disturbances 588
Typical movements in magnetograms 589

	PARAGRAPH
Remarks about the connection between volcanic and seismic phenomena	590
Description of the typical movements and enumeration of the instances when these were apparently casually observed to be concurrent with some volcanic phenomena	591
Reference to the short period movements	592
Reference to other suspected movements in the magnetic traces at times of volcanic eruptions and to some kind of relation between the two phenomena	593 to 596
Remarks about short period movements of about two minutes; their association and incidence in large numbers during the quiet epoch; and their magnetic origin contrasted with their reproduction by mechanical means by the behaviour of magnetographs as delicate seismoscopes	597

CONCLUSION.

General remarks on the nature of the phenomenon of terrestrial magnetism	599
Concluding remarks	600

TABLE OF CONTENTS.

Colaba Magnetic Record (1846—1905).

PART I.

Magnetic Data and Instruments.

INTRODUCTION.

	PARAGRAPH
Colaba record extends from 1846—1905	1
Owing to the introduction of electric tramways the magnetic record at Colaba closed in 1906 and was transferred to Alibag about 18 miles away	*id.*
The two records compared for the years 1904 and 1905	*id.*
The scope and object of the volume	2
Remarks about the comparability of the record throughout the period of 60 years	3
Sub-division of the data into the eye observation series (1846—1872) and the magnetograph series (1872—1905)	4
Remarks about the degree of accuracy aimed at in the results	5

CHAPTER I.

ABSOLUTE INSTRUMENTS.

1. Horizontal Force.

Two sets of instruments in use during the period; one from 1847—1867 and the other from 1868 to 1905.	6
The old magnetometer considered unreliable and its place taken by Grubb's H. F. magnetometer (see Chapter III)	7
The instrument used from 1868 to 1905 was the Kew unifilar magnetometer No. 23 by Elliot Brothers.	8
Formulæ for the vibration and deflection experiments	*id.*
Remarks about the process of observation and their reduction	9
Adopted value of P_o and the mean value of P_o	10
The gradual change in P_o expressed by formula $P_o = A + Bt$	11
Derivation of the values of P and Q by Lamont's formulæ	12
Method determining the values of P′ and Q′ by observations at more than 3 distances	13
Advantages of the method	14
Formulæ of reduction and the values obtained for the Colaba instrument	15
These values not absolutely correct	16
Cursory examination of the salient features of the derivation of the distribution constants and the mode of application of the distribution correction	17 to 22
Comparison of the theoretical values, the actual values and the adopted value of P_o ...	23
Reference to the small probable shift in the value of H through 38 years	24
The probable change in P′ and Q′ due to change in P_o	25
Remarks about the gradual decline in the value of P_o	26
Comparison of the standard instrument with four other magnetometers, and the shifts in the values of H by using P and Q corrections instead of P_o correction only	27
Remarks about the adopted value of P_o and its theoretical value derived from P and Q	28
Reference to the instrumental errors	29
Values of M (the moment) subject to a gradual decay	30
This decrement for the Colaba magnet expressed by the formula $\Delta M = A + Bt^{-1}$	31
Reference to the dislocations in the decrement	*id.*
Other abrupt changes in the values of M	32
Occasional occurrence of such abrupt movements in values of P_o	33
The product $P_o\sqrt{M}$ is approximately in the Colaba instrument a constant quantity	*id.*
Determination and the adopted value of K_m	34
Occurrence of large probable errors in the observations of vibration with the inertia cylinder ...	35
Evidence of a small growth in the value of K_m	36
Reference to the cause of the uncertainty in the determination of the time of vibration of a magnet loaded with the inertia cylinder	37
Small growth in the value of K_m not due to change in the position of the centre of gravity of mass due to the secular change in Dip	38
Examination as to whether this growth is due to the small diminution in the mass of the magnet ...	39
Constant values of P_o and K_m have been adopted in the reductions which is the least objectionable of all other methods	*id.*
Derivation of the probable errors of observations in the determination of the values of H for some selected years	40
Forms A and B showing details of the method of taking absolute observations	41

PARAGRAPH

2. Absolute Instruments : Declination.

The observations did not commence till 1868 42
For the period 1846—1867 Grubb's D magnetometer (Chapter V) relied upon for absolute values ... 43
Results before 1856 regarded as unreliable 44
The Kew unifilar magnetometer when compared with four others, give accordant results 45
Reference marks used at Colaba ... ... 46 to 48
Probable errors of observations of Declination 49
Method of taking Declination observations, Form C ... ... *id.*

3. Absolute Instruments : Inclination.

The indications of the old instrument (1846 to 1867) very rough ... ... 50 and 51
The Kew Dip Circle No. 49 by Barrow in use from 1868—1905 ... ... 52 and 53
Observations between 1873 and 1887 unreliable 54
Method of taking Dip observations, Form D ... ... *id.*
Probable errors of observations of Inclination 55

CHAPTER II.

HORIZONTAL FORCE : VARIATION INSTRUMENTS.

1. Horizontal Force Magnetograph.

Description and working of the instrument ... ... 56 to 58
Factors for converting scale reading into ordinates on the photographic paper 59

2. Scale Co-efficient of the H. F. Magnetograph.

The mechanical theory of the bifilar magnetometer 60
Its application for the derivation of the scale co-efficient 61
Formula for the derivation of the monthly values of the scale co-efficient 62
Another method : the method of deflections ... ... 63 and 64
Modification in the method when the moment of the magnet is previously known 65
The details of the process of observations 66
The whole process for the determination of the scale co-efficient illustrated by an example ... 67 and 68
Modification in the method before 1887 ... ... 69 and 70
The importance of the terms p and J 71

3. The Temperature Co-efficient.

Necessity for (1) securing a magnet with a small co-efficient (2) providing for small variations of temperature 72
Necessity for an open scale thermometer measuring the actual change in the temperature of the magnet 73
Three methods of determining the temperature co-efficient 74
Their advantages and disadvantages 75
Method (3) adopted at Colaba 76
Results of heating and cooling experiments performed from time to time 77

4. Use of the Differential Instrument.

Process of derivation of the mean monthly absolute values 78
Process of the derivation of the zero of the H. F. magnetograph instrument and the probable errors involved ... ... 79 to 81

5. The Magnetograph as a Recorder of Secular Change.

The creep of the zero unsteady during earlier years 82
Adjustments and their effect on the comparability of the zeros from year to year ... ... 83 to 85
The consecutive differences of the annual means of the zero treated by the formula $\Delta Z = \alpha + \beta t^{-1}$ ... 86
Theoretical values of the zero built up from their calculated differences 87
The departures of the observed from the theoretical values indicate approximately the behaviour of the instrument ... ... 88 and 89
These departures run parallel to similar departures of the Grubb's H. F. magnetometer ... ... 90 and 91
Examination of the possible causes to which these departures could be assigned ... ... 92 to 94
The existence of an annual variation in the progression of the values of the zero 95
Determination of the temperature co-efficient from the monthly values of the zero 96
The annual variation of zero cannot be ascribed to a possible over-correction of the temperature of the magnetograph nor to the thermometer not correctly measuring the actual temperature of the magnet ... ... 97 and 98

PARAGRAPH

The annual variation does not appear to be due to the possible irregular expansion of the photographic paper and the condition of the film at the time the ordinates are tabulated ... ... 99 to 103
The cause of the annual variation may lie in a non-magnetic source of variation in the results of the absolute determinations, such a contingency possible though not probable 104
In absence of any of these causes it may be regarded as a differential magnetic effect on the annual march of H at the place (overground) where absolute observations are taken and (underground) where the magnetograph is located 105
Comparison of the annual variations of H as derived from absolute observations and as registered independently by H. F. magnetograph 106
Comparison of annual variations of H, of the H. F. magnetograph zero, of D, and of the D magnetograph zero 107
Determination of the final residual errors in the progression of the zero, which measure partly the probable errors in the absolute observations of H and partly the irregularities in the creep of the zero ... ...108 and 109

6. Magnetograph as Recorder of Diurnal Variations.

Mode of tabulation of the hourly ordinates and of the formation of monthly abstracts arranged from 10 A.M. to 10 A.M. ... ... 111 to 115

7. Temperature Errors in the Diurnal Inequality by H. F. Magnetograph.

Temperature correction very small and inappreciable 116
Results of experiments conducted to determine whether the attached thermometer measures the actual temperature of the magnet 117
The results show that the diurnal inequality may safely be accepted as compensated for temperature ... 118
The use of Richard Freres' thermograph in the underground room as a refinement in the process is problematic ... ... 119 to 121

8. Aperiodic Element in the Diurnal Inequality

The principle of the aperiodic element and the mode of its progression 122
The magnitude of the aperiodic correction and the mode of its application ... ... 123 to 125

9. Use of the Variation Instrument for the derivation of the Daily Means.

The process of derivation of the daily means illustrated by an example 126
Description of the tables which contain the final data 127

CHAPTER III.

HORIZONTAL FORCE: DIFFERENTIAL INSTRUMENTS—(*continued*).

1. Grubb's Force Magnetometer.

Description of the instrument and the process of taking and reducing the observations .. ... 128 to 132

2. Scale Co-efficient.

Formula for the determination of the scale co-efficient 133
Determination of the scale co-efficient from observational data only (1847 to 1855) 134
The process of derivation of the scale co-efficient from observational data and results of deflection experiments (1856 to 1872) 135
The process of determination of the scale co-efficient (1873 to 1905) 136

3. Grubb's Magnetometer as a Recorder of Secular Changes.

Determination of the value of zero of the instrument; periods of undisturbed adjustment 137
The secular progression in the value of the Zero expressed by the equation $\zeta = a + b\sqrt{t}$ 138
Derivation of the theoretical curve and the departures of the observed from the theoretical ... ... *id.*
Similarity in the curve of these departures with that of similar departures of H. F. magnetograph ... 139
Points of disagreement between these two sets of curves 140
Reference to large departures in years immediately following the time of fresh adjustment ... ... *id.*
The process of derivation of the zero series (1856 to 1872) 141
Process of derivation of the annual values of absolute H from the annual mean scale readings of the Grubb's magnetometer after correcting the latter for the creep of the zero 142

4. Temperature Corrections of Grubb's.

Three conditions necessary for the correct elimination of the temperature errors, *viz.*, (1) the correct value of the co-efficient, (2) an open scale thermometer, (3) the certainty of the thermometer measuring the actual changes of the temperature of the magnet 143
The scale of the thermometer attached to Grubb's 144
Early determinations of the value of the co-efficient by two methods 145

PARAGRAPH

Recent determination by the third method 146
Adopted values of the co-efficient in scale divisions 147
Errors in the ordinates of the diurnal variations long suspected to be due to the thermometer not measuring the actual temperature of the magnet 148
Average excess diurnal variations of H as registered by Grubb's H. F. magnetometer and H. F. magnetograph (1873 to 1905) 149
These excesses ascribed to more than one likely cause (1) to the march of the magnetic variation itself being different at two places or (2) to the adoption of a faulty temperature co-efficient or (3) to the faulty record by the attached thermometer of the actual changes of the temperature of the magnet ... ... *id.*
Reference to the investigations conducted from time to time to explain this discrepancy ... ... *id.*
Experiments performed in 1906 to elucidate the question 150
Results of the experiment or the derivation of the excess diurnal inequality of temperature as registered by the thermometer in contact with the magnet, and the thermometer attached to the magnetometer 151
Comparison of the diurnal variations of H as registered by the Grubb's H. F. magnetometer and the H. F. magnetograph determined from the selected quiet-days of the year 1872 and the derivation of the excess diurnal inequalities ... ... 152 to 155
Similarity in the curves of these excess diurnal inequalities of H and of temperature referred to in paragraph 151 156
Process of derivation of the excess temperature corrections applicable to the series of the diurnal inequality of H registered by Grubb's H. F. magnetometer ... ...157 and 158
Comparison of the five 11 yearly inequalities as a rough test of the accuracy of these corrections ... 159
The existence of an annual variation in the zero of the instrument 160
Examination of the probable causes which determine this annual variation ... ... 161 to 164
Derivation of the monthly means of H from the mean monthly scale readings after the elimination of this annual variation 165

6. Use of the Differential Instrument.

Observed absolute values of H corrected to the mean of the day by scale readings of this instrument ... 166
Similar absolute values derived by making use of the tabulations of the H. F. magnetograph indicated appreciable differences between the two sets of results 167
Probable explanation of these differences ... ...167 and 168
Reference to the importance of having a duplicate set of instruments allowing of an intelligent and effectual control over their working demonstrated by the experience derived from the behaviour of of Grubb's magnetometer at Colaba 169

CHAPTER IV.

DECLINATION: VARIATION INSTRUMENT.

1. The Declination Magnetograph.

Description of the instruments ... ... 170 to 172

2. The Scale Co-efficient.

Measurements for the determination of the scale co-efficient and for factors for changing scale readings into ordinates and *vice versa* ... ... 173 to 176

3. Use of the Differential Instrument.

Process for the reduction of the observed absolute values to the mean of the day 177
Process for the determination of the value of the zero of the instrument ... ... *id.*
The discussion about the latter does not affect the absolute values of D derived in the usual manner ... 178

4. Declination Magnetograph as a Recorder of Secular Change.

Annual values showing the creep of the zero ... ...179 and 180
The creep of the zero expressed by the formula $\zeta = \alpha + \beta t + \gamma t^2$ 181
Examination of the probable causes which determine the uniform creep of the zero and the minor fluctuations superposed thereon ... ... 182 to 191
The existence of an annual variation in the zero series and the examination of the probable causes to which it may be ascribed 192
Comparison of the annual inequality of D as derived from absolute observations and as registered by D magnetograph and Grubb's D magnetometer 193

5. Use of the Magnetograph for the derivation of the Daily Means.

Process of the derivation of the daily means illustrated by an example 194

6. Diurnal Variation of Declination by the Declination Magnetograph.

Process of derivation of the diurnal inequality 195

CHAPTER V.

DECLINATION: VARIATION INSTRUMENT.

PARAGRAPH

1. Grubb's Magnetometer.

Description of the instrument 196
Instrument used as an indicator of absolute values till 1867 197
Process of observation 198
Value in arc of a unit division of the scale 199
True meridian readings and the torsion co-efficients ... ...200 and 201
These values originally derived accepted for the period before 1861 202
The instrument in undisturbed adjustment from 1861—1895 and therefore the extension of the calculated zero series derived from absolute observations (1868—1905) backwards to 1861 justified 203
Process of observation before and after 1872 ... ...204 and 205
Process of derivation of the annual means of D from the scale readings of the magnetometer after correcting the latter for the creep of the zero for the period 1861 to 1895, no corrections being available for the earlier period 1847—1860 ... ... 206 to 208

2. Determination of the Zero of the Instrument.

Process of derivation of the zero values (1868—1895) 209
The creep of the zero expressed by the formula $\zeta = \alpha + \beta\sqrt{t}$ 210
The theoretical value derived from data of the period 1868 to 1895 passes through the observed value in 1861 ... ... *id.*
The departures of the observed from the theoretical values showing two-year fluctuations run parallel to similar departures for the zero of the D magnetograph ... ...211 and 212
The existence of an annual variation in the zero series and its possible relation to moisture of the atmosphere affecting the instrument 213
The annual variation of D as registered by D magnetograph after correcting it for the annual variation of the zero runs fairly parallel to the variation determined from absolute observations ... 214

3. Use of the Grubb's Instrument.

Differences in the absolute values of D when reduced to the mean of the day by scale readings of Grubb's D magnetometer and by tabulations of D magnetograph 215
Probable explanation of these differences 216
Values corrected by the magnetograph may have been affected by small errors of similar type between 1871—1876 217
Corrections to reduce the observed absolute values to the mean of the day, though small, are not above suspicion in regard to their accuracy and the necessity hence of the duplication of the work by two independent sets of instruments in all large observatories is clearly indicated 218
Diurnal inequality of declination derived from 1848 to 1872 219
Comparison of the diurnal inequality as registered by D magnetometer and D magnetograph shows no appreciable difference between the two 220

CHAPTER VI.

VERTICAL FORCE VARIATION INSTRUMENTS.

1. V. F. Magnetograph No. 2.

Description of the instrument **221**
The accuracy of the results of the V. F. magnetograph not commensurate with that of the other two ... **222**
Defects of a peculiar type in the Colaba V. F. magnetograph No. 1 ... ... **223**
Principle of the balance magnetograph **224**
Double arrangements for eye observations and photographic record **225**
Factors for converting scale readings into ordinates and *vice versa* 226

2. Scale Co-efficient of the V. F. Magnetograph (No. 2).

The theory of the balance magnetometer **227**
Scale co-efficient derivable by the method of vibrations and the method of deflections **228**
The theory of the deflection method **229**
The process and formulæ used for the derivation of the scale co-efficient given in detail ... ... 230 to 239
The comparison of the simultaneous record of this instrument with that of the Watson's magnetograph installed at Alibag shows close and accordant results **240**

3. Temperature Co-efficient of the V. F. No. 2 Magnetograph.

Results of heating experiments of the magnetograph in 1895 and 1907, and the adopted value of the temperature co-efficient ... ... 241 to 243

PARAGRAPH

4. Use of the V. F. No. 2 Instrument.

Process of derivation of the mean monthly absolute values of V corrected to the mean of the day ... 244
No discussion of the zero series in this instrument has been attempted 245
Process of derivation of the diurnal inequality ... ...246 and 247
Necessity for considering the day from 10 A.M. to 10 A.M. ... ... *id.*

5. Temperature Corrections to Diurnal Inequality.

Temperature correction small and inappreciable 248
Experiments conducted to determine whether the attached thermometer correctly measures the actual temperature of the magnet 249
Results show that in the variation of the magnet temperature the amplitude is smaller and the phase is different 250
The diurnal inequality accepted as compensated for temperature ... ... *id.*
To rely upon the indications of Richard Freres thermograph record is unsafe 251
Necessity of a small temperature co-efficient, a small temperature variation and an open scale thermometer 252
Derivation of the aperiodic correction and its application 253
Tables giving the diurnal inequalities 254

6. Variation Instrument (Magnetograph No. 1).

Derivations of factors for converting scale readings into ordinates and *vice versa* 255
In this instrument, the sensitiveness of the instrument is different for different readings of the scale owing to the curvature in the knife-edge 256
General nature of this curvature and its influence on the co-efficient 257
Process of derivation of the true curvature of the knife-edge 258
Formulæ for the determination of the scale co-efficient ... ...259 and 260
Process of derivation of the co-efficient before 1882 ... ... 261 to 263
Modification in the process after 1882 264
Adopted values of the co-efficients 265

7. Temperature Co-efficient of the Magnet of the V. F. No. 1 Magnetograph.

Temperature bar altered in 1879 266
Results of heating experiments and the adopted value of the co-efficient ... ... 267 to 269

8. Use of the V. F. No. 1 Magnetograph.

Reduction of the absolute V. F. to the mean of the day 270
Derivation of the diurnal inequalities 271
Corrections for aperiodic changes 272
Reference to the degree of accuracy to which the diurnal inequalities registered by V. F. No. 1 magnetograph may be accepted as reliable 273

9. Comparison of the Diurnal Inequalities of Vertical Force as registered simultaneously by V. F. No. 1 and No. 2 Magnetographs.

Comparison extends over five years 1894—1898 274
Differences not seriously large but persistent 275
Movements of the No. 1 instrument indicate a contracted range suggestive of some defect in the knife-edge 276
Probable cause of the differences suspected at first to be due to uncompensated effects of temperature ... 277
The accidental coincidence in the character of the indications of the thermograph and the excess inequality led to the formation of the hypothesis of the operation of two vitiating causes (1) diminution of range and (2) temperature effects ... ... 278 to 281
The application of these two conditions gave unsatisfactory results 282
The results of special temperature experiments (paragraph 117) when used showed results indicating a step in the right direction 283
Indications during deflection experiments of the sluggish behaviour of the balance and the sensible difference in the degree of sluggishness for positive and negative movements 284
Equations representing lag, diminution of range and temperature, solved for the average months, for the summer and for the year, and the constants derived by the method of least squares ...285 and 286
The results showed that the adopted hypotheses though fairly simulating the average phenomenon failed to elucidate the real defect in the working of the balance 287
The examination of the consecutive differences showed that the sluggishness of the balance was not uniform, but was sensibly less so in respect of movements indicating increase of force than in the case of movements in the opposite direction 288
Process adopted for the elimination of the effects of this sort of sluggishness and the derivation of the residual errors 289
The parallelism of the residual curves to the curve of the actual temperature of the magnet leaves little room for doubt as to the appropriateness of the above hypothesis 290

	PARAGRAPH
Formula representing these conditions	*290*a*
This serves as a workable method for determining the effects of the defective knife-edge	*290*b*
The old inequalities have therefore been corrected by the average differences derived from the comparison (1894—1898) from month to month	*290*c*
Some uncertainty must remain in regard to the acceptance of these corrections for individual months and the calculations of the Fourier co-efficients have therefore been restricted to average months and average years	*290*d*

* Paragraphs 291, 292, 293, and 294 in the text should read 290*a*, 290*b*, 290*c*, and 290*d*.

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LIST OF PLATES.

Colaba Magnetic Data—Parts I and II.

Description of Plates.	No. of Plate.	Page
Comparison of magnetometers for the determination of distribution constants ...	1	13
Curves showing the behaviour of the Grubb's H. F. magnetometer and H F. magnetograph, indicating the secular and annual variations of absolute Horizontal Force	2	55
Comparison of the diurnal inequalities of Horizontal Force as registered by Grubb's H. F. magnetometer and H. F. magnetograph for the year 1872 ...	3	123
Curves showing the behaviour of the Grubb's declinometer and declination magnetograph as indicating the secular and annual variations of absolute declination	4	157
Comparison of the diurnal inequalities of Vertical Force as registered by the Vertical Force magnetographs Nos. 1 and 2	5	245
Traces of Vertical Force No. 1 magnetograph showing different features in its behaviour	6	246
Excesses of the diurnal inequalities of Vertical Force as registered by the Vertical Force magnetograph No. 1 over those by No. 2	7	250
Excesses of the diurnal inequalities of Vertical Force as registered by the Vertical Force magnetograph No. 1 over those by No. 2	8	250
Secular and annual variations of Absolute Horizontal Force	9	265
Secular and annual variations of Absolute Declination	10	273
Secular and annual variations of Absolute Vertical Force and Inclination ...	11	276
Diurnal inequality of Horizontal Force (magnetograph)	12 to 16	282
Diurnal inequality of Horizontal Force (magnetometer)	17 to 20	136
Changes in the diurnal inequality of Horizontal Force due to average seasonal and intermittent secular seasonal effects	21	295
Horizontal Force diurnal inequality (magnetograph); excesses of each year over the average year	22	298
Horizontal Force diurnal inequality (magnetograph); excesses of each average month of the groups of sun-spot years over the average corresponding month of the whole period (1872 to 1904)	23	298
Horizontal Force diurnal inequality (magnetometer); excesses of each average month of the groups of sun-spot years over the average corresponding month and the excesses of each year over the average year of the whole period 1850 to 1871	24	298
Diurnal inequality of Horizontal Force and its Harmonic components ...	25 to 28	306
Changes in the diurnal inequality of H and D due to average seasonal and secular seasonal effects	29	*ib.*
Diurnal inequality of Declination (magnetograph)	30 to 34	334
Diurnal inequality of Declination (magnetometer)	35 to 38	196
Changes in the diurnal inequality of declination due to average seasonal and secular seasonal effects	39	344
Declination diurnal inequality (magnetograph); excesses of each year over the average year	40	346
Declination diurnal inequality (magnetograph); excesses of each average month of the groups of sun-spot years over the average corresponding month of the whole period, 1872 to 1904	41	*ib.*
Declination diurnal inequality (magnetometer); excesses of each average month of the groups of sun-spot years over the average corresponding month, and the excesses of each year over the average year of the whole period, 1850 to 1871	42	*ib.*
Diurnal inequality of Declination and its harmonic components	43	349
Diurnal inequality of Declination (magnetograph)	44 to 49	184
Diurnal inequalities of Vertical Force (magnetographs)	50 to 54	378
Changes in the diurnal inequality of Vertical Force due to average seasonal and intermittent secular seasonal effects	55	385
Diurnal inequality of Vertical Force (magnetograph); excesses of each year over the average year	56	387
Diurnal inequality of Vertical Force (magnetograph); excesses of each average month of the groups of sun-spot years over the average corresponding month of the whole period, 1873 to 1904	57	*ib.*

Description of Plates.	No. of Plate.	Page.
Diurnal inequality of Vertical Force and its harmonic components	58	391
Diurnal inequality of inclination	59 and 60	402
Vector diagrams showing the diurnal inequality in the horizontal plane (northerly and easterly forces)	61 to 66	407
Vector diagrams showing the diurnal inequality in the vertical plane (E.-W.), (vertical and easterly forces)	67 to 71	418
Vector diagrams ; Dip and declination (average month and year, 1894 to 1904) ...	72	*ib.*
Character curves and diurnal variations of disturbances	73	461
Magnetograms of selected disturbances recorded at Colaba together with corresponding records of Kew, Powlowsk and Batavia Observatories ...	74 to 80	472
Principal magnetic disturbances (Horizontal Force)	81 & 81A to 81K	263
Diurnal inequality of Horizontal Force for quiet days	82 and 83	564
Excess diurnal inequality of Horizontal Force (all-days less quiet-days) ...	84 to 87	*ib.*
Excess diurnal inequality of H (all-days less quiet-days ; winter, summer, year) ...	88	567
Curves showing hourly values of Horizontal Force and their running means ...	89	538
Diurnal variation of H : Secular phase disturbance and the first component ...	90	578
Diurnal inequality of Declination for quiet days	91 and 92	594
Diurnal inequality of Vertical Force for quiet days	93 and 94	604
Curves showing the average lunar diurnal variations for each phase of the moon (arranged in solar hours)	95	625
Curves showing the average lunar diurnal variations for each phase of the moon and for the whole lunation (arranged in lunar hours)	95*a*	625
Curves showing for the quarter November to January and for the maximum and minimum sun-spot years the average lunar diurnal variations for each phase of the moon and for the whole lunation	95*b*	629
Curves showing for the quarter November to January and for the complete lunations, the average lunar diurnal variations for each year and for the whole period	95*c*	*ib.*
Lunar diurnal variations of D, V, and H for each lunation : May 1900 to May 1901.	96	636
Variation of 27-day period in the daily means and diurnal ranges of H ...	97	664
Variation of frequency of quiet days (27-day period)	98	*ib.*
Variation of daily means of H ; 27·5-day and 27·25-day periods ...	99	*ib.*
Solar spots and magnetic data, 1846 to 1907	100	689
Secular variations of solar spot numbers and magnetic (periodic) ranges of H, D, and V, and of the variability and departures from the mean of the daily means and daily ranges of H	101	726
Disturbance inequalities or diurnal inequalities of each month less the average diurnal, seasonal and secular variations	102, 102*a* and 102*b*	718
Secular variation curves of frequency and intensity of days of disturbances of different magnitudes	103	711
Secular variations of meteorological and some magnetic elements ...	104	750
Excess diurnal variations of Declination, Temperature, Vapour pressure and Vertical Force for each month, over their average diurnal inequalities of the year	105	762
Diurnal variations of the meteorological and magnetical elements ...	106	762
Magnetograms showing typical quiet days	107	771
Magnetograms showing typical movements	108 to 111	776

ERRATA.

Colaba Magnetic Data, 1846 to 1905, Part II.

Page 266 Table 239, Column 11, 1875, for 37329 read 37293.
" " " " " 2, 1886, for 31415 " 37415.
" " " " " 11, 1897, for 35442 " 37442.
" 267 " 240, Annual inequality, 1894 to 1904, December, for 299 read 29.
" " " 239, Figures in the last column are correct to 1*y*.
" 271 " 242, Column 11, for difference figures opposite the years 1859, 1860, 1861, 1863, 1864, 1865, 1866, 1867, 1872, 1875, 1884, 1889, 1891, 1892, 1893, read + 2′ 36″, + 1′ 1″, + 0′ 17″, − 0′ 24″, − 1′ 6″, − 0′ 31″, + 0′ 44″, + 0′ 42″, + 0′ 46″ − 0′ 29″, + 0′ 14″, + 0′ 13″, + 0′ 13″, + 0′ 22″, − 0′ 10″ respectively.
" 272 " 243, January 1885, for 25′ 21″ read 55′ 21″.
" 281 " 247, Yearly means of V. F. calculated, for 1902; for ·148730 read ·148130 and for the corresponding difference − 395 in the next column read + 205.
" 287 " 252, 1889, 20*h*., for 102 read − 102.
" 288 " 253, Mean 1894 to 1904, 19*h*., − 123 to be in thin type.
" " " " " 20*h*., − 127 " thick type.
" " " " " Range, for 419 read 423.
" 302 " 263, May 11*h*., for + 60 read + 90.
" 313 " 267, Mean of q_1, 1894 to 1904 September, for 4·36 read 4·46.
" 331 " 284, September 11*h*., for − 389 read + 389.
" 333 " 286, Range, January and February, for 1·44 and 0·95 read 1·47 and 0·98 respectively.
" 336 " 291, 1902, 7*h*., for − 1·92 read + 1·92.
" 358 " 308, q_3, November 1894, for − 2·12 read − 0·12.
" 377 " 328, October 9*h*., for + 102 read − 102.
" 380 " 333, 1895, 6*h*., for 141 read + 141.
" 382 " 337, June 10*h*., for − 15 read − 154.
" " " 338, March 10*h*., for + 80 read − 80.
" 399 " 356, October 1894, P_2, for 5·86 read 4·40.
" " " " " μ_2, for 43° 9′ read 61° 27′
" " " " October 1903, for 553° 17′ read 353° 17′
" 403 " 360, March 7*h*., for 0·4 read + 0·4.
" 404 " 362, Mean 1894 to 1904, 8*h*., for 0·1 read − 0·1.
" " " " 1898, 23*h*., for 1·5 read 0·5.
" 411 " 369, 1879, 14*h*., for 124 read − 124.
" 414 " 376, June 10*h*., for 42 read − 42.
" 422 " 381, 1873, April 1st, for 15 read − 15.
In the headings of Table 381, pages 427 to 449, read (10*h* to 10*h*) after "character of each day".
Page 428 Table 381, 1884, August 30, for 9 read 0.
" 429 " " 1885, March 11, for 2 read − 2.
" 430 " " 1886, January 1, for 4 read − 4.
" 431 " " 1887, July 30, for − read − 3.
" 433 " " 1889, August 31, for blank opposite Ca read 0.
" 436 " " 1892, March 7, for − 0 read − 9.
" 438 " " 1894, June 23, for + ·7 read + 17.
" 440 " " 1896, June, at the bottom of table opposite M, for 6 read 0.
" 442 " " 1898, May " " M, for 1 read 0.
" 447 " " 1903, July 10, for + 10 read − 10.
" 470 " 391, Column 6, 20*h*., for − 279 read + 279.
" 475 Line 15 from top, for thence read then.
" 480 Table 394, 1878, January 24*d*. 7*h*. column, for − 46 read + 46.
" 481 " " 1882, November 12*d*. 23*h*. column, for 352 read − 352.
" 498 " 397, 1878, June 3*d*. 3*h*. for 115 read − 115.
" 517 " 413, September 7*h*., for − 8 read − 85.
" " " " May 10*h*., for 2 5 read 285.
" 518 " 414, September 6*h*., for 96 read − 96.
" " " " May 18*h*., " + 121 read − 121.
" " " " October 19*h*., " 90 read − 90.
" 520 " 419, " 6*h*., " − 144 read − 114.
" 521 " 421, 1897 9*h*., " 185 read + 185.
" 522 " 423, January 8*h*., " 38 read + 38.
" 526 " 430, Hour column, last figure, for 3 19 read 23 19.
" 527 " 432, December 6*h*., for + 1 read + 19.
" 528 " 434, February 17*h*., " 34 read − 34.
" " " " January 19*h*., " 11 read − 11.
" 543 " 450, 1899, December 5*h*., for 1 read − 1.
" 550 " 451, 1900, August 8th, " 12 " − 12.
" 551 " " 1903, September 30th, for − 27 read + 27.
" 565 " 458, 1901, p_4, for − 0·6 read − 0·06.
" 596 " 486, in the year column opposite 7*h*. and 10*h*. for − 0·05 and − 0·04 read − 0·03 and − 0·03 respectively
" 597 " 487, October 2*h*., for + 9·32 read + 0·32.
" " " " " 10*h*., " − 1·42 " − 0·42.
" " " " August 16*h*., " + 3·33 " 0·33.
" " " 488, September 2*h*., " + 2·21 " 0·21.
" " " " December 8*h*., " − 2·41 " − 0·41.
" " " " October 9*h*., " + 9·68 " + 0·68.
" " " " December 9*h*., " 0·16 " − 0·16.
" " " " March 16*h*., " + 9·33 " 0·33.
" 598 " 489, May 6th, " 424 read 494.
" " " " Annual means, 1894, 4·00 and 3·81 read 400 and 381 respectively.
" " " " Annual means, 1901, for 3·09 and 3·06 read 309 and 306 respectively.
" " " " in the foot-note for 10*h*. to 10*h*. in the first case read 0*h*. to 0*h*.
" 599 " " 1898, March 3*d*., for 151 read 158.
" " " " " July 18th, " 476 " 479.
" " " " Annual means for 1898, for 3·41 and 3·25 read 341 and 325 respectively.

Page 599 Table 489, Annual means for 1899, for 3·33 and 3·33 read 333 and 333 respectively.
" 605 " 495, 1900, 13*h*., for 59 read −69
" " " " 1896, 18*h*., " 5 " −5.
" " " " 1904, 18*h*., " 2 " −2.
" " " " " 19*h*., " 7 " −7.
" " " 496, 1894, 6*h*., " 6 " −6.
" " " " 1899, 12*h*., " 11 " −11.
" " " " 1901, 22*h*., " 1 " −1
" 614 " 504, Seven-eighth phase, 1879-80, 8*h*., for −8 read +8.
" 615 " 505, One-eighth " 1884-85, 23*h*., " 0 " 10.
" 617 " " Five-eighth " 1872-73, 22*h*., " −14 " +14.
" 623 " 507, Vertical Force, one-eighth phase, opposite 7 and 8 hours, for −1 and −1 read −7 and −7.
" 631 " 511, Maximum spot years, 1st quarter, 22*h*., for −2 read +2.
" 633 " 513, 1887-88, 5*h*., for 11 read −11.
" 634 " 514, Average, 7*h*., for 3 read −3.
" 636 Paragraph 529, line 10, for plate 95 read plate 95*a*.
" 637 Table 516, Last column 3*h*., for 2 read + 2.
" 641 " 519, Last quarter, 1875, 18*h*., for +2 read +12.
" 643 " 520, 1891, October 24, for +22 read −22.
" 646 " " 1896, November 30, " −15 " +15.
" " " " 1897, June 17, −32 to be in thick type.
" 650 " " 1905, December 27, for −10 read +10.
" 652 " 521, 1892, December 15, " 6 " −6.
" " " " 1893, October 1, " +15 " −15.
" " " " " August 7, " −12 " +12.
" " " " " October 24, " −59 " +59.
" 653 " " 1894, July 11, " 18 " −18.
" 654 " " 1897, September 24, " + " +1.
" 662 " 524, Diurnal Ranges, 1898-99, 23*d*., for 28 read −28.
" 664 Paragraph 537, line 21, for 98 read 99.
" 665 " 539, " 6, " 99 " 98.
" 668 Table 527, for (1883 to 1894) read (1883 to 1904).
" 670 " 528, 1897, June 26, for 8 read −8.
" 671 " " 1898, February 11, " 2 " −2.
" 673 " " 1903, August 21, " −10 " −11.
" 674 " " 1905, January 8, " 8 " −8.
" 678 Paragraph 548, line 4, after 528A add from which.
" 680 Table 528A, 1897, April 20, for +23 read −23.
" 683 " " 1902, October 11, " −28 " +28.
" 686 " 530, 1878, June, for 221 read +221.
" 687 " 531, 1878, September, for 24 read +24.
" " " 532, 1880, April " +157 " +137.
" " " " 1887, February " −23 " +23.
" " " " 1888, April " +155 " +55.
" " " " 1890, January " +128 " +125.
" " " " " April " +28 " +128.
" " " " 1891, " " +110 " +10.
" " " " 1893, " " −228 " −128.
" " " " 1894, " " −106 " −206.
" " " " 1895, " " −14 " −114.
" 697 " 543, 1887, May 4, for 1 read +1.
" 701 " " 1895, February 22, " −5 " +5.
" " " " 1896, July 3, " 11 " −11.
" 703 " " 1900, May 8, " 9 " −9.
" " " " " June 24, " 1 " −1.
" " " " " December 30, " blank " 0
" 704 " " 1901, May 6, " 6 " 0
" 706 " " 1906, March 3, " +25 " −25.
" " " " " April 14, " 7 " −7.
" " " " 1905, " 27, " 7 " −7.
" 708 " 547, 1872, February, for −431 read −421.
" 715 " 552, for 1872 June 24 read 1872 June 22nd and for 1883 October 9 read 1883 October 5.
" " " " opposite August 4, for 26 read 27.
" " " " for October 3rd, 1872, read October 13th, 1872.
" 718 Line 9 from top, for considering read . Considering.
" 723 Table 557, 1883, November, for 257 read 287.
" 730 " 560, Column 4, decimal points not required.
" " " " " 13, average, for + 5 read ± 5.
" 737 " 563, Annual variation, February, for 9·2 read −9·2.
" 738 " 564, April 1864, for 119 read 109.
" 740 " 566, 1872, March, for 29·820 read 29·850.
" 744 " 570, for means, 1873—190 read means, 1873—1905.
" " " " Annual variation for August, for ·020 read −·020.
" 747 " 573, 1886, February, for 87·8 read 78·8.
" 748 " 574, 1884, Columns 15 and 16, for 190 and 137 read 199 and 157.
" 758 " 580, Temperature μ_2, November, for 57 read 7.
" 759 " 581, Column 14, 16*h*., for 1·1 read −1·1.
" 767 " 587, 1881, μ_5 for 56′ 54′ read 56′ 44′.
" 773 " 590, Column 4, opposite 1901, November 15, for −3 read +3.
" " " " " 4, " 1903, March 30, " −3 " +3.
" " " " " 4, " 1902, September 23, " +9 " −9.
" 774 " 591, Column 8, 12*h*., for 41 read −41.
Plate 9, Scale for Figure 1*a*, for +30 γ read −30γ.
" " IIIa, for −30 γ " +30γ.
Table of Contents, Part II, page v, line 31 from top, for trem read term.

Some of the misprints above shown have been corrected by the hand wherever possible, especially in the case of the omissions of signs and figures.

COLABA OBSERVATORY.

Absolute Horizontal Force
Secular and Annual Variations.

Plate 9.

1845 1848 1851 1854 1857 1860 1863 1866 1869 1872 1875 1878 1881 1884 1887 1890 1893 1896 1899 1902 1905

Scale : Each Small Division = 10γ.

Fig I.

Fig II.

Fig III.

37400

37400

37350

37400

Theoretical Curve of H.F.

37200

37000

Theoretical Curve of H.F.

37200

37000

36800

36600

36600

Annual Inequality of H.F.
Absolute Determinations

Jan Apr. July. Oct. Jan.

+6γ 0 -6γ

Fig IV. 1872-1882.

Fig V. 1883-1893.

Fig VI. 1894-1904.

Fig VII. 1872-1904. +3° 0 -3° Scale for Temperature.

Fig VIII. Maximum Spots.

Fig IX. Minimum Spots.

Annual Inequality of H.F.
Grubb's Magnetometer.

Jan. Apr July Oct Jan

Fig X. 1846-1872.

Fig XI. 1872-1904.

+6γ 0 -6γ

Fig Ia.

Fig IIa.

Fig IIIa.

-30γ 0 0 0 +30γ

Scale for Solar Spots. 126 112 98 84 70 56 42 28 14 0

Fig XII. Solar Spots Curve.

Fig I. { Thick Curve = Theoretical Curve of H.F.
Thin " = Observed Absolute H.F. (Corrected.)

Fig II. { Thick Curve = Theoretical Curve of H.F.
Thin " = Absolute Force by Magnetograph.

Fig III. { Thick Curve = Theoretical Curve of H.F.
Thin " = Absolute Force by Grubbs.

Fig Ia Difference Curve Thick and Thin of Fig I.
Fig IIa " " " " Fig II.
Fig IIIa " " " " Fig III.

Fig VII Dotted Curve denotes Variation of Ground Temperature. (20 Inches Below Ground.)

Govt Photozinco: Office, Poona, 1909

CHAPTER I.

Horizontal Force and its Secular and Annual Variations.

291. The data prepared and collected in Part I are already available and may now be taken up for discussion.

It will be remembered how the determinations by absolute observations of the values of horizontal force for the earlier period, 1847 to 1867, have been considered uncertain and how in their stead the series by Grubb's magnetometer has been recommended as more reliable. Hence in column 2 of table 239 the annual means of the absolute series as observed for this period have been entered in small type. The Grubb's series is shown in the same table in column 11, which is filled up and completed by entries of the annual means of force of the later period to 1905 also, as shown in column 14 of table 106 in Part I of the volume.

The observed absolute values of force for the period 1868 to 1905 as derived from the Kew Unifilar and shown in column 2 of table 239, are corrected for the mean of the day by the Grubb's magnetometer and appear in column 3; while in column 4 the same are given as corrected by the magnetograph.

292. The annual means in columns 3 and 4 show slight differences but these have been already examined and referred to. Of the two, the series in column 4, however, is accepted as being practically free from errors and has therefore been used for the purposes of discussion below.

293. On examination it will be readily seen that the curve of these mean annual values of force can fairly approximately be expressed by the formula $H = a + bt + ct^2$ where a, b and c are some constants and t represents the number of years reckoned from some convenient year 1871·5. The constants derived by least squares from 34 equations of condition are $a = 37237{\cdot}17\gamma$; $b = 16{\cdot}75\gamma$; $c = -0{\cdot}35\gamma$.

From these constants the calculated values of the theoretical curve, given in column 5, have been derived. In column 6 are given the departures of the observed from the theoretical curve, which show how far the latter curve may be accepted as representing the graph of the observed annual means. These curves are charted in figure 1, plate IX, the thick curve representing the theoretical and the thin the observed curve.

294. The theoretical curve, for obvious reasons, can only be depended upon for parallelism just for the period considered, and for that period alone, but it is interesting to note that it runs, fairly coincident with the curve of absolute force derived from the Grubb's variation magnetometer,* shown in column 11 and charted as thin curve in figure 2, plate IX, for practically the whole period, 1846—1905, though the period (1846—1871) has not been considered in the derivation of the theoretical curve.

295. In column 7 of the same table are given the annual mean values of the sun spot figures published by Wolfer; which together with the departure curves in columns 6, 12 and 15 are charted for convenient reference and comparison respectively in figures 12, 1*a*, 2*a* and 3*a* in the same plate. The parallelism† disclosed here shows quite markedly how the mean annual values of absolute force, which are ordinarily supposed to be subject only to the influence of secular changes of a great period, are affected almost regularly by a disturbance inequality of nearly the same periodicity as the one which affects the solar spots. The fluctuations, it will be readily noted, are not indicated merely because a particular formula has been used, as it becomes obvious at a glance that, in any case, the force values on the average stand lower generally during the period of maximum spot years, and higher during the minimum epoch in any single 11-year cycle.

The effect of such fluctuations on the regular march of secular force under the influence of the great unknown period, if it is a growing phenomenon as was the case at Colaba prior to the year 1897, is to accelerate the rate of growth during the interval between the maximum and the minimum spot epochs and to retard it during the interval of years from minimum to maximum; while reverse effects, of course, follow when the secular change becomes negative, that is, when it is retrograding after passing the maximum turning point as was the case at Colaba after 1897. It will be seen hence that under such conditions it is not possible to derive the correct mean annual change unless the annual means are freed from these disturbance effects or their values are averaged for a number of years extending over a complete period, whatever it be, of 11 years or thereabout.

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* Refer paragraph 142, Chapter III, Part I, data from which are again reproduced for ready reference in table 239, columns 8, 9, 10 and 11.

† The sharp peak seen in figure 3*a* for the year 1873 is due to instrumental defect brought about by the re-adjustment of the instrument that year (*vide* Part I, Chapter III).

TABLE 239.—*Annual Means and Secular Variation of Absolute Horizontal Force.*

Unity = 1γ = ·00001 C. G. S.

Year.	Annual means of observed Absolute Determinations.	Observed absolute values in col. 2 corrected from monthly mean scale reading of Grubb's Magnetometer.	Observed absolute values in col. 2 corrected from monthly mean tabulations of magnetograph.	Theoretical curve derived from col. 4 by formula $H = a + bt + ct^2$.	Differences, col. 4 – col. 5.	Wolfer's sun-spot numbers.	Mean annual scale reading of Grubb's magnetometer corrected for temperature.	Differences of consecutive annual means in col. 8 converted into c. G. S. unit. Unity = 1γ	Annual change in col. 9 corrected for instrumental change by formula.	Absolute values derived from col. 10 by values of force of selected years.	Differences, col. 11 – col. 5.	Differences, col. 11 – col. 4.	Values of absolute Force derived from the mean annual values of the tabulation ordinates of H. F. Magnetograph corrected for temperature and instrumental change.	Differences, col. 14 – col. 5.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1846 ...	...	...	...	36597	...	61	...	...	...	...	...	...	...	...
1847 ...	*36638*	...	...	36631	...	98	18·79	+77	+69	...	...	...	...	...
1848 ...	*36653*	...	...	36665	...	124	20·92	+73	+65	36557	−108	...	...	...
1849 ...	*36703*	...	...	36697	...	96	22·96	+70	+64	36622	− 75	...	...	...
1850 ...	*36760*	...	...	36729	...	66	24·91	+38	+32	36686	− 43	...	...	...
1851 ...	*36773*	...	...	36761	...	64	21·63	+97	+92	36718	− 43	...	...	...
1852 ...	*36904*	...	...	36791	...	54	24·33	+35	+30	36810	+ 19	...	...	...
1853 ...	*36913*	...	...	36821	...	39	13·97	+50	+45	36840	+ 19	...	...	...
1854 ...	*36906*	...	...	36850	...	21	15·34	+50	+45	36885	+ 35	...	...	...
1855 ...	*36914*	...	...	36879	...	7	16·71	...	...	36930	+ 51	...	...	...
1856 ...	*37015*	...	...	36906	...	4	18·89	+ 5	+ 1	36953	+ 47	...	...	...
1857 ...	*37059*	...	...	36933	...	23	18·97	− 19	− 23	36954	+ 21	...	...	...
1858 ...	*37064*	...	...	36959	...	55	18·63	+25	+21	36931	− 28	...	...	...
1859 ...	*37132*	...	...	36985	...	94	19·08	+29	+25	36952	− 33	...	...	...
1860 ...	*37141*	...	...	37010	...	96	19·60	+39	+35	36977	− 33	...	...	...
1861 ...	*37199*	...	...	37034	...	77	20·29	+22	+19	37012	− 22	...	...	...
1862 ...	*37209*	...	...	37058	...	59	20·69	+31	+27	37031	− 27	...	...	...
1863 ...	*37252*	...	...	37080	...	44	21·24	+28	+25	37058	− 22	...	...	...
1864 ...	*37277*	...	...	37102	...	47	21·75	+39	+36	37083	− 19	...	...	...
1865 ...	*37047*	...	...	37124	...	30	22·46	+17	+14	37119	− 5	...	...	...
1866 ...	*37116*	...	...	37144	...	16	23·00	+30	+26	37133	− 11	...	...	...
1867 ...	*37167*	...	...	37164	...	7	23·54	+21	+18	37159	− 5	...	...	...
1868 ...	37163	37146	...	37184	...	37	23·92	+ 4	+ 2	37177	− 7	...	...	...
1869 ...	37186	37163	...	37202	...	74	24·00	+20	+17	37179	− 23	...	...	...
1870 ...	37220	37183	...	37220	...	139	24·36	+24	+21	37196	− 24	...	...	...
1871 ...	37245	37203	...	37237	...	111	24·79	+14	+11	37217	− 20	...	...	...
1872 ...	37256	37222	37228	37254	− 26	102	25·05	+18	+15	37228	− 26	0	...	...
1873 ...	37274	37252	37251	37269	− 18	66	10·39	+64	+61	37188	− 81	− 63	...	...
1874 ...	37301	37282	37281	37284	− 3	45	11·51	+46	+44	37249	− 35	− 32	...	...
1875 ...	37323	37310	37313	37298	+15	17	12·31	+38	+36	37329	− 5	− 20	...	...
1876 ...	37347	37333	37333	37312	+21	11	12·97	+21	+18	37329	+ 17	− 4	...	...
1877 ...	37353	37342	37343	37325	+18	12	13·34	+17	+14	37347	+ 22	+ 4	...	...
1878 ...	37367	37355	37359	37337	+22	3	13·63	+11	+ 8	37361	+ 24	+ 2	...	...
1879 ...	37382	37368	37372	37349	+23	6	13·82	+ 2	0	37369	+ 20	− 3	...	...
1880 ...	37380	37365	37363	37359	+ 4	32	13·85	+ 3	+ 1	37369	+ 10	+ 6	37352	− 7
1881 ...	37374	37357	37358	37369	− 11	54	13·90	− 11	− 14	37370	+ 1	+12	37362	− 7
1882 ...	37359	37340	37340	37379	− 39	60	13·71	+15	+13	37356	− 23	+16	37354	−25
1883 ...	37389	37374	37375	37387	− 12	64	13·98	+30	+28	37369	− 18	− 6	37373	−14
1884 ...	37437	37413	37414	37395	+19	63	14·50	+18	+15	37397	+ 2	−17	37396	+ 1
1885 ...	37427	37410	37411	37402	+ 9	52	14·81	+ 6	+ 4	37412	+ 10	+ 1	37420	+18
1886 ...	31415	37407	37406	37409	− 3	25	14·92	+ 5	+ 2	37416	+ 7	+10	37421	+12
1887 ...	37421	37410	37411	37415	− 4	13	15·01	+11	+ 9	37418	+ 3	+ 7	37433	+18
1888 ...	37436	37420	37422	37420	+ 2	7	15·20	+11	+ 9	27427	+ 7	+ 5	37444	+24
1889 ...	37438	37427	37429	37424	+ 5	6	15·39	+ 6	+ 4	37436	+ 12	+ 7	37449	+25
1890 ...	37445	37433	37434	37428	+ 6	7	15·50	− 6	− 8	37440	+ 12	+ 6	37452	+24
1891 ...	37441	37423	37424	37431	− 7	36	15·39	− 18	− 20	37432	+ 1	+ 8	37442	+11
1892 ...	37424	37403	37405	37433	− 28	73	15·08	+12	+10	37412	− 21	+ 7	37418	−15
1893 ...	37437	37418	37419	37434	− 15	85	15·29	− 6	− 9	37422	− 12	+ 3	37434	0
1894 ...	37426	37408	37408	37435	− 27	78	15·18	+15	+13	37413	− 22	+ 5	37427	− 8
1895 ...	37444	37426	37427	37435	− 8	64	15·44	+ 5	+ 3	37426	− 9	− 1	37437	+ 2
1896 ...	37463	37443	37444	37435	+ 9	42	15·52	+15	+13	37429	− 6	−15	37436	+ 1
1897 ...	37463	37447	37449	37434	+15	26	15·77	+ 1	− 1	35442	+ 8	− 7	37437	+ 3
1898 ...	37445	37434	37437	37432	+ 5	27	15·79	− 4	− 6	37441	+ 9	+ 4	37430	− 2
1899 ...	37448	37437	37441	37429	+12	12	15·72	+13	+11	37435	+ 6	− 6	37431	+ 2
1900 ...	37454	37439	37442	37426	+16	9	15·95	+ 2	0	37446	+ 20	+ 4	37435	+ 9
1901 ...	37447	37435	37439	37421	+18	3	15·98	− 9	− 11	37446	+ 25	+ 7	37433	+ 12
1902 ...	37440	37425	37428	37417	+11	5	15·83	−21	−23	37435	+ 18	+ 7	37426	+ 9
1903 ...	37423	37409	37412	37411	+ 1	24	15·48	−12	−14	37412	+ 1	0	37399	−12
1904 ...	37410	37390	37391	37405	−14	42	15·28	− 6	− 8	37398	− 7	+ 7	37389	−16
1905 ...	37400	37381	37382	37398	−16	63	15·18	...	...	37390	− 8	+ 8	37382	−16

TABLE 240.—*Mean monthly values of Horizontal Force corrected for the mean of the day by H. F. Magnetograph and their mean Annual Inequalities.*

Unity = ·1γ = ·000001 C. G. S.

Years.		Month.												Year.	Values of Horizontal Force calculated by formula $H = a + bt + ct^2$.	Observed less calculated.
		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1872	... ...	372022	371830	372170	372522	372401	372545	372418	372219	372349	372259	372280	372343	372280	372540	− 260
1873	... ...	372068	372260	372314	372571	372699	372538	372694	372696	372466	372655	372541	372684	372515	372690	− 180
1874	... ...	372773	372553	372505	372705	372741	372795	372845	372989	372904	373046	372864	372967	372807	372840	− 30
1875	... ...	372918	372770	372989	373177	373173	373207	373249	373119	373046	373350	373355	373163	373126	372980	+ 150
1876	... ...	373073	373103	373166	373325	373453	373438	373384	373440	373463	373434	373403	373318	373333	373120	+ 210
1877	... ...	373389	373440	373459	373473	373357	373299	373402	373425	373392	373469	373539	373472	373426	373250	+ 180
1878	... ...	373523	373484	373611	373526	373389	333486	373726	373746	373662	373636	373671	373672	373594	373370	+ 220
1879	... ...	373650	373749	373738	373835	373723	373809	373864	373811	373613	373704	373600	373585	373723	373490	+ 230
1880	... ...	373765	373834	373647	373926	373728	373693	373730	373347	373490	373435	373454	373569	373635	373590	+ 40
1881	... ...	373602	373568	373556	373464	373638	373638	373702	373667	373523	373595	373498	373488	373578	373690	− 110
1882	... ...	373458	373455	373584	373260	373290	373455	373489	373423	373561	373427	373125	373284	373401	373790	− 390
1883	... ...	373515	373502	373476	373653	373765	373796	373685	373862	373877	373917	373999	373983	373752	373870	− 120
1884	... ...	374066	373944	373980	374199	374298	374299	374203	374255	374148	374071	374081	374163	374142	373950	+ 190
1885	... ...	374111	374013	374085	374104	374093	374122	374153	374047	374108	374155	374166	374129	374107	374020	+ 90
1886	... ...	373992	374131	374211	374153	374095	374214	374102	374133	374055	373989	373870	373823	374064	374090	− 30
1887	... ...	374056	374218	374060	374010	374137	374083	374099	374083	374117	374156	374217	374137	374114	374150	− 40
1888	... ...	374077	374243	374243	374253	374216	374273	374269	374186	374251	374269	374110	374245	374219	374200	+ 20
1889	... ...	374239	374247	374199	374268	374277	374244	374358	374343	374317	374360	374296	374295	374287	374240	+ 50
1890	... ...	374325	374298	374355	374342	374346	374395	374435	374456	374264	374245	374300	374339	374342	374280	+ 60
1891	... ...	374419	374302	374193	374149	374139	374254	374266	374251	374151	374161	374238	374311	374236	374310	− 70
1892	... ...	374025	373939	373880	374117	373908	373924	373839	373945	374162	374159	374336	374359	374049	374330	− 280
1893	... ...	374188	374250	374210	374244	374354	374247	374157	374054	374181	374183	374092	374148	374192	374340	− 150
1894	... ...	374035	373892	373979	374127	374306	374166	373962	373995	373934	374247	374145	374221	374084	374350	− 270
1895	... ...	374109	374071	374168	374211	374412	374269	374212	374285	374261	374387	374363	374525	374273	374350	− 80
1896	... ...	374465	374260	374399	374430	374371	374572	374435	374441	374371	374490	374545	374565	374425	374350	+ 90
1897	... ...	374480	374487	374507	374338	374461	374561	374653	374476	374547	374474	374480	374379	374487	374340	+ 150
1898	... ...	374423	374488	374350	374290	374361	374404	374362	374386	374119	374299	374346	374573	374367	374320	+ 50
1899	... ...	374514	374310	374294	374395	374450	374455	374364	374401	374339	374369	374472	374512	374406	374290	+ 120
1900	... ...	374406	374349	374386	374474	374203	374446	374410	374427	374523	374466	374547	374408	374420	374260	+ 160
1901	... ...	374456	374360	374378	374443	374427	374490	374405	374417	374358	374291	374414	374280	374393	374210	+ 180
1902	... ...	374274	374354	374351	374290	374269	374350	374327	374276	374160	374222	374279	374242	374283	374170	+ 110
1903	... ...	374265	374288	374212	374093	374114	374270	374256	374087	374034	374000	373919	373865	374117	374110	+ 10
1904	... ...	374114	374029	373987	373789	373887	373896	373904	373929	373909	373755	373816	373942	373913	374050	− 140
1905	... ...	373817	373784	373850	373738	373855	373879	373877	373817	373798	373790	373731	373935	373823	373980	− 160
1872-1882.	Annual Inequality ...	− 107	− 125	− 62	+ 33	+ 16	+44	+98	+42	+ 4	+54	− 8	+ 11	...	...	...
	Correction for Secular change	+ 62	+ 51	+ 40	+ 28	+ 17	+ 6	− 6	−17	− 28	− 40	− 51	− 62	...	...	...
	Inequality corrected for Secular change...	− 45	− 74	− 22	+ 61	+ 33	+50	+92	+25	− 24	+14	− 59	− 51	...	...	...
1883-1893.	Annual Inequality ...	− 45	− 38	− 56	− 1	+ 11	+31	+ 5	+10	+11	+14	+18	+ 39	...	...	...
	Correction for Secular change	+ 22	+ 18	+ 14	+ 10	+ 6	+ 2	− 2	− 6	− 10	− 14	− 18	− 22	...	...	...
	Inequality corrected for Secular change...	− 23	− 20	− 42	+ 9	+ 17	+33	+ 3	+ 4	+ 1	0	0	+ 17	...	...	...
1894-1904.	Annual Inequality ...	+ 32	− 28	− 16	− 28	+ 6	+63	+ 9	− 6	−58	−17	+12	+299	...	...	...
	Correction for Secular change	− 9	− 7	− 6	− 4	− 2	− 1	+ 1	+ 2	+ 4	+ 6	+ 7	+ 9	...	...	...
	Inequality corrected for Secular change...	+ 23	− 35	− 22	− 32	+ 4	+62	+10	− 4	−54	−11	+19	+ 38	...	...	...
1872-1904.	Annual Inequality ...	− 47	− 64	− 46	+ 1	+ 11	+46	+37	+15	−14	+18	+ 8	+ 27	...	...	...
	Correction for Secular change	+ 26	+ 21	+ 17	+ 12	+ 7	+ 2	− 2	− 7	−12	−17	−21	− 26	...	...	...
	Inequality corrected for Secular change...	− 15	− 43	− 29	+ 13	+ 18	+48	+35	+ 8	−26	+ 1	−13	+ 1	...	...	...
Maximum spot years.	Annual Inequality ...	−157	−200	−144	+ 59	+102	+71	− 9	+ 1	+14	+68	+65	+126	...	...	...
	Correction for Secular change	+ 93	+ 76	+ 59	+ 42	+ 25	+ 8	− 8	−25	−42	− 59	−76	− 93	...	...	...
	Inequality corrected for Secular change...	− 64	−124	− 85	+101	+127	+79	−17	−24	− 28	+ 9	−11	+ 33	...	...	...
Minimum spot years.	Annual Inequality ...	− 49	− 31	− 28	+ 9	− 27	+16	+37	+32	0	+16	+32	− 3	...	...	...
	Correction for Secular change	+ 30	+ 24	+ 19	+ 14	+ 8	+ 3	− 3	− 8	− 14	−19	−24	− 30	...	...	...
	Inequality corrected for Secular change...	− 19	− 7	− 9	+ 23	− 19	+19	+34	+24	− 14	− 3	+ 8	− 33	...	...	...

296. If the facts given above are accepted as connoting a real phenomenon, and there is little room for doubt that they do, it may be advantageous for purposes of investigation to free the annual means from this short period disturbance effects which obviously appear to be superposed upon those of the large cycle of unknown periodicity, as both these effects may or may not be definitely traceable to a common origin. It will be seen later that the quiet-day results also show these fluctuations quite as prominently as the all-day results (*vide* figure in paragraph 462, Chapter XI).

In passing it may also be remarked that just as in the 11-year period disturbance of the absolute values, the rate of secular change during some years is accelerated while in others it is retarded, a precisely parallel phenomenon is prominently noticed to run in the secular change of force in 24 hours. The quiet day, which almost invariably shows a high daily mean, as will be seen later, indicates conditions of an accelerated secular rise compared with those of the average all-day; while the disturbed day, which has invariably a low daily mean, is distinctly characterised by a rapid fall of secular force during its course. Both the phenomena and their possible inter-relation have been fully examined in Chapters X, XI and XIII.

297. Recurring to the consideration of the theoretical curve it may be noted that the formula used in paragraph 293 for the fitting of the curve is a parabola of the second order. It is clear that the phenomenon may be more appropriately represented by a repeating curve. But a closer inspection of the curve shows that as the period involved is large and the observed portion a very small part of the whole, the problem is more or less indeterminate.* One can by mere inspection and trial get formulæ upon formulæ as shown below giving fairly close fits, the period ranging from 200 to about 700 years:—

$$H = 36769\gamma + 666\gamma \cos (2^\circ\ 0')t \qquad \text{Period } 180 \text{ years.}$$
$$H = 35023\gamma + 2412\gamma \cos (1^\circ\ 0')t \qquad \text{,, } 360 \text{ ,,}$$
$$H = 28158\gamma + 9277\gamma \cos (0^\circ\ 30')t \qquad \text{,, } 720 \text{ ,,}$$

298. The question here is strictly not one which requires the provision of the best fit for the curve but that which secures the best possible curve so as to bring out correctly the perturbation effects of the 11-year cycle. All the above noted formulæ hence are hardly of any utility beyond indicating the possible limits of time within which the great secular period is likely to fall.

At any rate, the differences of any of the approximate theoretical curves and the observed curve clearly disclose the 11-year periodicity; and, accepting the theoretical curve in paragraph 293 provisionally as correct, a change of sun-spot number from 0 to 100 appears roughly to correspond to a change of about $\pm 30\gamma$ in the absolute force at Colaba or to a total range of movement of about 60γ.

299. With reference to this disturbance of the secular curve of force, it will be seen in Chapter XI, where the results of quiet days of the 11 years, 1894 to 1904, have been discussed in comparison with those of all days for the same period, that the annual values of force as determined by the selected days show oscillations of precisely the same character; but with this difference that the departures are slightly contracted in range and that all annual means derived from the particular quiet days are forced higher up by an amount ranging from less than 1γ to 18γ, depending upon the position of the year in the 11-year cycle and also upon the character of the particular quiet days selected. This last relation is also referred to and fully examined in detail in the chapter on quiet days.

300. The thin curve in figure 2, plate IX, represents the secular march of the values of absolute force derived by the help of the magnetograph from the mean annual values of the tabulation ordinates of the instrument duly corrected for instrumental and other changes. This curve furnishes practically an independent series of force comparable with those determined by other methods given in figures 1 and 3.

301. The general sweep of the curves clearly indicates that the maximum of the great secular period for this element at Colaba has been reached and passed. The maximum value of force indicated by the (observed) annual means is attained in the year 1897, its value being 37449γ; but if the formula in paragraph 293 is accepted as denoting the conditions of the correct secular curve, the epoch of maximum as derived from it when the annual increment vanishes, *i. e.*, when $\frac{dH}{dt} = 2ct + b = 0$; and therefore $t = -\frac{b}{2c} = 23{\cdot}9$, would be $1871{\cdot}5 + 23{\cdot}9 = 1895{\cdot}4$.

2. *Annual Inequality.*

302. Examining the march of the annual inequalities in the first instance from the later period, 1872—1905, derived from table 240 of absolute observations, the results of which are summarised in table 241 below, it will be seen that the character of the variations which exhibit a semi-annual inequality the principal maximum and minimum of which fall to occur about June and February respectively, is more or less persistent in each of the inequalities of the three 11-year periods as also in that of the whole period.

* But for this, Pearson's method of moment would have been most useful for an attempt to fit the simple sine curve $H = A + B\cos\theta t + C\sin\theta$ to the observed values and to evaluate the constants by equating them to the area and moments.

TABLE 241.—*Annual Inequalities of Horizontal Force.*

Unity = 1γ.

No.	Period.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	1872—1882	−4·5	−7·4	−2·2	+6·1	+3·3	+5·0	+9·2	+2·5	−2·4	+1·4	−5·9	−5·1
2	1883—1893	−2·3	−2·0	−4·2	+0·9	+1·7	+3·3	+0·3	+0·4	+0·1	0	0	+1·7
3	1894—1904	+2·3	−3·5	−2·2	−3·2	+0·4	+6·2	+1·0	−0·4	−5·4	−1·1	+1·9	+3·8
4	1872—1904	−1·5	−4·3	−2·9	+1·3	+1·8	+4·8	+3·5	+0·8	−2·6	+0·1	−1·3	+0·1
5	Ground Temperature * ...	−3·5°	−4·0°	−2·2°	+·5°	+2·8°	+3·5°	+2·1°	+1·1°	+0·5°	+0·8°	+0·1°	−1·7°
6	Maximum sun-spot years ...	−6·4	−12·4	−8·5	+10·1	+12·7	+7·9	−1·7	−2·4	−2·8	+0·9	−1·1	+3·3
7	Minimum sun-spot years ...	−1·9	−0·7	−0·9	+2·3	−1·9	+1·9	+3·4	+2·4	−1·4	−0·3	+0·8	−3·3
	From Grubb's Magnetometer Record—												
8	1848—1872 ...	−5·6	−8·7	−1·1	+0·8	+7·9	+7·1	+5·5	+3·1	−1·1	−1·0	+1·1	−7·6
9	1872—1904 ...	−2·7	−4·6	−3·2	−1·0	+1·1	+4·4	+3·6	+1·9	−0·9	+0·3	−0·6	+1·3

It will also be noticed that the amplitudes of the movement appear to be clearly affected by the relative disturbed conditions of each of the three 11-year cycles, as shown by figures 4, 5, 6, and 7 in plate IX, that of 1872—1882 being the most disturbed.

Further, the inequality typical of the years of maximum spots, shown in figure 8 in which the maximum occurs a little earlier in May, and the minimum falls unaffected in February, while fairly nearly preserving the character of the average curve, shows that its range, as would be expected, is also influenced by this periodic 11-year disturbance. It is markedly accentuated, while the inequality of the minimum epoch shown in figure 9 on the other hand appears to be adversely affected and for the same reason is so clearly suppressed as to make the fine movements almost irregular and uncertain.

303. These inequalities derived from the absolute determinations as they happen to be of small magnitude may, hence at first sight, be suspected to be due to uncompensated effects of temperature in the vibration and deflection experiments already referred to in Chapter II, Part I. This has been examined and found to be inadmissible. The large fluctuations of the range with the 11-year disturbance however remove any initial doubt which may possibly exist on this question as they would not for obvious reasons be explained by temperature effects; and similar inequalities derived from variation instruments (*vide* Chapter II, Part I) to which reference will presently be made, and from the quiet-day data as discussed in paragraph 467, Chapter XI, further adduce ample independent evidence placing the reality of the phenomenon above suspicion.

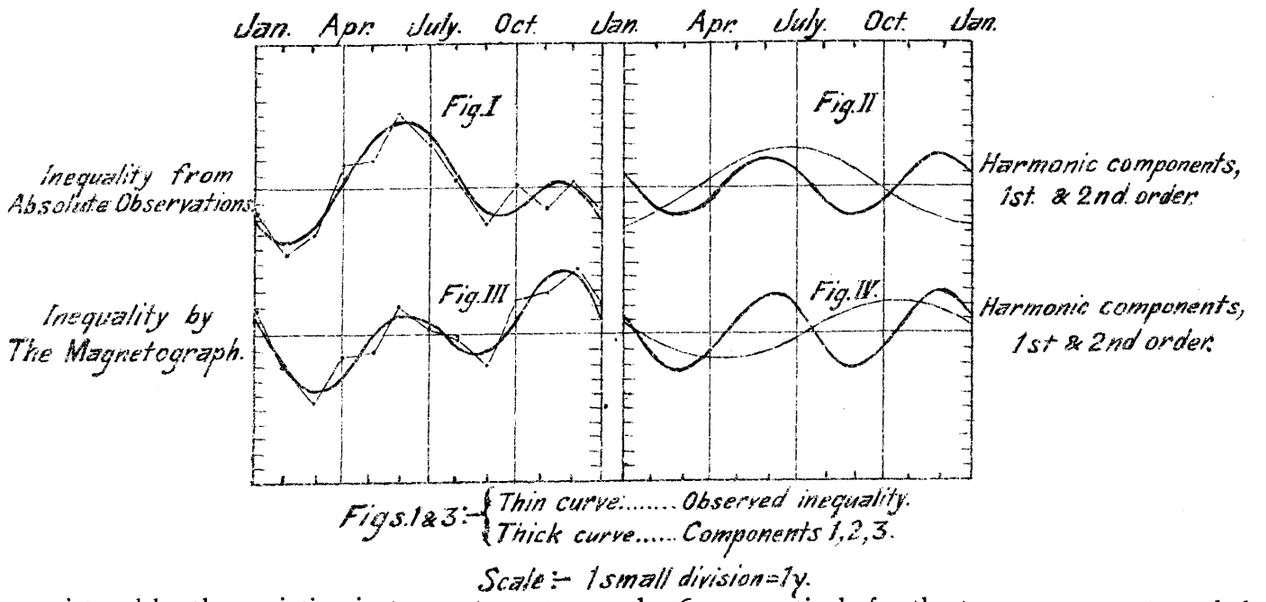
304. The analysis† in Fourier series of the average annual variation of force indicated in the table above in row 4 shows that in the inequality the first and the second components only are significant. The former has an amplitude of 2·6γ and the latter 2·2γ. The angles of maximum epoch a_1, a_2 reckoned from 1st January for the two components are 182° 36′ and 158° 43′ respectively. The dates derived from these angles of maximum epoch correspond to 4th July and 9th June. Figures 1 and 2 given below enable the inequality and the results of the analysis to be examined at a glance. It will be seen that as noted at almost all observatories over the world, the secular change does not progress uniformly in its march from month to month. The summer months indicate a decided tendency to increase the values of force, while the reverse effects are noted in the winter months.

305. It is instructive also to examine at the same time the average inequality of absolute force as registered by the variation instrument (magnetograph) to which reference has already been made in paragraph 106, Chapter II, Part I. This inequality and the results of its analysis in Fourier series are charted together for comparison in figures 3 ‡ and 4 below. It will be seen that the amplitudes of the inequality

* Ground temperature 20 inches below the surface, 1872—1904.

† The inequality has been analysed in the usual way in terms of harmonic components in the form :—$C_1 \sin (t + T_1) + C_2 \sin (2t + T_2) + \ldots\ldots$ where C_1, C_2 are the amplitudes of the first two orders; t denotes the time reckoned from middle of January, 30° being taken equivalent to one month. No correction is allowed for the unequal lengths of the months, all being taken as denoting 1/12 of the year. For the relations of T_1, T_2 etc., to a_1, a_2 the angle of the first maximum reckoned from 1st January alluded to above (refer forms F, G in Chapter V).

‡ The apparent run of the curve at first sight leads one to suppose that the progressive change due to instrumental change has not been allowed for. But this has been correctly applied and the character of the curve is correct.



as registered by the variation instrument are 1·9γ and 2·6γ respectively for the two components and the angles of maximum epoch are $a_1 = 296^\circ\ 19'$ and $a_2 = 159^\circ\ 45'$. It will thus become clear that the variation instrument faithfully reproduces the second component of the absolute inequality almost correctly as in the first result, while the first component curiously has its phase altered from 4th July in figure 2 to 26th October in figure 4. Instrumental defects and irregularities can scarcely be expected to produce results which affect only one component leaving the other almost uninfluenced. Explanations regarding this discrepancy have already been attempted in Chapter II, Part I; but whatever be the true cause it does appear that the semi-annual pulse, which is disclosed in both, is the dominant and certain feature of the inequality, though it is difficult to believe that the first component which is nearly of the same magnitude as the second can be merely an accidental feature and not due to some specific cause of action.

306. In this connection perhaps a passing reference may be made, if only to show that the examination of none of the possibly correlated phenomena has been overlooked, to the annual inequality of ground temperature shown by No. 5 variation in table 241, which indicates, as in the dotted curve, figure 7, plate IX, a close resemblance to the magnetic inequality from absolute determinations.

The ground temperature inequality when compared with the annual inequality of ordinary air temperature (not shown here) shows a lag, the minimum and maximum phases being both retarded in the ground temperature series from January to February and from May to June respectively. Assuming for the moment that the principal cause of the magnetic inequality may be of external origin, it is conceivable that the induced effects of the emanations from the sun, whatever their character and manner of influencing the magnetic inequality be, are retarded in their phase by some cause similar to that by which the concurrent heat radiations are retarded by being conducted through the ground. If this is conceded it is also conceivable that such minute effects may differ, differently affecting the variation instrument located 30 feet below ground* and the absolute instrument observed in the room of the tower about 50 feet above the ground where the absolute determinations are made. It must be noted however on the other hand that the supposed relation cannot be carried further, as the 11-year fluctuation disclosed in the range of the annual magnetic inequality is not indicated† at least visibly in that of the ground temperature, while the disturbing effects due to this periodicity can be clearly traced in this magnetic element at Colaba *throughout* its diurnal, annual, and secular march.

307. The annual inequalities from 1848 to 1872 and of the later record from 1872 to 1904 derived from Grubb's variation magnetometer, the process of derivation of which has been fully referred to in Chapter III, Part I, are given in table 241 above in rows 8 and 9 and charted in figures 10 and 11 in plate IX. These inequalities also fairly correctly exhibit the typical character of the curve fully confirming the inference referred to above, that the annual variation of absolute force is a real phenomenon due to some specific cause of action.

* The absolute values of force, declination and dip derived from observations taken in the magnetograph room before the roof was put on showed the following mean excesses over the simultaneously derived values of the elements at the electrometer tower: $\Delta H = +\ 191\gamma$; $\Delta D = +\ 8'{\cdot}9$; $\Delta I = -\ 13'$, *vide* volume for 1879—1882 for details as regards differences in the magnetograph room itself depending upon the position of the instrument in the room

† Se

TABLE 242.—*Annual Means and Secular Variation of Absolute Declination (Easterly).*

Year.	Annual means of observed absolute determinations by Kew magnetometer.	Observed Absolute values in col. 2 corrected from monthly mean readings of Grubb's magnetometer.	Observed Absolute values in col. 2 corrected from monthly mean tabulations of magnetograph.	Theoretical curve referred to in paragraph 310.	Differences, col. 4 – col. 5.	Mean annual readings of Grubb's magnetometer.	Mean inferred value of the scale division 0·00 of the Grubb's magnetometer.	Calculated value of the Zero derived by the formula $Z = a - b\sqrt{t}$.	Absolute declination by calculated Zero.	Differences, col. 10 – col. 5.	Calculated Easterly Force Unity = 1γ.	Values of absolute declination derived from the mean annual value sof the tabulation ordinates of D magnetograph corrected for instrumental change.	Differences, col. 13 – col. 5.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	′ ″	′ ″	′ ″	′ ″	′ ″		′ ″	′ ″	′ ″	′ ″		′ ″	′ ″
1846 ...	...	...	...	...	...	...	...	...	*9 27*	...	...	...	...
1847 ...	...	...	...	...	...	...	...	...	*10 14*	...	...	...	...
1848 ...	...	...	...	...	...	...	...	...	*10 36*	...	...	...	...
1849 ...	...	...	...	...	...	...	...	...	*10 49*	...	...	...	...
1850 ...	...	...	...	...	...	...	...	...	*12 4*	...	...	...	...
1851 ...	...	...		...	...	...	...	...	*12 55*	...	...	...	...
1852 ...	...	...	...	...	...	...	...	...	*12 53*	...	...	...	...
1853 ...	...	...	...	...	...	...	...	...	*14 23*	...	...	...	...
1854 ...	...	...	...	...	...	...	...	...	*14 12*	...	...	...	...
1855 ...	...	...	...	...	...	...	...	...	*15 28*	...	...	...	...
1856 ...	...	...	...	...	...	...	...	...	*15 4*	...	...	...	...
1857 ...	...	...	...	...	...	...	...	...	*15 24*	...	...	...	...
1858 ...	...	...	...	...	...	...	...	...	*15 57*	...	...	...	...
1859 ...	...	...	...	15 2	...	...	...	...	17 38	+2 36	162	...	...
1860 ...	...	...	...	19 6	...	...	...	...	20 7	+1 1	206	...	...
1861 ...	...	...	...	22 58	...	...	...	...	23 15	+0 17	247	...	...
1862 ...	...	...	...	26 39	...	32·72	...	197 13	26 7	−0 32	287	...	...
1863 ...	...	...	...	30 9	...	33·22	...	197 1	29 45	−0 24	325	...	...
1864 ...	...	...	...	33 27	...	33·59	...	196 52	32 21	−1 6	361	...	...
1865 ...	...	...	...	36 35	...	34·12	...	196 45	36 4	−0 31	395	...	...
1866 ...	...	...	...	39 29	...	34·71	...	196 39	40 13	+0 44	427	...	...
1867 ...	...	...	...	42 9	...	35·08	...	196 34	42 51	+0 42	456	...	...
1868 ...	43 57	45 4	...	44 38	...	35·43	196 47	196 29	45 22	+0 44	483	...	...
1869 ...	46 8	47 29	...	46 54	...	35·70	196 9	196 24	47 14	+0 20	508	...	...
1870 ...	47 47	49 21	...	48 55	...	36·03	196 34	196 19	49 37	+0 42	530	...	...
1871 ...	49 38	51 13	51 11	50 45	+0 26	36·32	196 40	196 15	51 38	+0 53	550	51 13	+0 28
1872 ...	51 34	53 3	53 3	52 21	+0 42	36·53	196 14	196 11	53 7	+0 46	567	53 0	+0 39
1873 ...	52 38	54 0	54 0	53 44	+0 16	36·63	196 0	196 8	53 52	+0 8	583	53 50	+0 6
1874 ...	53 26	54 27	54 26	54 54	−0 28	36·72	196 9	196 4	54 32	−0 22	595	54 36	−0 18
1875 ...	54 26	55 21	55 22	55 51	−0 29	36·83	196 1	196 0	55 22	−0 29	606	55 21	−0 30
1876 ...	55 3	55 58	55 58	56 36	−0 38	36·91	195 56	195 57	55 57	−0 39	614	56 4	−0 32
1877 ...	55 32	56 39	56 34	57 8	−0 34	36·96	195 35	195 54	56 20	−0 48	620	56 32	−0 36
1878 ...	56 0	57 6	56 57	57 28	−0 31	37·00	195 25	195 51	56 40	−0 48	624	57 1	−0 27
1879 ...	56 26	57 30	57 22	57 36	−0 14	37·02	195 12	195 48	56 54	−0 42	626	57 9	−0 27
1880 ...	56 21	57 9	57 12	57 32	−0 20	37·01	195 26	195 45	56 49	−0 43	625	57 25	−0 7
1881 ...	55 55	57 12	57 14	57 17	−0 3	37·04	195 35	195 42	57 6	−0 11	623	57 12	−0 5
1882 ...	55 55	56 50	56 54	56 51	+0 3	36·86	194 44	195 39	55 55	−0 56	618	57 6	+0 15
1883 ...	55 55	57 2	57 3	56 14	+0 49	36·99	195 25	195 37	56 50	+0 36	612	56 43	+0 29
1884 ...	54 33	55 39	55 32	55 32	...	36·83	195 41	195 34	55 46	+0 14	603	55 51	+0 23
1885 ...	53 52	55 3	55 2	54 31	+0 31	36·65	195 6	195 31	54 38	+0 7	593	54 54	+0 23
1886 ...	52 34	53 28	53 28	53 27	+0 1	36·49	195 36	195 29	53 35	+0 8	582	53 40	+0 13
1887 ...	51 13	52 21	52 22	52 12	+0 10	36·28	195 15	195 26	52 10	−0 2	568	52 11	−0 1
1888 ...	50 4	51 22	51 18	50 49	+0 29	36·17	195 31	195 24	51 30	+0 41	553	50 57	+0 8
1889 ...	48 13	49 29	49 26	49 18	+0 8	35·88	195 25	195 22	49 31	+0 13	537	49 22	+0 4
1890 ...	46 22	47 34	47 26	47 39	−0 13	35·62	195 31	195 19	47 46	+0 7	519	47 26	−0 13
1891 ...	44 26	45 54	45 49	45 53	−0 4	35·37	195 30	195 17	46 6	+0 13	500	45 49	−0 4
1892 ...	42 40	44 2	43 53	44 0	−0 7	35·11	195 35	195 15	44 22	+0 22	479	44 7	+0 7
1893 ...	40 19	41 45	41 39	42 0	−0 21	34·73	195 17	195 12	41 50	−0 10	457	41 37	−0 23
1894 ...	38 34	39 36	39 33	39 54	−0 21	34·34	194 47	195 10	39 12	−0 42	434	39 36	−0 18
1895 ...	36 9	37 31	37 8	37 42	−0 34	33·94	194 7	195 8	36 30	−1 12	411	37 6	−0 36
1896 ...	33 46	35 2	34 55	35 24	−0 29	...	...	...	...	...	385	35 4	−0 20
1897 ...	31 19	...	32 40	33 2	−0 22	...	...	...	...	...	360	32 23	−0 39
1898 ...	28 34	...	29 41	30 34	−0 53	...	...	...	...	...	333	29 45	−0 49
1899 ...	25 23	...	26 33	28 1	−1 28	...	...	...	...	...	305	26 43	−1 18
1900 ...	23 6	...	24 31	25 23	−0 52	...	...	...	...	...	276	24 16	−1 7
1901 ...	20 56	...	21 51	22 41	−0 50	...	...	...	...	...	247	21 49	−0 52
1902 ...	18 28	...	19 25	19 55	−0 30	...	...	...	...	...	217	19 30	−0 25
1903 ...	16 39	...	17 35	17 5	+0 30	...	...	...	...	...	186	17 26	+0 21
1904 ...	14 28	...	15 29	14 11	+1 18	...	...	...	...	...	154	15 15	+1 4
1905 ...	12 51	...	13 59	11 14	+2 45	...	...	...	...	...	122	14 9	+2 55

Note.— + indicates movement to east.

TABLE 243.—*Mean monthly values of Declination (Easterly) corrected for the mean of the day by Declination Magnetograph, and their mean annual Inequalities.*

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
	Month.												
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
1871	49 55	50 16	50 34	51 1	51 1	50 38	50 56	51 31	51 15	52 1	52 33	52 26	51 11
1872	52 35	52 40	52 52	53 11	52 31	52 42	52 36	53 5	53 18	53 41	53 44	53 36	53 3
1873	53 54	53 42	53 49	53 47	54 2	54 0	54 23	54 37	54 7	53 57	53 58	53 50	54 0
1874	53 41	54 5	54 18	54 17	54 15	54 35	54 27	54 23	54 27	54 49	54 50	55 5	54 26
1875	54 55	55 11	55 26	55 29	55 42	55 26	55 22	55 20	55 1	55 16	55 27	55 51	55 22
1876	55 54	55 48	55 47	55 31	55 29	55 27	55 39	56 5	56 31	56 30	56 18	56 32	55 58
1877	56 40	56 19	56 36	56 25	56 27	56 11	56 13	56 25	56 41	56 50	56 56	57 2	56 34
1878	57 10	57 24	57 1	57 11	56 55	56 53	56 38	56 10	56 26	56 46	57 9	57 43	56 57
1879	57 38	57 37	57 35	57 17	57 11	57 16	57 29	57 8	57 51	57 10	57 4	57 7	57 22
1880	56 57	56 57	57 0	57 6	57 1	57 10	57 16	57 30	57 20	57 8	57 33	57 27	57 12
1881	57 15	57 30	57 17	57 23	57 39	57 17	57 8	57 4	57 0	57 14	57 26	56 30	57 14
1882	56 29	56 21	56 29	57 6	56 49	56 46	56 49	56 37	56 46	57 26	57 47	57 20	56 54
1883	57 20	57 42	57 32	57 27	56 55	57 43	57 27	56 57	56 55	56 46	56 8	55 48	57 3
1884	55 31	55 51	56 1	55 57	55 34	55 40	55 34	55 14	55 15	55 21	55 19	55 8	55 32
1885	25 21	55 12	55 3	55 11	55 22	55 22	55 10	55 6	55 1	54 34	54 34	54 27	55 2
1886	54 31	53 53	53 52	53 30	53 15	53 20	53 39	53 27	53 3	53 1	53 6	53 4	53 28
1887	53 4	53 16	53 3	52 47	52 17	52 25	52 10	52 2	52 2	51 43	51 52	51 40	52 22
1888	51 13	51 37	51 46	52 10	51 51	51 16	51 21	51 11	51 1	51 3	50 57	50 11	51 18
1889	50 3	49 51	49 50	49 44	49 36	49 22	49 8	49 18	49 7	49 17	49 13	48 47	49 26
1890	48 35	48 26	48 9	47 37	47 39	47 7	47 4	47 17	46 54	46 53	46 52	46 38	47 26
1891	46 24	46 44	46 34	46 15	45 56	45 51	45 14	45 17	45 29	45 22	45 36	45 10	45 49
1892	44 54	45 9	44 45	44 9	44 2	43 23	43 16	43 11	43 24	43 36	43 38	43 13	43 53
1893	42 59	42 48	42 31	42 12	41 58	41 14	40 54	40 41	40 52	41 28	41 10	40 58	41 39
1894	40 44	40 33	40 12	39 29	39 16	39 7	39 2	39 22	39 30	39 19	39 17	38 51	39 33
1895	38 30	38 26	38 4	37 34	37 16	37 2	36 46	36 25	36 27	36 20	36 35	36 6	37 8
1896	35 45	35 37	35 25	35 3	35 22	34 34	34 28	34 18	35 13	34 46	34 23	34 2	34 55
1897	33 50	33 33	33 45	33 35	33 10	32 44	32 38	31 57	31 57	31 55	31 25	31 27	32 40
1898	30 52	30 49	31 4	30 8	29 43	29 50	29 29	29 27	29 21	29 0	28 36	27 52	29 41
1899	27 47	27 44	27 16	27 4	27 1	26 48	26 20	26 2	25 37	26 7	25 38	25 17	26 33
1900	25 52	25 55	25 20	24 51	24 53	24 26	24 27	24 14	23 41	23 42	23 38	23 13	24 31
1901	22 49	22 48	22 10	22 16	22 6	21 57	21 46	21 33	21 19	21 13	21 16	21 2	21 51
1902	20 42	20 38	20 25	20 14	19 52	19 23	19 15	18 54	18 56	18 40	18 11	17 51	19 25
1903	18 50	18 13	18 27	17 47	17 8	17 15	17 40	17 35	17 3	17 18	17 0	16 40	17 35
1904	16 43	16 20	16 30	16 7	15 35	15 29	15 31	15 10	14 44	14 44	14 21	14 39	15 29
1905	14 17	14 9	14 6	14 24	13 58	14 27	13 40	13 59	13 56	13 46	13 32	13 29	13 59
1872-1882. Annual Inequality ...	−0 5	−0 8	−0 5	−0 2	−0 6	−0 7	−0 6	−0 4	+0 2	+0 9	+0 17	+0 16	...
1872-1882. Correction for Secular change	+0 9	+0 7	+0 6	+0 4	+0 2	+0 1	−0 1	−0 2	−0 4	−0 6	−0 7	−0 9	...
1872-1882. Inequalily corrected for Secular change...	+0 4	−0 1	+0 1	+0 2	−0 4	−0 6	−0 7	−0 6	−0 2	+0 3	+0 10	+0 7	...
1883-1893. Annual Inequality ...	+0 38	+0 41	+0 34	+0 22	+0 8	−0 1	−0 11	−0 18	−0 21	−0 21	−0 25	−0 43	...
1883-1893. Correction for Secular change	−0 41	−0 34	−0 26	−0 19	−0 11	−0 4	+0 4	+0 11	+0 19	+0 26	−0 34	−0 41	...
1883-1893. Inequality corrected for Secular change...	−0 3	+0 7	+0 8	+0 3	−0 3	−0 5	−0 7	−0 7	−0 2	+0 5	+0 9	−0 2	...
1894-1904. Annual Inequality ...	+1 11	+1 1	+0 50	+0 26	+0 11	−0 4	−0 11	−0 24	−0 30	−0 34	−0 49	−1 8	...
1894-1904. Correction for Secular change	−1 6	−0 54	−0 42	−0 30	−0 18	−0 6	+0 6	+0 18	+0 30	+0 42	+0 54	+1 6	...
1894-1904. Inequality corrected for Secular change...	+0 5	+0 7	+0 8	−0 4	−0 7	−0 10	−0 5	−0 6	0 0	+0 8	+0 5	−0 2	...
1872-1904. Annual Inequality ...	+0 31	+0 28	+0 25	+0 13	+0 3	−0 4	−0 9	−0 14	−0 14	−0 14	−0 16	−0 28	...
1872-1904. Correction for Secular change	−0 29	−0 24	−0 19	−0 13	−0 8	−0 3	+0 3	+0 8	+0 13	+0 19	+0 24	+0 29	...
1872-1904. Inequality corrected for Secular change...	+0 2	+0 4	+0 6	0 0	−0 5	−0 7	−0 6	−0 6	−0 1	+0 5	+0 8	+0 1	...
Maximum spot years. Annual Inequality ...	+0 27	+0 31	+0 25	+0 12	−0 4	−0 8	−0 13	−0 14	−0 12	−0 5	−0 13	−0 29	...
Maximum spot years. Correction for Secular change	−0 28	−0 23	−0 18	−0 13	−0 8	−0 3	+0 3	+0 8	+0 13	+0 18	+0 23	+0 28	...
Maximum spot years. Inequality corrected for Secular change...	−0 1	+0 8	+0 7	−0 1	−0 12	−0 11	−0 10	−0 6	+0 1	+0 13	+0 10	−0 1	...
Minimum spot years. Annual Inequality ...	+0 36	+0 36	+0 25	+0 18	+0 7	−0 5	−0 10	−0 18	−0 17	−0 18	−0 22	−0 32	...
Minimum spot years. Correction for Secular change	−0 31	−0 25	−0 20	−0 14	−0 8	−0 3	+0 3	+0 8	+0 14	+0 20	+0 25	+0 31	...
Minimum spot years. Inequality corrected for Secular change...	+0 5	+0 11	+0 5	+0 4	−0 1	−0 8	−0 7	−0 10	−0 3	+0 2	+0 3	−0 1	...

Note.— + means movement to east.

COLABA OBSERVATORY.

Absolute Declination
Secular & Annual Variations.

PLATE 10

1845 1848 1851 1854 1857 1860 1863 1866 1869 1872 1875 1878 1881 1884 1887 1890 1893 1896 1899 1902 1905

SCALE FOR EASTERLY FORCE

·00125 ·00200 ·00300 ·00400 ·00500 ·00600

SCALE FOR NORTHERLY FORCE

37400 37300 37200 37100 37000

1905 1900 1895 1890 1885 1880 1875 1870 1865 1860 1859

FIG XI

THEORETICAL CURVE OF D.

FIG I

FIG II

FIG III

55′ 50′ 40′ 30′ 20′ 10′ 0′

ANNUAL INEQUALITY OF D
ABSOLUTE DETERMINATIONS

JAN. APR. JULY. OCT. JAN.

1872 To 1882 — FIG IV

1883 To 1893 — FIG V

1894 To 1904 — FIG VI

1872 To 1904 — FIG VII

MAXIMUM SPOTS — FIG VIII

MINIMUM SPOTS — FIG IX

+6″ 0 −6″

ANNUAL INEQUALITY OF D
GRUBB'S MAGNETOMETER

JAN. APR. JULY OCT. JAN.

1846 To 1872 — FIG X

+6″ 0 −6″

FIG IA.

FIG IIA.

FIG IIIA.

+1′ 0 0 0 −1′

SCALE :— EACH SMALL DIVISION = 30″ OR EACH LARGE DIVISION = 5′

FIG I { THICK CURVE — THEORETICAL CURVE OF D.
THIN " — ABSOLUTE D BY GRUBBS.

FIG II { THICK CURVE — THEORETICAL CURVE OF D.
THIN " — OBSERVED ABSOLUTE D (CORRECTED BY MAGNETOGRAPH) FROM 1871–1905 AND ABSOLUTE D BY GRUBBS FROM 1859–1870.

FIG III { THICK CURVE — THEORETICAL CURVE OF D.
THIN " — ABSOLUTE D BY MAGNETOGRAPH

FIG IA DIFFERENCE CURVE THICK AND THIN OF FIG I.
FIG IIA " " " " FIG II.
FIG IIIA " " " " FIG III.
FIG XI SECULAR VARIATION OF THE RESULTANT FORCE IN THE HORIZONTAL PLANE

Govt Photozinco. Office, Poona, 1909.

CHAPTER II.

1. Declination, its Annual and Secular Variations.

308. All important data for the declination element, derived from tables in Part I which are necessary for discussion, have been collected here for ready reference in tables 242 and 243. In column 2, table 242, appear the observed values of declination by the Kew Unifilar, from 1868 to 1905. For the period antecedent to this, as also for that concurrent with it, the values derived from Grubb's variation declinometer (see Chapter V, Part I), are collected in column 10 of the same table, columns 7, 8 and 9 also being recopied from tables in Part I for ready reference here. In column 3 the observed values given in column 2 have been corrected by Grubb's for the mean of the day, while in column 4 the same appear similarly corrected by the declination magnetograph.

309. Taking up the examination of the mean annual values of declination and their secular march, it will be noticed that the curve is markedly regular and uniform. The derivation of the theoretical curve, such as may fit the secular curve of declination, has not been attempted afresh, as the one derived in the investigation undertaken in the year 1896 (*vide* volume for the year 1896, Appendix E) from the declination record of the period, 1862 to 1894, serves the present purpose well enough. The data from which the curve is calculated, appear in column 10; and the theoretical curve has been the more readily adopted, because though derived then from a restricted period (up to the year 1894) its march has continued since to run practically concurrent with the observed absolute determinations for the next 10 years, that is, till 1905,* and promises fairly consistently to do so still for a period of at least another 5 years, not to speak of the coincidence of the curve with the observed values of declination for the earlier years, 1858—1862.

310. In the discussion referred to in the volume of 1896, the general form of the equation of the second degree $ax^2+bxy+cy^2+dx+ey+1=0$ was adopted where x = time in years reckoned from November 15th, 1861; and y = declination in seconds of arc (unity=100 seconds). The constants derived by least squares are (*vide* volume for 1896, Appendix E) $a = -\cdot003704239$; $b = -\cdot0006332303$; $c = \cdot0002984279$; $d = \cdot1542828$, and $e = -\cdot07348405$.

For facility of computation and the subsequent derivation of the theoretical curve, the formula $y = Ax+B-\sqrt{Cx^2+Dx+E}$ was used, the constants A, B, C, D and E being re-calculated from the previous constants a, b, c, d, e. The values of the derived constants used in the computations are:

$$A = 1\cdot060944;\ B = 123\cdot12;\ C = 13\cdot53812;\ D = -255\cdot7413;\ E = 11807\cdot2912.$$

311. This theoretical curve is shown in column 5 of table 242. It is also charted as a thick curve in figures 1, 2, and 3, plate X. The thin curve in figure 1 represents the graph of the observed values by Grubbs as given in column 10 of the same table. In figure 2 the thin curve denotes the observed values of declinations corrected by the magnetograph from the year 1871 to 1905 (shown in column 4 of the table); the values for the earlier period, 1859 to 1870, are re-charted in figure 2 merely to enable the continuous march of declination from 1859 to 1905 to be readily examined. The interruption between 1870 and 1871 denotes the break of continuity due to the change of instruments. In figure 3 the thin curve represents the annual means of declination as derived from the tabulation ordinates of the magnetograph (corrected for instrumental change as shown in Chapter IV, Part I). This series which is given in column 13 may be taken practically as an independent series comparable to the other two.

312. The differences of the observed values of declination by each of the three processes from the theoretical curve values shown in column 11, 6 and 14 of the table are charted in figures $1a$, $2a$, $3a$ respectively. It will be seen that though not markedly adducing convincing evidence, as in the horizontal force results, of being affected by the 11-year disturbance, the differences do create a strong suspicion of being influenced about the years of maximum spots, 1871 and 1883, and of minimum spots, 1877 and 1900, indicating that the declination element is also affected by this disturbing cause; though it seems also equally clear that the influence fails to become explicit about the maximum of 1892—1894. It may however be remarked that absence of such movements, or rather their non-detection, now and again in this element cannot be regarded as evidence against the possibilty of the existence of such movements, considering, as will be seen later, that at Colaba, even under the influence of the greatest of magnetic disturbances, the declination and vertical force curves are but feebly affected.

313. In this element also, as in H at Colaba, it will be seen that the maximum of the great secular period had been reached and passed within the period considered. The greatest annual mean declination, recorded 57′ 22″ E is for the year 1879 (column 4 of table 242); and if the formula in paragraph 310

* The theoretical values from the year 1905 to 1908 however tend to show somewhat larger departures indicating a diminution in the rate of secular change.

represents the true march of the secular curve, the maximum epoch as derived from the greatest value of y in the equation $y = Ax+B-\sqrt{Cx^2+Dx+E}$ works out at 1879·2. This indicates an earlier culmination by about 16 years of the easterly force at Colaba than of the horizontal or northerly force.

314. It is interesting to note here that the secular variation of force in the horizontal plane as given by the combined curves of secular change of horizontal force and declination, the latter converted into its equivelent value in force from the year 1859 to 1905, shows (*vide* figure 11, plate X) that the resultant maximum force $\sqrt{N^2+E^2}$*, where N and E are the northerly and easterly forces respectively, was passed about the year 1895, which is practically coincident with the maximum epoch of H force, as the declination or easterly force is comparatively very small.

It will be seen that the curve is here perfectly smooth in its run, while a similar curve derived from the observed values of H and D shown in the volume for the year 1890, indicates a somewhat complex system of loops in the curve between the years 1877 and 1883, about the turning point of the declination curve. As in the curve now shown the irregularities due to the 11-year fluctuations in the absolute values, have been removed by the adoption of the theoretical curves of H and D, the reason of the disappearance of the loops becomes obvious.

2. *The Annual Inequality.*

315. Coming to the consideration of the annual inequality of declination derived from the absolute determinations of the period, 1872—1905, it will be seen from the following table which gives the inequalities of each of the three 11-year periods, of the average of the whole period, and of the group of years of maximum and minimum spots, that it is a very minute variation with a total range of about 15 seconds only; and, but for its persistent and markedly definite recurrence in each of the three 11-year cycles, one is inclined, at first sight, to regard it as being insignificant and accidental. Figures 4 to 9, plate X, which are charted on a large scale, show two distinctly marked maxima about March and October with a well defined sweep of minimum about June. As will be seen later, the greatest westerly elongation of the needle occurs in its diurnal march at 12 noon when the sun passes the meridian, and in its annual march the minimum easterly declination in June—that is the greatest westerly elongation of the needle also corresponds to the greatest northerly declination of the sun. The 11-year period appears here also to have an appreciable influence on the range of the annual inequality as indicated by figures 7 and 8 which give the inequalities of the average years, and of the group of the most disturbed years. The latter inequality while showing a somewhat larger range, indicates the October maximum particularly accentuated with a tendency to an earlier minimum about May.

TABLE 244.—*Annual Inequalities, Declination.*

	Period.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	1872—1882 ...	+4″	−1″	+1″	+2″	−4″	−6″	−7″	−6″	−2″	+3″	+10″	+7″
2	1883—1893 ...	−3	+7	+8	+3	−3	−5	−7	−7	−2	+5	+9	−2
3	1894—1904 ...	+5	+7	+8	−4	−7	−10	−5	−6	0	+8	+5	−2
4	1872—1904 ...	+2	+4	+6	0	−5	−7	−6	−6	−1	+5	+8	+1
5	Years of maximum spot	−1	+8	+7	−1	−12	−11	−10	−6	+1	+13	+10	−1
6	Years of minimum spot	+5	+11	+5	+4	−1	−8	−7	−10	−3	+2	+3	−1
7	From Grubb's Magnetometer Record, 1846—1872 ...	−5	0	+4	+4	0	−8	−15	−8	+2	+12	+10	−3

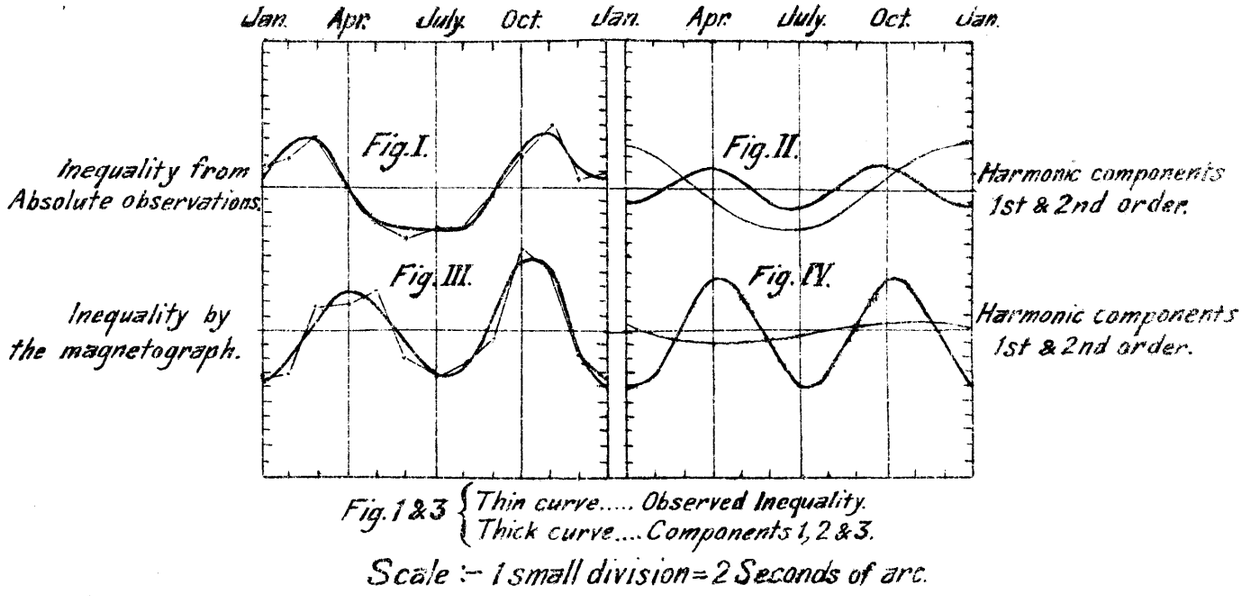
316. It is problematic if any analysis of the inequality which in its entirety constitutes a small variation can be of much practical utility. However analysing the average inequality No. 4 in the above table, in Fourier series we obtain the following constants:—

$$C_1 = 5''\cdot9;\ C_2 = 2''\cdot9;\ C_3 = 2''\cdot3;\ a_1 = 0^\circ\ 33';\ a_2 = 97^\circ\ 19';\ a_3 = 64^\circ\ 59'$$

* The horizontal force and the declination force may at Colaba be provisionally accepted as practically equivalent to the northerly force and easterly force respectively, as the declination during the period examined fluctuated between 10′ E and 57′ E only (refer also Chapter IX, *infra*).

The above epochs of maximum correspond to 1st January, 8th April and 7th March respectively for the three components. It will be noticed that the first is the dominant component here and the third component is as much signficant as the second. The results are charted below in figures 1 and 2.

317. Taking up for consideration the annual inequality (*vide* paragraph 192, Chapter IV, Part I) as registered by the variation instrument (the Magnetograph), as also the results of its analysis in harmonic components the constants of which are $C_1 = 1''{\cdot}2$; $C_2 = 7''{\cdot}6$; $C_3 = 1''{\cdot}5$: $a_1 = 299^\circ\ 20'$; $a_2 = 113^\circ\ 41'$; $a_3 = 64^\circ\ 46'$, it will appear from figures 3 and 4, which are specially drawn on a larger scale to represent



this inequality and the analysed components respectively, that practically the whole variation is made up of the second component which here becomes the dominant feature, the first and the third being almost subdued.

318. Small as the actual inequalities themselves and their differences which have been already examined,* are, the fairly close resemblance disclosed by the figures 1 and 3 in the above chart in regard to the general character of the inequality, scarcely allows of any serious doubt as to the reality of the phenomenon to be entertained, even though in the results of the analysis, the dominant feature indicated in the former happens to be the annual term and in the latter the semi-annual term.

319. In regard to the annual inequality derived from the earlier period 1846 to 1872, no absolute observations we know of, are available for this period. There is no other alternative hence but to resort to the results of the differential instrument Grubb's Declinometer. Unfortunately as already remarked in Chapter V, Part I, the indications of this instrument are vitiated by atmospheric influences, specially those of moisture, and though an attempt has been made to eliminate the disturbing effects of this factor, the inequality derived under such circumstances can hardly be expected to be reliable and free from irregularities. The inequality so derived, however, is given as No. 7 in the table above, and is also charted in figure 10, plate X. Such as it is, it will be seen that the general run of even this inequality is closely similar to that of the other inequalities.

320. The reality of the phenomenon, however small its magnitude, can scarcely hence remain open to doubt when the general runs of the curves furnished by practically three independent methods, show decidedly accordant results. It will also be seen that the character of the Bombay declination curve appears to be in close agreement with those registered at Pavolovsk, Tiflis, Moscow, Paris, Trivandrum and Batavia though it differs somewhat from those at Greenwich, Kew and a few other places.

321. It is clearly evident at any rate, as will also appear from the results in the subsequent chapters, that a general tendency exists for the declination needle towards a westerly elongation during the summer months of the year, while an equally strong tendency is noted during the winter months in the opposite or easterly direction.

* *Vide* paragraph 193, Chapter IV, Part I.

CHAPTER III.

Inclination and its Secular and Annual Variations.

322. The observations of inclination from 1846 to 1867, as already alluded to in Chapter I, Part I, are considered unreliable. The annual means of these observations hence are given in italics in table 245 which may be taken at best as very rough measures of the values of inclination. In the same table appear the results of inclination observations taken with the Kew Dip Circle for the period 1868 to 1905. It is this series which now requires a careful examination.

TABLE 245.—*Annual means of Inclination.*

Years.	Observed Inclination.	Inclination calculated.	Years.	Observed Inclination.	Inclination calculated.	Differences.	Years.	Observed Inclination.	Inclination calculated.	Differences.
1	2	3	4	5	6	7	8	9	10	11
	° ′			° ′	° ′	° ′		° ′	° ′	° ′
1846 ...	*18 37·7*	...	1868 ...	19 3·9	19 6·5	−0 2·6	1888 ...	20 10·6	20 12·1	−0 1·5
1847 ...	*18 17·9*	...	1869 ...	19 5·8	19 8·4	−0 2·6	1889 ...	20 18·9	20 16·9	+0 2·0
1848 ...	*18 8·5*	...	1870 ...	19 7·1	19 10·3	−0 3·2	1890 ...	20 23·7	20 22·3	+0 1·4
1849 ...	*18 47·9*	...	1871* ...	19 8·8	19 12·4	−0 3·6	1891 ...	20 28·9	20 27·3	+0 1·6
1850 ...	*18 55·5*	...	1872 ...	19 13·9	19 14·5	−0 0·6	1892 ...	20 33·3	20 32·7	+0 0·6
1851 ...	*19 1·5*	...	1873 ...	19 14·7	19 16·9	−0 2·2	1893 ...	20 35·1	20 38·2	−0 3·1
1852 ...	*18 57·4*	...	*1874* ..	*19 14·6*	*19 19·5*	*−0 4·9*	1894 ...	20 40·7	20 43·9	−0 3·2
1853 ...	*19 11·4*	...	*1875* ...	*19 13 3*	*19 22·2*	*−0 8·9*	1895 ...	20 48·5	20 49·8	−0 1·3
1854 ...	*18 56·0*	...	*1876* ...	*19 11·8*	*19 25·1*	*−0 13·3*	1896 ...	20 55·6	20 55·7	−0 0·1
1855 ...	*18 56·9*	...	*1877* ...	*19 20·2*	*19 28·1*	*−0 7·9*	1897 ...	20 59·1	21 1·9	−0 2·8
1856 ...	*19 4·7*	...	*1878* ...	*19 2·00*	*19 31·3*	*−0 11·3*	1898 ...	21 6·2	21 8·2	−0 2·0
1857 ...	*19 4·0*	*18 8·2*	*1879* ...	*19 22·2*	*19 34·7*	*−0 12·5*	1899 ...	21 13·9	21 14·7	−0 0·8
1858 ...	*19 17·9*	*18 58·1*	*1880* ...	*19 21·6*	*19 38·2*	*−0 16·6*	1900 ...	21 21·9	21 21·3	+0 0·6
1859 ...	*19 4·5*	*18 58·2*	*1881* ...	*19 43·0*	*19 41·9*	*+0 1·1*	1901 ...	21 29·7	21 28·0	+0 1·7
1860 ...	*19 5·2*	*18 58·5*	*1882* ...	*19 42·8*	*19 45·7*	*−0 2·9*	1902 ...	21 36·1	21 34·9	+0 1·2
1861 ...	*19 3·3*	*18 58·9*	*1883* ...	*19 43·4*	*19 49·7*	*−0 6·3*	1903 ...	21 43·4	21 42·0	+0 1·4
1862 ...	*19 7·1*	*18 59·5*	*1884* ...	*19 45·0*	*19 53·9*	*−0 8·9*	1904 ...	21 49·0	21 49·2	−0 0·2
1863 ...	*19 10·7*	*19 0·3*	*1885* ...	*19 46·3*	*19 58·2*	*−0 11·9*	1905 ...	21 57·4	21 56·5	+0 0·9
1864 ...	*19 19·9*	*19 1·2*	*1886* ...	*19 45·9*	*20 2·6*	*−0 16·7*				
1865 ...	*19 23·5*	*19 2·3*	*1887* ...	*19 46·9*	*20 7·3*	*−0 20·4*				
1866 ...	*19 12·8*	*19 3·6*								
1867 ...	*19 4·5*	*19 5·0*								

* The place of observation which up to 1871 was located on the ground floor of the electrometer tower was transferred to the top floor of the tower in September 1871.

323. Examining the observed annual means in table 245, which for the purpose of readily following the discussion are charted as thin curve in plate XI, figure 1, it will be seen that the curve is not continuous, because at every attempt at adjustment of the instrument, the behaviour of which after the year 1873 had grown very unsatisfactory, there is a sudden dislocation or break in the continuity of the record. These breaks are denoted by dotted lines in figure 1. The break between 1871-1872 is of course known to be due to the transfer of the observations from the ground floor to the top floor of the electrometer tower, the difference in dip as measured at the two places being 3·0 minutes of arc.

324. After 1873, however, the observations continued to give persistent evidence of irregularities, which eventually necessitated a careful examination and adjustment of the circle in January 1877. The result was that after the adjustment, the Dip Circle suddenly showed an increased reading by about 8 minutes, indicated by the dotted line between 1876 and 1877. This was at the time considered as a satisfactory result, and the instrument was observed under these conditions of adjustment till 1881. On some doubts arising again in October 1881 a fresh adjustment was made and a sudden jump of as many as 22 minutes

Plate II.

COLABA OBSERVATORY

Secular & Annual variations of Absolute Vertical Force & Inclination.

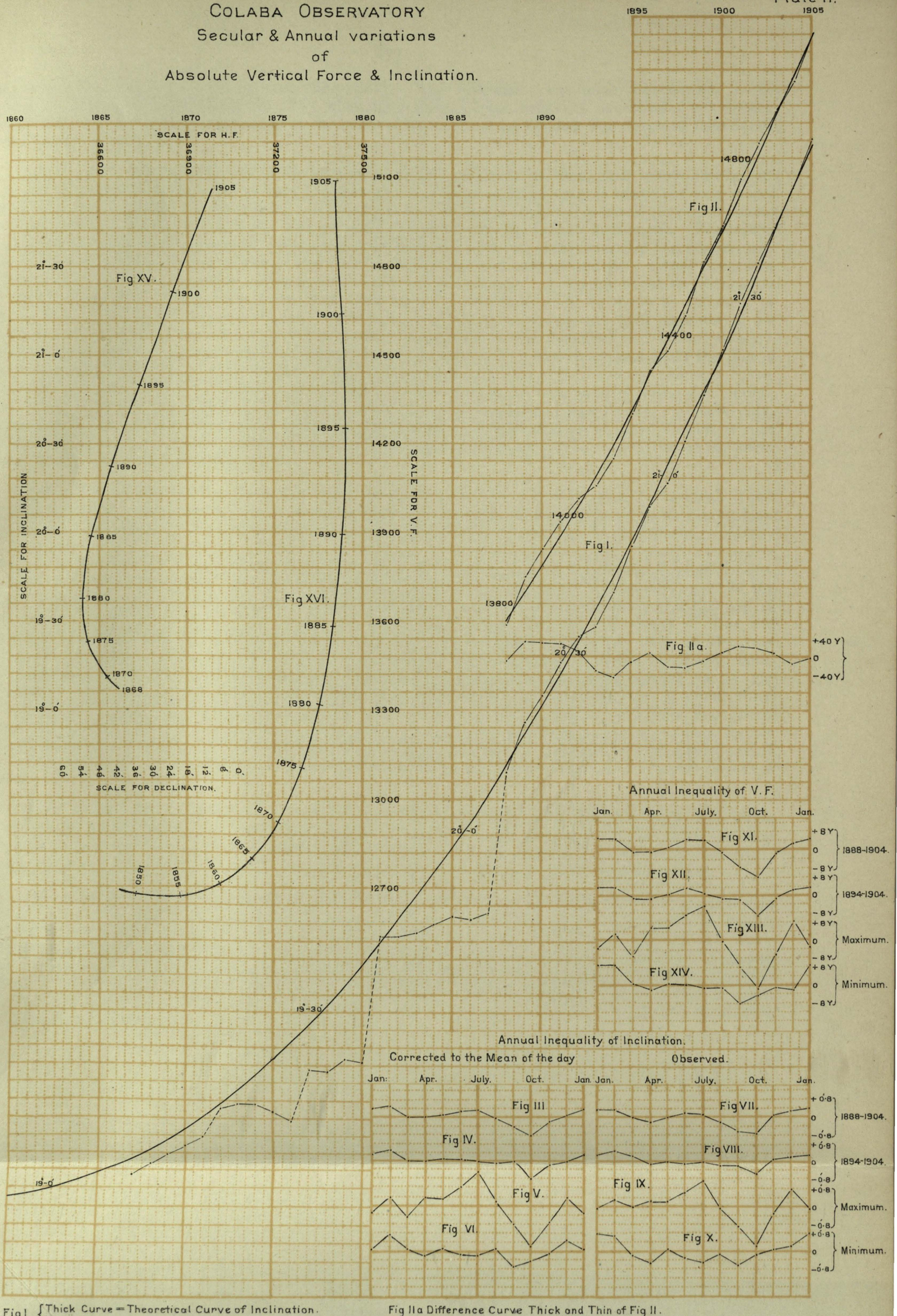


Fig I { Thick Curve = Theoretical Curve of Inclination.
Thin Curve = Observed Absolute Inclination.

Fig II { Thick Curve = Theoretical Curve of V.F.
Thin Curve = Absolute V.F. (Corrected by Magnetograph)

Fig IIa Difference Curve Thick and Thin of Fig II.

Fig XV Secular Variation of the Direction of Total Force. (Inclination and Declination.)

Fig XVI " " of Total Force. (H.F. and V.F.)

Govt. Photozinco. Office, Poona, 1909.

was again noted (see dotted line between 1880-1881). The instrument was under observation in this new state of adjustment till December 1887, when again its suspicious behaviour necessitated yet another re-adjustment, when another dislocation of the curve of dip of about 23 minutes was observed (see dotted line between 1887-1888).

325. After this, the behaviour of the instrument as will presently be seen, gave every satisfaction and the short series from 1888 to 1905 together with the first five initial years is hence the only record which is reliably available for discussion. In passing it may be noted that, a Dip Circle previously tested at Kew was received in 1897 and was very carefully compared with the Colaba instrument. The results were found to be in close agreement. Subsequent comparisons with two other new Dip Circles received later, also showed that the indications of the Colaba instrument were correct and gave closely accordant results also, the differences lying within probable errors of observations. Accepting hence the inclination observations by the Colaba instrument from 1868 to 1871 and from 1888 to 1905 as reliable, an examination of the annual means in column 9, table 245, showed that the change was fairly large during the interval such as to allow the secular growth to be well represented by the equation* $\tan i = \alpha + \beta t + \gamma t^2$, where i represents the angle of inclination (somewhere about 20°), α, β, γ some constants, and t the time in years reckoned from 1887·5. The formula, it will be seen, ensures a fairly close fit to the *observed* curve, the constants derived from 22 equations of condition, by the method of least squares, being $\alpha = \cdot 36636$, $\beta = \cdot 00155$, and $\gamma = \cdot 0000265$ (equivalent in arc to 20° 7′·2, 5′·3, and 0′·09 respectively). In table 245, columns 3, 6, 10, are given the annual values of dip derived from this theoretical curve (which is also charted in thick curve, figure 1, plate 11, and the departures in columns 7 and 11 show how far the latter curve fits the observed inclination values.

326. It is obvious that the theoretical curve should be applicable only to the period considered (1868—1871 and 1888—1905), but in absence of any other data or method of investigation the curve may at least provisionally be utilised for the purposes of examination of the behaviour of the dip instrument, specially as it appears that the curve after passing the annual value of 1888 sweeps practically through two earlier points, *viz.* the observed annual means of 1881 and 1872 which have not been included in the calculations, without any appreciable error. We know that the instrument was in order in the year 1872; and for the other coincident point the circle was just carefully re-adjusted in 1881. Assuming hence that the use of the curve is justifiable prior to 1888 for such a purpose, it appears that the adjustment of 1881 had succeeded so far in bringing the indication of the instrument, for the time at least, very near to the true dip. The mischief however does not seem to have been permanently remedied as the instrument thereafter apparently does not continue to measure the secular change correctly. The parallel run of the theoretical curve with the annual means of the four years, 1868 to 1871, with a difference of about three minutes—just the difference observed between the two places of observation, *viz.* on the ground floor where the observations were made from 1868 to 1871, and on the electrometer tower from 1872—tends further to strengthen the inference that the theoretical curve may fairly be held to indicate the true secular march of inclination from 1868 to 1905. The curve derived from the formula referred to in the foot-note below gives the same result.

327. At any rate a glance at figure 1, plate XI, makes it perfectly clear that the Kew Dip Circle was not only utterly incapable of measuring absolute inclinations from the year 1873 to 1887, but that even as a *variation instrument* (contrary to the view expressed in the appendix of the volume for 1891-1892, based upon an erroneous view) it had failed absolutely to give even reliable *differential* dip.

328. The observed values of inclination for the years 1868 to 1873 and from 1888 to 1905 therefore are all that can be looked upon as reliably accurate in the long series of the inclination record at Colaba extending over a period of sixty years from 1846 to 1905—a result unfortunately due to the faulty principle of relying too much upon the indications of a single instrument as being sufficiently accurate for requirements, without providing for a precautionary safeguard so essential in accurate scientific work. The absolute necessity of the duplication of all such work at important observatories at least, by two independent sets of instruments could hardly be better demonstrated than by the inclination observations at Colaba.

329. Accepting the theoretical curve as a fairly approximate measure of the secular march of inclination, the minimum turning point which the constants indicate at a not very distant epoch, must

* The equation $i = a + bt + ct^2$ was also tried *including* the values of dip for the years 1868 to 1871 in the calculations along with the series given in column 14, table 246. The former values of inclination were duly corrected for the difference of site referred to in parapraph 323 in order that they may be made comparable to the latter series. The constants obtained by least squares were :— $a = 20° 7′·1$; $b = 4′·71$; $c = 0′·0805$. It will be seen that the results are practically the same as those given by the equation given above and the minimum epoch indicated by both the formulæ is precisely the same.

have been passed about the year 1858 when the increments vanishing $t = -\frac{\beta}{2\gamma}$. It will be seen that the rough values of inclination given by the old instrument in the early years of the fifties (*vide* table 245, column 2) are so far useful for examination in this direction. They do indicate very small fluctuations between 1851 and 1861 as the values of the inclination of the two years which are 10 years apart are practically the same, suggesting conditions about a turning point. This may or may not be a correct inference; but if it is, the turning points of all magnetic elements occurred at Colaba within a period of 40 years: the horizontal force reached its maximum in 1895·4 and the declination in 1879·2; while the inclination probably passed its minimum somewhere about 1858.

330. Of all magnetic elements the inclination measurements are the most troublesome to deal with, in regard to reducing them to the mean of the day. As the vertical force tabulations cannot be directly standardised from dip observations, the simultaneous readings, at the time of the inclination observations, both of the horizontal force and vertical force variation instruments, are essentially necessary in the process which thus becomes considerably complex.

From absolute observations of horizontal force the curve of the H. F. variation instrument is standardised as usual, whence the value of the absolute horizontal force *at the time of* the dip observation is correctly ascertained. This multiplied by the tangent of the observed dip, gives us the value of the absolute vertical force and this value in its turn is then used for standardising the curves of the vertical force variation instrument for the derivation of the value of the mean datum for the month. From this and the mean monthly tabulation ordinate of the instrument, the monthly value of the absolute vertical force is derived; and finally with this absolute value of vertical force and the mean monthly value of horizontal force, the mean monthly value of the inclination is secured. Such corrected values of dip have been given in table 246 from the year 1888—1905. In table 247 are collected the absolute values of vertical force similarly derived, *vide* table 186, Chapter VI, Part I.

331. It may perhaps be interesting in passing to observe how the combination of the secular changes in Declination and Dip as suggested by Bauer, indicates the progress of the phenomenon at Colaba from 1868 to 1905. This combined secular curve is charted in figure 15, plate XI, and calls for no remarks.

2. *Annual Inequality of Inclination.*

332. The inequalities derived from the period 1888 to 1905, shown in table 246, the results of which are also charted in figures 3 to 10 in plate XI, all clearly indicate a definitely marked phenomenon. It will be seen that the inequalities whether they are derived from the uncorrected observations of Dip, table 11, charted in figures 7 to 10, or from the same corrected for the mean of the day as given in table 246 and charted in figures 3 to 6, are practically the same.

333. The general run of the inequality discloses a semi-annual period with two maxima, one in February and the other in July, and two minima, in October and in April. The October minimum, it will be observed, is however the conspicuous feature of the average inequality. It will also be noticed that here too the inequality is clearly subject to the disturbing effects of the 11-year cycle. The range of the average inequality which is about 1′·3 is intensified to 3′·3 in the inequality of years of maximum spots,* particularly the July maximum being very strongly emphasised. This well-pronounced July maximum, and equally prominent October minimum both appear to be the dominant features of the inequality of the years of maximum energy.

334. It may be remarked that the inequalities of Vertical Force discussed in the next Chapter are practically the same in character and general run as what might be expected in a place geographically situated like Colaba near the equator.

* Only 18 years have been considered in this element, as more years are not available.

TABLE 246.—*Mean monthly values of Inclination corrected for the mean of the day and their mean annual Inequalities.*

Years.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
		° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
1888	... ...	20 8·3	20 8·4	20 8·2	20 10·2	20 10·4	20 10·8	20 11·2	20 9·5	20 9·0	20 12·9	20 13·6	20 13·8	20 10·5
1889	... ...	20 19·8	20 19·5	20 17·7	20 16·8	20 18·5	20 19·7	20 19·0	20 19·8	20 19·7	20 19·0	20 20·6	20 20·8	20 19·2
1890	... ...	20 20·9	20 20·9	20 22·1	20 23·2	20 23·3	20 23·3	20 25·1	20 25·7	20 24·8	20 24·9	20 26·7	20 26·9	20 24·0
1891	... ...	20 27·9	20 28·4	20 28·4	20 27·8	20 28·3	20 29·6	20 29·8	20 30·6	20 29·7	20 30·3	20 32·4	20 31·5	20 29·6
1892	... ...	20 32·6	20 32·7	20 33·5	20 35·3	20 34·3	20 36·2	20 35·7	20 36·0	20 30·9	20 30·7	20 34·1	20 36·1	20 34·0
1893	... ...	20 35·3	20 35·8	20 35·4	20 35·5	20 36·3	20 36·9	26 37·1	20 35·4	29 35·8	20 35·4	20 36·1	20 37·6	20 36·0
1894	... ...	20 36·6	20 38·6	20 36·5	20 40·9	20 41·0	20 41·8	20 43·0	20 41·7	20 43·1	20 41·5	20 44·5	20 45·5	20 41·2
1895	... ...	20 45·6	20 47·0	20 46·5	20 46·6	20 46·9	20 49·3	20 48·3	20 49·5	20 50·5	20 50·2	20 52·4	20 54·4	20 48·9
1896	... ...	20 54·2	20 55·1	20 56·0	20 56·2	20 57·4	20 58·4	20 58·3	20 55·0	20 57·6	20 55·0	20 56·4	20 55·7	20 56·3
1897	... ...	20 57·0	20 57·0	20 58·2	20 59·5	20 59·7	21 0·6	20 59·6	21 0·5	21 1·1	21 1·2	21 2·0	21 3·5	21 0·0
1898	... ...	21 3·9	21 4·5	21 4·9	21 5·7	21 5·7	21 6·3	21 6·7	21 7·6	21 9·2	21 8·5	21 8·3	21 8·9	21 6·7
1899	... ...	21 10·2	21 12·2	21 12·3	21 12·0	21 13·0	21 13·5	21 14·3	21 15·2	21 15·9	21 16·9	21 17·3	21 18·3	21 14·3
1900	... ...	21 19·0	21 20·6	21 20·8	21 20·7	21 22·0	21 21·4	21 21·8	21 23·5	21 23·8	21 24·2	21 24·6	21 25·5	21 22·3
1901	... ...	21 27·0	21 27·4	21 27·8	21 28·4	21 29·5	21 30·3	21 31·1	21 31·7	21 32·2	21 32·2	21 32·7	21 34·2	21 30·4
1902	... ...	21 34·1	21 34·4	21 34·9	21 35·4	21 35·9	21 35·9	21 37·3	21 39·1	21 38·9	21 39·1	21 40·5	21 40·3	21 37·1
1903	... ...	21 41·3	21 40·3	21 40·8	21 41·1	21 41·5	21 42·2	21 43·5	21 45·7	21 45·4	21 45·3	21 47·2	21 47·8	21 43·5
1904	... ...	21 48·4	21 49·0	21 48·7	21 47·9	21 48·8	21 48·9	21 49·8	21 49·5	21 49·5	21 51·1	21 51·9	21 53·0	21 49·7
1905	... ...	21 54·5	21 56·3	21 56·2	21 55·0	21 56·4	21 57·3	22 0·6	22 0·3	22 1·2	22 0·8	22 0·8	22 1·7	21 58·4
1888—1905.	Annual Inequality.	−0 2·5	−0 1·9	−0 1·8	−0 1·3	−0 0·7	0 0·0	+0 0·6	+0 0·8	+0 0·9	+0 1·0	+0 2·2	+0 3·0	...
	Correction for Secular change.	+0 2·9	+0 2·4	+0 1·8	+0 1·3	+0 0·8	+0 0·3	−0 0·3	−0 0·8	−0 1·3	−0 1·8	−0 2·4	−0 2·9	...
	Inequality corrected for Secular change.	+0 0·4	+0 0·5	0 0·0	0 0·0	+0 0·1	+0 0·3	+0 0·3	0 0·0	−0 0·4	−0 0·8	−0 0·2	+0 0·1	...
1894—1904.	Annual Inequality.	−0 3·0	−0 2·2	−0 2·1	−0 1·5	−0 0·8	−0 0·2	+0 0·3	+0 0·8	+0 1 5	+0 1·3	+0 2·5	+0 3·3	...
	Correction for Secular change.	+0 3·3	+0 2·7	+0 2·1	+0 1·5	+0 0·9	+0 0·3	−0 0·3	−0 0·9	−0 1·5	−0 2·1	−0 2·7	−0 3·3	...
	Inequality corrected for Secular change.	+0 0·3	+0 0·5	0 0·0	0 0·0	+0 0·1	+0 0·1	0 0·0	−0 0·1	0 0·0	−0 0·8	−0 0·2	0 0·0	...
Maximum spot years.	Annual Inequality.	−0 2·7	−0 1·6	−0 2·0	−0 0·7	−0 0·4	+0 0·6	+0 1·7	+0 0·9	+0 0·3	−0 0·3	+0 1·3	+0 2·8	...
	Correction for Secular change.	+0 2·4	+0 2·0	+0 1·5	+0 1·1	+0 0·7	+0 0·2	−0 0·2	−0 0·7	−0 1·1	−0 1·5	−0 2·0	−0 2·4	...
	Inequality corrected for Secular change.	−0 0·3	+0 0·4	−0 0·5	+0 0·4	+0 0·3	+0 0·8	+0 1·5	+0 0·2	−0 0·8	−0 1·8	−0 0·7	+0 0·4	...
Minimum spot years.	Annual Inequality.	−0 2·6	−0 1·9	−0 2·0	−0 1·3	−0 0·8	−0 0·4	+0 0·1	+0 1·0	+0 0·8	+0 1·6	+0 2·5	+0 3·2	...
	Correction for Secular change.	+0 3·2	+0 2·6	+0 2·1	+0 1·5	+0 0·9	+0 0·3	−0 0·3	−0 0·9	−0 1·5	−0 2·1	−0 2·6	−0 3·2	...
	Inequality corrected for Secular change.	+0 0·6	+0 0·7	+0 0·1	−0 0·2	+0 0·1	−0 0·1	−0 0·2	+0 0·1	−0 0·7	−0 0·5	−0 0·1	+0 0·0	...

CHAPTER IV.

Vertical Force and its Secular and Annual Variations.

335. We have already seen how in table 186, Part I, the vertical force magnetograms have been standardised, and the absolute values of the force have been derived therefrom from month to month. These monthly means from 1888 to 1905 together with the annual means are for the purpose of ready reference collected in table 247.

The annual means are charted in figure 2, plate XI, and it will be seen, as might be expected, that the secular march runs fairly parallel with that of inclination.

336. We have of course the correct annual means of Horizontal Force available for the six years 1868 to 1873 and likewise also we have for the same years, the mean annual values of inclination which as already remarked in paragraph 328 are reliably accurate. Thus the annual mean values of vertical force can so far be fairly correctly derived for the years 1868 to 1873. These values are respectively: 12874γ, 12903γ, 12925γ, 12953γ, 12987γ and 13005γ.

The value of the vertical force for the year 1905 is 15083γ. It will thus be seen that between 1868 and 1905 in a period of 27 years, the vertical force at Colaba rose from 12874γ to 15083γ, indicating the large change of 2209γ—almost one-seventh of the average force V, while the secular change in horizontal force H does not exceed 300γ during the same period. As the sweep of the curve of V passing through 1868 to 1873 and then through 1888 to 1905, is remarkably large and well defined the observed values can be readily indicated in the usual way by the formula $V = a + bt + ct^2$. The constants derived from the data are $a = 13700\gamma$; $b = 60{\cdot}78\gamma$; $c = 0{\cdot}894\gamma$. From the general sweep of the curve the probable existence of a turning point within the years of observation is indicated and the constants show, when worked out, that this probable epoch of minimum falls at 1854 or thereabouts.

337. Attempts at securing the theoretical secular curves have now been made for H, I and V and as the latter two have so far been derived practically independently from observations of dip and of the vertical force magnetograph, the derivation indirectly of the theoretical curve of H is obviously also possible from I and V.

Though the derivations of the three curves is to a certain extent an involved operation, the three curves being interdependent upon one another, the fact that the values of the curve of H so (secondarily) derived are in close agreement with those of the original curve of H derived in paragraph 293, throughout the period 1848—1905 and even for some years beyond the same on either side, presumably indicates that these curves may be accepted fairly approximately to represent the conditions of the secular growth in the different elements at Colaba for the period considered.

338. Figure 16, plate XI, represents the secular change of the total force $\sqrt{N^2+V^2}$ in the vertical plane (N—S) for the period 1848 to 1905 derived by the combination of the curves of N and V (H being taken, as it very nearly does, to represent N). The calculated figures for V are collected in the last columns of table 247.

339. The period under examination—1888 to 1905—is somewhat short, and any definite evidence therefore in regard to the influence of the disturbance of the 11-year period on the secular march of vertical force can scarcely be expected. However the differences of the observed values and the calculated curve are charted in figure 2*a*, plate XI. The effects disclosed do show a decided influence of this period on the curve. During the minimum spot epoch about 1888—1890 the vertical force stands higher; and equally decidedly does it show lower values about the maximum spot epoch at 1894. The curve then glides along the calculated curve to 1899 and a decided rise is again indicated in 1901 and 1902 when we know that the magnetic energy as indicated by the range figures, see table 261, was at its lowest minimum in the Colaba record of 60 years. The indications of the fall of force thereafter are also clearly seen from the value of 1904 which stands lower than the calculated curve. The value for 1905, however, does not stand as low as might be expected.

TABLE 247.—*Mean monthly and annual values of Vertical Force and their annual Inequalities.*

Unity = ·1γ = ·000001 C. G. S.

Years.	Months. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Observed yearly means.	Yearly means of Vertical Force calculated.	Difference (obs. less cal.).	Year.	Vertical Force calculated.	Year.	Vertical Force calculated.	Year.	Vertical Force calculated.
1888	·137181	·137257	·137218	·137473	·137508	·137562	·137606	·137358	·137329	·137824	·137841	·137914	·137506	·137620	−114	1848	·126890	1866	·128180	1884	135260
1889	·138661	·138627	·138394	·138302	·138503	·138638	·138613	·138691	·138685	·138617	·138784	·138806	·138610	·138250	+360	1849	·126820	1867	·128420	1885	135820
1890	·138830	·138825	·138992	·139114	·139133	·139145	·139375	·139478	·139284	·139295	·139547	·139574	·139216	·138900	+316	1850	·126750	1868	·128680	1886	136400
1891	·139724	·139761	·139712	·139619	·139690	·139878	·139920	·140003	·139858	·139935	·140218	·140124	·139870	·139570	+300	1851	·126710	1869	·128960	1887	137000
1892	·140156	·140147	·140236	·140562	·140346	·140578	·140492	·140560	·139988	·139983	·140467	·140724	·140353	·140260	+ 93	1852	·126690	1870	·129250	...	...
1893	·140564	·140635	·140583	·140604	·140750	·140780	·140772	·140517	·140613	·140567	·140622	·140828	·140653	·140970	−317	1853	·126670	1871	·129570	...	...
1894	·140669	·140864	·140632	·141234	·141311	·141360	·141444	·141283	·141428	·141365	·141690	·141839	·141260	·141690	−430	1854	·126680	1872	·129900	...	...
1895	·141815	·141968	·141951	·141975	·142086	·142332	·142195	·142357	·142479	·142488	·142754	·143058	·142288	·142430	−142	1855	·126710	1873	·130240	...	...
1896	·143017	·143049	·143225	·143256	·143379	·143580	·143525	·143107	·143412	·143130	·143316	·143237	·143269	·143190	+ 79	1856	·126760	1874	·130610	...	...
1897	·143384	·143348	·143541	·143628	·143715	·143855	·143775	·143814	·143906	·143897	·143996	·144146	·143750	·143970	−220	1857	·126820	1875	·130990	...	...
1898	·144214	·144313	·144307	·144393	·144414	·144514	·144539	·144664	·144759	·144742	·144744	·144904	·144542	·144770	−232	1858	·126890	1876	·131400	...	...
1899	·145036	·145209	·145219	·145214	·145357	·145430	·145505	·145621	·145686	·145820	·145914	·146063	·145506	·145580	− 74	1859	·126990	1877	·131820	...	...
1900	·146098	·146282	·146321	·146343	·146386	·146417	·146463	·146684	·146742	·146779	·146862	·146923	·146525	·146410	+115	1860	·127110	1878	·132250	...	...
1901	·147130	·147136	·147203	·147292	·147427	·147549	·147625	·147701	·147736	·147713	·147829	147959	·147525	·147260	+265	1861	·127250	1879	·132710	...	...
1902	·147951	·148010	·148077	·148119	·148170	·148200	·148371	·148585	·148497	·148563	·148763	·148716	·148335	·148130	+205	1862	·127390	1880	·133180	...	...
1903	·148848	·148733	·148772	·148758	·148814	·148972	·149126	·149339	·149283	·149253	·149462	·149512	·149073	·149010	+ 63	1863	·127560	1881	·133680	...	...
1904	·149695	·149735	·149682	·149497	·149641	·149666	·149785	·149748	·149738	·149883	·150006	·150199	·149773	·149920	−147	1864	·127750	1882	·134190	...	...
1905	·150332	·150555	·150564	·150367	·150593	·150717	·151127	·151073	·151166	·151121	·151103	·151293	·150834	·150840	− 6	1865	·127960	1883	·134710	...	...
1888—1905. Annual Inequality...	−310	−246	−237	−174	− 92	+ 16	+ 76	+ 94	+ 95	+116	+280	+385	...	...	...	...	...	...	...	...	...
1888—1905. Correction for Secular change.	+362	+296	+230	+165	+ 99	+ 33	− 33	− 99	−165	−230	−296	−362	...	...	...	...	...	...	...	...	...
1888—1905. Inequality corrected for Secular change.	+ 52	+ 50	− 7	− 9	+ 7	+ 49	+ 43	− 5	− 70	−114	− 16	+ 23	...	...	...	...	...	...	...	...	...
1894—1904. Annual Inequality...	−362	−290	−265	−194	−104	+ 3	+ 46	+ 96	+166	+163	+318	+429	...	...	...	...	...	...	...	...	...
1894—1904. Correction for Secular change.	+402	+329	+256	+183	+110	+ 37	− 37	−110	−183	−256	−329	−402	...	...	...	...	...	...	...	...	...
1894—1904. Inequality corrected for Secular change.	+ 40	+ 39	− 9	− 11	+ 6	+ 40	+ 9	− 14	− 17	− 93	− 11	+ 27	...	...	...	...	...	...	...	...	...
Max. spot years. Annual Inequality...	−345	−225	−271	− 83	− 25	+ 84	+184	+ 83	+ 24	− 16	+195	+396	...	...	...	...	...	...	...	...	...
Max. spot years. Correction for Secular change.	+313	+256	+199	+142	+ 85	+ 28	− 28	− 85	−142	−199	−256	−313	...	...	...	...	...	...	...	...	...
Max. spot years. Inequality correct d for Secular change.	− 32	+ 31	− 72	+ 59	+ 60	+112	+156	− 2	−118	−215	− 61	+ 83	...	...	...	...	...	...	...	...	...
Min. spot years. Annual Inequality...	−325	−248	−262	−211	−109	− 35	+ 29	+106	+111	+218	+331	+396	...	...	...	...	...	...	...	...	...
Min. spot years. Correction for Secular change.	+417	+341	+265	+190	+114	+ 38	− 38	−114	−190	−265	−341	−417	...	...	...	...	...	...	...	...	...
Min. spot years. Inequality corrected for Secular change.	+ 92	+ 93	+ 3	− 21	+ 5	+ 3	− 9	− 8	− 79	− 47	− 10	− 21	...	...	...	...	...	...	...	...	...

2. Annual Inequality of Vertical Force.

340. The inequalities given in table 247, and charted in figures 11 to 14, plate XI, show, as already remarked, precisely the same features as those disclosed by the inclination inequalities. Analysing the average inequality given in figure 11, plate XI, in Fourier series, it appears that the first and second components alone are significant. The constants of analysis are

$$C_1 = 3{\cdot}8\gamma\,;\ C_2 = 5{\cdot}5\gamma : a_1 = 91^\circ\ 27'\,;\ a_2 = 8^\circ\ 5'.$$

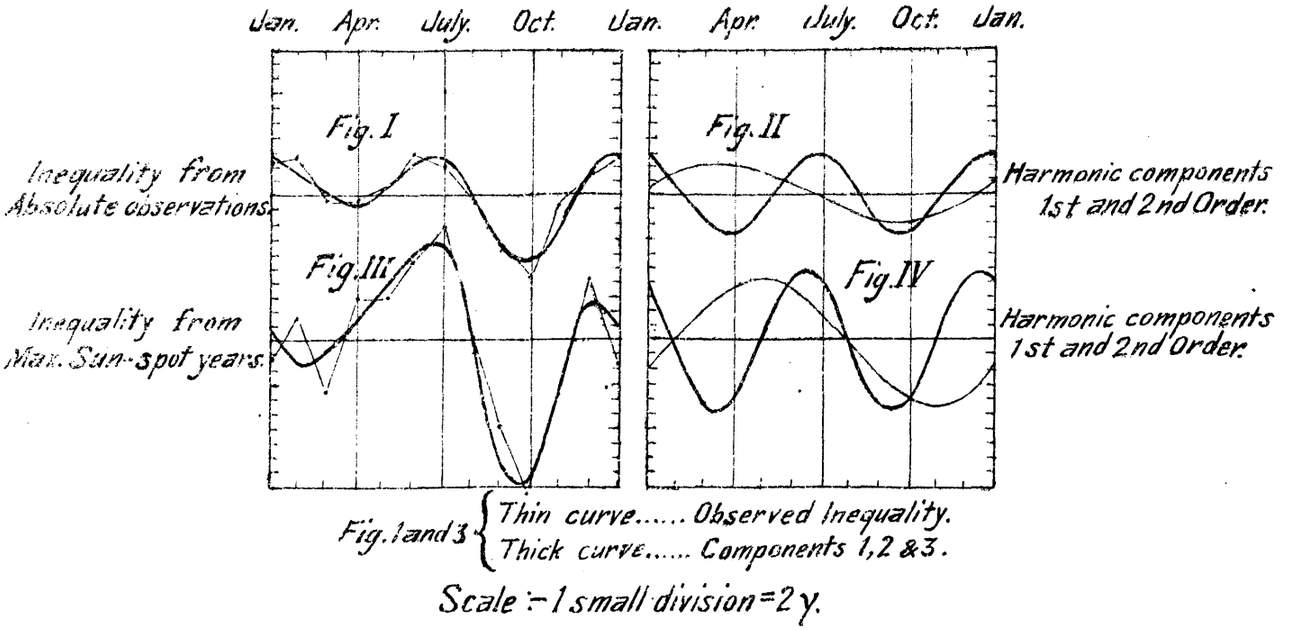
It will also be seen that the second is the dominant component, being half as much large again as the first, its two maxima falling on 8th January and 8th July.

341. Analysing the inequality of the maximum spot years, figure 13, plate XI, the constants of which are given below, it will be seen that when compared with the constants given above, not only are the amplitudes of both the second and the first components intensified, but the third component also acquires considerable significance. The constants of analysis are

$$C_1 = 8{\cdot}4\gamma\,;\ C_2 = 9{\cdot}6\gamma\,;\ C_3 = 4{\cdot}0\gamma : a_1 = 131^\circ\ 34'\,;\ a_2 = 179^\circ\ 11'\,;\ a_3 = 5^\circ\ 57'.$$

It will be noted that while the date of maximum epoch for the first component changes from 3rd April in the average inequality, to 13th May in the maximum spot inequality, the date of the second component remains fairly steady falling about 8 days earlier than in the average inequality. The date of the maximum of the third component falls practically coincident with that of the second.

The results of the analysis are charted below to show the progression of the phenomenon clearly at a glance.

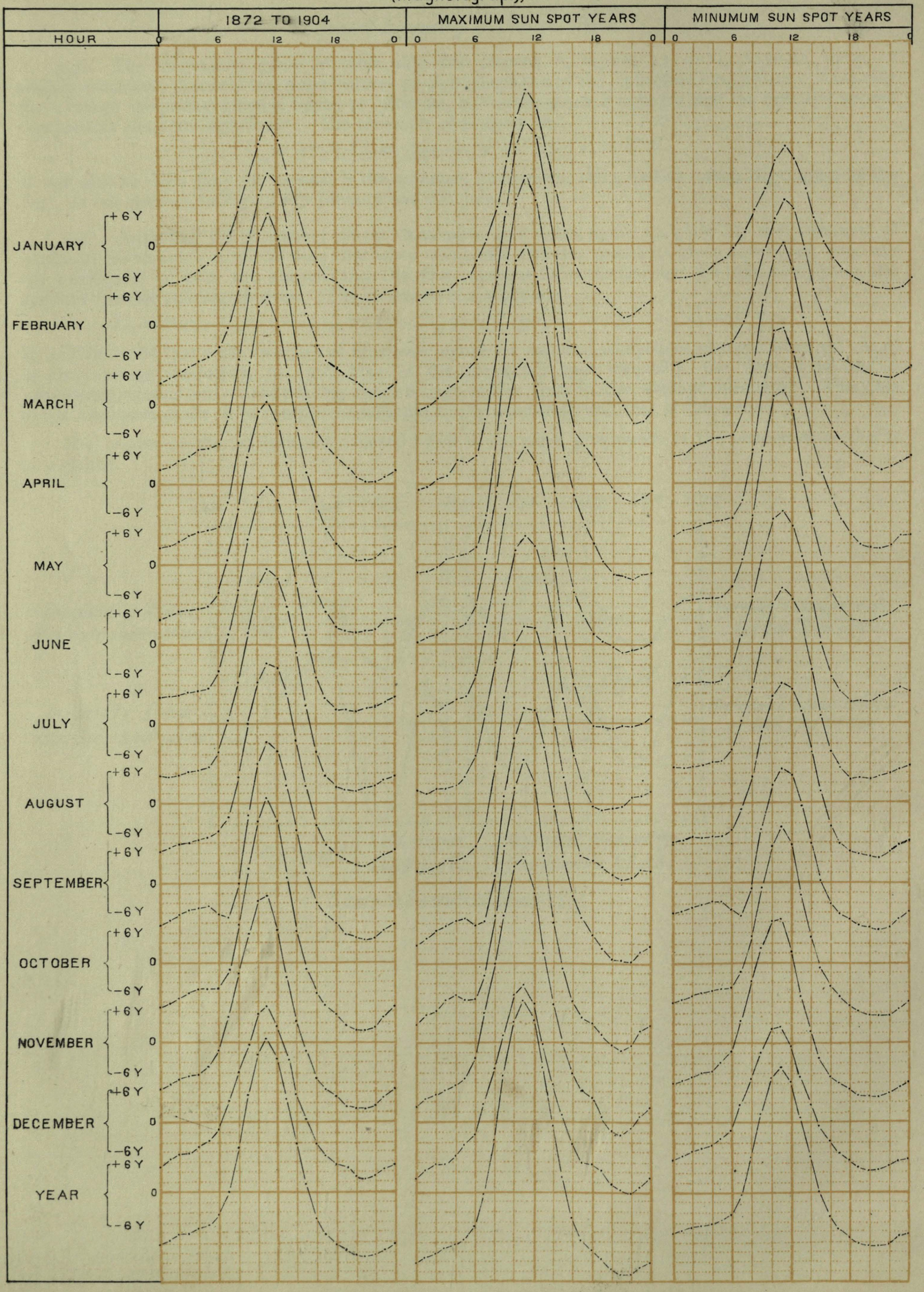


COLABA OBSERVATORY.

Horizontal Force Diurnal Inequality

(Magnetograph)

Plate 12.



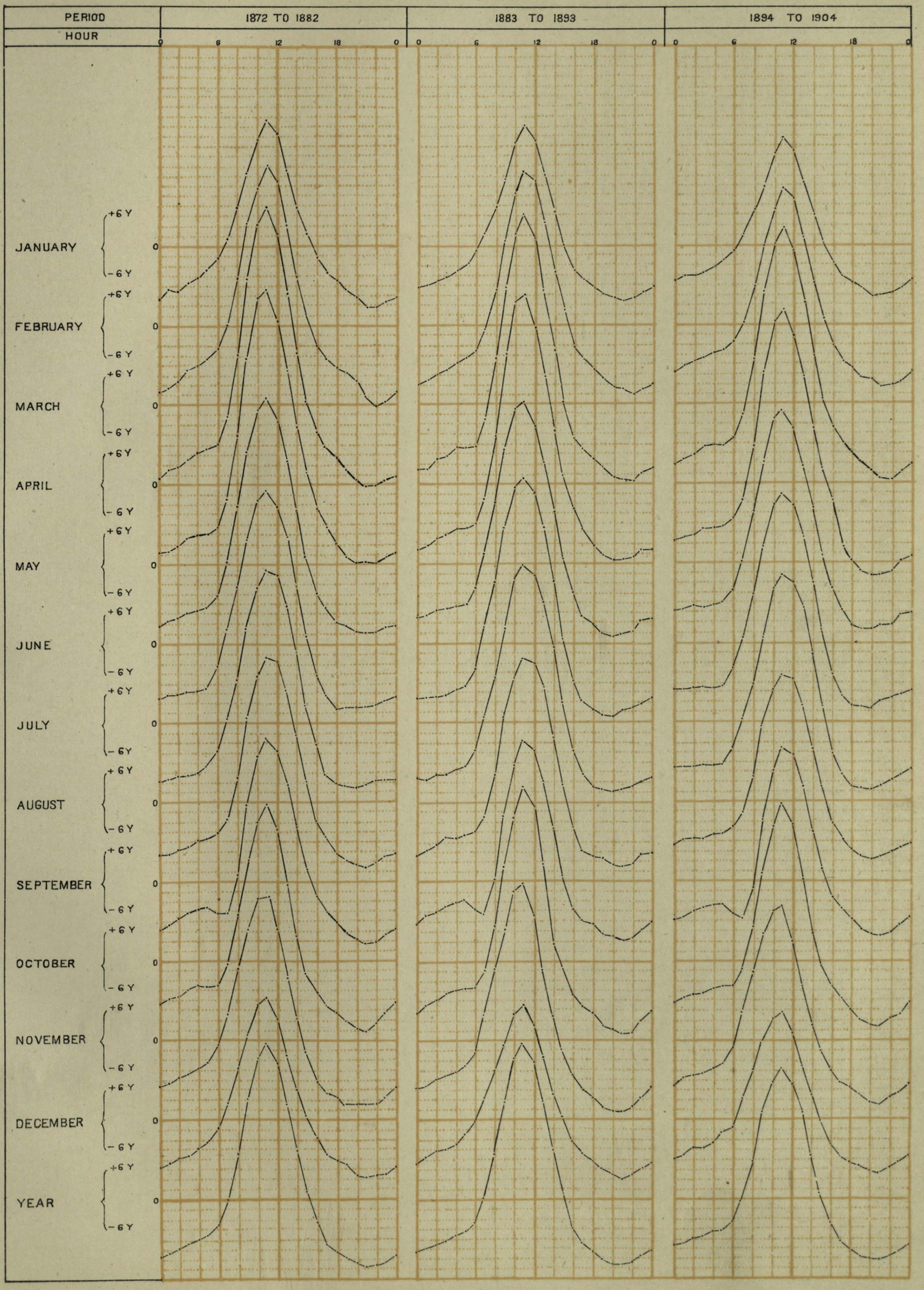
Gov.t Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY.

Horizontal Force Diurnal Inequality

(Magnetograph)

Plate 13



Gov.t Photozinco. Office, Poona. 1909.

COLABA OBSERVATORY.

Horizontal Force Diurnal Inequality

(Magnetograph)

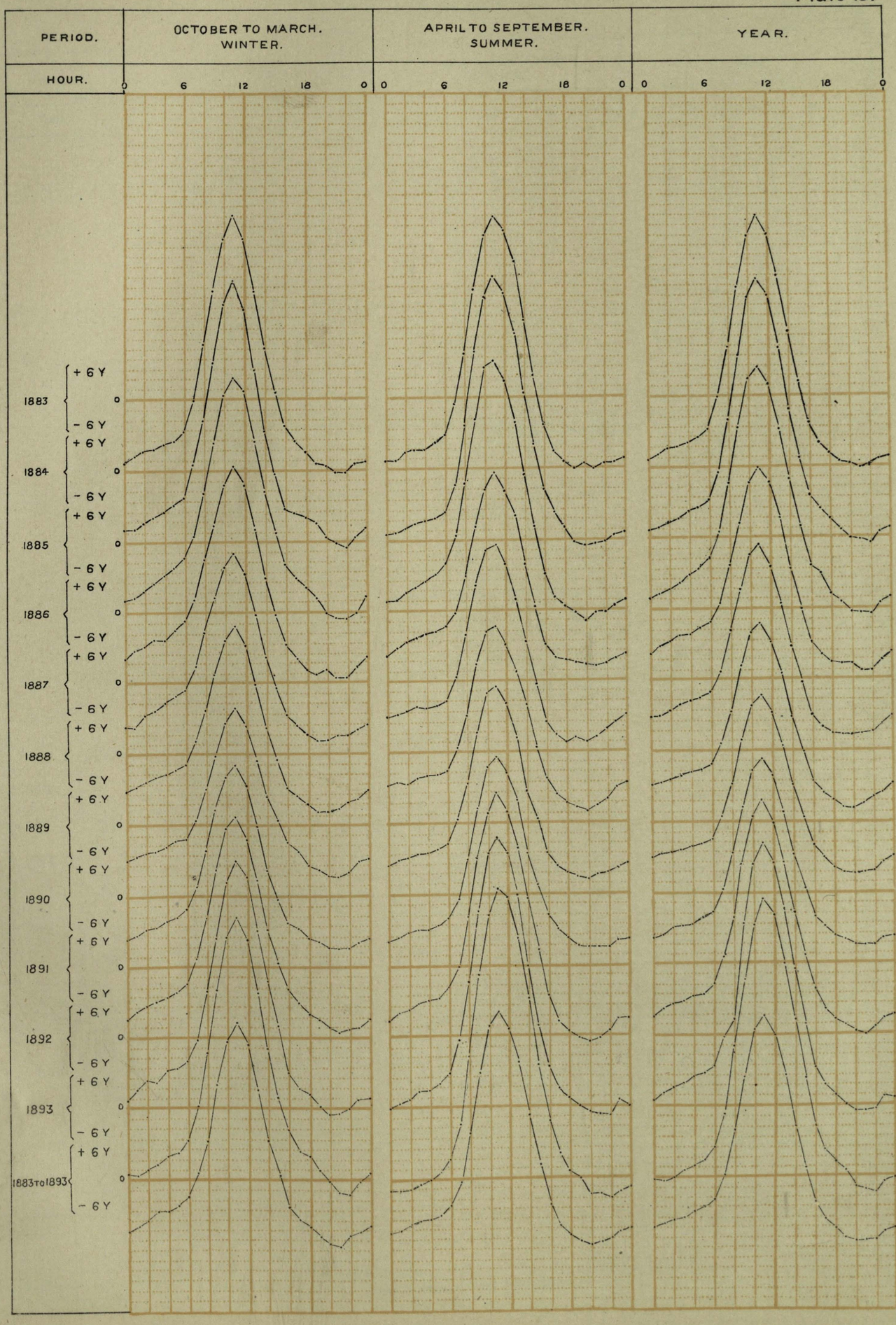
Plate 14

Govt. Photozinco: Office, Poona. 1909.

COLABA OBSERVATORY.

Horizontal Force Diurnal Inequality.
(Magnetograph.)

Plate 15.



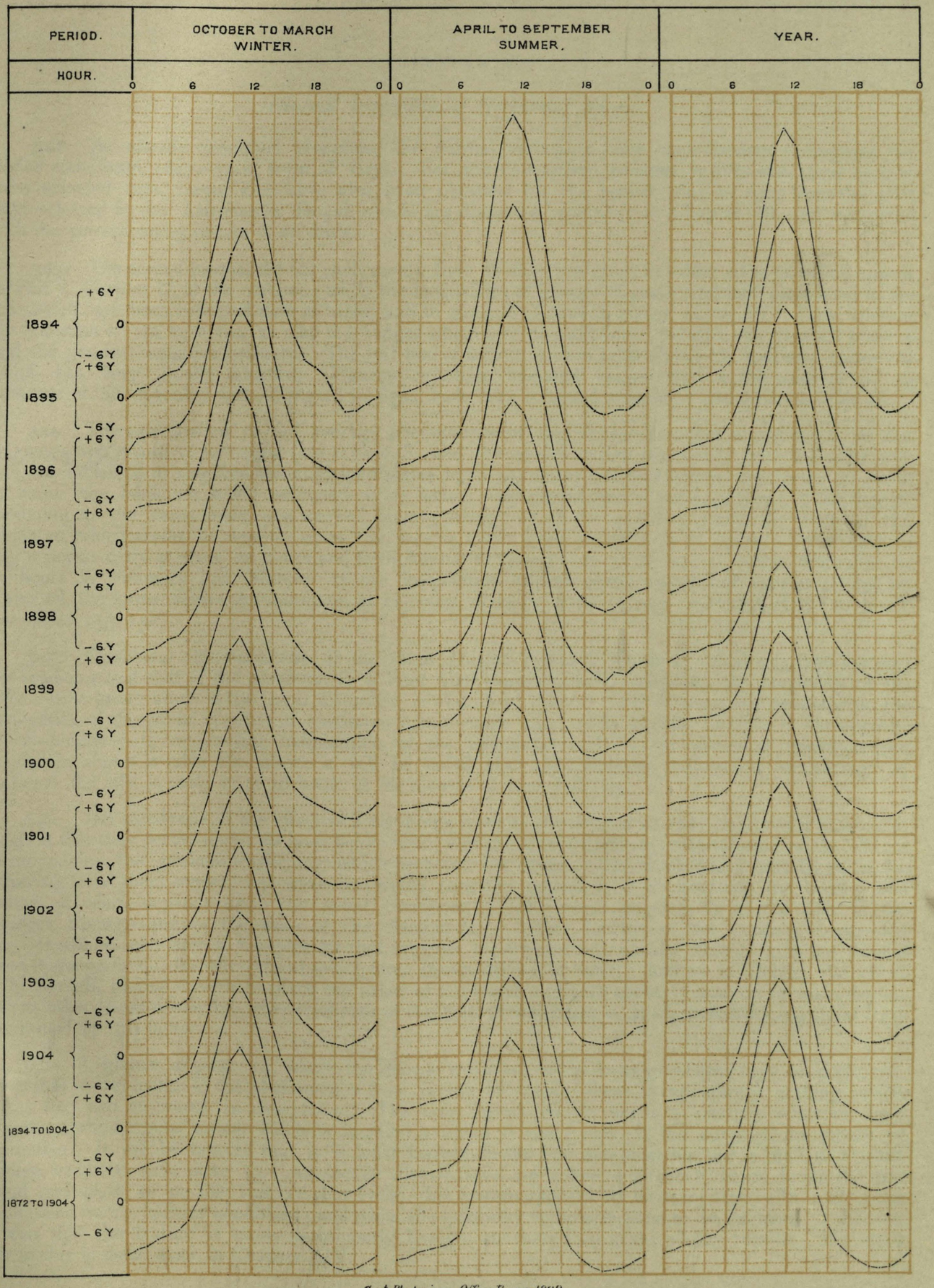
Govt. Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY

Horizontal Force Diurnal Inequality

(Magnetograph.)

Plate 16.



Govt. Photozinco. Office Poona. 1909

CHAPTER V.

Diurnal Inequality of Horizontal Force.

342. As already remarked elsewhere the diurnal variations have been obtained throughout the period considered, 1847—1905, from all days. For the comparison of these results with those derived from selected days, inequalities have also been obtained for the period 1894 to 1905 from the quiet days selected by the Astronomer Royal, which are discussed separately in Chapter XI, and compared with the corresponding results of *all* days.

343. The diurnal inequalities for each month from all days are given in tables 19 to 52 which appear in Part I, Chapter II, of the volume; while the inequalities of groups of years and half years used in the discussion have been collected here in tables 248 to 260 and charted in plates 12 to 16. They contain the ordinates of the 24 hours, as also the ranges which give the difference between the greatest positive and the greatest negative ordinate. The last row of figures in each table shows the aperiodic correction which has been finally adopted. Figures denoting summed range, that is the sum of all 24 ordinates of the inequality without regard to signs, have been collected separately and given in table 261.

344. The examination of the average phenomenon of the diurnal variation as indicated by the magnetograph record 1872—1904 (see table 248, and the earlier series practically tells the same tale also, see tables 90 to 103, and the subjoined plates 17 to 20) shows a clearly defined maximum at about 11 hours, the minimum being exhibited at 21 hours. The persistence of the occurrence of the time of maximum at the same hour, is a marked feature throughout all the months; while the time of the minimum, which seems to depend upon the season, varies from 20 hours to 22 hours. From April to July it occurs early at about 20 hours and from August to January at 21 hours; it shifts thereafter to 22 hours in February and March. If the inequalities typical of the winter and summer groups be examined, the former shows the minimum at 21 hours, while the latter group indicates it at 20 hours (see tables 253, 254).

345. Examining the variations of the three 11-year cycles as shown in tables 255, 256 and 257 this tendency to a shift of the minimum to a later hour, appears well marked in the inequality of the 1872—1882 group which is the most disturbed of the three cycles. It is emphasised generally in the inequalities of the group of years of maximum spots—table 259; while equally forcibly is the opposite effect—tendency to an *earlier* culmination of the minimum—seen in the group of minimum spot inequalities shown in table 260, where it will be noted that the minimum occurs on an average at 20 hours and falls so early as at 18 hours in the months of June and July.

346. The steadiness of the effect of a disturbing force at the time of its culmination to a maximum, which in this case occurs about an hour before noon, and the uncertainty or unsteadiness of the effects accompanying the gradual weakening which precedes the final cessation or rather withdrawal of the disturbing force about sunset, are what one would naturally expect in a phenomenon the waxing and waning of which depends upon the usual conditions which prevail respectively at the time of the meridian passage and at the time of the disappearance below horizon of the exciting cause—the sun. It will be seen later in Chapter XI that irregular movements are usually absent, and the diurnal curve is generally quieter when the absolute force stands higher in value. And as at Colaba the effect of the periodic diurnal wave is to place the value of the hourly ordinate about 11 A.M. or 12 noon higher than at other hours of the day, the steadiness of the hour of maximum is, in all probability, partly at least maintained by this factor.

347. A glance at plate 12, where the diurnal variations of the average months have been charted, shows that in the march of the phenomenon from month to month there is apparently nothing which strikes the eye anywhere as exceptional. The only feature which needs a passing reference here is perhaps the irregular sweep which is incident at about 6 and 7 A.M. in the curve of the month of September. It will be noticed that it is least marked in the first and most marked in the last 11-year average variation, *vide* plate 13. As secular disturbances are noted to be most intense during the first period and least so in the last 11-year cycle, this feature appears to be associated with and more emphasised during quieter conditions; and when the quiet-day variations come to be examined it will also be seen that the feature is more prominently brought out there than in the all-day results. We shall refer to this in detail again in Chapter XIV.

TABLE 248.—*Horizontal Force Magnetograph—Showing, for the period 1872—1904, the mean Diurnal Inequality of Horizontal Force for each month of the year and for the whole year.*

1872—1904.	Month.												Year.
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	- 87	-119	-132	-128	-112	-108	-106	- 98	- 87	- 92	- 96	- 88	-104
1 19	- 77	-107	-124	-122	-105	-105	-107	- 92	- 76	- 82	- 84	- 76	- 96
2 19	- 75	- 97	-112	-113	- 99	-103	-103	- 85	- 65	- 74	- 76	- 68	- 89
3 19	- 66	- 85	-101	-104	- 94	- 99	- 99	- 80	- 56	- 63	- 69	- 63	- 82
4 19	- 53	- 74	- 91	- 98	- 92	- 96	- 96	- 75	- 51	- 56	- 61	- 54	- 75
5 19	- 39	- 62	- 89	- 93	- 85	- 88	- 88	- 70	- 48	- 55	- 50	- 37	- 67
6 19	- 17	- 46	- 79	- 83	- 57	- 52	- 56	- 59	- 63	- 54	- 19	- 15	- 50
7 19	+ 18	- 3	- 25	- 35	+ 7	+ 20	+ 5	- 29	- 70	- 17	+ 54	+ 41	- 3
8 19	+ 72	+ 79	+ 93	+ 87	+110	+109	+ 84	+ 51	- 1	+ 74	+139	+101	+ 83
9 19	+132	+176	+235	+246	+217	+209	+181	+160	+134	+188	+218	+157	+188
10 19	+204	+260	+345	+359	+306	+296	+278	+245	+239	+281	+285	+218	+276
11 19	**+241**	**+304**	**+382**	**+376**	**+322**	**+316**	**+311**	**+283**	**+282**	**+330**	**+292**	**+232**	**+306**
12 19	+209	+280	+331	+317	+279	+287	+294	+274	+265	+285	+225	+192	+270
13 19	+141	+195	+220	+222	+206	+222	+236	+220	+199	+172	+127	+121	+190
14 19	+ 68	+ 98	+105	+111	+108	+121	+147	+127	+106	+ 61	+ 43	+ 55	+ 96
15 19	+ 11	+ 22	+ 7	+ 26	+ 16	+ 20	+ 38	+ 35	+ 20	- 14	- 19	+ 5	+ 14
16 19	- 35	- 41	- 56	- 43	- 53	- 66	- 54	- 43	- 40	- 62	- 71	- 42	- 50
17 19	- 62	- 70	- 81	- 88	- 98	-109	-103	- 84	- 64	- 86	- 97	- 72	- 84
18 19	- 75	- 87	-103	-119	-124	-133	-128	-102	- 81	-104	-109	- 83	-104
19 19	- 89	-101	-123	-140	-132	-133	-131	-113	-102	-122	-126	- 94	-117
20 19	-103	-115	-144	**-151**	**-138**	**-136**	**-135**	-122	-112	-135	-133	-108	-128
21 19	**-110**	-131	-155	-150	-135	-128	-129	**-123**	**-116**	**-139**	**-135**	**-115**	**-130**
22 19	-108	**-142**	**-156**	-148	-131	-124	-121	-116	-114	-130	-127	-109	-127
23 19	- 99	-135	-144	-132	-117	-114	-113	-104	- 98	-111	-111	- 98	-115
Range ...	351	446	538	527	460	452	446	406	398	469	427	347	436
Average progressive increase per day.	- 6	- 6	- 7	- 8	- 8	- 7	- 7	- 7	- 7	- 6	- 5	- 4	- 7

TABLE 248a.—*Excess Diurnal Inequality of Horizontal Force for each average month of the period 1872—1904 over the average year, showing the average seasonal disturbance.*

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+17	−15	−28	−24	− 8	− 4	− 2	+ 6	+17	+12	+ 8	+16	157
1 19	+19	−11	−28	−26	− 9	− 9	−11	+ 4	+20	+14	+12	+20	183
2 19	+14	− 8	−23	−24	−10	−14	−14	+ 4	+24	+15	+13	+21	184
3 19	+16	− 3	−19	−22	−12	−17	−17	+ 2	**+26**	+19	+13	+19	185
4 19	+22	+ 1	−16	−23	−17	−21	−21	0	+24	+19	+14	+21	199
5 19	+28	+ 5	−22	−26	−18	−21	−21	− 3	+19	+12	+17	+30	222
6 19	**+33**	+ 4	**−29**	**−33**	− 7	− 2	− 6	− 9	−13	− 4	+31	+35	206
7 19	+21	0	−22	−32	+10	+23	+ 8	−26	−67	−14	**+57**	**+44**	324
8 19	−11	− 4	+10	+ 4	+27	+26	+ 1	**−32**	**−84**	− 9	+56	+18	282
9 19	−56	−12	+47	+58	+29	+21	− 7	−28	−54	0	+30	−31	373
10 19	**−72**	−16	+69	**+83**	**+30**	+20	+ 2	−31	−37	+ 5	+ 9	−58	432
11 19	−65	− 2	**+76**	+70	+16	+10	+ 5	−23	−24	**+24**	−14	−74	403
12 19	−61	+10	+61	+47	+ 9	+17	+24	+ 4	− 5	+15	−45	**−78**	376
13 19	−49	+ 5	+30	+32	+16	**+32**	+46	+30	+ 9	−18	**−63**	−69	399
14 19	−28	+ 2	+ 9	+15	+12	+25	**+51**	**+31**	+10	**−35**	−53	−41	312
15 19	− 3	+ 8	− 7	+12	+ 2	+ 6	+24	+21	+ 6	−28	−33	− 9	159
16 19	+15	+ 9	− 6	+ 7	− 3	−16	− 4	+ 7	+10	−12	−21	+ 8	118
17 19	+22	+14	+ 3	− 4	−14	−25	−19	0	+20	− 2	−13	+12	148
18 19	+29	**+17**	+ 1	−15	**−20**	**−29**	**−24**	+ 2	+23	0	− 5	+21	186
19 19	+28	+16	− 6	−23	−15	−16	−14	+ 4	+15	− 5	− 9	+23	174
20 19	+25	+13	−16	−23	−10	− 8	− 7	+ 6	+16	− 7	− 5	+20	156
21 19	+20	− 1	−25	−20	− 5	+ 2	+ 1	+ 7	+14	− 9	− 5	+15	124
22 19	+19	−15	−29	−21	− 4	+ 3	+ 6	+11	+13	− 3	0	+18	142
23 19	+16	**−20**	−29	−17	− 2	+ 1	+ 2	+11	+17	+ 4	+ 4	+17	140
Sum without regard to signs...	689	211	611	661	305	368	337	302	567	285	530	718	5,584

TABLE 263b.—*Excess Diurnal Inequality of Horizontal Force showing the secular difference between the seasonal variations at times of maximum and minimum spot epochs.*

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+19	−27	−10	−16	−12	− 9	+ 9	+ 2	− 5	+19	+ 9	+22	159
1 19	**+27**	−29	− 8	−24	−16	− 4	+ 2	− 5	+ 2	+24	+11	+22	174
2 19	+21	−28	−11	−21	−16	− 8	+ 5	− 6	0	+24	+12	**+28**	180
3 19	+12	−16	**−15**	−25	−13	− 3	− 4	+ 3	+ 2	+33	+10	+18	154
4 19	+ 9	−15	0	−27	**−20**	+ 7	− 3	− 4	+ 1	**+34**	+12	+19	151
5 19	+ 5	−13	− 9	−27	−17	+ 5	+ 9	− 2	+ 4	+17	+ 9	+22	139
6 19	+ 5	− 9	−15	**−33**	− 9	+10	+15	−10	− 5	+ 5	+15	+15	146
7 19	− 5	−13	− 8	−28	+ 8	+21	**+18**	**−22**	−14	+ 1	**+22**	+ 3	163
8 19	−21	− 3	− 4	− 5	+14	**+21**	+14	−17	− 9	+ 7	+ 5	−20	140
9 19	−21	+ 3	+ 1	+22	**+28**	+14	+12	−11	−11	+ 8	−10	−42	183
10 19	**−24**	+31	+ 3	+36	+27	+ 4	− 6	− 5	**−19**	+ 4	− 3	−41	203
11 19	−15	**+33**	+12	**+41**	+18	+ 1	−22	−11	− 9	+ 6	− 4	**−44**	216
12 19	−16	+26	+15	+31	+14	+ 5	−19	0	+ 6	− 7	− 8	−42	189
13 19	−22	**+21**	**+18**	+27	+ 4	+ 9	− 4	+ 9	+20	−22	−16	−35	207
14 19	− 9	+17	+17	+16	+ 2	+ 2	+12	+ 3	+20	**−34**	−12	−22	166
15 19	− 6	+ 8	+ 3	+12	+ 2	− 8	+ 6	+ 2	**+23**	−33	− 2	− 5	110
16 19	− 8	+ 8	− 1	+14	+ 1	−10	0	− 2	+18	−28	+ 6	− 3	99
17 19	− 4	**+16**	+16	+ 8	+ 5	−19	−16	+ 1	+10	−25	+ 1	+ 2	123
18 19	+ 5	+12	+ 8	+10	− 3	**−26**	**−26**	+ 8	− 3	−10	+ 5	+18	134
19 19	+ 8	+12	+ 2	+ 3	− 3	−16	−25	+11	−11	− 7	− 6	+28	132
20 19	− 1	+19	− 6	− 1	0	− 4	− 8	**+17**	−13	−10	**−22**	+26	127
21 19	− 2	0	+ 4	+ 5	− 4	+ 1	+ 2	+15	0	−15	−15	+18	81
22 19	+16	−28	− 6	− 7	− 6	− 4	+17	+13	− 3	0	− 5	+10	115
23 19	+24	**−37**	−12	−14	−13	−11	+14	+13	− 4	+20	+ 2	+11	175
Sum without regard to signs...	305	424	204	453	255	222	268	192	212	393	222	516	3,666

TABLE 249.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for the half-year—April to September—for each of the years 1872 to 1882 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

April to September. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	(Mean) 1872 to 1882.
H. m.												
0 19	-194	-137	-124	-109	- 86	- 79	- 93	- 89	-103	-132	-134	-116
1 19	-184	-130	-115	- 97	- 86	- 80	- 88	- 88	- 98	-132	-120	-111
2 19	-179	-130	-103	- 92	- 83	- 73	- 81	- 85	- 87	-125	-111	-104
3 19	-177	-114	- 98	- 82	- 79	- 66	- 75	- 80	- 79	-119	-105	- 98
4 19	-174	-106	- 88	- 79	- 79	- 65	- 72	- 75	- 71	-117	- 90	- 92
5 19	-165	-103	- 81	- 68	- 78	- 66	- 68	- 71	- 64	-107	- 79	- 86
6 19	-125	- 79	- 66	- 49	- 62	- 56	- 57	- 54	- 47	- 84	- 69	- 68
7 19	- 37	- 27	- 24	- 17	- 18	- 18	- 16	- 13	- 12	- 27	- 20	- 21
8 19	+117	+ 76	+ 56	+ 63	+ 59	+ 59	+ 57	+ 66	+ 74	+ 87	+ 81	+ 72
9 19	+288	+216	+187	+175	+165	+153	+152	+173	+186	+233	+206	+194
10 19	+462	+352	+307	+277	+251	+237	+233	+256	+277	+340	+311	+300
11 19	**+486**	**+377**	**+348**	**+296**	**+273**	**+272**	**+264**	**+277**	**+306**	**+370**	**+339**	**+328**
12 19	+436	+343	+322	+264	+244	+241	+245	+248	+276	+335	+324	+298
13 19	+338	+270	+237	+198	+187	+174	+186	+187	+203	+261	+239	+225
14 19	+201	+162	+141	+109	+110	+ 92	+100	+ 95	+111	+150	+130	+127
15 19	+ 73	+ 49	+ 38	+ 20	+ 27	+ 14	+ 21	+ 16	+ 19	+ 38	+ 34	+ 32
16 19	- 31	- 29	- 38	- 46	- 34	- 46	- 44	- 45	- 48	- 49	- 48	- 42
17 19	- 91	-106	- 82	- 89	- 73	- 78	- 73	- 74	- 91	- 89	- 77	- 84
18 19	-131	-133	-114	-108	-101	-103	- 88	- 99	-121	-116	-115	-112
19 19	-154	-148	-135	-114	-107	-104	- 96	-107	-122	-138	-130	-123
20 19	-180	-149	-146	-116	**-114**	**-106**	-102	**-110**	-132	-145	**-147**	-132
21 19	-188	**-161**	**-148**	**-122**	-110	-104	**-106**	-110	**-134**	**-147**	-136	**-133**
22 19	-191	-159	-142	-114	-102	-102	-102	-107	-125	-146	-142	-130
23 19	**-197**	-146	-130	-111	- 94	- 89	- 92	- 92	-115	-139	-140	-122
Range ...	683	538	496	418	387	378	370	387	440	517	486	461
Average progressive increase per day ...	- 48	- 29	- 18	- 18	- 15	- 14	- 10	- 8	- 7	- 6	- 5	- 16

TABLE 250.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for the half-year—January to March and October to December—for each of the years 1872 to 1882 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

October to March. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	(Mean) 1872 to 1882.
H. m.												
0 19	-185	-134	-114	- 97	- 97	- 89	- 84	- 95	-109	-121	-114	-113
1 19	-161	-123	-101	- 87	- 84	- 75	- 79	- 87	- 98	-108	-100	-100
2 19	-141	-120	-108	- 85	- 75	- 71	- 77	- 85	- 88	- 99	- 85	- 94
3 19	-114	-108	- 87	- 75	- 72	- 59	- 69	- 76	- 75	- 90	- 72	- 82
4 19	- 89	- 95	- 80	- 67	- 64	- 53	- 59	- 65	- 63	- 78	- 66	- 71
5 19	- 85	- 83	- 71	- 52	- 54	- 44	- 52	- 54	- 53	- 66	- 61	- 61
6 19	- 57	- 60	- 49	- 35	- 35	- 34	- 37	- 39	- 33	- 44	- 43	- 42
7 19	+ 10	- 1	+ 2	+ 6	+ 6	+ 4	+ 10	+ 9	+ 23	+ 13	+ 14	+ 9
8 19	+131	+101	+ 97	+ 94	+ 80	+ 71	+ 84	+ 88	+106	+102	+110	+ 97
9 19	+255	+214	+203	+182	+166	+151	+168	+169	+199	+214	+211	+194
10 19	+408	+336	+298	+255	+255	+227	+218	+231	+271	+307	+295	+282
11 19	**+444**	**+373**	**+323**	**+283**	**+278**	**+256**	**+242**	**+258**	**+291**	**+335**	**+328**	**+310**
12 19	+386	+328	+264	+236	+238	+215	+199	+219	+248	+279	+278	+263
13 19	+262	+223	+170	+153	+144	+128	+125	+136	+152	+175	+183	+168
14 19	+129	+116	+ 80	+ 67	+ 68	+ 52	+ 53	+ 56	+ 67	+ 77	+ 77	+ 77
15 19	+ 35	+ 21	+ 3	- 5	- 1	- 5	+ 5	+ 6	+ 1	- 2	- 2	+ 5
16 19	- 38	- 40	- 43	- 61	- 48	- 42	- 26	- 35	- 50	- 52	- 77	- 47
17 19	- 86	- 86	- 79	- 89	- 76	- 68	- 53	- 53	- 77	- 72	- 97	- 76
18 19	-107	- 98	- 88	- 94	- 89	- 80	- 75	- 71	- 90	- 91	-115	- 91
19 19	-138	-128	-103	- 99	-101	- 91	- 90	- 82	-105	-109	-130	-107
20 19	-174	-157	-119	**-113**	-111	- 94	-100	- 96	-128	-136	-130	-123
21 19	-209	**-173**	**-144**	-112	**-122**	**-101**	**-102**	-110	-132	**-147**	-131	-135
22 19	**-225**	-166	-144	-113	-114	-100	- 99	**-113**	**-135**	-146	**-139**	**-136**
23 19	-222	-154	-130	- 99	- 99	- 97	- 96	-103	-120	-141	-133	-127
Range ...	669	546	467	396	400	357	344	371	426	482	467	446
Average progressive increase per day ...	- 40	- 22	- 14	- 13	- 12	- 12	- 9	- 7	- 6	- 5	- 5	- 13

TABLE 251.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for the half-year—April to September—for each of the years 1883 to 1893 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

April to September. Bombay Civil Time.	Year. 1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	(Mean) 1883 to 1893.
H. m.												
0 19	-125	-129	-123	- 92	- 71	- 66	- 81	- 94	-110	-143	-166	-109
1 19	-124	-124	-121	- 77	- 67	- 60	- 75	- 85	- 96	-137	-166	-103
2 19	-112	-119	-107	- 63	- 60	- 61	- 71	- 78	- 91	-129	-163	- 96
3 19	-106	-112	- 98	- 57	- 53	- 56	- 63	- 73	- 81	-110	-153	- 87
4 19	-104	-106	- 84	- 48	- 54	- 50	- 61	- 72	- 77	-108	-142	- 82
5 19	- 91	-100	- 70	- 45	- 52	- 47	- 59	- 63	- 69	- 99	-130	- 75
6 19	- 73	- 89	- 49	- 37	- 43	- 40	- 43	- 50	- 48	- 78	-102	- 59
7 19	- 15	- 34	+ 5	- 9	+ 2	+ 1	+ 1	- 14	- 3	- 12	- 39	- 11
8 19	+ 83	+ 82	+108	+ 61	+ 89	+ 68	+ 74	+ 62	+ 82	+101	+ 95	+ 82
9 19	+213	+226	+239	+161	+184	+167	+176	+163	+203	+243	+257	+203
10 19	+319	+334	+338	+239	+257	+235	+251	+246	+295	+357	+374	+295
11 19	**+353**	**+375**	**+349**	**+268**	**+267**	**+246**	**+265**	**+265**	**+335**	**+384**	**+427**	**+321**
12 19	+325	+346	+309	+237	+224	+209	+232	+233	+299	+357	+409	+289
13 19	+263	+263	+229	+184	+160	+154	+164	+180	+226	+275	+329	+221
14 19	+150	+143	+128	+ 89	+ 78	+ 70	+ 78	+ 95	+127	+139	+208	+119
15 19	+ 40	+ 42	+ 21	+ 2	- 10	+ 2	+ 2	+ 15	+ 23	+ 17	+ 79	+ 21
16 19	- 55	- 44	- 71	- 71	- 81	- 58	- 62	- 45	- 64	- 66	- 33	- 59
17 19	-109	- 91	-117	-100	-112	- 89	- 90	- 73	-119	-108	- 97	-100
18 19	-131	-117	-137	-101	**-122**	-104	-104	+ 91	-138	-129	-132	-119
19 19	-141	-148	-148	-107	-118	-114	-111	-103	-149	-144	-147	-130
20 19	-139	**-157**	**-163**	-109	-122	**-120**	**-114**	**-107**	**-155**	-155	-176	**-138**
21 19	**-144**	-153	-151	**-113**	-115	-110	-109	-107	-147	-160	-178	-135
22 19	-139	-149	-150	-110	- 99	- 96	-105	-107	-136	**-161**	**-181**	-130
23 19	-137	-137	-135	-100	- 82	- 78	- 93	- 96	-109	-131	-172	-116
Range ...	497	532	512	381	389	366	379	372	490	545	608	459
Average progressive increase per day ...	- 5	- 4	- 4	- 3	- 3	- 4	- 3	- 3	- 3	- 2	- 3	- 3

TABLE 252.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequalily of Horizontal Force for the half-year—January to March and October to December—for each of the years 1883 to 1893 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

October to March. Bombay Civil Time.	Year. 1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	(Mean) 1883 to 1893.
H. m.												
0 19	-126	-119	-118	- 93	- 83	- 76	- 72	- 88	-104	-121	-134	-103
1 19	-114	-117	-112	- 77	- 86	- 68	- 63	- 80	- 91	-103	-136	- 95
2 19	-103	-105	-100	- 68	- 67	- 57	- 58	- 68	- 82	- 90	-122	- 84
3 19	-100	- 93	- 83	- 58	- 56	- 49	- 57	- 62	- 78	- 91	-113	- 67
4 19	- 92	- 81	- 68	- 57	- 43	- 41	- 46	- 54	- 64	- 70	- 99	- 65
5 19	- 81	- 71	- 54	- 36	- 28	- 34	- 37	- 44	- 56	- 62	- 90	- 54
6 19	- 63	- 54	- 34	- 20	- 17	- 21	- 32	- 30	- 37	- 49	- 63	- 38
7 19	+ 3	+ 7	+ 10	+ 23	+ 31	+ 23	+ 5	+ 15	+ 13	- 3	0	+ 12
8 19	+105	+ 98	+ 94	+103	+100	+ 84	+ 67	+ 85	+ 93	+ 87	+105	+ 75
9 19	+211	+212	+193	+172	+167	+158	+134	+166	+186	+194	+230	+184
10 19	+312	+324	+282	+250	+229	+227	+200	+230	+271	+302	+339	+270
11 19	**+360**	**+365**	**+320**	**+285**	**+256**	**+251**	**+230**	**+255**	**+296**	**+365**	**+378**	**+306**
12 19	+312	+315	+290	+250	+216	+218	+195	+217	+250	+314	+332	+264
23 19	+209	+197	+197	+165	+129	+137	+125	+138	+166	+210	+227	+173
14 19	+ 98	+ 74	+ 95	+ 67	+ 50	+ 51	+ 56	+ 46	+ 71	+109	+117	+ 76
15 19	+ 9	- 11	+ 19	- 9	- 14	- 13	+ 5	- 11	+ 3	+ 20	+ 19	+ 2
16 19	- 57	- 78	- 47	- 65	- 62	- 69	- 38	- 56	- 49	- 71	- 48	- 58
17 19	- 84	- 86	- 77	- 94	- 83	- 86	- 57	- 67	- 74	-101	- 87	- 81
18 19	-107	- 95	- 93	-115	-101	-100	- 82	- 84	- 98	-115	- 99	- 99
19 19	-130	-108	-115	-122	**-116**	**-115**	- 94	- 94	-107	-140	-125	-115
20 19	-139	-136	-141	-118	-115	-115	102	-104	-124	**+158**	-148	-127
21 19	-146	-141	-155	**-135**	-106	-111	**-104**	**-105**	**-134**	-155	-168	**-133**
22 19	**-148**	**-156**	**-158**	-135	-107	-100	- 98	-105	-129	-146	**-170**	-132
23 19	-128	-138	-142	-110	- 93	- 94	- 78	- 99	-123	-127	-144	-116
Range ...	508	521	478	420	372	366	334	360	430	523	548	439
Average progressive increase per day ...	- 2	- 3	- 3	- 4	- 3	- 2	- 2	- 2	- 3	- 3	- 1	- 3

TABLE 253.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequalities of Horizontal Force for the half-year—April to September—for each of the years 1894 to 1904 and for the whole period of eleven years, also for the period of thirty-three years from 1872 to 1904.*

Unity = ·1γ = ·000001 C. G. S.

April to September.	Year.											1894 to	1872 to
Bombay Civil Time.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1904.	(Mean) 1904.
H. m.													
0 19	−132	−130	−103	− 88	− 85	− 75	− 86	− 81	− 77	− 84	− 96	− 94	−107
1 19	−128	−127	− 93	− 84	− 79	− 71	− 82	− 77	− 72	− 80	− 98	− 90	− 101
2 19	−120	−115	− 85	− 76	− 74	− 67	− 80	− 76	− 68	− 77	− 95	− 85	− 95
3 19	−111	−107	− 81	− 74	− 72	− 63	− 79	− 76	− 69	− 71	− 86	− 81	− 89
4 19	−104	−103	− 84	− 66	− 66	− 64	− 80	− 75	− 67	− 69	− 83	− 78	− 84
5 19	− 96	− 95	− 79	− 61	− 63	− 61	**− 80**	− 70	− 67	− 65	− 79	− 74	− 79
6 19	− 72	− 64	− 61	− 46	− 49	− 43	− 64	− 58	− 59	− 54	− 68	− 58	− 62
7 19	− 15	− 11	− 20	− 12	− 15	− 6	− 22	− 20	− 34	− 24	− 30	− 19	− 17
8 19	+113	+ 94	+ 68	+ 58	+ 58	+ 71	+ 58	+ 50	+ 35	+ 51	+ 64	+ 65	+ 73
9 19	+252	+226	+188	+158	+158	+171	+157	+150	+136	+150	+188	+176	+191
10 19	+363	+339	+286	+244	+233	+248	+239	+232	+218	+248	+282	+267	+287
11 19	**+397**	**+366**	**+320**	**+273**	**+258**	**+267**	**+265**	**+255**	**+247**	**+284**	**+319**	**+296**	**+315**
12 19	+367	+332	+299	+248	+238	+239	+246	+232	+227	+247	+301	+271	+286
13 19	+279	+247	+225	+197	+182	+174	+189	+174	+172	+196	+229	+206	+217
14 19	+145	+136	+127	+116	+110	+ 92	+107	+ 94	+ 90	+113	+122	+114	+120
15 19	+ 31	+ 30	+ 32	+ 31	+ 31	+ 2	+ 29	+ 18	+ 21	+ 24	+ 26	+ 25	+ 26
16 19	− 70	− 56	− 51	− 39	− 43	− 63	− 34	− 41	− 33	− 50	− 55	− 49	− 50
17 19	−118	−104	− 92	− 89	− 78	− 99	− 72	− 69	− 65	− 92	− 95	− 88	− 91
18 19	−148	−124	−124	−114	− 99	−120	− 98	− 90	− 83	−112	−121	−112	−114
19 19	−167	−146	−135	−122	−113	**−124**	−104	**− 99**	− 90	−118	**−130**	**−123**	−125
20 19	**−177**	**−159**	**−142**	**−132**	**−121**	−118	−108	− 98	− 95	**−119**	−130	−127	**−132**
21 19	−169	−150	−140	−121	−106	−107	**−109**	− 99	**− 97**	−113	−130	−122	−130
22 19	−168	−146	−137	−108	−110	−102	−101	− 90	− 91	−106	−125	−117	−126
23 19	−150	−134	−117	− 93	− 93	− 81	− 89	− 82	− 78	− 90	−106	−101	−113
Range ...	574	525	462	405	379	391	374	354	344	403	449	419	447
Average progressive increase per day.	− 3	− 2	− 2	− 2	− 3	− 2	− 1	− 2	− 2	− 3	− 2	− 2	− 2

TABLE 254.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for the half-year—January to March and October to December—for each of the years 1894 to 1904 and for the whole period of eleven years, also for the period of thirty-three years from 1872 to 1904.*

Unity = ·1γ = ·000001 C. G. S.

October to March.	Year.											1894 to	1872 to
Bombay Civil Time.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1904.	(Mean) 1904.
H. m.													
0 19	−142	−105	− 92	−101	− 90	− 65	− 77	− 82	− 75	− 78	− 85	− 90	−102
1 19	−124	− 80	− 71	− 91	− 75	− 63	− 73	− 79	− 74	− 69	− 75	− 79	− 92
2 19	−121	− 77	− 68	− 80	− 62	− 50	− 68	− 68	− 68	− 62	− 69	− 72	− 83
3 19	−107	− 71	− 66	− 72	− 60	− 43	− 60	− 62	− 67	− 54	− 60	− 66	− 71
4 19	− 93	− 64	− 63	− 65	− 44	− 43	− 54	− 57	− 59	− 42	− 56	− 58	− 65
5 19	− 89	− 57	− 52	− 56	− 37	− 32	− 46	− 50	− 50	− 43	− 46	− 52	− 59
6 19	− 60	− 29	− 42	− 35	− 14	− 26	− 27	− 38	− 34	− 32	− 34	− 34	− 38
7 19	+ 5	+ 19	+ 12	+ 19	+ 22	+ 11	+ 15	+ 8	+ 10	+ 9	+ 15	+ 13	+ 11
8 19	+111	+114	+ 95	+ 98	+ 95	+ 68	+ 83	+ 80	+ 80	+ 80	+ 83	+ 90	+ 87
9 19	+218	+209	+186	+186	+172	+142	+156	+164	+158	+161	+175	+175	+184
10 19	+313	+293	+273	+262	+233	+199	+215	+216	+215	+230	+242	+245	+265
11 19	**+352**	**+321**	**+306**	**+299**	**+258**	**+228**	**+242**	**+236**	**+236**	**+266**	**+273**	**+274**	**+297**
12 19	+314	+280	+267	+254	+220	+196	+197	+192	+196	+220	+230	+233	+253
13 19	+209	+182	+174	+165	+126	+120	+121	+114	− 115	+148	+143	+147	+163
14 19	+107	+ 85	+ 75	+ 70	+ 51	+ 44	+ 51	+ 44	+ 42	+ 58	+ 58	+ 62	+ 72
15 19	+ 32	− 1	0	+ 3	− 4	− 8	− 2	− 8	− 10	− 8	− 7	− 1	+ 2
16 19	− 28	− 67	− 54	− 48	− 48	− 52	− 45	− 39	− 45	− 51	− 55	− 48	− 51
17 19	− 71	−108	− 88	− 79	− 76	− 76	− 64	− 54	− 65	− 78	− 79	− 76	− 78
18 19	− 82	−123	−114	− 98	− 89	− 92	− 77	− 68	− 70	− 92	− 92	− 91	− 93
19 19	−104	−137	−133	−123	−108	− 94	− 87	− 83	− 83	−110	−107	−106	−109
20 19	−141	−153	−145	−132	−115	**− 96**	− 97	− 92	**− 91**	−117	−119	−118	−123
21 19	**−171**	**−156**	**−146**	**−138**	**−128**	− 96	**−108**	− 92	− 90	**−122**	**−122**	**−124**	**−131**
22 19	−169	−148	−135	−124	−121	− 88	−104	**− 94**	− 88	−113	−115	−118	−129
23 19	−158	−125	−120	−111	−107	− 85	− 93	− 83	− 82	−100	−102	−106	−116
Range ...	523	477	452	437	386	324	350	330	327	388	395	398	428
Average progressive increase per day.	− 2	− 2	− 1	− 2	− 1	− 2	− 1	− 2	− 2	− 2	0	− 2	− 2

TABLE 255.—*Horizontal Force Magnetograph—Showing for the period 1872—1882 the mean Diurnal Inequality of Horizontal Force for each month of the year and for the whole year.*

Unity = ·1γ = 000001 C. G. S.

1872—1882	Month.												Year.
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	−107	−139	−145	−140	−124	−112	−116	−108	− 99	− 88	− 98	− 98	−114
1 19	− 90	−126	−132	−136	−115	−107	−115	−104	− 88	− 81	− 86	− 87	−106
2 19	− 92	−116	−124	−123	−113	−107	−112	− 97	− 75	− 76	− 79	− 79	− 99
3 19	− 77	− 95	−111	−113	−104	−103	−109	− 94	− 64	− 63	− 70	− 75	− 90
4 19	− 65	− 85	−100	−107	−101	− 99	−104	− 83	− 61	− 53	− 61	− 62	− 82
5 19	− 52	− 72	− 92	−105	− 94	− 92	− 94	− 78	− 56	− 56	− 49	− 46	− 74
6 19	− 27	− 53	− 82	− 92	− 68	− 49	− 61	− 68	− 69	− 56	− 15	− 22	− 55
7 19	+ 11	− 4	− 27	− 36	− 2	+ 22	0	− 39	− 70	− 12	+ 53	+ 34	− 6
8 19	+ 70	+ 91	+ 97	+ 92	+106	+107	+ 81	+ 45	+ 5	+ 85	+136	+102	+ 85
9 19	+139	+200	+245	+252	+220	+203	+183	+160	+146	+195	+217	+167	+194
10 19	+224	+285	+369	+385	+318	+298	+282	+258	+260	+287	+292	+235	+291
11 19	**+263**	**+323**	**+426**	**+398**	**+341**	**+314**	**+317**	**+303**	**+295**	**+324**	**+293**	**+248**	**+319**
12 19	+231	+295	+350	+336	+292	+286	+307	+295	+272	+270	+227	+205	+280
13 19	+157	+205	+230	+236	+214	+222	+241	+235	+205	+158	+128	+132	+197
14 19	+ 80	+104	+110	+121	+114	+121	+150	+143	+114	+ 56	+ 48	+ 63	+102
15 19	+ 26	+ 25	+ 9	+ 30	+ 21	+ 22	+ 43	+ 45	+ 28	− 22	− 18	+ 11	+ 18
16 19	− 20	− 37	− 51	− 42	− 49	− 57	− 41	− 34	− 27	− 62	− 78	− 33	− 44
17 19	− 54	− 63	− 80	− 84	− 91	−102	− 97	− 73	− 57	− 86	−105	− 68	− 80
18 19	− 68	− 83	−103	−117	−118	**−130**	−123	−101	− 81	−101	−111	− 79	−101
19 19	− 84	− 93	−129	−142	−125	−127	−127	−117	−102	−118	−127	− 91	−115
20 19	−105	−112	−150	−156	−133	−129	**−130**	−126	−116	−136	−127	−112	−128
21 19	−121	−140	−162	−155	**−137**	−126	−126	**−130**	**−125**	**−140**	**−128**	**−118**	**−134**
22 19	**−123**	**−162**	**−163**	**−159**	−135	−124	−118	−123	−122	−126	−127	−115	−133
23 19	−116	−159	−157	−145	−129	−118	−116	−114	−110	−106	−113	−109	−124
Range ...	386	490	569	557	478	444	447	433	420	464	421	366	453
Average progressive increase per day.	− 15	− 14	− 15	− 15	− 17	− 18	− 17	− 15	− 15	− 14	− 11	− 10	− 15

TABLE 256.—*Horizontal Force Magnetograph—Showing for the period 1883—1893 the mean Diurnal Inequality of Horizontal Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1883—1893	Month.												Year.
Bombay. Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	− 85	−120	−129	−133	−113	−113	−111	−103	− 82	−102	− 97	− 89	−106
1 19	− 80	−109	−126	−121	−108	−113	−113	− 95	− 68	− 90	− 91	− 74	− 99
2 19	− 71	−100	−110	−113	− 96	−111	−106	− 86	− 62	− 77	− 79	− 65	− 90
3 19	− 65	− 92	−104	−103	− 91	−105	−102	− 73	− 51	− 64	− 73	− 60	− 82
4 19	− 49	− 79	− 88	− 96	− 90	− 98	− 96	− 74	− 42	− 58	− 65	− 51	− 74
5 19	− 36	− 63	− 88	− 90	− 81	− 87	− 86	− 68	− 38	− 54	− 53	− 30	− 64
6 19	− 10	− 50	− 83	− 80	− 50	− 54	− 57	− 60	− 56	− 56	− 24	− 6	− 49
7 19	+ 25	− 7	− 28	− 31	+ 20	+ 29	+ 10	− 28	− 64	− 19	+ 53	+ 45	0
8 19	+ 79	+ 72	+ 93	+ 97	+122	+123	+ 91	+ 58	+ 4	+ 72	+143	+100	+ 88
9 19	+137	+169	+236	+263	+228	+232	+191	+169	+134	+190	+223	+149	+193
10 19	+207	+263	+345	+367	+313	+316	+286	+253	+236	+289	+302	+214	+283
11 19	**+242**	**+311**	**+383**	**+381**	**+321**	**+333**	**+318**	**+289**	**+285**	**+349**	**+316**	**+232**	**+313**
12 19	+210	+292	+334	+316	+277	+301	+295	+280	+266	+311	+247	+193	+277
13 19	+143	+204	+229	+217	+205	+233	+241	+229	+201	+196	+142	+122	+197
14 19	+ 63	+106	+109	+103	+101	+122	+152	+131	+103	+ 74	+ 49	+ 53	+ 97
15 19	+ 1	+ 27	+ 5	+ 19	+ 12	+ 13	+ 42	+ 35	+ 9	− 10	− 20	+ 5	+ 11
16 19	− 49	− 42	− 68	− 49	− 59	− 77	− 59	− 53	− 58	− 71	− 74	− 44	− 59
17 19	− 69	− 69	− 88	− 95	−106	−117	−106	− 99	− 80	− 93	−101	− 70	− 91
18 19	− 83	− 92	−108	−123	−124	−139	−131	−108	− 88	−110	−119	− 85	−109
19 19	97	−105	−123	−142	−140	−145	−135	−113	−106	−130	−139	− 97	−123
20 19	−103	−121	−147	**−153**	**−147**	**−148**	**−139**	−125	−115	−138	**−144**	−112	−133
21 19	**−109**	−128	−151	−151	−141	−138	−136	**−129**	**−117**	**−146**	−143	**−120**	**−134**
22 19	−107	**−140**	**−153**	−148	−135	−133	−128	−125	−114	−145	−136	−112	−131
23 19	− 95	−128	−139	−133	−119	−122	−119	−105	− 95	−120	−116	− 99	−116
Range ...	351	451	536	534	468	481	457	418	402	495	460	352	447
Average progressive increase per day.	− 2	− 3	− 4	− 5	− 4	− 3	− 3	− 3	− 3	− 3	− 2	− 2	− 3

TABLE 257.—*Horizontal Force Magnetograph—Showing for the period 1894—1904 the mean Diurnal Inequalities of Horizontal Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1894—1904	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 71	− 97	− 121	− 111	− 100	− 99	− 93	− 85	− 79	− 85	− 91	− 76	− 92
1 19	− 60	− 85	− 114	− 110	− 94	− 97	− 92	− 78	− 72	− 74	− 76	− 68	− 85
2 19	− 62	− 75	− 101	− 104	− 89	− 92	− 91	− 72	− 59	− 68	− 69	− 58	− 78
3 19	− 57	− 68	− 88	− 94	− 89	− 90	− 87	− 73	− 53	− 62	− 64	− 55	− 73
4 19	− 45	− 58	− 85	− 91	− 85	− 90	− 88	− 69	− 50	− 57	− 58	− 47	− 69
5 19	− 30	− 52	− 88	− 84	− 80	− 86	− 84	− 62	− 49	− 54	− 47	− 35	− 63
6 19	− 13	− 35	− 72	− 76	− 55	− 52	− 51	− 50	− 65	− 51	− 16	− 15	− 46
7 19	+ 20	+ 1	− 21	− 37	+ 2	+ 11	+ 5	− 21	− 74	− 19	+ 57	+ 42	− 3
8 19	+ 67	+ 75	+ 90	+ 73	+ 103	+ 98	+ 79	+ 50	− 11	+ 67	+ 139	+ 101	+ 78
9 19	+ 119	+ 160	+ 225	+ 221	+ 203	+ 190	+ 170	+ 151	+ 121	+ 178	+ 214	+ 156	+ 176
10 19	+ 182	+ 231	+ 322	+ 323	+ 289	+ 276	+ 268	+ 225	+ 220	+ 269	+ 260	+ 205	+ 256
11 19	**+ 218**	**+ 273**	**+ 356**	**+ 347**	**+ 305**	**+ 299**	**+ 298**	**+ 257**	**+ 266**	**+ 317**	**+ 266**	**+ 217**	**+ 285**
12 19	+ 187	+ 254	+ 308	+ 299	+ 267	+ 274	+ 280	+ 247	+ 257	+ 274	+ 200	+ 177	+ 252
13 19	+ 122	+ 177	+ 202	+ 214	+ 198	+ 211	+ 226	+ 194	+ 191	+ 161	+ 112	+ 109	+ 176
14 19	+ 60	+ 83	+ 97	+ 111	+ 107	+ 120	+ 138	+ 107	+ 100	+ 54	+ 31	+ 49	+ 88
15 19	+ 6	+ 13	+ 7	+ 31	+ 15	+ 24	+ 30	+ 26	+ 25	− 11	− 20	− 2	+ 12
16 19	− 37	− 45	− 48	− 38	− 51	− 65	− 61	− 44	− 33	− 52	− 60	− 50	− 49
17 19	− 63	− 77	− 76	− 85	− 98	− 108	− 106	− 79	− 56	− 79	− 84	− 77	− 82
18 19	− 74	− 88	− 98	− 115	− 128	− 128	− 130	− 97	− 75	− 100	− 98	− 86	− 101
19 19	− 87	− 106	− 118	− 135	− 133	− 128	− 133	− 109	− 99	− 119	− 113	− 95	− 115
20 19	**− 102**	− 113	− 135	**− 144**	**− 134**	**− 130**	**− 135**	**− 115**	− 106	− 130	− 128	− 102	**− 123**
21 19	− 100	**− 126**	− 152	− 143	− 127	− 119	− 126	− 110	**− 107**	**− 131**	**− 132**	**− 106**	− 123
22 19	− 95	− 125	**− 153**	− 138	− 123	− 116	− 118	− 100	− 104	− 119	− 119	− 98	− 117
23 19	− 86	− 117	− 136	− 119	− 104	− 103	− 103	− 92	− 88	− 107	− 104	− 86	− 104
Range ...	320	399	509	491	439	429	433	372	373	448	398	323	408
Average progressive increase per day.	− 1	− 2	− 3	− 4	− 2	− 1	− 1	− 2	− 2	− 2	− 1	− 1	− 2

TABLE 258.—*Horizontal Force Mognetograph—Showing the mean diurnal inequality of Horizontal Force for each average month of the intermediate sun-spot years, 1874, 1875, 1880, 1881, 1882, 1885, 1886, 1890, 1891, 1895, 1896, 1897, 1898, 1903, 1904 and for the average year.*

Unity = ·1γ = ·000001 C. G. S. unit

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	− 89	− 117	− 133	− 123	− 111	− 112	− 110	− 98	− 89	− 87	− 92	− 86	− 104
1 19	− 73	− 101	− 122	− 117	− 105	− 112	− 106	− 87	− 74	− 78	− 78	− 74	− 94
2 19	− 73	− 92	− 109	− 106	− 98	− 105	− 103	− 77	− 62	− 71	− 69	− 67	+ 86
3 19	− 62	− 80	− 97	− 97	− 95	− 102	− 96	− 71	− 53	− 60	− 63	− 64	− 78
4 19	− 51	− 69	− 94	− 89	− 88	− 99	− 95	− 60	− 49	− 51	− 55	− 53	− 71
5 19	− 39	− 60	− 90	− 81	− 81	− 88	− 87	− 56	− 43	− 48	− 47	− 33	− 63
6 19	− 14	− 40	− 78	− 69	− 53	− 50	− 54	− 50	− 61	− 48	− 14	− 11	− 45
7 19	+ 22	0	− 26	− 20	+ 8	+ 17	+ 1	− 31	− 70	− 11	+ 58	+ 45	− 1
8 19	+ 76	+ 82	+ 93	+ 103	+ 108	+ 104	+ 74	+ 39	0	+ 79	+ 141	+ 109	+ 84
9 19	+ 133	+ 178	+ 238	+ 256	+ 215	+ 207	+ 167	+ 149	+ 136	+ 193	+ 222	+ 163	+ 188
10 19	+ 205	+ 252	+ 350	+ 357	+ 305	+ 296	+ 273	+ 232	+ 243	+ 286	+ 285	+ 219	+ 275
11 19	**+ 238**	**+ 294**	**+ 387**	**+ 370**	**+ 322**	**+ 315**	**+ 308**	**+ 276**	**+ 288**	**+ 334**	**+ 289**	**+ 234**	**+ 305**
12 19	+ 205	+ 268	+ 337	+ 310	+ 281	+ 285	+ 298	+ 268	+ 266	+ 289	+ 220	+ 193	+ 268
13 19	+ 139	+ 190	+ 223	+ 214	+ 209	+ 224	+ 243	+ 211	+ 194	+ 175	+ 126	+ 121	+ 189
14 19	+ 61	+ 94	+ 106	+ 104	+ 110	+ 128	+ 156	+ 125	+ 99	+ 59	+ 41	+ 56	+ 95
15 19	+ 6	+ 22	+ 5	+ 15	+ 17	+ 27	+ 47	+ 35	+ 14	− 21	− 22	+ 3	+ 12
16 19	− 37	− 36	− 59	− 60	− 52	− 63	− 49	− 40	− 47	− 68	− 81	− 50	− 53
17 19	− 64	− 67	− 85	− 102	− 102	− 106	− 103	− 78	− 65	− 91	− 108	− 78	− 87
18 19	− 78	− 86	− 105	− 131	− 126	− 131	− 124	− 102	− 81	− 110	− 121	− 91	− 107
19 19	− 92	− 101	− 126	− 148	− 135	− 134	− 129	− 116	− 103	− 132	**− 132**	− 97	− 120
20 19	− 101	− 119	− 147	**− 155**	**− 141**	**− 136**	**− 137**	**− 125**	− 115	**− 147**	− 132	− 112	− 131
21 19	**− 111**	− 138	− 155	− 151	− 136	− 127	− 132	− 121	**− 118**	− 147	− 132	**− 119**	**− 132**
22 19	− 107	**− 142**	**− 164**	− 148	− 135	− 123	− 127	− 114	− 114	− 133	− 126	− 113	− 129
23 19	− 98	− 136	− 145	− 132	− 118	− 114	− 114	− 107	− 99	− 115	− 112	− 99	− 116
Range ...	349	436	551	525	463	451	445	401	406	481	421	353	437
Average progressive increase per day.	− 4	− 4	− 6	− 7	− 5	− 4	− 5	− 6	− 6	− 5	− 4	− 3	− 4

TABLE 259.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for each average month of the maximum sun-spot years, 1872, 1873, 1883, 1884, 1892, 1893, 1894 and for the average year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−112	−174	−174	−179	−158	−148	−135	−135	−125	−121	−130	−113	−142
1 19	− 99	−165	−166	−176	−151	−138	−142	−135	−111	−105	−117	−100	−134
2 19	− 97	−152	−154	−166	−144	−141	−134	−129	−101	− 94	−107	− 84	−125
3 19	− 93	−129	−144	−155	−133	−130	−135	−116	− 88	− 76	− 98	− 83	−115
4 19	− 77	−115	−116	−149	−135	−117	−126	−117	− 80	− 67	− 86	− 70	−105
5 19	− 66	− 98	−120	−144	−125	−112	−110	−107	− 74	− 75	− 71	− 51	− 96
6 19	− 35	− 75	−107	−133	− 85	− 67	− 68	− 91	− 86	− 74	− 31	− 26	− 73
7 19	+ 6	− 20	− 35	− 70	+ 4	+ 28	+ 13	− 46	− 83	− 26	+ 60	+ 34	− 11
8 19	+ 74	+ 93	+110	+ 90	+139	+143	+119	+ 70	+ 13	+ 94	+160	+102	+101
9 19	+161	+220	+277	+294	+279	+260	+243	+206	+170	+233	+253	+172	+231
10 19	+262	+357	+415	+454	+397	+373	+352	+326	+295	+351	+354	+263	+350
11 19	**+316**	**+414**	**+466**	**+486**	**+416**	**+400**	**+382**	**+362**	**+352**	**+410**	**+371**	**+284**	**+388**
12 19	+282	+384	+412	+420	+363	+371	+358	+357	+346	+354	+300	+242	+349
13 19	+192	+276	+291	+308	+269	+290	+291	+294	+277	+217	+180	+162	+254
14 19	+107	+149	+154	+166	+146	+157	+186	+169	+161	+ 80	+ 75	+ 79	+136
15 19	+ 29	+ 43	+ 28	+ 60	+ 34	+ 27	+ 53	+ 53	+ 56	− 12	− 1	+ 20	+ 32
16 19	− 39	− 41	− 55	− 21	− 54	− 76	− 58	− 49	− 25	− 75	− 61	− 39	− 49
17 19	− 75	− 74	− 81	− 84	−104	−135	−125	−100	− 70	−109	− 99	− 78	− 94
18 19	− 84	− 96	−111	−117	−138	−164	−161	−112	− 99	−120	−112	− 81	−116
19 19	−104	−116	−142	−153	−154	−165	**−171**	−126	−131	−141	−148	− 97	−137
20 19	−137	−131	−176	−179	−165	**−168**	−169	−141	−149	−162	−178	−121	−156
21 19	**−148**	−163	−189	−183	**−173**	−165	−163	**−153**	−152	**−178**	**−183**	−137	**−166**
22 19	−140	**−200**	**−194**	**−193**	−172	−168	−147	−150	**−155**	−168	−171	**−140**	−166
23 19	−124	−196	−188	−180	−164	−161	−142	−132	−139	−135	−148	−130	−153
Range ...	464	614	660	679	589	568	553	515	507	588	554	424	554
Average progressive increase per day.	− 13	− 13	− 13	− 13	− 16	− 17	− 13	− 11	− 10	− 9	− 7	− 7	− 12

TABLE 260.—*Horizontal Force Magnetograph—Showing the mean Diurnal Inequality of Horizontal Force for each average month of the minimum sun-spot years 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901, 1902 and for the average year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 69	− 85	−103	−102	− 84	− 77	− 83	− 76	− 59	− 79	− 78	− 74	− 81
1 19	− 68	− 78	−100	− 94	− 77	− 76	− 86	− 73	− 56	− 72	− 71	− 65	− 76
2 19	− 63	− 69	− 88	− 90	− 73	− 77	− 84	− 68	− 47	− 64	− 65	− 58	− 70
3 19	− 55	− 63	− 79	− 80	− 69	− 76	− 81	− 69	− 40	− 59	− 59	− 51	− 65
4 19	− 40	− 54	− 71	− 77	− 69	− 78	− 78	− 68	− 36	− 56	− 54	− 44	− 60
5 19	− 28	− 43	− 69	− 76	− 66	− 73	− 76	− 64	− 37	− 51	− 39	− 32	− 54
6 19	− 9	− 36	− 62	− 70	− 45	− 45	− 52	− 52	− 52	− 50	− 17	− 12	− 42
7 19	+ 22	+ 3	− 18	− 33	+ 6	+ 19	+ 5	− 16	− 61	− 19	+ 46	+ 39	− 1
8 19	+ 66	+ 66	+ 83	+ 64	+ 95	+ 94	+ 75	+ 56	− 10	+ 55	+123	+ 90	+ 71
9 19	+112	+146	+205	+200	+181	+178	+161	+145	+108	+152	+190	+141	+160
10 19	+167	+208	+294	+301	+251	+248	+239	+214	+198	+231	+241	+188	+232
11 19	**+197**	**+248**	**+321**	**+313**	**+264**	**+263**	**+270**	**+241**	**+230**	**+273**	**+244**	**+197**	**+255**
12 19	+169	+230	+270	+262	+221	+236	+249	+230	+214	+235	+182	+158	+221
13 19	+110	+152	+171	+179	+162	+176	+192	+184	+156	+138	+ 95	+ 96	+151
14 19	+ 52	+ 69	+ 74	+ 87	+ 80	+ 90	+110	+104	+ 79	+ 52	+ 25	+ 39	+ 72
15 19	+ 6	+ 7	− 3	+ 21	+ 4	+ 5	+ 18	+ 24	+ 6	− 6	− 26	− 2	+ 4
16 19	− 30	− 48	− 52	− 33	− 54	− 65	− 56	− 45	− 41	− 45	− 64	− 34	− 47
17 19	− 51	− 70	− 77	− 72	− 90	− 97	− 89	− 81	− 60	− 64	− 79	− 60	− 74
18 19	− 65	− 84	− 95	−103	−111	**−115**	**−111**	− 96	− 71	− 85	− 92	− 74	− 92
19 19	− 76	− 92	−108	−120	**−115**	−113	−110	−100	− 83	− 97	−105	− 88	−101
20 19	− 84	−100	−119	**−127**	−115	−114	−110	**−107**	− 85	−101	−105	**− 96**	**−105**
21 19	− 85	−102	**−132**	−127	−108	−105	−104	−107	**− 91**	**−102**	**−107**	− 94	−105
22 19	**− 90**	**−106**	−122	−120	−100	− 98	− 98	− 97	− 86	−102	−100	− 84	−100
23 19	− 84	− 95	−115	−102	− 87	− 86	− 92	− 81	− 71	− 91	− 86	− 77	− 89
Range ...	287	354	453	440	379	378	381	348	321	375	351	293	360
Average progressive increase per day.	− 4	− 5	− 6	− 7	− 7	− 5	− 5	− 6	− 6	− 5	− 5	− 4	− 5

F

GOVERNMENT OBSERVATORY, BOMBAY.

Form for computers. Calculations of Fourier Co-efficients (4 orders).

		Colaba Civil Hour.	0	1	2	3	4	5	6	7	8	9	10	11
	a_0 to a_{11}	1	a_0	a_1	a_2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	a_{10}	a_{11}
	a_{12} to a_{23}	2	a_{12}	a_{13}	a_{14}	a_{15}	a_{16}	a_{17}	a_{18}	a_{19}	a_{20}	a_{21}	a_{22}	a_{23}
Col. 1—2 .	d_0 to d_{11}	3	d_0	d_1	d_2	d_3	d_4	d_5	d_6	d_7	d_8	d_9	d_{10}	d_{11}
	d_{11} to d_1	4		d_{11}	d_{10}	d_9	d_8	d_7		d_5	d_4	d_3	d_2	d_1
Col. 3—4 .	Δ_1 to Δ_5	5		Δ_1	Δ_2	Δ_3	Δ_4	Δ_5		δ_5	δ_4	δ_3	δ_2	δ_1
Col. 3+4 .	δ_5 to δ_1													
	$\Delta \sin nz$	6	d_0	$\Delta_1 \sin 75°$	$\Delta_2 \sin 60°$	$\Delta_3 \sin 45°$	$\Delta_4 \sin 30°$	$\Delta_5 \sin 15°$	d_6	$\delta_5 \sin 75°$	$\delta_4 \sin 60°$	$\delta_3 \sin 45°$	$\delta_2 \sin 30°$	$\delta_1 \sin 15°$
	$\delta \sin nz$													
Sum of figures in col. 6.	Values of p_1 & q_1	7	Sum		$\frac{\text{Sum}}{12} = p_1$				Sum		$\frac{\text{Sum}}{12} = q_1$			
Col. 1+2 .	S_0 to S_{11}	8	S_0	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}	S_{11}
	S_6 to S_{11}	9	S_6	S_7	S_8	S_9	S_{10}	S_{11}		d_0 to d_3	d_0	d_1	d_2	d_3
Col. 8—9 .	Σ_0 to Σ_5	10	Σ_0	Σ_1	Σ_2	Σ_3	Σ_4	Σ_5		$-(d_4$ to $d_7)$	$-d_4$	$-d_5$	$-d_6$	$-d_7$
	Σ_5 to Σ_1	11		Σ_5	Σ_4		Σ_2	Σ_1		d_8 to d_{11}	d_8	d_9	d_{10}	d_{11}
Col. 10—11		12		$\Sigma_1 \quad \Sigma_5$	$\Sigma_2 - \Sigma_4$		$\Sigma_2 + \Sigma_4$	$\Sigma_1 + \Sigma_5$		Sum θ_0 to θ_3	θ_0	θ_1	θ_2	θ_3
Col. 10+11														
Col. 12 into sine factors.		13	Σ_0	$(\Sigma_1 - \Sigma_5) \sin 60°$	$(\Sigma_2 - \Sigma_4) \sin 30°$	Σ_3	$(\Sigma_2 + \Sigma_4) \sin 60°$	$(\Sigma_1 + \Sigma_5) \sin 30°$		θ_3 & θ_1		θ_3		θ_1
Sum of figures in col. 13.	Values of p_2 & q_2	14	Sum	$\frac{\text{Sum}}{12} = p_2$		Sum	$\frac{\text{Sum}}{12} = q_2$			$\theta_1 - \theta_3$ $\theta_1 + \theta_3$		$\theta_1 - \theta_3$		$\theta_1 + \theta_3$
Col. 8+9 .	σ_0 to σ_5	15	σ_0	σ_1	σ_2	σ_3	σ_4	σ			θ_0	$(\theta_1 - \theta_3) \sin 45°$	θ_2	$(\theta_2 + \theta_3) \sin 45°$
	σ_5 to σ_3	16	σ_5	σ_4	σ_3						Sum	$\frac{\text{Sum}}{12} = p_3$	Sum	$\frac{\text{Sum}}{12} = q_3$
Col. 15—16	ψ_0 to ψ_2	17	ψ_0	ψ_1	ψ_2									
	ψ_2 & ψ_1	18		ψ_2	ψ_1									
Col. 17—18		19		$\psi_1 - \psi_2$	$\psi_1 + \psi_2$									
Col. 17+18														
Col. 19 into sine factors.		20	ψ_0	$(\psi_1 - \psi_2) \sin 30°$	$(\psi_1 + \psi_2) \sin 60°$									
		21	Sum	$\frac{\text{Sum}}{12} = p_4$	$\frac{(\psi_1 + \psi) \sin 60°}{12} = q_4$									

Non-periodic correction, $a_{24} - a_0$ $= 2c$

Correction for p_0 $= \frac{c}{24}$

Correction for p_1, p_2 p_3 and p_4 $= \frac{c}{12}$

" " q_1 $= \cdot 63c$

" " q_2 $= \cdot 31c$

" " q_3 $= \cdot 20c$

" " q_4 $= \cdot 14c$

$p_0 = (a_0 + a_1 + a_2 + \ldots\ldots a_{23}) \div 24$

		0	1	2	3	4	5	6	7					
Co-efficients p, q ...	22	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	$+p, +q$	$T = t$	$\mu_1 = 90° - t$	$\mu_2 = 45° - \frac{t}{2}$	$\mu_3 = 30° - \frac{t}{3}$	$\mu_4 = 22\frac{1}{2}° - \frac{t}{4}$
Non-periodic correction.	23	$\frac{c}{12}$	$\cdot 63c$	$\frac{c}{12}$	$\cdot 31c$	$\frac{c}{12}$	$\cdot 20c$	$\frac{c}{12}$	$\cdot 14c$	$-p, +q$	$T = 360° - t$	$90° + t$	$45° + \frac{t}{2}$	$30° + \frac{t}{3}$	$22\frac{1}{2}° + \frac{t}{4}$
Corrected co-efficients .	24	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	$-p, -q$	$T = 180° + t$	$270° - t$	$135° - \frac{t}{2}$	$90° - \frac{t}{3}$	$67\frac{1}{2}° - \frac{t}{4}$
										$+p, -q$	$T = 180° - t$	$270° + t$	$135° + \frac{t}{2}$	$90° + \frac{t}{3}$	$67\frac{1}{2}° + \frac{t}{4}$
$\log p$	25														
$\log q$	26														
$\log \tan t = \log p - \log q$	27														
t	28														
$\log \sin t$	29														
$\log P = \log p - \log \sin t$	30														
P	31														
T	32			$\frac{t}{2} =$		$\frac{t}{3} =$		$\frac{}{4} =$							
	33														
μ'	34														
Correction to midnight μ															

G.

GOVERNMENT OBSERVATORY, BOMBAY, MONTH OF JANUARY 1894.

Calculations of Fourier Co-efficients (4 orders) from hourly inequalities of H. F. (Magnetograph).

Colaba Civil Hour.	h. m. 10 19 / 22 19	h. m. 11 19 / 23 19	h. m. 12 19 / 0 19	h. m. 13 19 / 1 19	h. m. 14 19 / 2 19	h. m. 15 19 / 3 19	h. m. 16 19 / 4 19	h. m. 17 19 / 5 19	h. m. 18 19 / 6 19	h. m. 19 19 / 7 19	h. m. 20 19 / 8 19	h. m. 21 19 / 9 19
1 ...	+ 229	+282	+258	+ 179	+116	+ 45	- 4	- 57	- 74	- 82	-112	-140
2 ...	- 133	-139	-118	- 84	-109	-106	- 87	- 77	- 31	+ 8	+ 76	+161
3 ...	+ 362	+421	+376	+ 263	+225	+151	+ 83	+ 20	- 43	- 90	-188	-301
4 ..		-301	-188	- 90	- 43	+20		+151	+225	+ 263	+376	+421
5 ...		+722	+564	+ 353	+268	+131		+171	+182	+ 173	+188	+120
6 ...	+ 362	+697	+488	+ 250	+134	+ 34	+ 83	+165	+158	+122	+ 94	+ 31
7 ...	+1965			+ 163·7	= p_1		+653			+54·4	= q_1	
8 ...	+ 96	+143	+140	+ 95	+ 7	- 61	- 91	- 134	-105	- 74	- 36	+ 21
9 ...	- 91	-134	-105	- 74	- 36	+ 21			+362	+421	+376	+263
10 ...	+ 187	+277	+245	+169	+ 43	- 82			-225	-151	- 83	- 20
11 ...		- 82	+ 43		+ 245	+277			- 43	- 90	-188	-301
12 ...		+359	+202		+ 288	+195			+ 94	+180	+105	- 58
13 ...	+ 187	+311	+101	+169	+ 249	+ 97				- 58		+180
14 ...	+ 599	+49·9	= p_2	+515	+42·9	= q_2				+238		+122
15 ...	+ 5	+ 9	+ 35	+21	- 29	-40			+ 94	+168	+105	+ 86
16 ...	+21	- 29	- 40						+262	+21·8 = p_3	+191	+15·9 = q_3
17 ...	-16	+ 38	+ 75				Effect of Progressive change : negligible.					
18 ...		+ 75	+ 38									
19 ...		- 37	+113									
20 ...	-16	- 18	+ 98									
21 ...	-34	-2·8 = p_4	+ 8·2 = q_4									

	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
22 ...								
23 ...	+163·7	+54·4	+49·9	+42·9	+21·8	+15·9	-2·8	+8·2
24 ...	2·21405		1·69810		1·33846		0·44716	
25 ...	1·73560		1·63246		1·20140		0·91381	
26 ...	0·47845		0·06564		0·13706		9·53335	
27 ...	71° 37′		49° 19′		53° 54′		18° 51′	
28 ...	9·97725		9·87985		9·90741		9·50933	
29 ...	2·23680		1·81825		1·43105		0·93783	
P 30 ...	172·5		65·8		27·0		8·7	
31 ...	71° 37′		49° 19′		53° 54′		341° 9′	
	71° 37′		24° 39′		17° 58′		4° 43′	
μ' ...	18° 23′		20° 21′		12° 2′		27° 13′	
Correction to midnight ...	154° 45′		154° 45′		154° 45′		154° 45′	
μ ...	173° 8′		175° 6′		46° 47′		1° 58′	

h. m.
μ' = Time of first maximum reckoned from 10 19 A.M.
μ = Do. do. midnight.

TABLE 261.—*Horizontal Force Magnetograph—Showing monthly mean values and annual variation of summed ranges—Horizontal Force.*

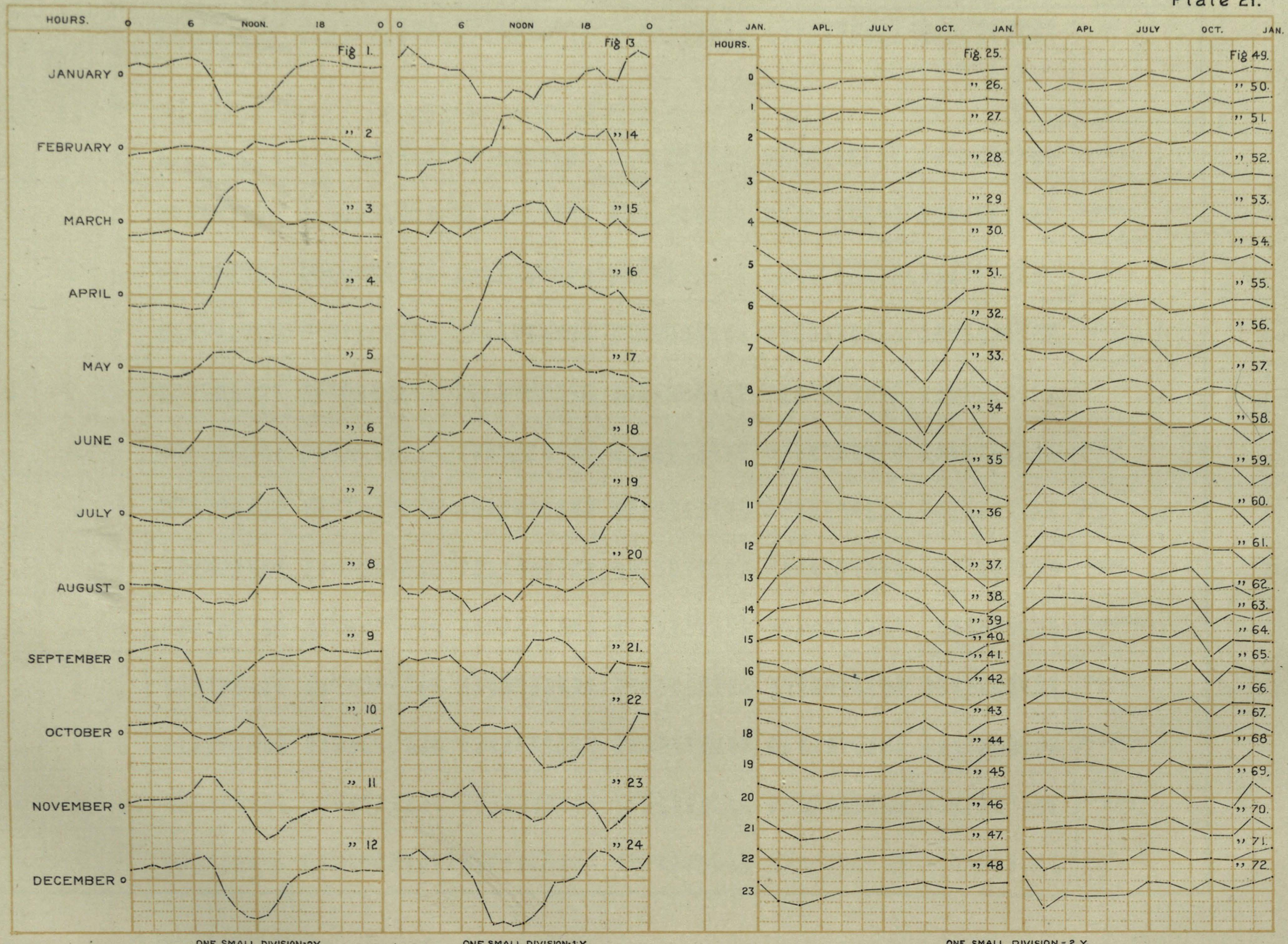
Unity = 1γ = ·00001 C. G. S. Unit.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1847	272	295	347	349	350	349	341	381	427	499	300	390	358
1848	348	424	466	455	379	400	443	414	319	375	371	373	397
1849	423	487	497	513	439	373	323	308	238	248	301	300	371
1850	295	370	413	396	296	349	321	231	250	296	286	160	305
1851	226	324	385	389	397	340	286	228	297	238	275	260	304
1852	250	240	291	300	301	271	239	256	161	252	259	194	251
1853	254	310	329	332	248	293	308	290	211	285	274	264	283
1854	212	260	259	239	289	247	257	207	178	236	242	142	231
1855	160	175	278	243	264	198	255	232	219	215	222	131	216
1856	207	241	288	303	233	275	270	266	277	285	259	227	261
1857	199	277	325	353	244	340	303	308	230	284	269	267	283
1858	272	301	423	452	362	344	366	369	388	363	395	298	361
1859	322	444	507	556	484	487	427	486	414	507	462	436	461
1860	348	438	543	496	488	483	507	507	380	408	358	240	433
1861	258	430	472	546	422	455	451	403	334	344	371	296	398
1862	239	339	452	431	362	400	421	318	375	291	365	266	355
1863	197	313	430	421	411	325	309	288	263	299	272	237	314
1864	235	284	338	377	272	341	352	257	201	260	262	188	281
1865	245	302	334	342	292	272	259	207	250	220	245	215	265
1866	172	243	351	339	301	321	237	227	187	208	234	245	255
1867	180	250	307	322	245	277	268	204	240	257	250	193	249
1868	245	220	337	302	309	302	329	244	224	252	268	306	278
1869	336	307	376	371	437	477	416	323	318	381	334	310	365
1870	284	392	589	638	645	523	577	490	500	618	558	489	525
1871	399	476	594	628	557	508	479	461	413	449	427	352	497
1872	367	518	504	555	527	440	490	435	449	348	403	406	453
1873	318	458	479	495	350	319	354	377	340	303	287	248	361
1874	281	357	375	395	344	325	322	314	269	233	266	250	311
1875	219	302	348	376	293	304	269	262	195	242	244	199	271
1876	243	246	334	320	285	255	293	248	184	216	259	209	258
1877	214	223	262	279	257	250	259	246	208	259	201	186	237
1878	147	221	296	313	256	276	241	237	193	224	257	188	237
1879	144	240	313	301	279	271	273	230	227	246	239	241	250
1880	248	255	305	338	274	307	274	280	277	330	270	236	283
1881	262	310	369	358	364	399	420	346	298	315	299	270	334
1882	206	274	418	363	371	354	336	297	297	327	347	248	320
1883	243	328	360	417	308	376	379	326	304	383	402	249	340
1884	275	337	466	466	418	404	310	318	270	312	328	218	343
1885	243	342	384	424	331	396	391	295	245	325	310	223	326
1886	243	288	395	313	269	267	247	211	208	231	271	174	260
1887	169	238	303	265	260	270	284	255	198	251	249	211	246
1888	246	232	288	251	246	262	246	208	192	227	212	194	234
1889	178	228	225	305	225	297	257	257	182	221	238	148	230
1890	151	248	274	296	257	248	265	229	230	270	239	214	243
1891	187	226	318	317	341	331	376	286	274	305	334	274	297
1892	258	373	357	374	399	419	383	378	321	365	344	240	351
1893	274	354	458	466	479	480	442	423	330	381	329	329	395
1894	270	363	392	430	400	438	434	332	331	357	370	261	365
1895	221	347	387	401	402	388	341	310	304	306	320	245	331
1896	232	272	362	361	359	323	317	229	268	328	268	216	295
1897	280	278	342	303	273	254	272	241	263	245	230	276	271
1898	179	253	315	310	270	296	263	195	196	234	258	189	246
1899	150	188	280	300	256	279	265	248	201	198	233	176	220
1900	184	229	270	264	242	255	307	264	220	222	220	182	238
1901	179	235	287	296	254	227	258	231	189	210	188	178	228
1902	145	213	275	251	248	223	222	221	202	235	232	176	220
1903	165	204	295	323	280	271	287	236	195	319	226	219	252
1904	159	221	340	336	312	351	335	277	242	256	278	222	277
1905	206	282	391	349	318	370	337	311	258	318	369	241	312
Annual Inequality. 1872—1905	−68	− 4	+56	+61	+27	+27	+27	− 9	−37	− 9	−12	−62	...
Maximum sun-spot years.	−87	+17	+58	+85	+39	+38	+26	− 3	−38	−23	−21	−94	...
Minimum sun-spot years.	−54	− 9	+49	+50	+19	+13	+28	+ 4	−36	− 8	− 6	−46	...

COLABA OBSERVATORY.

Changes in the Diurnal Inequality of Horizontal Force due to Average Seasonal and Intermittent Secular Seasonal effects.

Plate 21.



Figs. 1 -12 - Excesses of the average monthly inequalities over the average of the year.
Figs. 13-24- " " " " due to intermittent secular effects.

Figs. 25-48 - Annual variation of each hourly ordinate.
Figs. 49-72 - Excess annual variation of each hourly ordinate due to secular effects.

Gov.t Photozinco: Office, Poona, 1909.

348. The seasonal changes in the character of the diurnal inequality can be studied by the examination of the progression from month to month, of (1) the excess inequalities, that is the differences of the average inequality of each month and the mean diurnal inequality of the year, or of (2) the ranges or summed ranges of the inequalities of the months in their periodic seasonal march, either of which throw light on the phenomenon in different ways.

Seasonal change as indicated by excess inequalities.

In table 248*a* are collected the data necessary for the examination of the excess inequalities which are also charted in plate 21, figures 1 to 12. They show at a glance how the periodic disturbance affects the normal diurnal wave. In comparison with similar excess variations of D and V, see paragraphs 377, 399, the effects in H, it will be noted, are somewhat irregular and unsteady, and hence in this element more than in the others, it is difficult, to follow and interpret the progressive and continuous action of the forces, whatever they be, which control this phenomenon.

In table 248*a* the last row of figures which give the sum of the 24-hourly ordinates without regard to signs, may be taken as a relative measure of the disturbance to which the inequality of each month is subject; while similar figures in column 14 of the table give a measure of the disturbance of each hour.

349. The months which appear to be least influenced by seasonal changes, are February and October. December and January, closely followed by March and April, are the most disturbed. Viewing hence the phenomenon from the standpoint of the average, figures 1 to 12 in plate 21 enable us to differentiate between the characters of the disturbance, and it will be seen that the December and January excess inequalities when compared with those of March and April, clearly indicate the reversal of conditions in the latter months.

350. There are some general features of the progression which it will be instructive to particularise as they may be useful later on. In the month of March the time of the maximum which is due to occur at about 11 A.M., appears earlier in April, while the amplitude is at the same time intensified. In May and June the amplitude diminishes; and as the time of the maximum falls to occur earlier and earlier as the season advances, the existence of the maximum is just discerned in July at about 7 A.M. While the principal maximum is thus shifting and waning in intensity, the minor maximum, which is insignificant and occurs at about 17 hours in the month of March, moves in the same direction as the former, occurs earlier and earlier and grows in intensity, till in July it becomes the dominant feature of the curve at 14 hours. In August the principal maximum disappears merging in the night hours, leaving the minor maximum as the only notable feature, occurring at 13 hours. This maximum in its turn now shows definite signs of waning, and in the September inequality it almost disappears. The sudden transition of the excess inequality from apparently disturbed conditions in September to a state of comparative quiet in October and thence back to disturbed conditions almost reverse in character, in November, constitutes, it will be seen, as notable a feature in the whole progression as the one in February which indicates a state of quietude between the months of January and March, the disturbances in which are almost equal and opposite in character. The minor maximum, it will be seen, takes the place of the principal maximum in October, and the signs of the development of the *reverse* effects in the excess inequalities typical of the winter conditions just begin to show themselves about this time as much as the signs of their complete disappearance are indicated in the month of February. The minor maximum under the changed conditions, grows in intensity now as the time of its occurrence falls earlier. It is incident at about 8 A.M. in November, about 7 A.M. in December, and merges finally in the early morning hours in the month of January. This minor maximum in its apparent progress from 6 P.M. to 6 A.M. seems to carry with it the principal minimum, which, in March, occurs at about 23 hours. Its earlier incidence and somewhat irregular growth can be traced from month to month from March to December, and to January in which month the minimum occurs at about 11 A.M. and indicates as dominant a feature in the winter excesses as the principal maximum occurring about the same time, does in the typical summer inequalities in March and April.

351. The data in table 248*a* are charted also, to show the seasonal variation of the disturbance in the ordinates* of each hour. A glance at figures 25 to 48 in plate 21 will be sufficient to show that the periodic seasonal disturbance is in the first instance mainly confined to hours when the sun is above the horizon, the effect on the night hours being comparatively feebly pronounced. It will also be noted that

Seasonal variation of each hourly ordinate of diurnal inequality.

* It must be remembered that the ordinates of each hour are considered here without regard to the changes due to the absolute phenomenon, both of which when combined can alone give the whole observed phenomenon.

however feeble the disturbance of the night hours may seem, its seasonal progression shows conditions which in character appear to be practically the reverse of those noted in the solar hours. From 19 hours to midnight and thence to 5 hours the curves are almost all uniformly symmetrical in their progression, and it is possible to accept a single average curve which may fairly faithfully represent the seasonal change typical of all the night hour ordinates. The case of the solar hours, however, is different. Each hour has its own specially marked features, and though the curves are not all absolutely irregular or unsymmetrical an average single curve cannot be found to represent the changes effectively for all the hours without showing large departures. It will be seen that the progression of the ordinates at 7 hours and 8 hours is peculiarly constituted, as during the first six months of the year, it simulates the behaviour of the curve of night hours while for the other half of the year it follows the solar hours. Hence the seasonal inequality of the most disturbed hours—the average of 10 hours and 11 hours—has been taken for examination as typifying the periodic seasonal change due to *solar effects*, conditions of which, it will appear later, nearly approximate to those of the range or summed range figures referred to in paragraph 355.

352. The results of analysis* in Fourier series of the two curves—representing the conditions of the night hours and of the most disturbed solar hour—give the following co-efficients:—

Co-efficients of night hours	Co-efficients of solar hours.
$C_1 = 1{\cdot}70\gamma$; $a_1 = 305^\circ\ 14'$	$C_1 = 3{\cdot}96\gamma$; $a_1 = 127^\circ\ 4'$
$C_2 = {\cdot}75\gamma$; $a_2 = 12^\circ\ 38'$	$C_2 = 3{\cdot}87\gamma$; $a_2 = 101^\circ\ 26'$
$C_3 = {\cdot}91\gamma$; $a_3 = 12^\circ\ 34'$	$C_3 = 2{\cdot}55\gamma$; $a_3 = 70^\circ\ 36'$

where C_1, C_2, C_3 are the amplitudes of the 1st, 2nd and 3rd component and a_1, a_2, a_3 are the respective phase angles denoting the time of *first* maximum reckoned from 1st January.

353. It will be observed that in the solar hours the second component is as strong as the first, the third being also almost equally significant; but in the night hours, the last two components are considerably subdued. The coincidence of the epochs of the maxima of the former with the minima of the latter is, it will be seen, notably close.

354. As already remarked the general run of the solar hour curve is almost nearly the same as that indicated by the summed range; and as the examination of the latter curve follows in detail presently, no further remarks appear to be necessary, though perhaps it may seem more appropriate, if solar action is accepted solely as the direct or indirect exciting cause, to examine in detail the seasonal progression of the most active solar hour rather than that of the range or summed range which indicates the average conditions of *all* hours including the night hours.

Annual variation of range and summed ranges.

355. Referring now to the range of the diurnal movements, it will be seen that a distinctly definite maximum about the vernal equinoctial months—March and April—is exhibited, a tendency to a minor maximum being also indicated about October. These effects appear to be somewhat intensified in the range of inequalities of the years of maximum sun-spot, while in the minimum spot group they appear to be much subdued, *vide* tables 248, 259, 260.

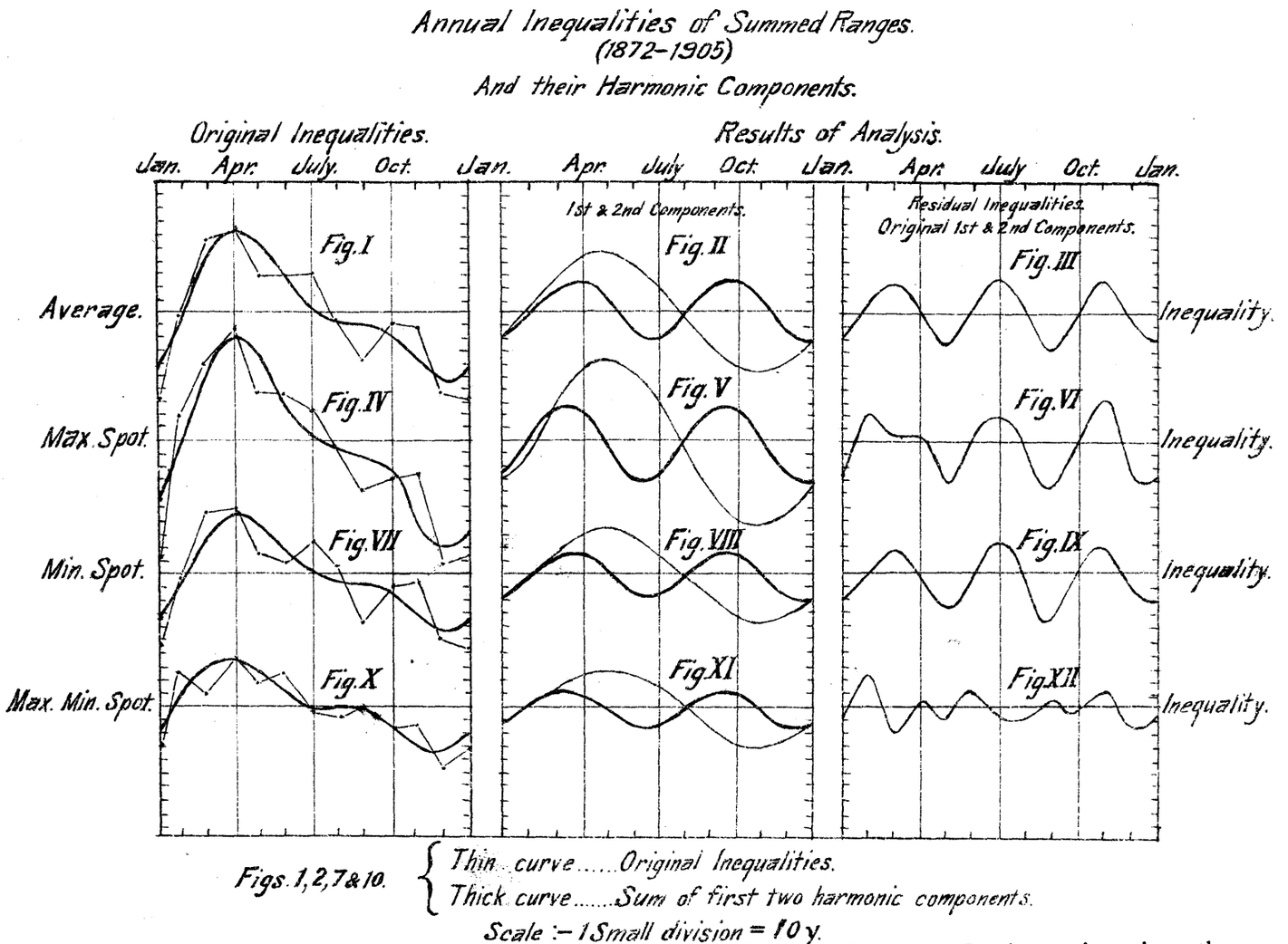
The variations in the range of an inequality are ordinarily accepted to represent the conditions of change in the inequality; but they cannot always be depended upon to give the true indications of the progression. Hence perhaps the sum of all ordinates of the inequality without regard to signs which gives the average ordinate in 24 hours, may be considered as a more appropriate factor representing the variation due to disturbing effects. Such summed ranges given in table 261 and charted in figure 1 below clearly indicate the phenomenon which is about the same as that noted above. The dominant feature of the curve, which is also so pronounced in the solar hours as referred to in paragraph 352, is the sudden and abrupt rise from the minimum range in January, to its maximum value in April, in about 3 months, while the degradation steadily thereafter advances with minor fluctuations through the remaining eight months of the year to December.

---

* The annual variation of the hourly ordinates have been analysed in the usual way expressed in terms of harmonic components in the form

$$C_1 \sin(t + T_1) + C_2 \sin(2t + T_2) + C_3 \sin(3t + T_3) \ldots\ldots$$

where C_1, C_2, C_3 ..... are the amplitudes of the several components; t denotes the time reckoned from middle of January, 30° being taken as equivalent to a month. No correction is allowed for the unequal lengths of the months, all being taken as $\frac{1}{12}$th of the year. For relation of T_1, T_2, T_3 ..... to epochs of first maximum refer forms F and G.



356. The analysis* of the average annual variation (figure 1 above) in Fourier series gives the following co-efficients; C_1, C_2, C_3 are the amplitudes of the 1st, 2nd and 3rd components; and a_1, a_2, a_3 the angles of first maximum reckoned from 1st January :—

$C_1 = 45{\cdot}1\gamma$; $a_1 = 136° 42' =$ 19th May.

$C_2 = 22{\cdot}6\gamma$; $a_2 = 100° 28' =$ 12th April.

$C_3 = 25{\cdot}1\gamma$; $a_3 = 72° 15' =$ 14th March.

The results charted above side by side with the actual variation exhibit the progression clearly. The third component, it will be seen, appears to be as significant as the second. The two first harmonic components are drawn in figures 2, 5, 8 and 11, the residual curve (difference between the original and the sum of the two harmonic curves) being shown in figures 3, 6, 9 and 12. It will be observed how regular is this residual curve which very nearly represents the harmonic curve of the third order.† The dates indicating the occurrence of the maxima derived from the above angles measured from 1st January show that they all fall within about two months of the vernal equinox.

357. It will appear from the various tables that both the range and the summed range appear in their secular march from year to year to be subject to a disturbance of the same, or rather nearly the same, period as that disclosed by the solar spots. This relation is fully discussed later in Chapter XIV.

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* The monthly means of the summed ranges have been analysed in the usual way expressed in terms of harmonic components in the form

$$S_0 + C_1 \sin(t + T_1) + C_2 \sin(2t + T_2) + \ldots\ldots\ldots\ldots$$

where S_0 denotes the arithmetic mean of the 12 monthly values; t denotes the time reckoned from middle of January, 30° being taken equivalent to a month. No correction is allowed for the unequal lengths of the month, all being taken as $\frac{1}{12}$th of the year. For relation of T_1, T_2, etc., to a_1, a_2, etc., the angles of first maximum reckoned from 1st January given above, *vide* forms F and G.

† The small irregularity in figure 6 is, it will be seen later, due to the abnormal condition of the month of February 1872 in regard to the diurnal range, see Chapter XIV.

358. Comparing, however, the annual inequality of the summed range (and the range figures likewise show almost the same phenomenon) during years of greatest and least magnetic energy, as shown in figures 4 and 7 above, it becomes apparent from the following harmonic co-efficients derived for these two epochs and for the difference curve, figure 10, that the latter practically exhibits the same character as the original curves.

Secular effects on the annual variation of summed range at times of maximum and minimum spot.

Maximum spot.	Minimum spot.	Difference curve.
$C_1 = 62{\cdot}1\gamma$; $a_1 = 136^\circ\ 20'$—18th May.	$C_1 = 34{\cdot}9\gamma$; $a_1 = 138^\circ\ 16'$—20th May.	$C_1 = 27\ 1\gamma$; $a_1 = 133^\circ\ 57'$—16th May.
$C_2 = 29{\cdot}1\gamma$; $a_2 = 94^\circ\ 56'$—6th April.	$C_2 = 17{\cdot}2\gamma$; $a_2 = 98^\circ\ 34'$—10th April.	$C_2 = 12{\cdot}2\gamma$; $a_2 = 89^\circ\ 49'$—1st April.
$C_3 = 25{\cdot}9\gamma$; $a_3 = 69^\circ\ 50'$—12th March.	$C_3 = 23{\cdot}8\gamma$; $a_3 = 76^\circ\ 54'$—19th March.	$C_3 = 9{\cdot}4\gamma$; $a_3 = 47^\circ\ 45'$—18th February.

Whatever hence may be the exciting cause, it seems that its relation at least in this respect to the annual march from month to month remains persistently constant, the amplitudes of the movements alone being affected by the waxing and waning effects of the exciting cause.

359. In passing it may be remarked that the influence of the 11-year period disturbance on the magnetic traces may be conveniently regarded as compounded of two effects: (1) a steady factor affecting the range which waxing and waning from month to month and year to year may be taken as a more or less regular and uniform *periodic* phenomenon amenable to treatment, but independent of (2) the secondary effects or storms, &c., which punctuate the march of the phenomenon here and there, which may be possibly periodical also, but unlike the former, transitory and more or less discontinuous in their effects which are not largely perceptible in the average monthly values of the diurnal range. For it will be seen when this question comes to be examined in its relation to the progress from day to day of the daily mean values of absolute force, that the effects presumably associated with the larger storms and disturbances are usually shortlived, are not cumulative as they are rapidly compensated and do not appreciably interfere with the march of the average periodic monthly range under the steady cumulative influence of the other factor which appears to progress independently, whether there be storm or not This question is fully treated in the chapter on disturbances and in Chapter XIV.

360. Considering now the progression of the diurnal inequality in the first instance, from year to year hence under this periodic influence of the (disturbing) secular force of the 11-year cycle it will be seen from table 262 and more readily from plate 22 in which are charted the excess inequalities of each year over that of the average of thirty-three years, that the character of the progression of this phenomenon from year to year is conspicuously uniform. These excess variations which cut out on the average,* appear about the years of maximum spots to be *mere reproductions*, on a smaller scale, of *the force inequalities* themselves which gradually and fairly regularly decrease in amplitude as the years recede from the maximum epoch. About 1875·0, 1880·5, 1886·0, 1891·5, 1897·0 and 1904·5 these effects seem to vanish, and the reverse effects begin just then to exhibit themselves which in their turn gather strength and grow larger, and when the minimum epoch is reached the excess variations shew the largest *reversed* inequality. This of course follows as a result of the mathematical treatment adopted but it is the regularity of the phenomenon which is specially worthy of note. It will also be seen that the time of the occurrence (in the excess inequalities) of the maximum, invariably occurs at 11 hours as also that of the minimum which occurs almost always at about 23 hours, whatever may the year or the month be (see also table 263 and plate 23).

Secular change of diurnal variations under the influence of the 11-year period.

361. The transition epochs or dates of the average phenomenon about which the positive excesses vanish and the negative excesses just begin to be indicated, as also the turning points maximum and minimum seem to be more or less all definitely marked. Then again while the first four of the intervals of transition are strikingly uniform in duration—about 5·5 years—the last one between 1897·0 and 1904·5 is lengthened out considerably.

362. This prolonged interval followed by the much retarded maximum of 1906, which happens to be the lowest and most diffused maximum on record in the Colaba curve of 60 years, indicates some probable inter-relation between the two effects. It also suggests the possibility of a change of conditions which determines the apparent periods involved, the variability of which in the case of a correlated phenomenon—the sun-spots—has been so clearly demonstrated by Schuster, and of the reversion to the conditions of the 13 and 9 year periods, from those of the 11-year period which has markedly prevailed during the last 60 years. The transition epochs as given by the Colaba record are about 1850·5, 1858·0, 1863·5, 1869·5, 1875·0, 1880·5, 1886·0, 1891·5, 1897·0 and 1904·5, the first four being registered by the older series, *vide* plate 24. It will be seen that the interval between 1850 and 1858 is repeated for the first time after about five 11-year cycles during which the interval between the transition epochs has been practically uniform, namely of 5·5 years.

* This is strictly true only if the *exact* number of years of the period involved or its multiple be taken. Otherwise a residual effect will vitiate the curves.

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Horizontal Force Diurnal Inequality (Magnetograph.)

Excesses of each year over the average year

Plate 22.

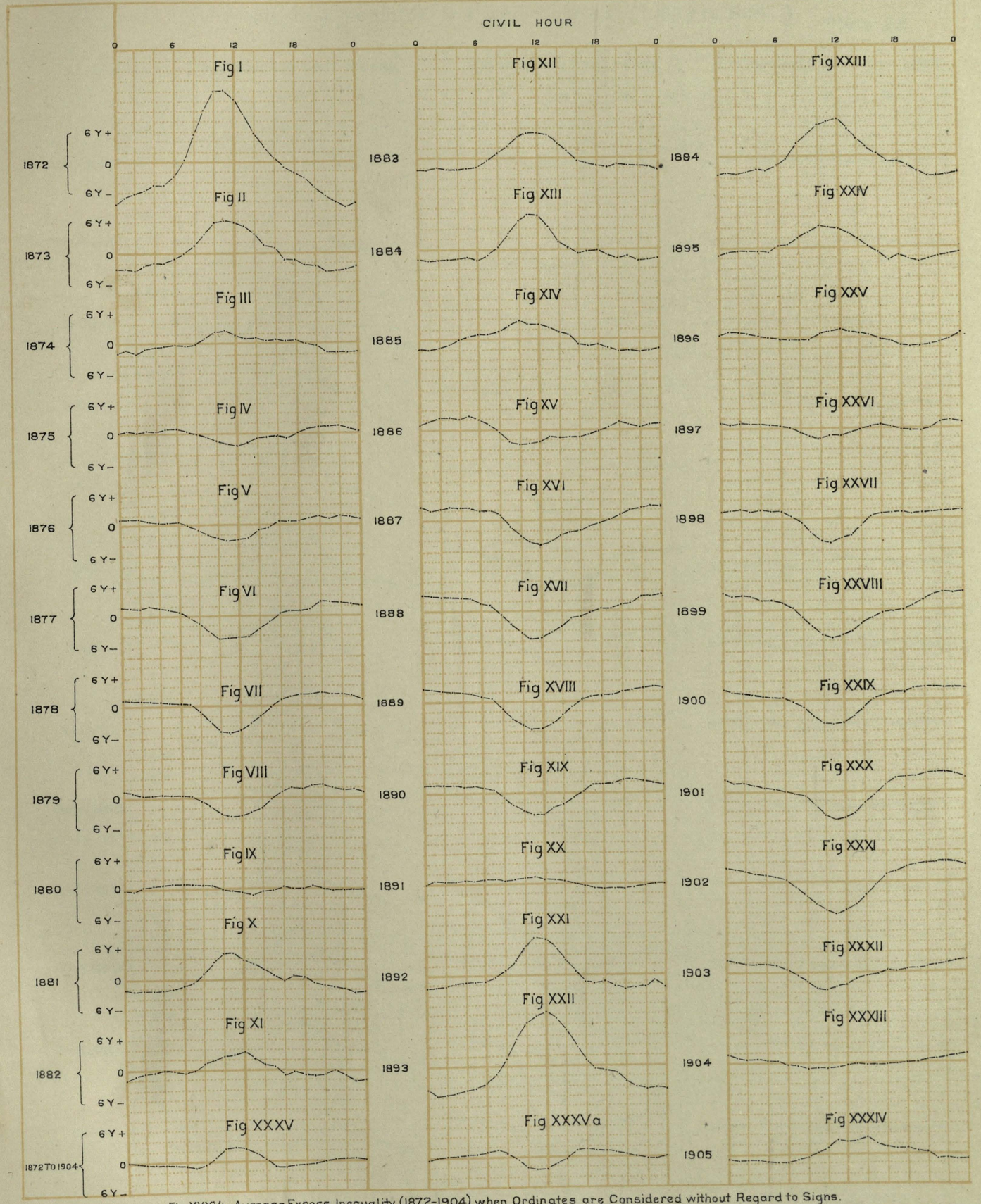


Fig. XXXV:—Average Excess Inequality (1872–1904) when Ordinates are Considered without Regard to Signs.
Fig. XXXV a—Fig. XXXV Reversed.

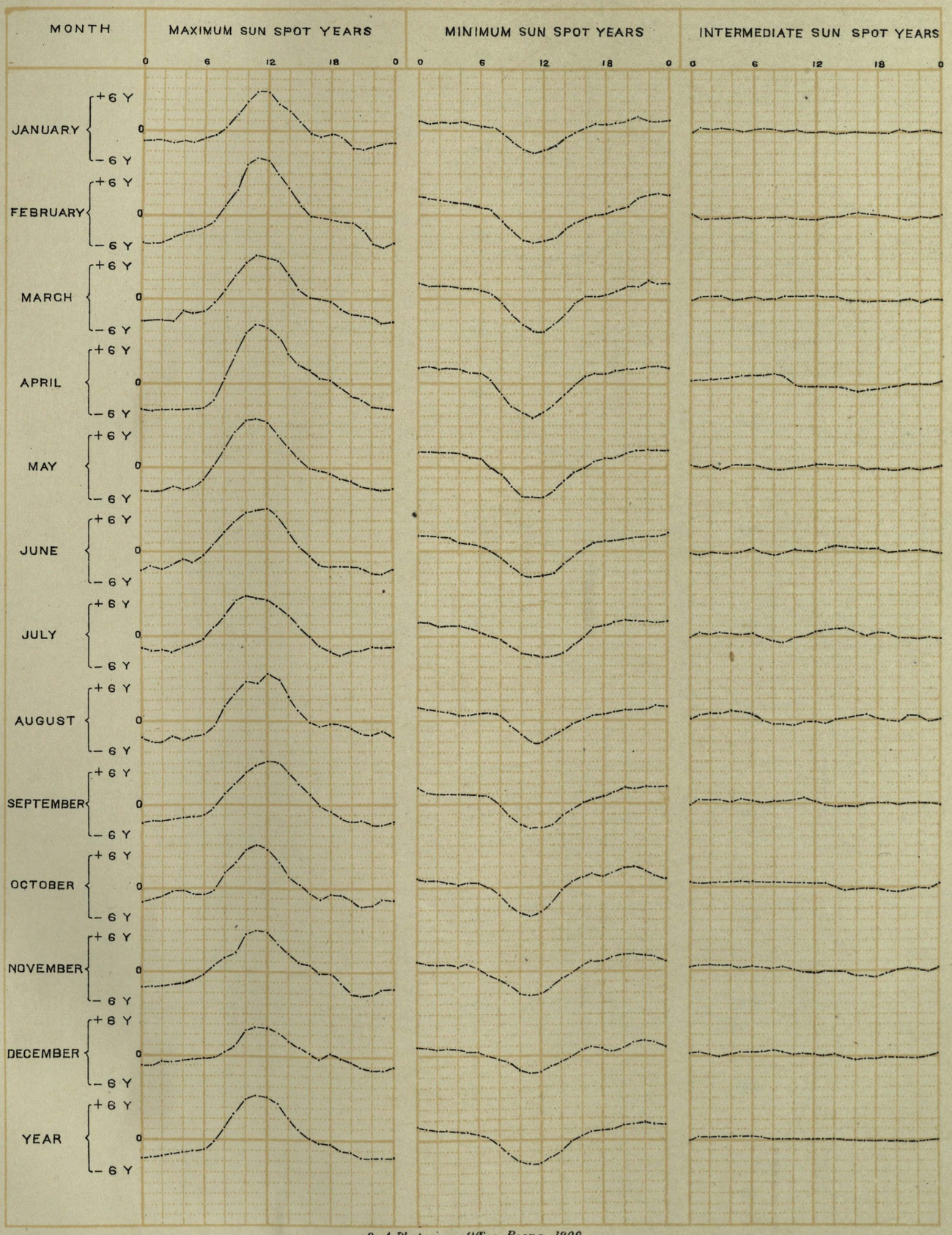
Govt Photozinco: Office, Poona. 1909.

COLABA OBSERVATORY

Horizontal Force Diurnal Inequality (Magnetograph)

Excesses of each average month of the groups of sun spot years over the average corresponding month of the whole period (1872 to 1904.)

Plate 23.



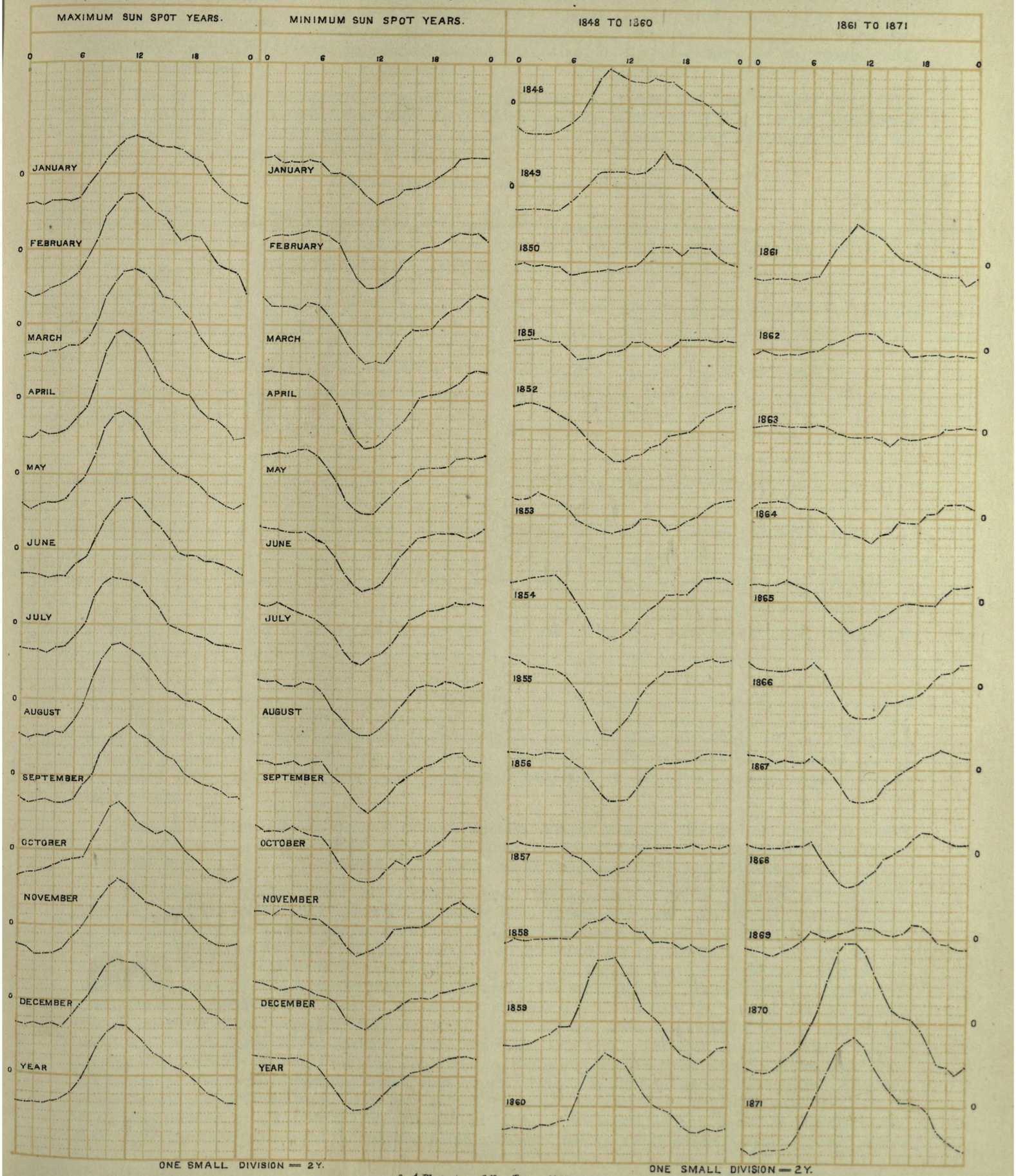
Gov.t Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY

Horizontal Force Diurnal Inequality (Magnetometer)

Excesses of each average month of the groups of Sun spots years over the average corresponding month and the excesses of each year over the average year of the whole period (1850 to 1871)

Plate 24



Gov.t Photozinco: Office, Poona 1909

363. In order to secure a truly periodic diurnal curve it is of course necessary to have a complete cycle of the larger period involved in the progression. The inequality derived from any short period data can hardly be expected to be free, apart from irregularities, from the residual secular effects which of course differ for the several short periods considered.

Normal diurnal inequality.

The curve of diurnal inequality obtained from the average of 33 years and from the quiet years 1874, 1875, 1880, 1885, 1886, 1891, 1896, 1897, 1904, which are least perturbed by the 11-year disturbance are given together below for reference. The average curve of 55 years secured by combining the eye series with the magnetograph record, is also shown.

Diurnal Inequalities and Secular Excesses.

Unity = 0·1γ = ·000001 C. G. S.

Hours		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Inequality from quiet years ...	1	−103	−92	−85	−77	−69	−59	−42	+2	+85	+190	+272	+302	+267	+188	+93	+10	−54	−90	−110	−122	−131	−135	−130	−115
Inequality from 33 years	2	−103	−95	−88	−81	−73	−65	−48	+0	+86	+191	+273	+303	+267	+187	+94	+12	−52	−85	−105	−118	−129	−130	−127	−115
Inequality from 55 years	3	−107	−95	−84	−74	−65	−57	−43	−1	+95	+211	+299	+326	+286	+200	+101	+12	−58	−99	−125	−147	−155	−153	−142	−123
Excess inequalities of five 11-year groups over 55 years. 1850—1860	4	+6	+12	+17	+21	+22	+21	+9	−11	+2	+19	+25	+20	+16	+11	+8	+1	−7	−17	−34	−45	−39	−29	−16	−2
1861—1871	5	−14	−11	−6	−3	+1	+3	+5	+11	+24	+40	+52	+50	+39	+27	+13	0	−8	−20	−29	−39	−39	−36	−31	−22
1872—1882	6	−6	−9	−12	−12	−13	−12	−7	+1	−4	−10	−15	−14	−12	−9	−4	+1	+10	+15	+21	+30	+26	+18	+9	0
1883—1893	7	+1	−4	−6	−7	−8	−6	−5	+2	−6	−17	−17	−14	−10	−4	−5	−2	−2	+7	+16	+24	+22	+19	+11	+7
1894—1904	8	+15	+10	+6	+1	−3	−5	−2	−1	−16	−34	−44	−42	−35	−25	−14	−1	+9	+17	+24	+32	+32	+30	+25	+19

The departures of the diurnal inequalities of each of the five 11-year groups, from the average of 55 years, may be taken as fairly approximately indicating the character of the disturbing effects of the great unknown period. It will be seen that these secular effects apparently culminate to a maximum during the period 1861—1871, whilst they reach the lowest minimum on record in the last 11-year period, 1894—1904.

364. A reference may be useful here in connection with the seasonal change from month to month which appears to occur in the diurnal wave apparently intermittently periodic due to forces which determine the 11-year disturbance.

Annual variation of diurnal inequality due to secular effects.

This seasonal change which is superposed upon the periodic seasonal variation referred to in paragraph 348 can be derived from month to month from tables 263 and 263*a* for the average year representing the mean maximum-spot conditions, results of which are charted in plate 23 in the first set of figures, and for the average year representing mean minimum-spot conditions in the second set. It is obvious that there can be little or no seasonal activity indicated during the transition period or the intermediate years, as seen from the third set of figures in the same plate. Taking hence the excesses of each month's inequalities over that of the year or of figures 1 to 12 over 13 in each set, we obtain the excess disturbance inequalities from month to month induced under the action of the secular effect, which are roughly typical of the average conditions of the two mean sun-spot epochs. The seasonal change thus gradually passes from one character to the other, as the years progress from the mean maximum to the mean minimum, which thus nearly cuts out in the total period of 11 years. The two characteristic excess diurnal inequalities for each month would be correct in magnitude and character, if (1) a large number of 11-year cycles, is dealt with; if (2) no other larger secular period is involved and if the selection of the years round the maximum and minimum turning points is always symmetrically made.

But in the present case as the number of years of maximum in the period under examination is only 7 and that of the minimum 11, the monthly excess curves for each epoch can hardly be expected to be truly representative. In any case combining the two sets of the excess curves for each month (*vide* table 263*b* and figures 13 to 24, plate 21) so as to represent the total effect of the departure from mean minimum to mean maximum spot conditions, we find that in spite of small irregularities the general runs of the curves seem in the main to be similar to those of the periodic seasonal excess inequalities referred to in paragraph 348. Both the sets are charted in plate 21 side by side for facility of comparison. The peaks denoting the maxima which occur in both about the same time in the month of April; the early concurrent occurrence of the maxima in May and June; the minor maximum intensified in July at 14 hours; and generally the parallel run in both sets of curves embracing at least the dominant features of the curves from month to month, all clearly show that though here and there they are masked by irregularities from which, as already explained, such inequalities can hardly be expected to be free in the data of the kind dealt with, the points of resemblance clearly suggest a common relation.

The smoother annual average *disturbance* curves for the 24 hours derived from sums without regard to signs of each hourly ordinate as shown in columns 14 in each of the tables 248*a* and 263*b* which are charted below, also exhibit a parallelism which is strikingly close, and likewise strengthen the suggestion of a common origin of the two phenomena.

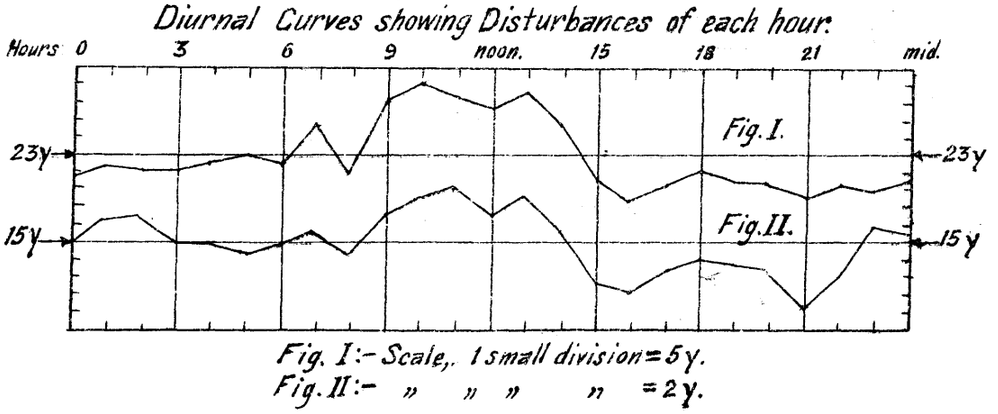


Figure 1 shows the average annual hourly disturbance curve due to periodic seasonal effects, while figure 11, enlarged about $2\frac{1}{2}$ times, shows the same, due to intermittent secular effects during the average maximum or minimum-spot epoch.

Annual variation of each hourly ordinate due to secular influence.

365. Comparing in a similar way the annual variation of each hour due to the periodic seasonal change referred to in paragraph 351, with the discontinuous secular effects of the 11-year period superposed upon the former, it will be seen from table 263*a* and figures 49 to 72, plate 21, that here too a fairly close resemblance in character between the two seasonal phenomena, periodic and aperiodic, is disclosed. This similarity of action on each of the 24 hours in their seasonal march from month to month and the resemblance referred to in the last paragraph between the excess seasonal inequalities of the diurnal curve dependent upon the two effects seem, at any rate, to accentuate strongly the probability of the common origin of the two phenomena. And it will be seen later that such parallelism is also clearly indicated in similar results of the other elements—D and V.

The annual variations of the summed range of the excess inequalities due to the secular effect, which are shown in the last row of tables 263 and 263*a* when suitably compounded and drawn side by side as shown below in figure 11 with the periodic annual variation of the summed range of the original diurnal inequalities referred to in paragraph 355 as figure 1, indicate the parallelism in the general run to be also fairly close.

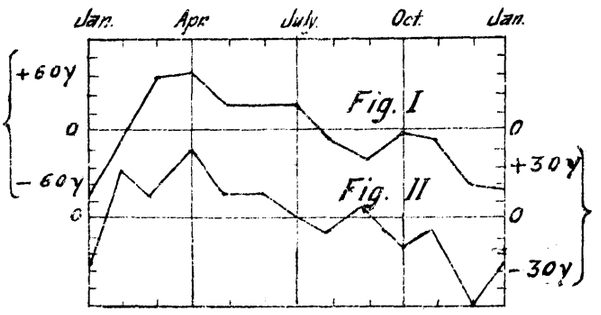


TABLE 262.—*Excess Diurnal Inequality of Horizontal Force of each year (1872 to 1904) over the mean of 33 years (corrected for progressive change).*

Unity = 0·1γ = ·000001 C. G. S.

Colaba Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.																								
1872 ...	−83	−71	−65	−56	−47	−47	−29	+ 4	+56	+101	+141	**+142**	+126	+96	+57	+29	+ 7	−13	−21	−34	−52	−71	−81	**−93**
1873 ...	−29	−29	−33	−25	−20	−20	−13	− 4	+14	+ 36	+ 59	**+ 60**	+ 58	+50	+37	+15	+10	−16	−15	−23	−27	**−38**	−36	−34
1874 ...	−14	−11	−15	− 9	− 7	− 6	− 4	− 5	− 3	+ 11	+ 23	**+ 26**	+ 19	+11	+11	+ 3	+ 8	− 1	+ 2	− 3	− 5	−15	**−16**	−15
1875 ...	+ 2	+ 5	+ 1	+ 5	+ 4	+10	+11	+ 1	− 1	− 5	− 14	− 20	**− 24**	−18	−11	− 9	− 6	− 7	+ 2	+ 9	+12	+13	**+14**	+10
1876 ...	+12	+12	+11	+ 8	+ 4	+ 3	+ 4	− 1	−11	− 20	− 26	**− 33**	− 31	−27	− 9	− 3	+ 8	+ 8	+ 8	+12	+15	+14	**+19**	+18
1877 ...	+20	+19	+18	+21	+17	+14	+ 7	− 2	−16	− 33	− 47	− 45	− 44	−41	−26	−12	+ 5	+10	+11	+18	**+28**	+28	+26	+22
1878 ...	+16	+13	+11	+11	+10	+ 8	+ 4	+ 1	−12	− 27	− 52	**− 54**	− 49	−35	−20	− 2	+14	+20	+23	+24	**+27**	+26	+26	+21
1879 ...	+12	+ 9	+ 4	+ 4	+ 5	+ 4	+ 4	+ 1	− 6	− 17	− 32	**− 39**	− 36	−28	−20	− 3	+10	+20	+19	+23	**+25**	+20	+17	+18
1880 ...	− 2	− 2	+ 2	+ 5	+ 8	+ 9	**+10**	+ 8	+ 7	+ 5	− 2	− 7	− 8	**−12**	− 7	− 4	+ 1	0	− 1	+ 3	− 2	− 3	− 3	− 2
1881 ...	−23	−24	−23	−23	−24	−21	−15	− 5	+10	+ 35	**+ 48**	+ 47	+ 38	+29	+18	+ 5	− 1	+ 3	+ 1	− 7	−12	−17	−19	**−25**
1882 ...	−20	−14	− 9	− 7	− 3	− 4	− 7	− 1	+11	+ 20	+ 28	+ 29	**+ 32**	+22	+ 9	+ 3	−12	− 3	−11	−13	−10	− 3	−13	**−22**
1883 ...	−22	−23	−19	−22	**−24**	−20	−19	− 4	+10	+ 23	+ 41	**+ 52**	+ 50	+47	+29	+12	− 5	−11	−15	−18	−11	−15	−16	−18
1884 ...	−20	−24	−23	−21	−20	−19	−23	−12	+ 6	+ 30	+ 54	**+ 65**	+ 62	+41	+14	+ 3	−10	− 4	− 2	−11	−19	−17	**−26**	−22
1885 ...	−17	−20	−15	−10	− 2	+ 4	+ 8	+10	+16	+ 26	+ 36	+ 30	+ 31	+24	+16	+ 7	− 8	−12	−10	−15	−24	−23	**−27**	−24
1886 ...	+11	+19	+22	+23	+21	**+26**	+20	+ 9	− 3	− 24	− 29	− 28	− 25	−14	−17	−16	−17	−12	− 3	+ 3	+14	+ 6	+ 4	+10
1887 ...	**+27**	+20	+24	+27	+26	+26	+19	+19	+10	− 14	− 31	− 43	**− 48**	−44	−31	−25	−21	−13	− 7	0	+10	+20	+24	+27
1888 ...	**+33**	+32	+29	+29	+28	+25	+19	+14	− 9	− 28	− 43	**− 55**	− 54	−43	−34	−18	−12	− 2	+ 3	+ 2	+10	+19	+29	+29
1889 ...	+27	+27	+24	+21	+20	+18	+11	+ 5	− 15	− 35	− 48	**− 57**	− 55	−44	−28	−10	+ 1	+11	+12	+14	+20	+24	+26	**+29**
1890 ...	+13	+14	+15	+14	+11	+13	+ 9	+ 3	−11	− 26	− 36	**− 44**	− 43	−30	−25	−11	0	+15	+17	+18	+23	**+24**	+21	+18
1891 ...	− 3	+ 3	+ 1	+ 1	+ 3	+ 3	+ 7	+ 7	+ 2	+ 4	+ 9	**+ 12**	+ 7	+ 7	+ 4	0	− 5	−11	**−13**	−11	−12	−11	− 6	− 1
1892 ...	−28	−25	−22	−19	−15	−15	−15	− 7	+ 9	+ 28	+ 56	**+ 71**	+ 68	+54	+30	+ 5	−18	−20	−17	−24	**−29**	−28	−27	−14
1893 ...	−46	**−56**	−55	−52	−47	−44	−35	−19	+15	+ 54	+ 83	+ 98	**+102**	+90	+69	+36	+10	− 7	−11	−18	−34	−43	−48	−43
1894 ...	−33	−31	−33	−28	−25	−26	−18	− 4	+27	+ 45	+ 64	+ 70	+ 73	+56	+32	+19	+ 2	−10	−10	−18	−31	−40	**−41**	−39
1895 ...	−13	− 9	− 8	− 8	− 9	−10	+ 2	+ 5	+19	+ 28	+ 42	+ 40	+ 38	+27	+17	+ 2	−11	−21	−19	−24	**−28**	−23	−20	−15
1896 ...	+ 6	+13	+12	+ 7	+ 1	0	− 3	− 3	− 3	− 3	+ 6	+ 9	**+ 15**	+11	+ 7	+ 3	− 2	− 5	−14	−16	**−16**	−13	− 9	− 4
1897 ...	+10	+ 8	+10	+ 8	+ 8	+ 8	+ 7	+ 4	− 7	− 18	**− 21**	− 18	− 17	− 7	− 1	+ 4	+ 7	+ 1	− 1	− 4	− 4	0	+11	**+13**
1898 ...	+16	+18	**+20**	+15	+18	+16	+16	+ 4	− 8	− 25	− 41	**− 46**	− 39	−34	−14	+ 1	+ 6	+ 8	+11	+ 8	+10	+13	+12	+15
1899 ...	**+34**	+28	+30	+28	+20	+19	+13	+ 3	−15	− 33	− 50	**− 57**	− 50	−41	−26	−16	− 6	− 3	− 1	+ 9	+21	+29	+32	+32
1900 ...	+22	+17	+13	+11	+ 7	+ 2	+ 2	− 3	−15	− 34	− 46	**− 49**	− 46	−33	−15	+ 1	+11	+17	+17	+22	**+25**	+25	+24	+24
1901 ...	+22	+17	+16	+12	+ 8	+ 5	0	− 5	−11	− 32	− 50	**− 59**	− 56	−44	−25	− 8	+11	+24	+26	+27	+32	+34	**+35**	+32
1902 ...	+28	+22	+20	+13	+11	+ 7	+ 1	−11	−28	− 43	− 58	**− 62**	− 56	−44	−28	− 7	+12	+20	+28	+31	+35	+36	**+37**	+35
1903 ...	**+23**	+20	+18	+18	+18	+12	+ 5	− 6	−20	− 32	**− 35**	− 29	− 28	−16	− 9	− 5	+ 1	0	+ 3	+ 4	+10	+12	+17	+20
1904 ...	**+14**	+ 8	+ 6	+ 8	+ 4	+ 2	− 3	− 6	−12	− 9	**− 11**	− 7	− 3	− 2	− 4	− 3	− 4	− 2	− 1	0	+ 3	+ 4	+ 7	+11
1905 ...	−12	−15	−13	−14	−18	−19	**−19**	−13	− 7	+ 3	+ 11	+ 25	+ 23	+26	**+30**	+18	+10	+ 8	+ 9	+ 2	+ 1	−12	−10	−13
* Variation of sums without regard to signs.	+ 1	0	− 1	− 3	− 5	− 6	− 9	**−14**	− 7	+ 7	+ 21	**+ 26**	+ 23	+14	+ 1	−11	−12	−10	− 9	− 6	− 1	+ 1	+ 3	+ 3

* The secular disturbance effect on each hourly ordinate is herein indicated. The ordinate at 11 hour shows largest fluctuations while those at 7 hour and 16 hour remain nearly constant.

TABLES 263 & 263*a*.—*Excess Diurnal Inequality of Horizontal Force of each month of the group of maximum and minimum sun-spot years over the corresponding month of the whole period of 33 years (1872—1904), corrected for progressive change.*

Maximum sun-spot years.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−24	− 54	−42	− 51	−45	−39	−29	−37	−38	−29	−34	−25	−38
1 19	−21	− 57	−41	− **53**	−45	−32	−34	−**43**	−35	−23	−33	−24	−37
2 19	−21	− 54	−41	− 52	−44	−36	−30	−43	−36	−20	−31	−16	−35
3 19	−26	− 43	−42	− 50	−37	−29	−35	−35	−31	−12	−29	−19	−32
4 19	−22	− 39	−24	− 50	−41	−19	−29	−41	−28	−10	−25	−15	−29
5 19	−25	− 34	−29	− 50	−38	−21	−20	−36	−25	−19	−20	−13	−28
6 19	−16	− 27	−26	− 48	−25	−12	−10	−31	−22	−19	−11	−10	−21
7 19	− 9	− 14	− 8	− 33	0	+12	+10	−16	−12	− 8	+ 7	− 6	− 6
8 19	+ 5	+ 17	+19	+ 5	+32	+38	+37	+21	+15	+21	+22	+ 2	+20
9 19	+32	+ 47	+45	+ 50	+66	+56	+65	+48	+37	+46	+36	+16	+45
10 19	+55	+ 94	+67	+ 93	+87	+72	+**71**	+79	+55	+69	+68	+44	+72
11 19	+**72**	+**107**	+**81**	+**108**	+**60**	+79	+68	+77	+69	+**79**	+**78**	+**51**	+**80**
12 19	+70	+101	+79	+101	+81	+**80**	+62	+**81**	+**80**	+68	+74	+49	+77
13 19	+48	+ 78	+69	+ 84	+60	+64	+53	+73	+77	+44	+52	+40	+62
14 19	+37	+ 49	+47	+ 53	+35	+33	+37	+41	+54	+18	+31	+23	+38
15 19	+16	+ 19	+19	+ 33	+16	+ 4	+13	+17	+35	+ 1	+17	+14	+17
16 19	− 6	− 2	0	+ 21	− 3	−12	− 5	− 7	+14	−14	+10	+ 2	0
17 19	−14	− 5	− 1	+ 3	− 8	−28	−23	−17	− 7	−24	− 2	− 7	−11
18 19	−10	− 10	− 9	+ 1	−15	−33	−34	−11	−18	−16	− 3	+ 2	−13
19 19	−16	− 16	−20	− 14	−23	−33	−**41**	−13	−29	−19	−22	− 3	−21
20 19	−33	− 17	−32	− 28	−28	−33	−34	−19	−37	−27	−45	−13	−28
21 19	−**38**	− 32	−34	− 33	−38	−37	−34	−30	−36	−**39**	−**48**	−22	−36
22 19	−32	− 58	−38	− 45	−41	−44	−26	−34	**41**	−38	−44	−31	−**39**
23 19	−25	− **61**	−**47**	− 48	−**47**	−**47**	−29	−28	−41	−24	−37	−**32**	−38
Sum without regard to signs.	673	1035	860	1107	945	893	829	878	872	687	779	479	823

Minimum sun-spot years.

Bombay. Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+18	+34	+29	+26	+28	+**31**	+23	+22	+28	+13	+18	+14	+23
1 19	+ 9	+29	+24	+28	+28	+29	+21	+19	+20	+10	+13	+11	+20
2 19	+12	+28	+24	+23	+26	+26	+19	+17	+18	+10	+11	+10	+19
3 19	+11	+22	+22	+24	+25	+23	+18	+11	+16	+4	+10	+12	+17
4 19	+13	+20	+20	+21	+23	+18	+18	+ 7	+15	0	+7	+10	+15
5 19	+10	+19	+20	+17	+19	+14	+11	+ 6	+11	+4	+11	+ 5	+12
6 19	+ 7	+10	+17	+13	+12	+ 6	+ 3	+ 7	+11	+4	+ 2	+ 3	+ 7
7 19	+ 3	+ 6	+ 7	+ 2	− 1	− 2	− 1	+13	+ 9	−2	− 8	− 2	+ 1
8 19	− 7	−13	−10	−23	−15	−16	−10	+ 5	− 9	−19	−16	−11	−13
9 19	−21	−30	−30	−46	−36	−32	−21	−15	−26	−36	−28	−16	−29
10 19	−36	−52	−51	−58	−55	−47	−38	−31	−41	−50	−44	−30	−43
11 19	−**43**	−**56**	−**61**	−**63**	−**58**	−**52**	−40	−42	−**52**	−**57**	−**48**	−**35**	−**50**
12 19	−39	−50	−61	−55	−58	−50	−**44**	−**44**	−51	−50	−43	−34	−48
13 19	−30	−43	−49	−43	−44	−45	−43	−36	−43	−34	−32	−25	−38
14 19	−15	−29	−31	−24	−28	−30	−36	−23	−27	− 9	−18	−16	−23
15 19	− 4	−15	−10	− 5	−12	−14	−19	−11	−14	+ 8	− 7	− 7	− 9
16 19	+ 5	− 7	+ 4	+10	− 1	+ 1	− 2	− 2	− 1	+17	+ 7	+ 8	+ 3
17 19	+11	0	+ 4	+16	+ 8	+12	+14	+ 3	+ 4	+22	+18	+12	+10
18 19	+10	+ 3	+ 8	+16	+13	+18	+17	+ 6	+10	+19	+17	+ 9	+12
19 19	+13	+ 9	+15	+20	+17	+20	+21	+13	+19	+25	+21	+ 6	+16
20 19	+19	+15	+25	+24	+23	+22	+25	+15	+27	+34	+28	+12	+23
21 19	+**25**	+29	+23	+23	+27	+23	+25	+16	+25	+37	+28	+21	+25
22 19	+18	+36	+**34**	+28	+**31**	+26	+**23**	+19	+**28**	+**28**	+**27**	+**25**	+**27**
23 19	+15	+**40**	+29	+**30**	+30	+**28**	+21	+**23**	+27	+20	+25	+21	+26
Sum without regard to signs.	394	595	608	638	518	585	513	406	532	512	487	355	509

2. *Analysis of the Diurnal Inequalities of Horizontal Force.*

366. The diurnal inequality is usually expressed in terms of the harmonic components in the forms

$$p_1 \cos t + q_1 \sin t + p_2 \cos 2t + q_2 \sin 2t + \ldots\ldots$$
$$P_1 \sin (t + T_1) + P_2 \sin (2t + T_2) + \ldots\ldots$$

where p_1, p_2, etc., are the cosine co-efficients and q_1, q_2, etc., the sine co-efficients of the several orders; t represents the time (15° for each hour) counted from 10 H. 19 M., the first tabulated hour in local time of the Colaba photographic record; $P_1 = \sqrt{p_1^2 + q_1^2}$ and T_1, T_2 are the phase angles. In the data, however, instead of the angles T_1, T_2 the phase angles representing the epochs of the first maximum μ_1, μ_2, etc., computed from T_1, T_2, etc., have been given which are originally reckoned in angular measure from 10 H. 19 M. and finally reduced to midnight. The full details of the derivation of the co-efficients have been given in the tabular statements F and G shown above.

367. Tables 264 to 275 give the results of the analysis of the inequalities in Fourier series carried to the fourth order of co-efficients. How far the observed phenomenon is correctly represented by the results of the analysis thereby obviating the necessity of carrying the approximation beyond the fourth order, is seen from the table below where the sums of the squares of the residuals, after deducting the summed result of the four orders from the observed curves of the average diurnal inequality of each month, are given for reference.

Unity = 0·01γ = ·0000001 C. G. S.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
296	212	296	909	231	265	414	505	1,266	288	340	340	135

368. The results* of analysis of the average months and of years as also the *average* of the results of the analysis of the various months and years are given side by side in table 276 to show how far the results by the two processes are comparable specially in cases when the variations of the angle μ are considerably large. The fairly uniform constancy in the angle μ, however, is a marked feature in the horizontal force data at Colaba, as even in the component of the fourth order which is very small and on an average about 1/19th only of the amplitude of the first component, it is markedly consistent.

369. The second component P_2 is less than one-half and the third component P_3 about one-fifth of the first component, *vide* table 264. And these ratios, it will be observed, are not appreciably disturbed in the group of years of either the maximum or minimum magnetic energy—table 266—nor in the average inequalities of either of the three 11-year groups.

The angles of maximum phase μ_1, μ_2, etc., whether for the average period or any single eleven year cycle or any group of years, tables 264—266, all show a fairly marked constancy indicating the time of *first* maximum at 11·1 hour, 11·6 hours, 3·2 hours, and 5·1 hours respectively for the components of the four orders. The greatest difference in the phase which is noticed in the first component when groups of years of the maximum and minimum energy are considered, is the later occurrence of the maximum epoch by about nineteen minutes during the maximum spot epoch. The second and the third components however show no appreciably large change, an early incidence by about four minutes only being indicated.

Annual variation of the amplitudes of the harmonic components.

370. The annual variation of the amplitudes from month to month of the first two components, when analysed, indicate precisely the same results as those already noted in the examination of the summed range series in paragraph 355. Whether the average years or years of maximum or of minimum spot are considered, it will be seen, from the co-efficients given below, that the incidence of the maximum epoch—μ—for both the annual and semi-annual terms of P_1 or P_2 is not appreciably affected.

* The results of analysis discussed herein are of the magnetograph record. The results of the analysis of the earlier period are given in tables 277 to 280 and the progression of the phenomenon indicated by the harmonic co-efficients is practically the same as that of the magnetograph record.

TABLE 264.—*Summary of Monthly Values of the Amplitude P and of the First Maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of different groups of years.*

Unity = 1γ = ·00001 C. G. S.

Months.	1872 to 1882.								1894 to 1904.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
January	15·21	5·79	2·86	1·02	168 8	173 13	48 11	43 51	12·39	5·45	2·15	1·00	162 49	174 12	48 45	85 14
February	19·36	7·52	4·44	0·66	170 0	171 27	48 32	81 29	15·88	7·25	3·42	0·82	166 7	175 33	49 59	84 48
March	22·25	10·60	5·60	1·80	169 0	171 57	46 21	75 23	19·80	9·61	5·08	1·42	168 47	173 1	45 33	75 9
April	22·32	11·14	5·04	2·00	169 50	172 50	45 12	69 30	19·54	10·22	4·13	1·79	169 46	175 7	46 26	71 2
May	19·68	9·75	3·52	0·80	167 42	171 24	46 21	67 5	17·98	9·54	2·86	0·71	165 58	173 26	46 46	67 27
June	18·92	9·57	2·53	0·06	166 13	171 44	50 11	51 55	17·84	9·70	2·57	0·13	166 49	173 44	51 42	61 30
July	19·06	9·73	2·57	0·21	170 33	174 56	55 38	77 29	17·78	9·81	2·55	0·25	167 49	176 34	54 57	0 45
August	17·69	9·03	3·31	0·82	172 26	178 56	54 7	79 7	15·00	8·20	2·81	0·64	169 20	177 48	53 2	79 1
September... ...	15·81	8·37	4·57	1·74	172 16	180 57	51 10	75 46	13·81	8·31	4·39	1·83	173 38	182 39	53 4	77 50
October	16·74	8·79	4·64	1·78	161 2	172 35	45 3	77 12	16·18	8·75	454	1·94	173 36	174 42	46 30	78 15
November	17·21	7·99	3·27	0·69	155 47	165 49	41 29	70 28	16·00	7·08	3·30	0·73	156 17	165 19	37 11	73 4
December	15·01	5·93	2·55	0·59	162 54	168 27	42 32	77 12	13·20	5·79	2·14	0·37	158 29	168 55	42 34	75 14
Winter	17·56	7·74	3 86	1·06	164 47	170 39	45 37	77 26	15·52	7·26	3·37	1·00	163 3	172 9	45 15	78 45
Summer	18·90	9·53	3·51	0·89	169 43	174 54	49 52	72 33	16·98	9·25	3·17	0·82	168 41	176 21	50 46	74 32
Year	18·21	8·61	3·66	0·96	167 21	173 0	47 39	75 16	16·23	8·23	3·23	0·90	166 1	174 31	47 57	76 47

	1883 to 1893.								1872 to 1904.							
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
January	14·00	6·07	2·53	1·03	162 50	172 15	50 36	85 34	13·85	5·76	2·51	1·01	164 46	173 12	49 10	84 59
February	18·04	8·09	3·85	1·12	170 27	175 1	51 28	83 5	17·75	7·60	3·90	0·87	169 0	174 0	49 55	83 4
March	21·09	10·75	5·36	1·54	169 0	172 50	47 44	76 0	21·05	10·32	5·35	1·58	168 56	172 36	46 36	75 29
April	21·37	11·00	4·90	2·07	168 10	172 21	44 59	68 49	21·08	10·78	4·68	1·97	169 15	173 23	45 28	69 44
May	19·47	9·66	3·14	0·66	164 34	171 42	45 1	67 22	19·03	9·64	3·17	0·72	166 5	172 11	46 4	67 21
June	20·38	10·56	2·85	0·18	165 20	171 48	49 42	73 10	19·04	9·95	2·64	0·14	166 5	172 24	50 31	73 46
July	19·48	9·94	2·64	0·08	169 6	175 37	55 9	81 27	18·76	9·82	2·59	0·34	169 12	175 42	55 18	71 46
August	17·20	9·14	3·50	0·39	169 47	178 26	54 30	79 27	16·62	8·78	3·21	0·62	170 38	178 26	53 57	79 17
September... ...	14·66	8·75	4·77	1·70	168 39	181 25	53 56	80 7	14·75	8·48	4·58	1·75	171 29	1 39	52 46	77 55
October	18·22	9·56	5·16	1·81	163 49	175 36	49 6	80 37	17·04	9·01	4·75	1·84	162 53	174 20	46 59	78 39
November	18·29	8·57	3·58	1·03	157 19	167 55	41 0	75 30	17·17	78·8	3·37	0·80	156 29	166 28	39 51	73 28
December	14·21	5·54	2·26	0·71	159 55	170 18	44 3	83 48	14·13	5·76	2·32	0·53	160 33	169 12	42 59	79 39
Winter	17·25	8·06	3·72	1·16	164 14	172 30	47 36	80 27	16·78	7·69	3·64	1·07	164 5	171 46	46 10	78 52
Summer	18·75	9·77	3·54	0·79	167 30	174 59	50 22	73 41	18·20	9·51	3·41	0·88	168 38	175 23	50 18	73 13
Year	17·99	8·91	3·62	0·95	165 56	173 51	48 56	77 42	17·47	8·58	3·50	0·95	166 26	173 47	48 12	76 19

TABLE 265.—*Horizontal Force Magnetograph—Showing the Mean Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each month of the years of the Sun-spot periods derived by averaging the values of p and q.*

TABLE 266.—*Horizontal Force Magnetograph—Showing the Mean Values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each month of years of Sun-spot periods (derived from table 265).*

Unity = 1γ = 00001 C. G. S.

Maximum Sun-spot Period.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January	+17·38	+4·11	+ 5·80	+5·10	+2·48	+2·27	+0·07	+1·41
February	+23·04	+7·79	+ 7·85	+5·93	+3·72	+4·30	+0·26	+1·05
March	+25·23	+7·78	+ 9·77	+7·26	+4·91	+3·81	+1·21	+1·31
April	+25·82	+9·59	+10·56	+8·34	+5·18	+3·41	+2·27	+0·96
May	+24·09	+6·23	+10·02	+6·48	+3·65	+2·20	+0·89	+0 07
June	+24·07	+4·99	+ 9·92	+6·97	+2·24	+2·63	−0·07	−0·10
July	+23·31	+5·81	+ 9·25	+7·68	+1·33	+2·16	+0·23	−0·08
August	+20·53	+7·21	+ 8·09	+7·81	+2·33	+3·51	+0·26	+0·53
September	+18·85	+6·84	+ 5·81	+8·67	+2·82	+4·14	+1·05	+1·35
October	+20·96	+3·27	+ 8·57	+6·98	+4·94	+3·64	+1·19	+1·70
November	+21·92	+2·39	+ 8·13	+4·24	+4·08	+1·10	+0·63	+1·10
December	+16·81	+2·98	+ 5·57	+3·51	+2·68	+1·71	+0·10	+0·67
Summer	+22·78	+6·78	+ 8·94	+7·66	+2·92	+3·01	+0·77	+0·45
Winter	+20·89	+4·72	+ 7·61	+5·50	+3·80	+2·80	+0·58	+1·21
Year	+21·83	+5·75	+ 8·28	+6·58	+3·36	+2·91	+0·67	+0·83

Maximum Sun-spot Period.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January	17·86	7·72	3·36	1·41	168 3	175 25	48 54	86 32
February	24·32	9·84	5·69	1·08	173 26	173 17	51 8	83 47
March	26·40	13·46	6·22	1·78	171 53	176 29	47 21	76 34
April	27·54	13·46	6·20	2·46	175 8	173 54	45 52	70 29
May	24·88	11·93	4·26	0·89	169 15	171 12	45 7	65 53
June	24·58	12·12	3·46	0·12	166 28	172 18	51 17	78 30
July	24·02	12·02	2·54	0·24	168 45	174 36	54 13	59 57
August	21·76	11·24	4·21	0·59	174 6	176 45	53 33	80 43
September	20·05	10·44	5·01	1·71	174 42	182 50	53 20	77 47
October	21·21	11·05	6·14	2·07	163 37	174 20	46 53	78 30
November	22·05	9·17	4·23	1·27	160 58	168 32	39 47	79 48
December	17·07	6·58	3·18	0·68	164 48	170 52	45 36	85 8
Winter	21·42	9·39	4·72	1·34	167 29	172 41	46 53	80 51
Summer	23·77	11·77	4·19	0·94	171 19	175 3	50 2	72 58
Year	22·57	10·57	4·45	1·10	169 30	173 59	48 23	77 34

Minimum Sun-spot Period.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January	+11·29	+1·71	+ 3·83	+2·54	+1·38	+1·35	+0·21	+0·79
February	+13·74	+2·56	+ 5·29	+4·14	+2·05	+2·25	+0·27	+0·77
March	+16·96	+3·51	+ 7·35	+4·91	+3·77	+2·48	+1·22	+0·91
April	+16·67	+4·13	+ 7·08	+5·70	+3·43	+2·03	+1·80	+0·70
May	+15·03	+2·21	+ 6·77	+4·66	+2·16	+1·39	+0·65	+0·02
June	+15·19	+2·41	+ 7·16	+4·92	+1·74	+1·49	+0·05	+0·06
July	+15·17	+3·49	+ 6·73	+5·44	+1·41	+2·02	+0·10	+0·19
August	+13·73	+3·36	+ 5·60	+5·55	+1·50	+1·93	+0·13	+0·28
September	+11·00	+2·94	+ 4·40	+5·73	+2·28	+3·22	+0·94	+1·22
October	+13·59	+2·55	+ 5·95	+4·55	+3·06	+2·39	+1·00	+1·15
November	+14·12	+0·13	+ 6·47	+2·21	+2·86	+0·64	+0·73	+0·39
December	+11·87	+0·86	+ 4·53	+2·22	+1·78	+0·57	+0·55	+0·40
Summer	+14·46	+3·09	+ 6·29	+5·33	+2·09	+2·01	+0·78	+0·41
Winter	+13·59	+1·89	+ 5·57	+3·43	+2·48	+1·61	+0·66	+0·73
Year	+14·03	+2·49	+ 5·93	+4·38	+2·28	+1·81	+0·72	+0·57

Minimum Sun-spot Period

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January	11·42	4·60	1·93	0·82	163 22	171 32	49 32	83 32
February	13·98	6·72	3·04	0·82	165 18	173 47	50 38	82 25
March	17·32	8·84	4·51	1·52	166 27	171 38	45 52	73 56
April	17·17	9·09	3·99	1·93	168 40	174 10	44 57	70 4
May	15·19	8·22	2·57	0·65	163 7	172 1	45 40	65 12
June	15·38	8·69	2·29	0·08	163 46	172 0	48 16	77 18
July	15·57	8·65	2·46	0·21	167 42	174 14	53 7	80 19
August	14·14	7·89	2·44	0·31	168 30	177 8	52 8	81 2
September	11·39	7·23	3·95	1·54	169 43	181 0	52 59	77 51
October	13·83	7·49	3·88	1·52	165 23	173 27	47 25	77 0
November	14·12	6·84	2·93	0·83	155 17	164 11	38 57	71 47
December	11·90	5·04	1·87	0·68	158 54	167 48	40 40	73 46
Winter	13·72	6·54	2·96	0·98	162 40	170 34	45 45	76 43
Summer	14·79	8·25	2·90	0·73	166 49	174 54	49 23	73 14
Year	14·52	7·37	2·91	0·86	164 38	172 59	47 34	75 10

Intermediate Sun-spot Period.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January	+13·62	+2·13	+ 4·63	+3·37	+1·86	+1·74	+0·17	+0·96
February	+17·02	+4·10	+ 5·54	+4·60	+2·78	+2·46	+0·23	+0·77
March	+20·68	+5·14	+ 8·49	+6·25	+4·52	+3·23	+1·09	+1·11
April	+20·63	+4·10	+ 8·76	+6·29	+3·80	+2·41	+1·69	+0·51
May	+18·80	+3·70	+ 7·76	+5·67	+2·49	+1·85	+0·66	+0·22
June	+18·71	+4·12	+ 7·98	+5·81	+1·63	+1·96	+0·23	+0·02
July	+18·11	+5·03	+ 6·83	+6·87	+1·06	+2·51	−0·11	+0·26
August	+15·55	+4·17	+ 5·22	+6·49	+1·59	+2·90	+0·51	+0·71
September	+14·23	+3·99	+ 5·08	+6·80	+2·93	+3·84	+1·15	+1·53
October	+17·37	+1·88	+ 7·03	+5·93	+3·83	+2·81	+0·98	+1·71
November	+17·17	−0·06	+ 7·35	+3·27	+3·14	+1·00	+0·63	+0·20
December	+14·31	+1·12	+ 5·17	+2·84	+2·06	+0·93	+0·14	+0·41
Summer	+17·67	+4·18	+ 6·94	+6·32	+2·25	+2·58	+0·69	+0·54
Winter	+16·69	+2·38	+ 6·37	+4·38	+3·03	+2·03	+0·54	+0·86
Year	+17·18	+3·28	+ 6·65	+5·35	+2·64	+2·30	+0·61	+0·70

Intermediate Sun-spot Period.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January	13·79	5·73	2·55	0·97	163 38	172 47	49 7	84 44
February	17·51	7·20	3·71	0·80	168 18	174 36	48 35	83 6
March	21·31	9·98	5·56	1·56	168 42	170 37	46 36	76 8
April	21·03	10·78	4·50	1·77	165 59	172 36	45 33	68 57
May	19·16	9·61	3·10	0·70	165 53	172 50	46 57	69 22
June	19·16	9·87	2·55	0·23	167 10	172 47	51 30	66 0
July	18·79	9·69	2·72	0·28	170 16	177 20	57 7	2 59
August	16·10	8·33	3·31	0·87	169 46	180 21	55 10	78 20
September	14·78	8·49	4·83	1·91	170 25	181 22	52 18	78 1
October	17·47	9·20	4·75	1·97	160 56	174 50	46 50	79 48
November	17·17	8·04	3·30	0·66	154 33	166 45	40 38	69 9
December	14·35	5·90	2·26	0·43	159 14	169 9	42 51	82 32
Winter	16·86	7·73	3·65	1·02	162 56	172 1	46 1	79 13
Summer	18·16	9·39	3·42	0·90	168 4	175 55	51 3	73 58
Year	17·49	8·53	3·50	0·94	165 35	174 10	48 26	76 45

	Annual terms of				Semi-annual terms of			
	P_1		P_2		P_1		P_2	
	Amplitude c_1	Phase μ_1	Amplitude c_1	Phase μ_1	Amplitude c_2	Phase μ_2	Amplitude c_2	Phase μ_2
		° ′		° ′		° ′		° ′
Average years ...	2·52γ	127 59	1·79γ	160 33	1·28γ	103 4	1·11γ	98 17
Maximum spot years ...	3·54γ	129 29	2·31γ	152 3	1·68γ	95 23	1·43γ	89 57
Minimum spot years ...	2·04γ	128 59	1·62γ	164 37	0·88γ	104 9	0·83γ	95 45

Considering now the variations in the amplitudes of each order in their *annual* growth compared with their secular progression in the 11-year cycle, it will be seen that in the first component the minimum value of P_1 about 14γ which is recorded in the month of January, increases in its seasonal change from winter to summer to a maximum of 21γ in April, *vide* table 264. This gives a ratio of increase of about 1·5; and this seasonal effect on the range appears to be almost equal to the secular effect of the 11-year cycle on P_1 as its value is indicated at about 15γ in the group of years of the *minimum*-spot which grows under the *secular* effect to about 23γ in the group of years of *maximum*-spot, *vide* table 266. From this it seems that at Colaba at least the *secular* activity as affecting the amplitudes of H, is as great as the seasonal activity. This equality of ratio is kept up more or less in all the components, as also in the whole range. A reference to the figures of range in tables 248, 259 and 260 shows that while a total seasonal change from 35γ to 54γ is recorded in its transition from January to March the secular change varies from 36γ to 55γ.

371. In plates 25 to 28 have been charted the results of Fourier analysis (1) of the diurnal inequalities of the average months, (2) of the group of years of maximum and minimum spot, and (3) of the half years exhibiting the winter and summer groups, to allow of a ready examination of the progression of the phenomenon in its seasonal and secular march. It will be noticed that by the division, as is usually adopted, of the year into winter and summer months, in this element at Colaba in view of the particular seasonal progression which gives a minimum effect in December and a maximum in April, a correct proportionate idea of the magnitude of the phenomenon is not adequately conveyed.

3. Eye Observation Series, 1850—1871.

372. The discussion of the diurnal phenomenon has been advisedly restricted in the first instance mainly to the magnetograph record of 33 years.

Tables 90 to 103 and 277 and 282 and plates 17 to 20, 24 and 29 collected here however show that the older series from 1850 to 1871 when examined for the various points discussed above, bears out the several statements fairly in all details.

As the period in each set is relatively short, the average yearly curves must obviously be affected differently for different secular effects, and even the average periodic seasonal change in each must involve to a greater or less extent, some vitiating factor of the kind referred to in paragraph 360. On the whole however it will be seen that allowing for such minor discrepancies the character and relative magnitude of the phenomenon shown by each set are fairly precisely the same.

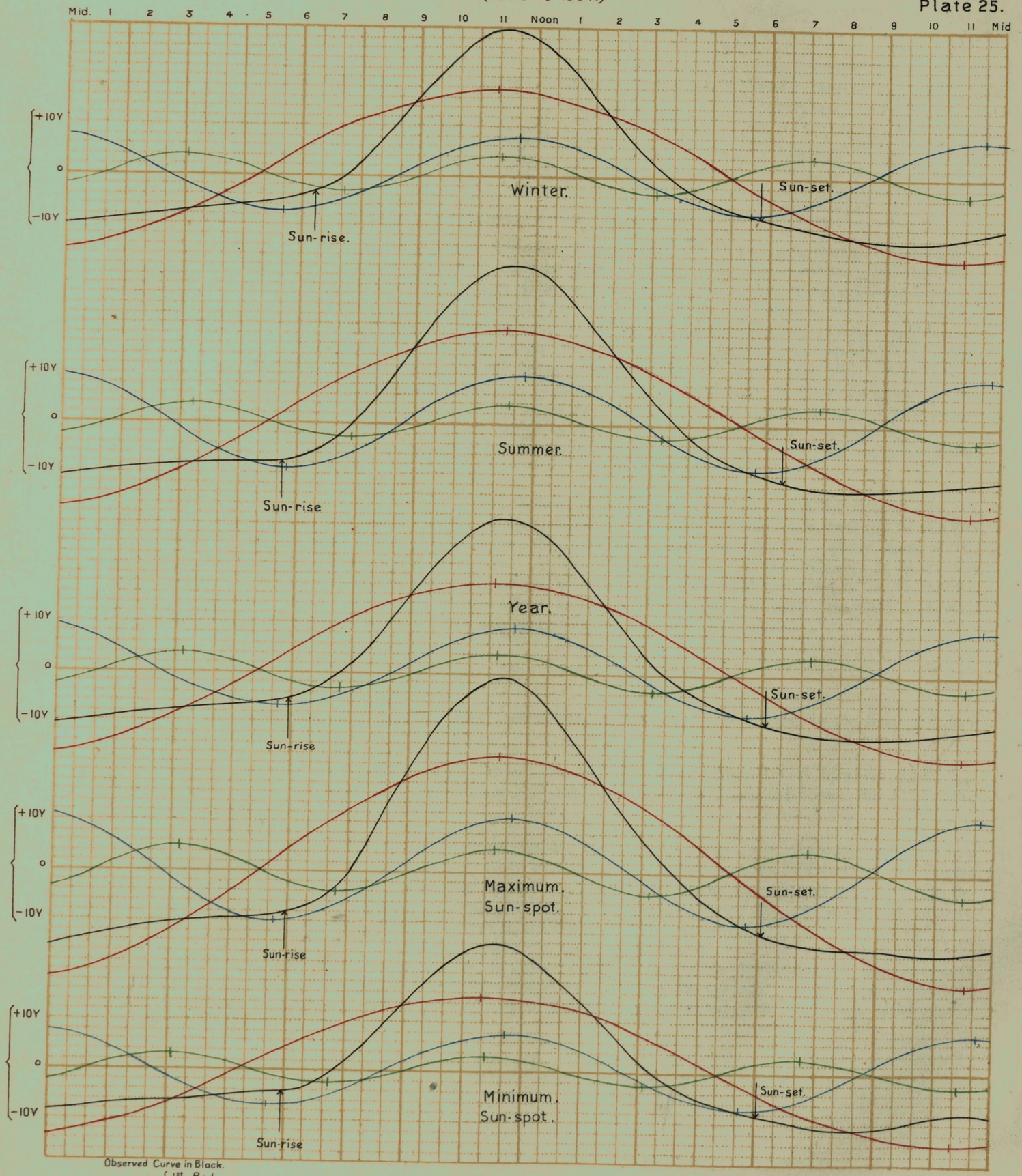
373. As the magnitude generally of the secular effects is more accentuated in the first 22 years than in the last 33 years, the parallelism in the older series, between the periodic seasonal and the secular seasonal changes is, in some months at least, more definitely pronounced (*vide* plate 29) than in the magnetograph series already discussed.

COLABA OBSERVATORY.

Diurnal Inequality of Horizontal Force and its Harmonic Components.

(1872 to 1904.)

Plate 25.



Observed Curve in Black.

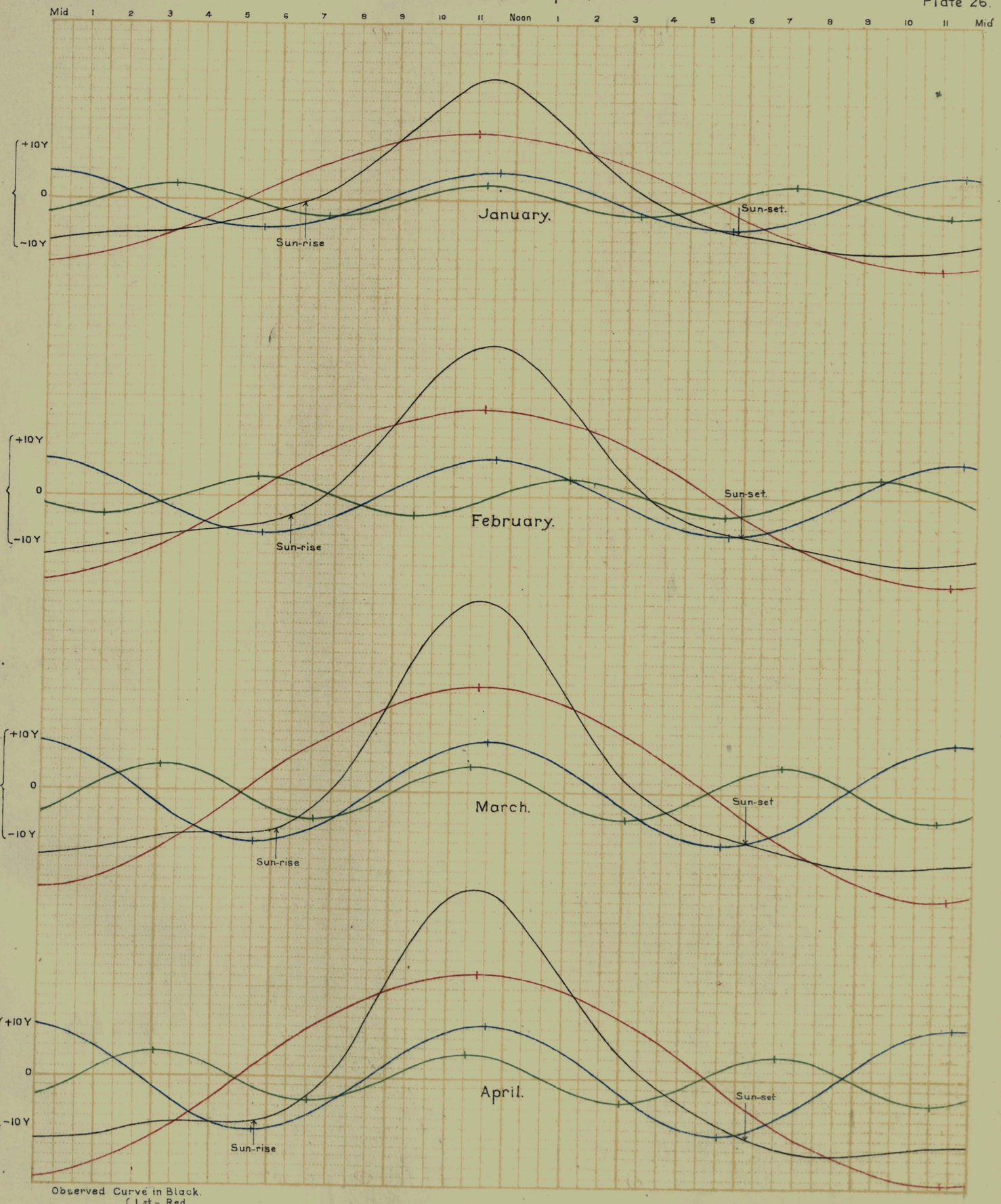
Components. { 1st Red. 2nd Blue. 3rd Green.

Govt Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY

Diurnal Inequality of Horizontal Force and its Harmonic Components for each month.
(January to April.)

Plate 26.



Observed Curve in Black.
Components. { 1st – Red. 2nd – Blue. 3rd – Green.

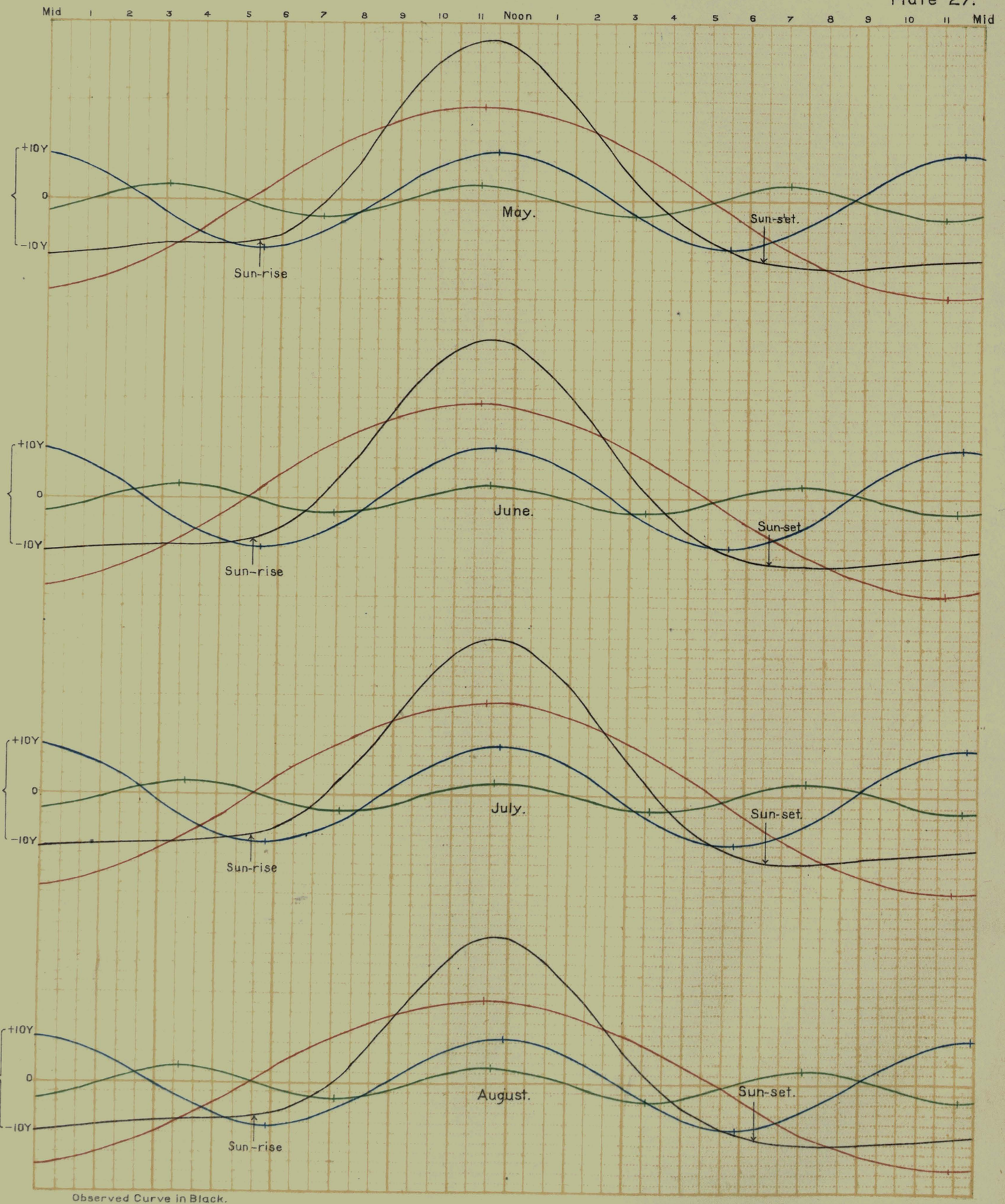
Govt Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY

Diurnal Inequality of Horizontal Force and its Harmonic Components for each month

(May to August)

Plate 27.



Observed Curve in Black.

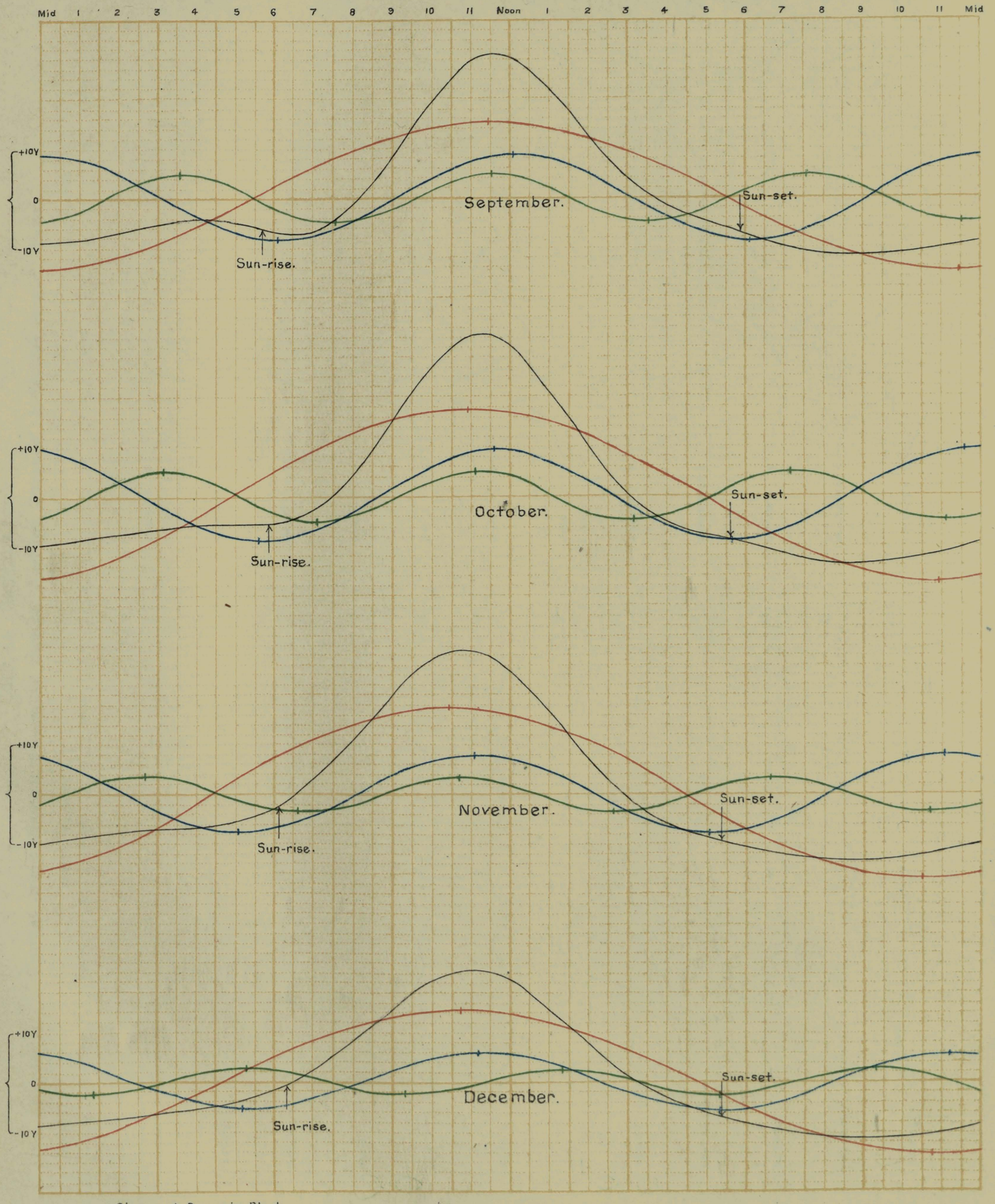
Components. { 1st - Red. 2nd - Blue. 3rd - Green.

Govt. Photozinco. Office, Poona. 1909.

COLABA OBSERVATORY.

Diurnal Inequality of Horizontal Force and its Harmonic Components for each month
(September to December)

Plate 28.



Observed Curve in Black.

Components { 1st Red; 2nd Blue; 3rd Green

Govt Photozinco. Office, Poona. 1909.

COLABA OBSERVATORY

Changes in the Diurnal Inequality due to Average Seasonal & Secular Seasonal effects

Plate 29

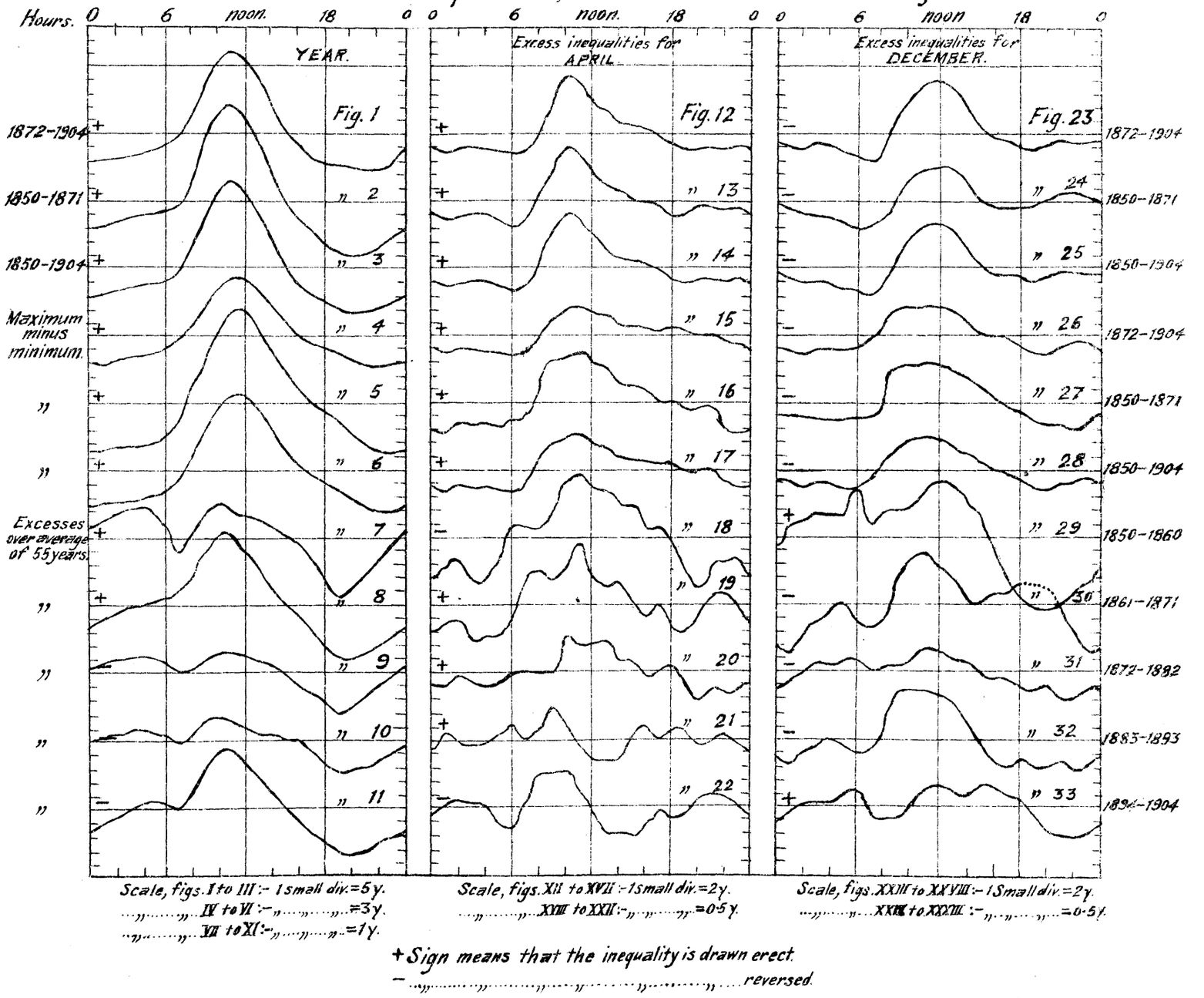
Figs: 1-12 and 25-36=Excesses of the average monthly inequalities over the average of the year

Figs: 13-24 and 37-48 = " " " " " due to intermittent secular effects.

Govt. Photozinco. Office Poona, 1909.

374. All the results of observations have for convenience of reference been collected together in

Table: Diurnal Inequalities, their Seasonal and Secular changes.



the above figures, which readily show how the records of the two periods by two independent instruments tell the same tale, as also how the whole of the diurnal phenomenon progresses when considered severally in its normal, seasonal and secular march.

Figures 1 to 3 give the average inequalities distinctive of each period. They are practically identical in character, etc., and the last, *viz.* figure 3, may tentatively be taken as the inequality which runs unaffected through the period of 55 years (*vide* tables 283, 284, 285) from month to month and year to year as a normal wave.

Considering in the first instance the change from year to year, there are superposed upon the normal wave (*a*) the fluctuations of a large period, the progression of which is only roughly approximately indicated by figures 7 to 11, of which figures 9, 10 and 11 are drawn reversed; and (*b*) the effects due to the periodic disturbance of about 11 years, represented fairly approximately by figures 4 to 6 which indicate the change from mean maximum to mean minimum conditions in the 11-year cycle. These fluctuations, if properly allowed for, may enable the diurnal curve of any particular year in the 55 years considered to be approximately computed.

The normal diurnal wave so derived for any year, is in its turn affected by seasonal changes from month to month. The character and the approximate magnitude of these average seasonal changes which wax, wane and reverse in the course of a year as much as (*a*) and (*b*) respectively do in the large unknown period, and in about 11 years, are shown by (*c*) figures 12 to 14, and 23 to 25 the effects of which are periodic and recur every year unaffected by secular effects; and (*a*) figures 15 to 17 and (*e*) figures 18 to 22 the effects of which however wax and wane in the yearly progressions due to the two secular periods. The extreme reverse effects of the season made out in December are shown in figures 26 to 28, and 29 to 33. It has been noted that the greatest seasonal *positive* effect is incident in the month of April and similar *negative* effect in December. Hence the departures of the several inequalities of April and December over that of the average year (the December curves being drawn reversed* for facility of comparison) have alone been given to represent the change of conditions from the maximum positive effects to the maximum negative in the whole year.

374. It will be noticed that the progressions whether denoting the normal, seasonal or secular change all show an inherent parallelism in their run during the 24 hours. The dominant feature—the maximum at 10 or 11 A.M.—is clearly prominent in all; and of the minor features those indicating a feeble maximum just before sunrise, and a sudden fall about 7 A.M. prior to the usual general rise of the curve as the solar hours gather strength, are, it will be seen, common to the seasonal as also to the large secular period curves. These features are as markedly indicated in the secular changes as in the month of September (*vide* plates 12 and 17) which is the only month showing the influence of this peculiarity.

The first six figures in the three columns all show remarkably consistent results exhibiting increased movements in the annual diurnal curve, *vide* figures 1 to 6, all of which have a corresponding movement in the April curves figures 12 to 17—and opposite effects in those of December, the curves of which are drawn reversed in figures 23 to 28. The secular seasonal curves, figures 15, 16, 17 and 26, 27, 28, of course all reverse in the minimum epoch and thus cut out when one 11-year cycle is fully completed.

We have no knowledge of the larger period and the adoption instead of the 55 years average must, for obvious reasons, introduce irregularities in the progressions represented by figures 7 to 11, 18 to 22, and 29 to 33. The effects also, it will be noted from the open scale adopted, are very small, and hence some considerable amount of uncertainty must prevail in regard to the correctness of the changes due to this large unknown secular period. For it will be observed that in the periods 1861—1871 and 1894—1904, figures 8 and 11, which practically mark the largest positive and negative secular movements due to the large period disturbance, we have the corresponding movements in the seasonal changes correctly interpreted as shown by the positive and negative signs for the months of April and December, figures 19 and 30, and 22 and 33, respectively. But in the case of the intermediate 11-year cycles 1850—1860, 1872—1882, 1883—1893, the seasonal progression becomes uncertain and reverses; the April that is the summer or positive effects are substituted by December which are the winter or negative effects and *vice versâ*. The first cycle 1850—1860 hence which simulates conditions of the minimum and the last two cycles of the maximum epoch, appear to be inconsistent, and reverse those indicated by figures 7, 9 and 10 respectively. This would not be the case if the seasonal fluctuations due to the larger period are, as assumed, of the same character as that of the usual annual excesses noted at times of minimum and maximum sun-spot epoch respectively due to the smaller period, namely of 11 years.

The existence of small sub-periods may also introduce small irregularities in the results. But as the amplitude of the variation of the 11-year cycle when compared with the irregular movements is very large, the latter can scarcely be of any very large significance. But in the fluctuations due to the larger unknown period where the amplitude is small, they may effectively mask the progression.

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* The + and − signs on the zero lines of the figures 1 to 33 show whether they have been charted erect or reversed.

TABLE 267.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = ·1γ = ·00001 C. G. S.

Years.	January.								February.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+22·42	+4·59	+5·76	+5·25	+3·05	+2·27	−1·04	+1·32	+32·64	+12·60	+ 5·45	−0·84	+6·58	+5·91	−0·64	−0·83
1873 ...	+19·20	+4·47	+5·72	+6·77	+3·18	+2·22	+0·57	+2·01	+25·62	+ 8·70	+10·44	+9·23	+4·22	+3·99	+0·13	+1·54
1874 ...	+17·37	+2·97	+6 30	+3·93	+2·69	+1·50	+0·52	+1·00	+22·46	+ 6·82	+ 6·06	+2·79	+5·11	+3·38	+0·42	+0·54
1875 ...	+13·33	+2·72	+4·62	+2·57	+1·16	+1·44	+0·28	+0·36	+17·65	+ 3·15	+ 6·33	+7·63	+2·06	+3·32	+0·56	+0·97
1876 ...	+15·07	+3·59	+4·38	+3·69	+2·35	+1·75	+0·36	+0·89	+14·92	+ 2·14	+ 6·66	+3·43	+3·23	+2·58	+0·77	+0·79
1877 ...	+13·20	+2·49	+5·66	+2·13	+2·57	+1·95	+0·71	+0·99	+13·40	+ 2·95	+ 4·37	+4·68	+1·73	+1·97	+0·52	+0·84
1878 ...	+ 9·51	+1·82	+2·73	+0·82	+1·43	+0·55	+0·66	+0·32	+13·22	+ 3·77	+ 4·42	+3·86	+1·86	+1·17	+0·26	+0·31
1879 ...	+ 8·89	+3·17	+2·21	+2·23	+1·18	+2·02	−0·26	+1·11	+14·67	+ 2·89	+ 5·81	+2·56	+2·31	+1·89	+0·09	+0·29
1880 ...	+15·05	+3·76	+5·03	+4·09	+2·05	+2·08	−0·26	+1·18	+15·06	+ 5·28	+ 5·89	+3·77	+2·90	+2·16	+0·51	+0·76
1881 ...	+16·43	+5·40	+3·98	+3·70	+2·42	+2·35	+0·34	+1·29	+19·25	+ 3·53	+ 6·99	+4·47	+3·40	+2·71	+0·17	+0·71
1882 ...	+12·37	+3·72	+4·58	+3·06	+1·90	+2·22	+0·72	+0·44	+16·59	+ 4·17	+ 6·67	+3·97	+3·25	+3·10	+0·19	+0·76
Mean ...	+14·80	+3·52	+4·63	+3·48	+2·18	+1·85	+0·24	+0·99	+18·68	+ 5·09	+ 6·28	+4·14	+3·33	+2·93	+0·26	+0·61
1883 ...	+14·42	+4·57	+5·25	+4·37	+1·97	+2·11	−0·47	+0·89	+19·42	+ 6·88	+ 7·07	+5·57	+3·13	+2·75	+0·32	+1·21
1884 ...	+16·32	+4·49	+7·30	+4·49	+2·74	+3·05	+0·35	+1·47	+19·51	+ 7·41	+ 8·36	+5·02	+4·00	+4·24	−0·45	+1·71
1885 ...	+15·17	+1·62	+5·97	+2·22	+1·77	+1·80	+0·45	+0·78	+19·91	+ 8·34	+ 5·79	+6·56	+3·26	+3·51	+0·23	+1·81
1886 ...	+15·12	+0·50	+4·63	+4·44	+0·95	+2·17	−1·07	+0·43	+17·96	+ 3·51	+ 5·62	+3·55	+1·67	+1·87	+0·35	+0·72
1887 ...	+10·72	+0·37	+3·59	+2·42	+0·56	+1·12	+0·24	+1·05	+14·72	+ 1·92	+ 4·98	+4·94	+1·75	+2·44	+0·17	+0·98
1888 ...	+15·36	−1·26	+5·57	+3·82	+1·25	+1·83	+0·12	+1·06	+14·03	+ 1·95	+ 5·78	+4·73	+1·70	+2·95	+0·12	+0·81
1889 ...	+11·07	+2·23	+3·47	+1·99	+1·26	+0·72	+0·34	+0·15	+13·42	+ 4·23	+ 4·98	+5·09	+1·82	+2·54	+0·09	+1·27
1890 ...	+ 9·69	+0·94	+3·34	+1·36	+1·87	+1·39	+0·07	+0·53	+14·96	+ 4·43	+ 5·09	+4·51	+2·11	+2·50	+0·05	+0·69
1891 ...	+11·64	+3·02	+3·99	+2·61	+2·14	+1·76	−0·17	+1·47	+14·43	+ 3·43	+ 3·56	+1·56	+2·44	+0·50	+1·06	−0·35
1892 ...	+16·04	+0·82	+6·57	+5·61	+2·12	+1·91	+0·68	+2·18	+22·51	+ 4·35	+ 8·72	+7·98	+2·03	+5·25	+1·15	+1·72
1893 ...	+16·87	+4·37	+5·00	+4·93	+2·14	+2·72	+0·66	+1·21	+20·09	+ 7·27	+ 7·67	+8·26	+3·30	+4·04	+0·50	+1·20
Mean ...	+13·86	+1·97	+4·97	+3·48	+1·71	+1·87	+0·11	+1·02	+17·36	+ 4·88	+ 6·15	+5·25	+2·47	+2·96	+0·33	+1·07
1894 ...	+16·37	+5·44	+4·99	+4·29	+2·18	+1·59	−0·28	+0·82	+21·52	+ 7·35	+ 7·22	+6·28	+2·75	+3·84	+0·78	+0·78
1895 ...	+13·63	+1·34	+5·42	+4·32	+2·02	+2·19	−0·57	+1·70	+21·89	+ 3·53	+ 5.14	+6·77	+2·82	+2·09	+0·09	+0·81
1896 ...	+14·68	−0·30	+5·37	+6·07	+2·32	+1·25	+0·32	+1·51	+17·03	+ 2·37	+ 5·37	+5·27	+3·31	+2·44	−0·64	+0·77
1897 ...	+17·89	+2·27	+5·84	+4·81	+1·56	+2·04	+1·25	+1·47	+16·62	+ 4·69	+ 6·06	+5·33	+2·97	+3·09	+0·12	+1·01
1898 ...	+11·35	+0·38	+4·34	+1·95	+1·96	+0·45	+0·50	+0·22	+16·13	+ 2·92	+ 3·97	+5·26	+2·65	+2·46	−0·18	+1·22
1899 ...	+ 9·23	+1·73	+2·87	+2·92	+0·48	+1·13	+0·63	+0·62	+11·36	− 0·70	+ 4·90	+5·38	+1·20	+3·70	−0·60	+0·72
1900 ...	-11·17	+0·47	+4·50	+3·21	+1·00	+1·49	−0·71	+1·18	+14·27	+ 3·21	+ 4·68	+4·10	+2 51	+2·06	+0·42	+1·18
1901 ...	+10·97	+2·26	+3·77	+2·42	+1·73	+1·14	+0·09	+0·23	+14·43	+ 3·27	+ 6 02	+3·26	+2·74	+1·62	+0·95	+0·99
1902 ...	+ 8·96	+1·97	+3·41	+2·24	+1·35	+1·20	+0·15	+1·06	+12·68	+ 2·52	+ 5·62	+3·53	+1·65	+1·88	+0·21	+0·27
1903 ...	+10·30	+2·38	+3·37	+2·47	+1·73	+1·32	+0·50	+0·97	+12·20	+ 1·93	+ 5·32	+3·27	+2·03	+1·02	+0·26	+0·23
1904 ...	+10·23	+1·16	+2·69	+2·91	+1·42	+2·07	−0·35	+1·07	+13·18	+ 3·44	+ 5·21	+4·32	+1·67	+2·78	+0·28	+0·88
Mean ...	+12·25	+1·74	+4·23	+3·42	+1·61	+1·44	+0·14	+0·99	+15·57	+ 3·14	+ 5·41	+4·80	+2·39	+2·45	+0·15	+0·81
Mean of 33 years ...	+13·64	+2·41	+4·61	+3·46	+1·83	+1·72	+0·16	+1·00	+17·20	+ 4·37	+ 5·95	+4·73	+2·73	+2·78	+0·25	+0·83

TABLE 267.—*Monthly values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = 1γ = ·00001 C. G. S.

Years.	March.								April.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+29·80	+ 7·71	+ 9·94	+9·42	+4·42	+3·93	+1·92	+1·09	+31·06	+12·27	+13·11	+7·84	+6·73	+4·52	+2·39	+0·46
1873 ...	+28·16	+10·07	+ 9·68	+7·31	+5·50	+4·43	+1·64	+2·28	+27·85	+11·72	+ 9·73	+8·63	+6·40	+3·89	+2·94	+1·19
1874 ...	+21·80	+ 5·36	+10·57	+5·51	+5·66	+3·59	+1·16	+1·67	+23·99	+ 3·94	+ 9·12	+7·29	+3·81	+1·95	+2·11	+0·35
1875 ...	+21·27	+ 2·66	+ 9·22	+5·18	+4·18	+3·47	+1·12	+0·98	+22·03	+ 5·53	+ 9·43	+6·22	+4·17	+3·53	+2·36	+0·59
1876 ...	+19·56	+ 5·62	+ 7·78	+5·80	+3·83	+2·80	+1·59	+1·14	+18·02	+ 6·36	+ 7·25	+6·44	+3·18	+1·78	+1·95	+0·84
1877 ...	+15·54	+ 2·79	+ 6·52	+5·45	+4·05	+3·36	+0·56	+1·51	+16·16	+ 3·99	+ 7·10	+6·16	+4·51	+1·95	+1·86	+1·33
1878 ...	+17·63	+ 4·28	+ 7·83	+4·36	+3·85	+2·10	+1·10	+0·65	+18·50	+ 4·39	+ 7·50	+4·70	+3·37	+1·66	+1·25	+0·37
1879 ...	+18·08	+ 5·26	+ 7·23	+5·81	+3·43	+2·69	+1·05	+0·67	+17·31	+ 4·90	+ 7·83	+5·75	+3·71	+1·85	+1·68	+0·73
1880 ...	+18·93	+ 2·59	+ 8·27	+3·34	+4·74	+1·69	+1·74	+0·41	+19·77	+ 5·01	+ 8·40	+6·11	+3·22	+2·95	+1·38	+0·22
1881 ...	+21·86	+ 6·47	+ 9·39	+5·85	+5·75	+3·17	+1·52	+1·73	+19·97	+ 6·87	+ 9·62	+6·87	+4·33	+2·52	+1·12	+0·72
1882 ...	+24·62	+ 7·42	+ 9·83	+7·83	+5·17	+3·99	+1·19	+1·24	+22·43	− 1·04	+ 9·77	+6·24	+3·84	+2·17	+1·60	+0·30
Mean ...	+21·57	+ 5·48	+ 8·75	+5·99	+4·60	+3·20	+1·33	+1·22	+21·55	+ 5·81	+ 8·99	+6·57	+4·30	+2·62	+1·89	+0·65
1883 ...	+21·84	+ 2·56	+ 9·18	+6·88	+3·26	+2·66	+0·92	+0·48	+24·05	+ 6·92	+ 9·77	+8·17	+3·47	+1·86	+2·07	+0·13
1884 ...	+26·99	+ 8·65	+11·79	+7·87	+6·13	+4·37	+1·15	+2·02	+25·93	+ 9·60	+11·13	+9·62	+5·07	+4·23	+2·88	+1·21
1885 ...	+22·75	+ 6·88	+ 7·43	+7·09	+4·97	+3·62	+1·30	+0·57	+26·12	+ 5·17	+10·85	+5·17	+5·62	+2·42	+1·65	+0·46
1886 ...	+23·05	+ 5·06	+ 9·81	+9·02	+3·72	+4·98	+0·77	+1·11	+19·14	+ 2·22	+ 8·35	+4·63	+3·79	+2·75	+1·94	+0·23
1887 ...	+18·24	+ 2·13	+ 8·54	+4·23	+3·57	+2·42	+1·12	+0·59	+16·12	+ 0·32	+ 7·73	+5·40	+3·33	+1·50	+1·98	+0·54
1888 ...	+17·25	+ 3·30	+ 7·20	+5·90	+3·47	+2·67	+1·13	+1·13	+15·79	+ 0·95	+ 6·41	+4·98	+3·77	+1·82	+2·57	+0·67
1889 ...	+13·07	+ 2·48	+ 6·46	+4·48	+2·66	+1·96	+1·27	+0·95	+17·85	+ 5·50	+ 7·45	+4·60	+4·34	+1·62	+1·62	+0·24
1890 ...	+16·07	+ 4·16	+ 7·27	+5·12	+3·99	+2·76	+1·01	+1·35	+17·55	+ 4·64	+ 7·07	+5·22	+3·32	+1·91	+1·48	+0·56
1891 ...	+18·13	+ 5·69	+ 8·42	+6·33	+4·32	+3·47	+0·86	+1·13	+19·12	+ 2·61	+ 8·12	+6·57	+3·79	+2·84	+2·13	+0·46
1892 ...	+20·97	+ 5·66	+ 9·12	+5·68	+4·24	+4·26	+1·05	+0·92	+21·32	+ 5·87	+10·81	+7·06	+5·80	+3·82	+2·07	+1·36
1893 ...	+26·39	+10·67	+10·41	+7·22	+5·48	+3·90	+1·32	+1·88	+26·00	+10·72	+11·24	+8·34	+4·09	+2·69	+1·78	+0·79
Mean ...	+20·43	+ 5·20	+ 8·69	+6·35	+4·16	+3·37	+1·08	+1·10	+20·82	+ 4·96	+ 8·99	+6·34	+4·22	+2·50	+2·02	+0·60
1894 ...	+22·49	+ 9·17	+ 8·26	+6·43	+5·33	+3·11	+0·47	+0·51	+24·51	+10·04	+ 8·10	+8·71	+4·71	+2·89	+1·73	+1·58
1895 ...	+22·75	+ 4·73	+ 9·33	+8·04	+4·64	+3·85	−0·02	+1·11	+23·61	+ 6·69	+10·19	+6·26	+4·95	+2·42	+1·67	+1·00
1896 ...	+21·77	+ 5·37	+ 7·66	+7·46	+4·65	+2·53	+1·07	+1·53	+20·83	+ 5·96	+ 9·17	+7·02	+4·25	+2·47	+1·31	+0·52
1897 ...	+19·84	+ 6·39	+ 7·50	+6·69	+4·29	+3·26	+0·69	+0·44	+18·45	+ 1·90	+ 7·52	+7·27	+2·88	+1·62	+1·35	+1·39
1898 ...	+20·34	+ 3·81	+ 5·83	+4·72	+3·49	+2·47	+1·67	+1·42	+18·51	+ 3·94	+ 6·44	+6·38	+2·96	+1·63	+2·10	+0·15
1899 ...	+16·91	+ 2·08	+ 7·64	+5·11	+3·99	+2·75	+1·72	+0·75	+17·42	+ 3·96	+ 7·38	+6·91	+2·52	+2·37	+1·97	+0·27
1900 ...	+17·24	+ 2·52	+ 5·77	+4·56	+4·23	+2·23	+0·69	+0·72	+14·82	+ 5·89	+ 5·17	+6·57	+2·53	+2·63	+1·22	+0·97
1901 ...	+17·03	+ 4·92	+ 7·36	+4·34	+4·06	+2·07	+1·78	+0·72	+17·05	+ 5·80	+ 6·84	+5·93	+3·09	+2·61	+1·60	+1·00
1902 ...	+16·01	+ 3·27	+ 8·56	+3·94	+4·37	+2·27	+1·42	+1·15	+14·40	+ 3·37	+ 7·24	+5·30	+3·37	+2·57	+1·88	+0·76
1903 ...	+16·90	+ 5·19	+ 7·60	+5·68	+3·65	+2·61	+0·95	+0·75	+18·74	+ 3·22	+ 8·05	+6·08	+2·48	+2·14	+1·37	+0·12
1904 ...	+20·07	+ 5·35	+ 9·24	+5·95	+4·62	+2·92	+1·27	+1·18	+19·12	+ 4·87	+ 9·30	+6·96	+3·55	+2·85	+1·71	+0·58
Mean ...	+19·21	+ 4·80	+ 7·70	+5·72	+4·30	+2·73	+1·06	+0·93	+18·86	+ 5·06	+ 7·76	+6·67	+3·39	+2·38	+1·63	+0·76
Mean of 33 years ...	+20·41	+ 5·16	+ 8·38	+6·02	+4·35	+3·11	+1·16	+1·08	+20·41	+ 5·28	+ 8·58	+6·53	+3·96	+2·49	+1·85	+0·67

TABLE 267.—*Monthly values of the p, q Co-efficients for the first four Orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = 1 γ = ·00001 C. G. S.

Years.	May.								June.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+30·92	+ 8·20	+12·05	+6·42	+5·36	+1·76	+0·96	+0·07	+24·33	+7·52	+10·52	+7·31	+3·38	+2·63	−0·77	−0·57
1873 ...	+20·01	+ 5·20	+ 9·11	+4·88	+2·84	+1·95	+1·18	−0·69	+19·28	+0·98	+ 6·77	+5·66	−0·41	+2·81	−0·03	−0·68
1874 ...	+20·36	+ 5·15	+ 7·63	+5·94	+3·00	+1·92	+0·80	+0·45	+18·67	+5·66	+ 7·87	+5·94	+1·22	+1·98	+0·58	+0·48
1875 ...	+17·29	+ 3·92	+ 7·02	+4·60	+2·38	+2·16	+0·81	+0·15	+17·59	+3·16	+ 8·11	+5·33	+1·80	+1·88	+0·13	−0·28
1876 ...	+16·86	+ 2·65	+ 7·93	+4·08	+2·72	+1·30	+0·72	−0·22	+14·85	+2·92	+ 5·72	+5·43	+0·98	+1·45	−0·24	−0·10
1877 ...	+14·94	+ 2·79	+ 6·10	+5·79	+2·15	+2·56	+0·91	+0·14	+15·03	−0·01	+ 6·43	+4·16	+1·66	+0·72	−0·11	−0·45
1878 ...	+15·12	+ 3·29	+ 6·72	+3·69	+2·02	+1·78	+0·47	+0·40	+16·09	+2·78	+ 7·83	+4·24	+2·31	+1·49	−0·19	−0·01
1879 ...	+16·48	+ 2·94	+ 7·11	+5·12	+2·11	+1·49	+0·68	+0·21	+15·87	+2·53	+ 7·55	+5·00	+1·82	+1·25	+0·12	+0·14
1880 ...	+16·63	+ 2·61	+ 6·84	+4·85	+3·12	+1·68	+0·58	+0·28	+18·15	+3·10	+ 8·26	+5·21	+2·16	+2·05	+0·03	+0·61
1881 ...	+21·17	+ 5·22	+ 9·42	+5·62	+2·60	+1·77	+0·51	−0·37	+23·26	+6·04	+ 9·82	+6·99	+1·69	+2·47	−0·05	+0·67
1882 ...	+21·15	+ 6·55	+ 9·55	+7·84	+3·52	+3·76	+0·48	+1·03	+20·82	+6·67	+ 8·50	+3·55	+2·66	+1·36	+1·01	−0·40
Mean ...	+19·18	+ 4·41	+ 8·15	+5·35	+2·89	+2·01	+0·79	+0·13	+18·54	+3·76	+ 7·94	+5·35	+1·75	+1·83	+0·04	−0·05
1883 ...	+18·02	+ 3·67	+ 8·32	+5·61	+2·29	+1·96	+0·20	+0·32	+22·24	+3·26	+ 9·59	+6·29	+2·15	+1·82	−0·35	−0·24
1884 ...	+24·28	+ 7·28	+10·64	+7·38	+3·84	+1·95	+1·02	+0·39	+24·45	+4·10	+ 9·76	+6·02	+2·85	+2·10	+0·26	+0·47
1885 ...	+20·30	+ 4·07	+ 7·41	+4·32	+2·99	+0·83	+1·28	+0·30	+23·42	+3·30	+11·01	+6·84	+2·35	+2·58	+0·81	−0·17
1886 ...	+15·88	+ 1·47	+ 7·65	+4·40	+2·79	+1·92	−0·01	−0·08	+15·83	+2·00	+ 7·47	+4·65	+2·32	+1·94	+0·07	+0·79
1887 ...	+15·59	+ 0·74	+ 7·26	+4·10	+2·30	+1·02	+0·53	−0·48	+15·41	+2·39	+ 7·13	+5·85	+0·66	+1·56	+0·06	−0·64
1888 ...	+14·73	+ 0·97	+ 6·80	+4·49	+1·78	−0·22	+1·11	−0·07	+15·54	+1·33	+ 7·33	+4·72	+2·26	+1·00	+0·16	+0·56
1889 ...	+13·39	+ 0·82	+ 6·35	+3·44	+2·47	+1·74	+0·21	−0·07	+17·57	+1·79	+ 8·27	+4·93	+1·93	+1·60	+0·29	+0·13
1890 ...	+15·37	+ 3·57	+ 6·21	+3·75	+2·49	+0·96	+0·69	−0·06	+14·39	+2·85	+ 6·85	+3·75	+1·61	+1·54	+0·02	−0·01
1891 ...	+21·35	+ 0·80	+ 8·03	+7·42	+1·50	+1·81	+1·12	+0·83	+19·13	+5·67	+ 7·13	+6·86	+0·92	+1·72	+0·24	+0·02
1892 ...	+24·97	+ 2·69	+ 8·31	+5·72	+3·92	+3·41	+0·31	−0·14	+24·69	+5·58	+10·33	+7·78	+2·72	+2·97	+0·06	+0·40
1893 ...	+27·15	+10·47	+11·12	+8·57	+3·26	+2·48	+0·58	+0·30	+27·64	+8·79	+11·47	+7·57	+2·44	+3·17	−0·08	−0·12
Mean ...	+19·18	+ 3·32	+ 8·01	+5·38	+2·69	+1·62	+0·64	+0·11	+20·03	+3·73	+ 8·76	+5·93	+2·02	+2·00	+0·14	+0·11
1894 ...	+23·31	+ 6·10	+10·60	+6·77	+4·01	+1·87	+1·37	+0·27	+25·84	+4·71	+11·00	+8·14	+2·58	+2·93	+0·40	+0·07
1895 ...	+ 24·02	+ 5·41	+ 9·77	+5·64	+3·28	+1·78	+0·57	+0·01	+22·79	+4·37	+10·06	+7·07	+2·40	+2·02	+0·30	+0·26
1896 ...	+21·47	+ 3·38	+ 8·62	+7·87	+2·54	+2·63	−0·25	+0·18	+17·81	+6·78	+ 6·90	+6·81	+1·23	+1·40	+0·64	−1·07
1897 ...	+16·32	+ 2·96	+ 6·77	+5·36	+1·43	+1·16	+1·47	+0·12	+15·07	+2·59	+ 5·05	+5·08	+0·05	+1·91	−0·34	−0·62
1898 ...	+16·07	+ 3·06	+ 6·64	+5·45	+2·13	+2·02	+0·27	+0·31	+17·42	+3·06	+ 6·96	+6·22	+0·89	+1·72	+0·09	−0·16
1899 ...	+15·23	− 0·01	+ 7·72	+4·37	+2·17	+1·22	+0·64	−0·12	+15·84	+2·92	+ 7·59	+4·90	+2·32	+1·87	+0·18	+0·25
1900 ...	+14·31	+ 1·61	+ 6·19	+5·43	+1·55	+0·70	+0·52	−0·27	+14·23	+4·15	+ 7·56	+4·82	+1·67	+1·56	−0·07	+0·11
1901 ...	+13·96	+ 5·00	+ 6·59	+5·75	+2·20	+2·09	+0·62	+0·42	+12·87	+2·88	+ 6·80	+4·63	+1·62	+1·72	+0·14	+0·27
1902 ...	+14·67	+ 3·55	+ 5·71	+5·03	+2·32	+1·59	+0·72	+0·30	+13·76	+2·87	+ 6·55	+5·43	+1·87	+2·12	+0·26	+0·35
1903 ...	+15·93	+ 4·87	+ 6·61	+5·94	+1·91	+1·88	+0·72	+0·07	+15·72	+4·13	+ 5·93	+6·43	+1·23	+2·55	+0·16	+0·52
1904 ...	+18·62	+ 2·51	+ 8·17	+6·07	+1·73	+1·54	+0·87	+0·10	+20·52	+2·46	+ 9·76	+6·36	+1·93	+2·27	−0·29	−0·30
Mean ...	+17·63	+ 3·49	+ 7·58	+5·79	+2·30	+1·68	+0·68	+0·13	+17·44	+3·72	+ 7·65	+5·99	+1·62	+2·01	+0·13	−0·03
Mean of 33 years ...	+18·66	+ 3·74	+ 7·91	+5·51	+2·63	+1·77	+0·71	+0·13	+18·67	+3·74	+ 8·12	+5·75	+1·79	+1·94	+0·11	+0·08

TABLE 267.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = 1γ = ·00001 C. G. S.

Years.	July.								August.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+27·95	+6·05	+13·05	+5·98	+2·27	+0·06	+0·88	−1·25	+23·55	+ 9·83	+ 9·96	+ 8·75	+2·58	+3·19	+0·51	+1·18
1873 ...	+19·76	+5·84	+ 8·54	+7·56	+1·11	+1·58	+0·12	+0·12	+21·47	+ 5·66	+ 7·83	+ 8·13	+2·33	+2·46	+0·37	+0·27
1874 ...	+18·49	+5·62	+ 6·28	+8·31	+0·68	+3·71	−0·06	+1·18	+18·41	+ 4·70	+ 5·67	+ 7·24	+2·54	+3·59	+0·16	+0·84
1875 ...	+16·01	+3·24	+ 5·34	+4·93	+0·74	+2·07	−0·47	+0·52	+14·45	+ 5·04	+ 5·99	+ 5·48	+1·55	+2·27	+0·75	+0·27
1876 ...	+16·80	+4·10	+ 7·49	+5·60	+1·62	+1·47	+0·32	+0·08	+13·81	+ 3·85	+ 5·59	+ 6·10	+1·48	+1·78	+0·47	+0·00
1877 ...	+14·64	+3·62	+ 7·22	+5·06	+1·16	+3·17	−0·04	+0·42	+13·70	+ 3·68	+ 5·73	+ 5·42	+1·01	+2·13	−0·02	+0·32
1878 ...	+13·14	+4·29	+ 5·88	+6·07	+1·01	+2·78	+0·14	+0·23	+12·85	+ 5·82	+ 3·48	+ 6·71	+0·82	+2·46	−0·13	+0·78
1879 ...	+15·82	+4·17	+ 6·21	+5·21	+1·15	+1·65	−0·01	−0·07	+13·18	+ 3·34	+ 6·12	+ 4·31	+2·03	+2·39	+0·35	+0·72
1880 ...	+15·87	+4·28	+ 5·92	+5·30	+0·29	+2·11	−0·08	−0·13	+17·14	+ 3·21	+ 4·03	+ 7·18	+1·41	+2·87	+1·07	+0·95
1881 ...	+24·10	+6·96	+ 9·40	+8·32	+1·38	+2·93	+0·32	−0·92	+19·42	+ 7·47	+ 7·56	+ 7·82	+2·20	+3·91	+0·52	+1·35
1882 ...	+19·11	+8·87	+ 6·18	+7·13	+1·57	+3·59	+0·32	+1·57	+17·32	+ 6·43	+ 4·05	+ 7·16	+1·29	+3·88	+0·79	+0·89
Mean ...	+18·34	+5·19	+ 7·41	+6·30	+1·18	+2·28	+0·13	+0·16	+16·85	+ 5·37	+ 6·09	+ 6·75	+1·75	+2·81	+0·44	+0·69
1883 ...	+21·90	+6·99	+ 8·20	+7·42	+0·79	+4·19	+0·51	−0·09	+17·87	+ 7·97	+ 6·13	+ 8·44	+1·97	+4·51	−0·35	+0·58
1884 ...	+18·45	+3·67	+ 6·55	+7·23	+2·36	+1·82	+0·37	+0·19	+16·92	+ 7·21	+ 6·56	+ 8·49	+1·63	+3·65	+0·57	+0·52
1885 ...	+22·56	+6·71	+ 7·81	+8·01	+1·14	+2·52	−0·34	−0·11	+17·80	+ 0·95	+ 7·07	+ 6·62	+1·47	+2·27	+0·12	−0·57
1886 ...	+14·57	+2·80	+ 4·95	+5·55	+0·33	+2·37	−0·45	−0·23	+12·39	+ 2·04	+ 3·52	+ 7·07	+0·95	+4·63	−0·21	+0·90
1887 ...	+16·59	+2·32	+ 7·72	+5·10	+1·72	+1·91	−0·20	+0·25	+15·35	+ 1·71	+ 6·22	+ 5·32	+3·02	+2·05	+0·06	+0·29
1888 ...	+14·15	+2·30	+ 6·58	+4·33	+1·43	+1·45	−0·32	−0·56	+12·06	+ 2·02	+ 5·19	+ 5·31	+1·37	+2·03	−0·03	+0·49
1889 ...	+15·17	+2·68	+ 6·58	+5·62	+1·76	+2·57	+0·28	+0·32	+15·37	+ 1·42	+ 6·17	+ 5·67	+1·12	+1·42	+0·20	−0·31
1890 ...	+15·36	+3·91	+ 6·02	+5·74	+1·13	+1·85	+0·20	+0·10	+13·36	+ 3·11	+ 5·62	+ 5·16	+1·97	+2·63	+0·52	+0·63
1891 ...	+21·67	+6·16	+ 8·12	+8·10	+1·65	+2·57	−0·07	+0·05	+17·10	+ 4·30	+ 5·75	+ 5·65	+1·56	+2·25	+0·20	+0·52
1892 ...	+21·52	+5·70	+10·23	+7·95	−0·02	+2·03	−0·32	+0·67	+21·04	+ 8·45	+ 9·53	+ 6·15	+2·74	+3·66	+0·77	+0·53
1893 ...	+25·53	+9·85	+ 8·83	+7·83	+1·64	+2·22	+0·67	+0·25	+23·57	+10·00	+ 6·37	+10·08	+1·80	+3·99	+0·36	+0·24
Mean ...	+18·86	+4·83	+ 7·42	+6·63	+1·27	+2·32	+0·03	+0·08	+16·62	+ 4·47	+ 6·19	+ 6·72	+1·78	+3·01	+0·20	+0·35
1894 ...	+26·09	+2·57	+ 9·36	+9·78	+1·14	+3·22	−0·59	−0·42	+19·32	+ 1·38	+10·28	+ 4·65	+3·24	+3·09	−0·38	+0·42
1895 ...	+20·37	+3·81	+ 7·45	+7·21	+1·44	+2·31	+0·28	+0·33	+17·85	+ 5·72	+ 6·56	+ 6·31	+1·57	+3·17	+0·70	+0·31
1896 ...	+18·27	+4·94	+ 6·29	+8·12	+1·25	+2·82	−0·53	+0·67	+13·60	+ 2·57	+ 4·78	+ 6·36	+1·78	+2·08	+0·81	+1·21
1897 ...	+15·73	+3·76	+ 6·33	+5·94	+1·02	+1·41	−0·12	+0·05	+13·67	+ 4·71	+ 4·79	+ 5·96	+1·61	+2·25	+0·56	+0·72
1898 ...	+14·73	+3·82	+ 7·22	+5·53	+0·57	+1·89	−0·08	−0·23	+11·02	+ 3·42	+ 3·72	+ 5·09	+1·19	+1·85	+0·30	+0·12
1899 ...	+15·67	+2·79	+ 6·44	+6·04	+1·65	+1·61	+0·31	+0·57	+14·52	+ 2·25	+ 5·77	+ 5·96	+1·11	+1·50	−0·27	+0·08
1900 ...	+17·70	+5·28	+ 7·04	+6·49	+1·59	+2·34	+0·36	+0·11	+14·98	+ 4·71	+ 6·40	+ 5·40	+1·77	+1·70	+0·43	−0·02
1901 ...	+14·89	+3·03	+ 6·66	+5·09	+1·04	+1·62	0·00	+0·17	+13·31	+ 2·91	+ 6·23	+ 4·84	+1·38	+1·56	+0·25	+0·07
1902 ...	+12·33	+3·79	+ 6·17	+5·18	+1·38	+1·66	+0·25	+0·53	+11·86	+ 5·20	+ 4·65	+ 6·05	+1·35	+2·25	+0·11	+0·64
1903 ...	+16·23	+4·76	+ 6·78	+6·85	+1·12	+2·53	−0·07	+0·40	+13·91	+ 2·42	+ 5·30	+ 6·62	+0·92	+2·72	+0·66	+1·01
1904 ...	+18·58	+5·83	+ 8·37	+8·17	+1·58	+2·99	−0·52	+0·59	+15·78	+ 6·52	+ 3·88	+ 7·63	+1·87	+3·12	+0·67	+1·52
Mean ...	+17·33	+4·03	+ 7·10	+6·76	+1·25	+2·22	−0·06	+0·25	+14·53	+ 3·80	+ 5·67	+ 5·90	+1·62	+2·30	+0·35	+0·55
Mean of 33 years ...	+18·17	+4·68	+ 7·31	+6·56	+1·23	+2·28	+0·30	+0·16	+15·99	+ 4·55	+ 5·95	+ 6·46	+1·72	+2·71	+0·33	+0·53

TABLE 267.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = 1γ = ·00001 C. G. S.

Years.	September.								October.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+24·39	+11·39	+6·71	+10·21	+3·97	+4·59	+2·13	+0·79	+20·94	−2·56	+9·33	+7·36	+7·06	+4·24	+2·78	+2·22
1873 ...	+19·78	+ 5·01	+5·66	+ 8·80	+2·74	+3·75	+0·77	+1·44	+18·81	+0·82	+6·99	+4·96	+3·76	+2·02	+0·69	+0·67
1874 ...	+14·91	+ 5·42	+4·60	+ 6·55	+3·64	+4·25	+1·46	+2·22	+13·40	+1·64	+6·62	+4·86	+3·69	+1·91	+0·92	+1·91
1875 ...	+11·57	+ 0·71	+3·92	+ 5·60	+2·15	+3·06	+0·87	+1·13	+13·99	+1·21	+7·85	+3·61	+3·03	+1·93	+0·61	+0 76
1876 ...	+ 9·69	+ 3·30	+3·70	+ 5·18	+2·02	+2·72	+0·99	+0·90	+13·08	+1·86	+5·26	+4·79	+2·95	+2·06	+0·51	+1·97
1877 ...	+11·41	+ 3·78	+4·22	+ 5·39	+2·06	+2·71	+1·21	+0·86	+15·25	+2·42	+6·93	+4·81	+3·26	+2·65	+0·96	+0·87
1878 ...	+11·07	+ 2·32	+4·32	+ 5·15	+2·01	+3·82	+0·49	+0·91	+13·48	+2·72	+5·79	+3·37	+3·30	+0·91	+1·19	+ 0·53
1879 ...	+13·04	+ 4·05	+4·67	+ 5·77	+2·38	+3·48	+1·08	+1·50	+14·48	+3·23	+6·60	+4·49	+3·46	+1·97	+1·02	+1·36
1880 ...	+16·50	+ 2·76	+6·26	+ 6·95	+3·42	+3·25	+1·38	+1·35	+20·23	+2·62	+8·00	+6·45	+4·09	+3·34	+1·74	+1·65
1881 ...	+16·79	+ 7·31	+6·02	+ 6·58	+5·42	+3·07	+2·48	+1·42	+19·04	+4·60	+7·38	+5·54	+4·68	+3·44	+1·00	+2·07
1882 ...	+16·72	+ 6·26	+6·10	+ 6·73	+3·02	+3·41	+0·92	+0·83	+20·33	+1·54	+7·77	+6·07	+4·53	+1·66	+1·27	+1·00
Mean ...	+15·08	+ 4·76	+5·11	+ 6·63	+2·98	+3·46	+1·25	+1·21	+16·64	+1·83	+7·14	+5·12	+3·98	+2·38	+1·15	+1·36
1883 ...	+17·16	+ 5·38	+6·55	+ 7·44	+2·21	+4·06	+0·79	+0·42	+21·92	+8·16	+8·95	+7·15	+5·31	+4·23	+1·21	+1·60
1884 ...	+14·97	+ 6·55	+4·92	+ 7·14	+2·59	+3·47	+1·03	+1·80	+19·49	+2·57	+7·09	+6·22	+4·92	+3·93	+1·19	+1·71
1885 ...	+14·92	+ 2·46	+5·01	+ 6·82	+1·95	+4·52	+1·59	+2·21	+20·78	+2·08	+6·45	+6·35	+4·01	+3·76	+0·01	+2·52
1886 ...	+11·85	+ 3·38	+3·67	+ 5·64	+2·38	+4·52	+0·41	+0·95	+14·32	+0·42	+6·02	+5·04	+3·31	+3·11	+0·81	+1·89
1887 ...	+11·02	− 0·63	+6·10	+ 6·08	+2·96	+3·61	+1·19	+0·79	+15·66	+1·08	+6·36	+4·22	+2·28	+3·39	+1·32	+0·53
1888 ...	+11·15	+ 1·98	+3·52	+ 6·47	+2·26	+3·26	+0·93	+1·97	+13·68	+2·14	+5·19	+5·81	+2·47	+3·27	+0·82	+1·38
1889 ...	+10·16	+ 1·75	+4·42	+ 5·43	+2·57	+3·17	+1·02	+1·96	+12·95	+3·11	+5·69	+5·15	+3·36	+2·83	+0·77	+1·22
1890 ...	+12·81	+ 4·07	+4·62	+ 6·61	+2·69	+4·32	+0·80	+1·40	+16·29	+0·74	+7·25	+6·01	+3·52	+3·12	+0·55	+1·56
1891 ..	+15·75	+ 1·02	+7·34	+ 8·01	+2·79	+4·32	+0·09	+1·72	+17·87	+3·39	+7·56	+7·56	+3·88	+3·75	+0·23	+1·47
1892 ...	+18·40	+ 6·27	+5·77	+ 8·17	+3·22	+3·84	+0·89	+1·88	+21·81	+2·69	+8·79	+9·69	+3·77	+4·86	+0·92	+2·00
1893 ...	+18·42	+ 6·57	+5·72	+ 9·43	+2·57	+5·31	+0·22	+1·45	+23·06	+5·37	+9·06	+6·80	+4·52	+2·54	+0·99	+1·97
Mean ...	+14·24	+ 3·53	+5·24	+ 7·02	+2·56	+4·04	+0·81	+1·50	+17·98	+2·89	+7·13	+6·36	+3·76	+3·53	+0·80	+1·62
1894 ...	+18·80	+ 6·74	+5·33	+ 9·49	+2·44	+3·97	+1·54	+1·69	+20·66	+5·86	+9·75	+6·68	+5·24	+3·67	+0·55	+1·74
1895 ...	+16·62	+ 6·10	+6·42	+ 8·98	+2·85	+4·65	+1·57	+2·00	+18·92	+1·23	+8·27	+5·45	+5·24	+2·29	+1·30	+1·88
1896 ...	+16·48	+ 2·69	+5·41	+ 6·60	+3·65	+4·03	+1·20	+1·87	+20·28	+3·00	+7·99	+6·78	+4·42	+1·82	+2·01	+1·55
1897 ...	+14·37	+ 5·34	+4·52	+ 7·82	+1·85	+4·04	+1·18	+1·28	+14·55	+2·37	+7·01	+4·50	+3·18	+2·53	+0·82	+1·98
1898 ...	+10·92	+ 4·46	+2·91	+ 5·52	+2·56	+2·65	+0·68	+1·76	+14·33	+1·93	+5·91	+4·77	+3·23	+2·31	+1·09	+0·96
1899 ...	+10·90	+ 1·55	+5·57	+ 6·39	+1·60	+3·62	+0·66	+0·78	+11·67	+2·49	+5·29	+4·32	+2·94	+2·38	+0·87	+0·96
1900 ...	+11·84	+ 4·91	+4·83	+ 5·92	+2·72	+2·74	+0·90	+1·14	+13·07	+3·34	+6·04	+4·32	+3·09	+2·38	+1·16	+1·39
1901 ...	+10·23	+ 4·02	+3·87	+ 5·41	+2·44	+2·83	+1·16	+1·29	+12·11	+2·39	+6·24	+4·14	+3·10	+1·89	+1·20	+1·04
1902 ...	+10·52	+ 5·35	+3·14	+ 5·84	+2·11	+3·45	+0·75	+1·37	+14·01	+3·30	+6·03	+4·61	+3·44	+2·51	+1·23	+1·43
1903 ...	+10·53	+ 2·49	+4·77	+ 6·36	+2·74	+3·19	+1·17	+1·16	+20·57	−1·31	+5·92	+9·72	+3·52	+4·55	+1·46	+2·88
1904 ...	+12·70	+ 5·40	+4·66	+ 7·22	+2·80	+4·37	+1·42	+1·62	+15·67	+2·72	+5·48	+6·28	+3·12	+2·66	+0·88	+1·64
Mean ...	+13·08	+ 4·36	+4·68	+ 6·87	+2·52	+3·59	+1·11	+1·45	+15·99	+2·48	+6·72	+5·60	+3·68	+2·64	+1·14	+1·59
Mean of 33 years ...	+14·13	+ 4·25	+5·01	+ 6·84	+2 69	+3·71	+1·06	+1·39	+16·87	+2·41	+6·99	+5·69	+3·81	+2·84	+1·04	+1·52

TABLE 267.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba), for each month of the year, from 1872 to 1904, calculated from Mean Hourly Horizontal Force of the several months.*

Unity = 1γ = ·00001 C. G. S.

Years.	November.								December.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+25·11	+1·87	+ 9·09	+5·73	+4·63	+0·94	+0·28	+1·34	+22·44	+6·46	+5·65	+4·62	+3·36	+2·61	+0·69	+0·83
1873 ...	+17·98	+1·13	+ 7·10	+2·61	+2·32	+0·77	+0·34	+0·74	+15·50	+2·73	+4·55	+2·53	+2·74	+0·96	−0·08	+0·19
1874 ...	+16·63	+1·38	+ 6·18	+3·64	+2·98	+0·66	+1·42	−0·15	+14·65	+2·73	+6·22	+3·61	+1·77	+1·11	−0·36	+0·09
1875 ...	+14·79	+0·61	+ 7·23	+2·17	+3·08	+0·89	+0·79	+0·43	+11·95	+2·05	+5·23	+1·52	+1·88	+0·86	−0·12	+0·26
1876 ...	+15·70	−0·10	+ 7·41	+3·29	+2·47	+1·52	+0·29	+0·43	+12·80	+0·62	+5·37	+2·87	+1·84	+0·72	+0·38	+0·01
1877 ...	+12·31	−0·37	+ 5·79	+1·04	+2·16	+1·43	+0·64	−0·38	+11·78	+1·52	+4·16	+2·29	+1·93	+0·73	+1·18	+0·70
1878 ...	+15·79	+0·62	+ 7·03	+2·83	+3·45	+0·24	+1·05	+0·81	+11·58	+1·35	+4·52	+2·80	+1·45	+1·21	+0·95	+0·61
1879 ...	+14·72	+0·80	+ 6·74	+1·87	+3·69	+0·50	+0·91	+0·44	+15·19	+2·56	+5·52	+1·11	+2·87	+0·10	+0·58	+0·59
1880 ...	+16·97	−0·31	+ 6·67	+1·53	+3·30	+0·87	−0·10	−0·09	+15·36	+0·69	+4·06	+2·44	+1·74	+0·28	+0·28	+0·50
1881 ...	+18·25	+0·67	+ 8·72	+3·46	+4·12	+1·47	+0·97	+0·57	+17·01	+1·42	+6·44	+2·61	+3·12	+0·48	+0·52	+0·57
1882 ...	+21·11	−2·86	+ 9·48	+4·90	+1·57	+3·16	+0·45	−1·18	+15·20	+1·26	+6·31	+3·59	+3·09	+2·02	+0·19	+0·57
Mean ...	+17·21	+0·31	+ 7·40	+3·01	+3·07	+1·13	+0·64	+0·27	+14·86	+2·13	+5·27	+2·73	+2·34	+1·01	+0·38	+0·45
1883 ...	+24·39	+1·25	+11·30	+5·47	+4·18	+1·72	+1·38	+1·22	+15·10	+3·56	+5·99	+4·21	+2·66	+2·06	+0·62	+1·00
1884 ...	+20·38	+0·35	+ 8·42	+4·27	+3·91	+1·59	+0·58	+1·02	+13·54	−0·16	+6·05	+1·72	+2·99	+2·61	+0·17	+1·57
1885 ...	+19·69	+1·41	+ 6·67	+3·69	+2·52	+1·33	+0·22	+0·58	+14·01	+2·62	+3·94	+3·54	+1·65	+1·27	−0·02	+1·07
1886 ...	+17·05	−0·57	+ 6·39	+3·39	+3·71	+0·93	−0·24	+0·05	+10·96	−0·38	+4·00	+2·18	+1·73	+0·26	−0·18	+0·60
1887 ...	+15·14	−0·27	+ 7·40	+2·34	+2·86	+0·63	+0·72	+0·66	+13·78	0·00	+4·32	+2·55	+1·47	+0·74	+0·90	+0·78
1888 ...	+12·71	−1·68	+ 7·14	+2·07	+3·05	+0·69	+0·70	+0·39	+12·36	+0·38	+3·72	+2·47	+1·45	+0·26	+0·06	+0·02
1889 ...	+15·42	−0·32	+ 5·08	+4·09	+2·78	+0·50	+1·00	+1·21	+ 9·58	−0·07	+2·88	+2·51	+1·13	+0·08	+0·37	+0·57
1890 ...	+14·40	−0·68	+ 7·87	+2·48	+3·19	+0·43	+1·47	+0·35	+13·61	+2·08	+4·38	+1·07	+1·61	+1·45	−0·19	+0·36
1891 ...	+20·57	+1·62	+ 8·73	+4·79	+3·30	+2·01	+1·19	+0·88	+17·77	+0·23	+5·62	+2·93	+2·55	+0·64	+0·39	+0·58
1892 ...	+21·03	+5·53	+ 6·95	+5·37	+3·87	+1·33	+0·74	+0·91	+14·72	+2·95	+3·57	+4·82	+1·66	+0·72	−0·42	+0·35
1893 ...	+20·18	+2·44	+ 8·43	+3·89	+4·09	+1·32	+0·36	+0·52	+20·20	+3·02	+7·82	+3·37	+2·93	+1·62	−0·39	+0·65
Mean ...	+18·27	+0·83	+ 7·67	+3·80	+3·41	+1·13	+0·74	+0·71	+14·15	+1·29	+4·75	+2·85	+1·89	+1·06	+0·15	+0·69
1894 ...	+24·37	+4·17	+ 5·63	+2·37	+5·57	+0·03	+0·74	+1·94	+16·20	+2·32	+5·48	+3·27	+2·42	+1·36	+0·10	+0·08
1895 ...	+19·87	−0·99	+ 8·43	+5·17	+2·92	+0·67	+0·75	−0·71	+15·11	+1·62	+5·28	+3·34	+1·30	+0·95	+0·52	−0·32
1896 ...	+16·40	+1·50	+ 6·84	+3·66	+2·87	+1·00	+0·23	0·00	+13·34	+0·69	+5·12	+4·19	+1·52	+2·22	+0·03	+0·43
1897 ...	+14·36	−0·27	+ 6·33	+1·62	+3·27	−0·18	+1·03	+0·59	+17·57	−0·11	+5·46	+4·51	+1·87	−0·15	+0·17	+0·51
1898 ...	+15·98	−1·02	+ 6·95	+2·58	+3·37	+0·62	+0·02	+0·51	+11·92	+0·22	+4·92	+1·94	+2·02	+1·07	+0·17	+0·71
1899 ...	+14·43	+0·74	+ 6·13	+2·02	+2·72	+0·72	+0·47	−0·01	+11·05	+0·12	+4·22	+2·85	+1·57	+0·41	+0·31	+0·71
1900 ...	+13·40	+1·38	+ 6·40	+1·34	+2·81	+0·05	+0·88	+0·12	+11·10	+0·98	+4·82	+1·75	+1·86	+0·49	+0·36	−0·22
1901 ...	+11·63	+0·50	+ 5·37	+1·47	+2·77	+0·42	+0·83	+0·44	+10·79	+0·52	+5·11	+1·56	+2·22	+1·10	+0·52	+0·43
1902 ...	+14·04	+0·17	+ 6·71	+1·98	+2·74	+0·37	+0·53	+0·23	+10·57	+1·52	+5·16	+1·67	+1·83	+0·42	+0·47	+0·25
1903 ...	+13·65	−0·42	+ 6·82	+2·38	+3·26	+0·94	+0·04	+0·33	+13·71	+1·97	+4·13	+3·09	+2·16	+1·02	+0·13	+0·31
1904 ...	+17·81	−1·04	+ 7·01	+3·54	+3·68	+0·14	+1·23	+0·83	+13·50	−0·42	+6·51	+2·11	+2·82	+0·45	+0·19	−0·13
Mean ...	+15·99	+0·43	+ 6·60	+2·56	+3·27	+0·43	+0·61	+0·39	+13·17	+0·86	+5·11	+2·75	+1·96	+0·85	+0·27	+0·25
Mean of 33 years	+17·16	+0·52	+ 7·23	+3·13	+3·25	+0·89	+0·66	+0·46	+14·06	+1·43	+5·04	+2·78	+2·11	+0·97	+0·27	+0·46

TABLE 268.—*Horizontal Force Magnetograph—Showing mean values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each half-year—April to September—for each of the years from 1872 to 1904, derived by averaging the values of p and q for the above months.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+27·03	+9·21	+10·90	+7·75	+4·05	+2·79	+1·02	+0·11
1873 ...	+21·36	+5·73	+ 7·94	+7·28	+2·50	+2·74	+0·89	+0·27
1874 ...	+19·14	+5·08	+ 6·86	+6·88	+2·48	+2·90	+0·84	+0·92
1875 ...	+16·49	+3·60	+ 6·63	+5·36	+2·13	+2·49	+0·74	+0·40
1876 ...	+15·00	+3·86	+ 6·28	+5·47	+2·00	+1·75	+0·70	+0·25
1877 ...	+14·31	+2·97	+ 6·13	+5·33	+2·09	+2·21	+0·63	+0·44
1878 ...	+14·46	+3·81	+ 5·95	+5·09	+1·92	+2·33	+0·37	+0·45
1879 ...	+15·28	+3·65	+ 6·58	+5·19	+2·20	+2·02	+0·65	+0·54
1880 ...	+17·34	+3·49	+ 6·62	+5·90	+2·27	+2·48	+0·73	+0·55
1881 ...	+20·78	+6·64	+ 8·64	+7·03	+2·94	+2·78	+0·82	+0·48
1882 ...	+19·59	+5·62	+ 7·36	+6·44	+2·65	+3·03	+0·85	+0·70
1883 ...	+20·21	+5·69	+ 8·09	+7·23	+2·15	+3·07	+0·48	+0·19
1884 ...	+20·83	+6·40	+ 8·26	+7·65	+3·06	+2·87	+1·02	+0·76
1885 ...	+20·85	+3·78	+ 8·19	+6·30	+2·59	+2·52	+0·85	+0·35
1886 ...	+14·94	+2·32	+ 5·93	+5·32	+2·09	+3·02	+0·29	+0·43
1887 ...	+15·01	+1·14	+ 7·03	+5·31	+2·33	+1·94	+0·60	+0·12
1888 ...	+13·90	+1·59	+ 5·97	+5·05	+2·14	+1·56	+0·74	+0·51
1889 ...	+14·92	+2·33	+ 6·54	+4·95	+2·36	+2·02	+0·60	+0·38
1890 ...	+14·80	+3·69	+ 6·06	+5·04	+2·20	+2·20	+0·62	+0·44
1891 ...	+19·02	+3·43	+ 7·41	+7·10	+2·03	+2·58	+0·62	+0·60
1892 ...	+21·99	+5·76	+ 9·16	+7·14	+3·06	+3·29	+0·63	+0·78
1893 ...	+24·72	+9·40	+ 9·12	+8·64	+2·63	+3·31	+0·59	+0·48
1894 ...	+22·98	+5·26	+ 9·11	+7·92	+3·02	+2·99	+0·68	+0·60
1895 ...	+20·88	+5·35	+ 8·49	+6·91	+2·75	+2·72	+0·85	+0·65
1896 ...	+18·08	+4·39	+ 6·86	+7·13	+2·45	+2·57	+0·53	+0·56
1897 ...	+15·60	+3·54	+ 5·83	+6·24	+1·47	+2·06	+0·68	+0·49
1898 ...	+14·78	+3·63	+ 5·65	+5·70	+1·72	+1·96	+0·56	+0·32
1899 ...	+14·93	+2·24	+ 6·74	+5·76	+1·89	+2·03	+0·58	+0·30
1900 ...	+14·65	+4·42	+ 6·20	+5·77	+1·97	+1·94	+0·56	+0·34
1901 ...	+13·72	+3·94	+ 6·16	+5·27	+1·96	+2·07	+0·63	+0·54
1902 ...	+12·92	+4·02	+ 5·58	+5·47	+2·07	+2·27	+0·66	+0·66
1903 ...	+15·18	+3·65	+ 6·24	+6·38	+1·73	+2·50	+0·67	+0·55
1904 ...	+17·55	+4·60	+ 7·36	+7·07	+2·24	+2·86	+0·64	+0·68
1872—1882.	+18·26	+4·88	+ 7·27	+6·16	+2·47	+2·50	+0·76	+0·46
1883—1893.	+18·29	+4·14	+ 7·43	+6·34	+2·42	+2·58	+0·64	+0·46
1894—1904.	+16·48	+4·09	+ 6·74	+6·33	+2·12	+2·36	+0·64	+0·52
1872—1904.	+17·67	+4·37	+ 7·15	+6·27	+2·34	+2·48	+0·73	+0·49

TABLE 269.—*Horizontal Force Magnetograph—Showing mean values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each half-year—January to March and October to December —for each of the years from 1872 to 1904, derived by averaging the values of p and q for the above months.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+25·56	+5·11	+7·54	+5·26	+4·85	+3·33	+ ·66	+ ·99
1873 ...	+20·88	+4·65	+7·40	+5·57	+3·62	+2·40	+ ·55	+1·24
1874 ...	+17·72	+3·48	+6·99	+4·06	+3·65	+2·02	+ ·68	+ ·84
1875 ...	+15·50	+2·07	+6·75	+3·78	+2·56	+1·98	+ ·54	+ ·63
1876 ...	+15·19	+2·29	+6·14	+3·98	+2·78	+1·90	+ ·65	+ ·87
1877 ...	+13·58	+1·97	+5·57	+3·40	+2·62	+2·01	+ ·76	+ ·75
1878 ...	+13·53	+2·43	+5·39	+3·01	+2·56	+1·03	+ ·87	+ ·54
1879 ...	+14·34	+2·98	+5·68	+3·01	+2·82	+1·53	+ ·55	+ ·74
1880 ...	+16·93	+2·44	+6·32	+3·60	+3·14	+1·74	+ ·65	+ ·73
1881 ...	+18·64	+3·68	+7·15	+4·27	+3·91	+2·27	+ ·75	+1·16
1882 ...	+18·37	+2·54	+7·44	+4·90	+3·25	+2·69	+ ·67	+ ·47
1883 ...	+19·51	+4·50	+7·96	+5·61	+3·42	+2·59	+ ·66	+1·07
1884 ...	+19·37	+3·88	+8·17	+4·93	+4·11	+3·30	+ ·50	+1·58
1885 ...	+18·72	+3·82	+6·04	+4·91	+3·03	+2·55	+ ·36	+1·22
1886 ...	+16·41	+1·42	+6·08	+4·60	+2·51	+2·22	+ ·07	+ ·80
1887 ...	+14·71	+ ·87	+5·86	+3·45	+2·08	+1·79	+ ·74	+ ·76
1888 ...	+14·23	+ ·80	+5·77	+4·13	+2·23	+1·94	+ ·49	+ ·80
1889 ...	+12·58	+1·94	+4·76	+3·88	+2·17	+1·44	+ ·64	+ ·89
1890 ...	+14·17	+1·94	+5·87	+3·42	+2·71	+1·94	+ ·56	+ ·81
1891 ...	+16·73	+2·90	+6·31	+4·30	+3·10	+2·02	+ ·59	+ ·86
1892 ...	+19·51	+3·67	+7·29	+6·52	+2·95	+3·05	+ ·69	+1·35
1893 ...	+21·13	+5·52	+8·06	+5·74	+3·74	+2·69	+ ·57	+1·24
1894 ...	+20·27	+5·72	+6·89	+4·89	+3·91	+2·27	+ ·39	+ ·98
1895 ...	+18·69	+1·91	+6·98	+5·51	+3·16	+2·01	+ ·34	+ ·74
1896 ...	+17·25	+2·10	+6·39	+5·57	+3·18	+1·88	+ ·50	+ ·96
1897 ...	+16·80	+2·56	+6·37	+4·58	+2·86	+1·76	+ ·68	+1·00
1898 ...	+15·01	+1·37	+5·32	+3·54	+2·79	+1·56	+ ·54	+ ·84
1899 ...	+12·44	+1·08	+5·17	+3·77	+2·15	+1·85	+ ·57	+ ·62
1900 ...	+13·37	+1·98	+5·37	+3·21	+2·58	+1·45	+ ·47	+ ·73
1901 ...	+12·83	+2·31	+5·64	+2·86	+2·77	+1·37	+ ·89	+ ·64
1902 ...	+12·71	+2·12	+5·91	+2·99	+2·56	+1·44	+ ·67	+ ·73
1903 ...	+14·55	+1·62	+5·53	+4·43	+2·72	+1·91	+ ·56	+ ·91
1904 ...	+15·08	+1·87	+6·02	+4·18	+2·89	+1·84	+ ·58	+ ·91
1872—1882.	+17·29	+3·06	+6·58	+4·08	+3·25	+2·08	+0·67	+0·81
1883—1893.	+17·01	+2·84	+6·56	+4·68	+2·91	+2·33	+0·53	+1·03
1894—1904.	+15·36	+2·24	+5·96	+4·14	+2·87	+1·76	+0·56	+0·82
1872—1904.	+16·55	+2·71	+6·37	+4·28	+3·01	+2·05	+0·59	+0·89

TABLE 270.—*Horizontal Force Magnetograph—Showing Mean Yearly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each year from 1872 to 1904, derived by averaging the values of p and q for all the months of the year.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+26·30	+7·16	+9·22	+6·50	+4·45	+3·06	+0·84	+0·55
1873 ...	+21·12	+5·19	+7·67	+6·42	+3·06	+2·57	+0·72	+0·76
1874 ...	+18·43	+4·28	+6·93	+5·47	+3·07	+2·46	+0·76	+0·88
1875 ...	+15·99	+2·83	+6·69	+4·57	+2·35	+2·24	+0·64	+0·51
1876 ...	+15·10	+3·08	+6·21	+4·72	+2·39	+1·83	+0·68	+0·56
1877 ...	+13·95	+2·47	+5·85	+4·36	+2·35	+2·11	+0·70	+0·60
1878 ...	+14·00	+3·12	+5·67	+4·05	+2·24	+1·68	+0·62	+0·49
1879 ...	+14·81	+3·32	+6·13	+4·10	+2·51	+1·77	+0·60	+0·64
1880 ...	+17·14	+2·97	+6·47	+4·75	+2·70	+2·11	+0·69	+0·64
1881 ...	+19·71	+5·16	+7·89	+5·66	+3·43	+2·52	+0·78	+0·82
1882 ...	+18·98	+4·08	+7·40	+5·67	+2·95	+2·86	+0·76	+0·59
1883 ...	+19·86	+5·10	+8·02	+6·42	+2·78	+2·83	+0·57	+0·63
1884 ...	+20·10	+5·14	+8·21	+6·29	+3·59	+3·08	+0·76	+1·17
1885 ...	+19·79	+3·80	+7·12	+5·60	+2·81	+2·54	+0·61	+0·79
1886 ...	+15·68	+1·87	+6·01	+4·96	+2·30	+2·62	+0·18	+0·61
1887 ...	+14·86	+1·01	+6·45	+4·38	+2·21	+1·87	+0·67	+0·44
1888 ...	+14·07	+1·20	+5·87	+4·59	+2·19	+1·75	+0·61	+0·65
1889 ...	+13·75	+2·13	+5·65	+4·42	+2·27	+1·73	+0·62	+0·64
1890 ...	+14·49	+2·82	+5·97	+4·23	+2·46	+2·07	+0·59	+0·62
1891 ...	+17·88	+3·16	+6·86	+5·70	+2·57	+2·30	+0·61	+0·73
1892 ...	+20·75	+4·71	+8·22	+6·83	+3·01	+3·17	+0·66	+1·06
1893 ...	+22·92	+7·46	+8·59	+7·19	+3·19	+3·00	+0·58	+0·86
1894 ...	+21·62	+5·49	+8·00	+6·40	+3·47	+2·63	+0·54	+0·79
1895 ...	+19·79	+3·63	+7·69	+6·21	+2·95	+2·37	+0·60	+0·70
1896 ...	+17·66	+3·25	+6·63	+6·35	+2·82	+2·22	+0·52	+0·76
1897 ...	+16·20	+3·05	+6·10	+5·41	+2·16	+1·91	+0·68	+0·74
1898 ...	+14·89	+2·50	+5·48	+4·62	+2·25	+1·76	+0·55	+0·58
1899 ...	+13·69	+1·66	+5·96	+4·76	+2·02	+1·94	+0·57	+0·46
1900 ...	+14·01	+3·20	+5·78	+4·49	+2·28	+1·70	+0·51	+0·53
1901 ...	+13·27	+3·12	+5·90	+4·07	+2·37	+1·72	+0·76	+0·59
1902 ...	+12·82	+3·07	+5·75	+4·23	+2·31	+1·86	+0·66	+0·69
1903 ...	+14·87	+2·64	+5·88	+5·41	+2·23	+2·21	+0·61	+0·73
1904 ...	+16·31	+3·23	+6·69	+5·63	+2·57	+2·35	+0·61	+0·80
1872—1882	+17·77	+3·97	+6·92	+5·12	+2·86	+2·29	+0·71	+0·64
1883—1893	+17·65	+3·49	+7·00	+5·51	+2·67	+2·45	+0·59	+0·75
1894—1904	+15·92	+3·17	+6·35	+5·24	+2·49	+2·06	+0·60	+0·67
1872—1904	+17·11	+3·54	+6·76	+5·29	+2·67	+2·27	+0·66	+0·69

TABLE 271.—*Horizontal Force Magnetograph—Showing Mean Yearly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba), for each year from 1872 to 1904 derived from the inequality for each year.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+26·29	+7·15	+9·21	+6·50	+4·46	+3·06	+0·84	+0·55
1873 ...	+21·11	+5·17	+7·69	+6·42	+3·06	+2·58	+0·71	+0·76
1874 ...	+18·42	+4·29	+6·93	+5·47	+3·06	+2·48	+0·76	+0·89
1875 ...	+16·00	+2·83	+6·69	+4·56	+2·34	+2·23	+0·64	+0·51
1876 ...	+15·10	+3·07	+6·20	+4·74	+2·40	+1·84	+0·68	+0·56
1877 ...	+13·94	+2·45	+5·86	+4·36	+2·35	+2·10	+0·71	+0·58
1878 ...	+13·98	+3·11	+5·67	+4·06	+2·24	+1·68	+0·58	+0·49
1879 ...	+14·79	+3·33	+6·14	+4·11	+2·51	+1·79	+0·59	+0·63
1880 ...	+17·12	+2·95	+6·47	+4·76	+2·70	+2·11	+0·69	+0·64
1881 ...	+19·71	+5·17	+7·89	+5·65	+3·42	+2·53	+0·78	+0·81
1882 ...	+18·97	+4·09	+7·40	+5·67	+2·95	+2·85	+0·77	+0·57
1883 ...	+19·86	+5·11	+8·02	+6·42	+2·79	+2·83	+0·58	+0·63
1884 ...	+20·09	+5·15	+8·21	+6·30	+3·58	+3·09	+0·76	+1·17
1885 ...	+19·78	+3·79	+7·09	+5·59	+2·80	+2·52	+0·60	+0·78
1886 ...	+15·67	+1·88	+6·00	+4·95	+2·31	+2·61	+0·17	+0·62
1887 ...	+14·86	+1·01	+6·46	+4·37	+2·19	+1·87	+0·66	+0·42
1888 ...	+14·07	+1·22	+5·86	+4·60	+2·19	+1·75	+0·62	+0·67
1889 ...	+13·73	+2·14	+5·66	+4·42	+2·27	+1·74	+0·62	+0·62
1890 ...	+14·47	+2·79	+5·97	+4·22	+2·45	+2·07	+0·57	+0·62
1891 ...	+17·88	+3·17	+6·86	+5·71	+2·57	+2·30	+0·61	+0·75
1892 ...	+20·76	+4·71	+8·22	+6·84	+3·02	+3·18	+0·67	+1·08
1893 ...	+22·91	+7·47	+8·60	+7·18	+3·18	+2·99	+0·62	+0·85
1894 ...	+21·62	+5·48	+7·99	+6·41	+3·45	+2·62	+0·54	+0·79
1895 ...	+19·80	+3·62	+7·69	+6·22	+2·93	+2·37	+0·59	+0·70
1896 ...	+17·67	+3·23	+6·62	+6·35	+2·82	+2·22	+0·52	+0·75
1897 ...	+16·19	+3·05	+6·09	+5·42	+2·17	+1·92	+0·67	+0·76
1898 ...	+14·87	+2·50	+5·49	+4·61	+2·27	+1·76	+0·56	+0·57
1899 ...	+13·68	+1·67	+5·97	+4·76	+2·03	+1·92	+0·57	+0·46
1900 ...	+14·01	+3·20	+5·79	+4·48	+2·27	+1·70	+0·52	+0·53
1901 ...	+13·26	+3·12	+5·90	+4·07	+2·37	+1·72	+0·76	+0·58
1902 ...	+12·82	+3·08	+5·74	+4·25	+2·32	+1·87	+0·67	+0·70
1903 ...	+14·87	+2·62	+5·88	+5·41	+2·23	+2·21	+0·61	+0·72
1904 ...	+16·30	+3·24	+6·69	+5·62	+2·57	+2·34	+0·61	+0·81
1872—1882	+17·77	+3·96	+6·92	+5·12	+2·86	+2·30	+0·70	+0·64
1883—1893	+17·64	+3·49	+7·00	+5·51	+2·67	+2·45	+0·59	+0·75
1894—1904	+15·92	+3·16	+6·35	+5·24	+2·49	+2·06	+0·60	+0·67
1872—1904	+17·11	+3·54	+6·76	+5·29	+2·67	+2·27	+0·63	+0·68

TABLE 272.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of table 267.*

Unity = 1γ = ·00001 C. G. S.

Years.	January.								February.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	22·89	7·79	3·80	1·68	166 19	175 56	46 58	**96 48**	34·99	5·51	8·85	1·05	175 51	150 22	48 44	**122 51**
1873 ...	19·71	8·86	3·88	2·09	167 51	179 39	46 23	83 18	27·06	13·94	5·81	1·54	173 30	175 30	49 13	86 3
1874 ...	17·62	7·42	3·08	1·13	164 27	170 44	44 28	80 23	23·47	6·67	6·13	0·68	171 38	167 7	45 55	77 47
1875 ...	13·60	5·29	1·85	0·46	166 17	169 18	51 48	77 47	17·93	9·91	3·91	1·12	164 52	179 55	54 9	79 45
1876 ...	15·49	5·73	2·93	0·96	168 9	174 49	46 58	81 45	15·07	7·49	4·13	1·10	162 55	168 23	47 37	76 11
1877 ...	13·43	6·05	3·23	1·22	165 26	165 4	47 9	78 20	13·72	6·40	2·62	0·99	167 10	178 14	50 59	79 19
1878 ...	9·68	2·85	1·53	0·73	165 35	163 7	41 46	71 13	13·75	5·87	2·20	0·40	170 40	175 19	45 29	77 15
1879 ...	9·44	3·14	2·34	1·14	174 22	177 23	54 39	**90 33**	14·95	6·35	2·98	0·30	165 54	166 39	47 51	82 57
1880 ...	15·51	6·48	2·92	1·21	168 47	174 19	49 53	**90 21**	15·96	6·99	3·62	0·92	174 4	171 4	46 59	78 47
1881 ...	17·30	5·43	3·37	1·33	172 57	176 13	49 28	83 34	19·57	8·30	4·35	0·73	165 8	171 3	47 36	83 53
1882 ...	12·92	5·51	2·92	0·84	171 29	171 38	51 14	72 37	17·11	7·76	4·49	0·78	168 52	170 8	49 18	83 45
Mean ...	15·24	5·87	2·90	1·16	168 20	172 34	48 15	82 25	19·42	7·74	4·46	0·87	169 9	170 20	48 32	84 25
1883 ...	15·13	6·83	2·89	1·01	172 20	174 38	50 24	**94 12**	20·60	9·00	4·17	1·25	174 15	173 52	48 31	83 33
1884 ...	16·93	8·57	4·10	1·51	170 8	170 33	50 46	83 54	20·87	9·75	5·83	1·77	175 33	170 15	50 18	**90 56**
1885 ...	15·26	6·37	2·52	0·90	160 51	164 57	49 55	79 45	21·59	8·75	4·79	1·82	177 29	179 2	50 27	85 26
1886 ...	15·13	6·41	2·37	1·15	156 39	176 39	56 52	**104 16**	18·30	6·65	2·51	0·80	165 48	170 54	50 50	80 46
1887 ...	10·73	4·33	1·25	1·08	156 44	171 45	55 54	84 2	14·84	7·01	3·00	1·00	162 11	177 8	52 52	84 48
1888 ...	15·41	6·75	2·22	1·07	150 4	171 59	53 18	85 38	14·17	7·47	3·41	0·82	162 40	174 24	54 46	85 9
1889 ...	11·29	4·00	1·45	0·37	166 8	169 40	44 40	70 42	14·07	7·12	3·13	1·27	172 15	177 34	52 53	86 14
1890 ...	9·74	3·61	2·33	0·54	160 17	165 50	46 57	85 22	15·60	6·80	3·27	0·69	171 15	175 32	51 22	86 13
1891 ...	12·03	4·77	2·77	1·48	169 18	171 21	47 54	88 54	14·83	3·89	2·49	1·12	168 7	166 35	38 37	60 11
1892 ...	16·06	8·64	2·85	2·28	157 41	175 0	48 45	82 55	22·93	11·82	5·63	2·07	165 41	175 59	57 42	79 49
1893 ...	17·43	7·02	3·46	1·38	169 16	177 3	52 1	80 6	21·37	11·27	5·22	1·30	174 39	178 19	51 40	81 36
Mean ...	14·10	6·12	2·56	1·16	162 41	171 46	50 41	85 26	18·11	8·14	3·95	1·26	169 59	174 30	50 54	82 15
1894 ...	17·25	6·58	2·70	0·87	173 8	175 6	46 47	**91 58**	22·74	9·57	4·72	1·10	173 36	175 16	52 53	76 0
1895 ...	13·70	6·93	2·98	1·79	160 22	174 2	50 31	**91 53**	22·17	8·50	3·51	0·82	163 55	181 9	46 56	85 40
1896 ...	14·68	8·10	2·64	1·54	153 35	179 0	44 11	84 16	17·19	7·52	4·11	1·00	162 40	176 59	46 53	**97 11**
1897 ...	18·03	7·57	2·57	1·93	161 59	174 30	52 17	77 9	17·27	8·07	4·29	1·02	170 31	175 25	50 8	85 33
1898 ...	11·36	4·76	2·01	0·55	156 40	166 51	39 4	70 41	16·39	6·59	3·62	1·23	165 1	**181 14**	49 2	89 21
1899 ...	9·39	4·09	1·23	0·88	165 22	177 30	57 5	75 53	11·38	7·28	3·89	0·94	151 13	178 35	58 46	**97 12**
1900 ...	11·18	5·53	1·79	1·38	157 10	172 30	53 28	**95 0**	14·63	6·22	3·25	1·25	167 26	175 22	47 53	82 21
1901 ...	11·20	4·48	2·07	0·25	166 23	171 6	45 53	81 55	14·80	6·85	3·18	1·37	167 31	168 58	44 57	76 18
1902 ...	9·17	4·08	1·81	1·07	167 9	171 24	48 38	85 14	12·93	6·64	2·50	0·34	165 59	170 49	51 0	77 47
1903 ...	10·57	4·18	2·18	1·09	167 46	172 52	47 12	80 26	12·35	6·24	2·27	0·35	163 44	170 33	43 39	75 8
1904 ...	10·30	3·96	2·51	1·13	161 13	178 23	53 16	**91 47**	13·62	6·77	3·24	0·92	169 23	174 35	54 25	82 50
Mean ...	12·44	5·48	2·23	1·13	162 48	173 56	48 57	84 12	15·95	7·30	3·51	0·94	165 33	175 21	49 41	84 6
Mean of 33 years ...	13·93	5·82	2·56	1·15	164 36	172 45	49 18	84 1	17·83	7·73	3·97	1·02	168 14	173 24	49 42	83 35

Values of μ in thick type are either the second or the last maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 272.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of table 267.*

Unity = 1γ = ·00001 C. G. S.

Years.	March.								April.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	30·78	13·70	5·91	2·21	169 15	176 29	48 38	72 9	33·39	15·28	8·11	2·43	176 18	170 12	46 3	67 29
1873 ...	29·91	12·13	7·06	2·81	174 26	173 17	47 42	78 19	30·21	13·00	7·49	3·17	177 34	175 32	45 11	70 16
1874 ...	22·45	11·92	6·70	2·03	168 34	168 31	45 33	78 33	24·31	11·67	4·28	2·14	164 5	174 4	43 47	67 6
1875 ...	21·44	10·58	5·43	1·49	161 53	169 25	47 59	75 3	22·71	11·30	5·46	2·43	168 51	171 28	48 10	68 16
1876 ...	20·35	9·70	4·74	1·96	170 47	173 6	46 48	73 40	19·11	9·70	3·64	2·12	174 11	175 34	44 30	70 35
1877 ...	15·79	8·50	5·26	1·61	164 56	174 42	47 59	82 10	16·64	9·40	4·91	2·29	168 37	175 14	42 33	73 39
1878 ...	18·14	8·96	4·39	1·28	168 24	169 19	44 17	72 24	19·01	8·85	3·76	1·50	168 6	170 47	43 29	68 20
1879 ...	18·83	9·27	4·36	1·25	170 58	174 9	47 27	72 53	17·99	9·72	4·15	1·83	170 33	172 54	43 35	70 37
1880 ...	19·11	8·92	5·03	1·79	162 32	165 45	41 17	68 4	20·39	10·39	4·37	1·40	168 58	172 46	48 55	67 1
1881 ...	22·80	11·06	6·57	2·30	171 14	170 43	44 22	76 56	21·12	11·82	5·01	1·33	173 44	172 31	44 49	72 56
1882 ...	25·71	12·57	6·53	1·72	171 31	174 1	47 18	76 18	22·45	11·59	4·41	1·63	152 6	171 2	44 34	67 24
Mean ...	22·30	10·66	5·63	1·86	168 35	171 46	46 18	75 8	22·48	11·16	5·05	2·02	169 22	172 55	45 3	69 25
1883 ...	21·99	11·47	4·21	1·04	161 26	173 11	47 49	71 38	25·03	12·74	3·94	2·07	170 48	174 42	44 9	65 39
1884 ...	28·34	14·17	7·53	2·32	172 31	171 37	46 35	79 50	27·65	14·71	6·60	3·12	175 4	175 10	48 2	70 27
1885 ...	23·77	10·27	6·15	1·42	171 35	176 35	46 46	70 40	26·63	12·02	6·12	1·71	165 57	167 30	42 31	68 39
1886 ...	23·60	13·33	6·21	1·35	167 8	176 3	52 30	78 34	19·27	9·55	4·68	1·95	161 22	169 15	46 44	66 27
1887 ...	18·36	9·53	4·31	1·27	161 25	167 56	46 8	71 42	16·12	9·43	3·65	2·05	155 53	172 13	42 50	68 34
1888 ...	17·56	9·31	4·38	1·60	165 35	174 25	47 17	76 0	15·82	8·12	4·19	2·66	158 12	173 41	43 20	68 24
1889 ...	13·30	7·86	3·30	1·59	165 30	172 7	46 53	73 57	18·68	8·76	4·63	1·64	171 53	170 36	41 34	66 52
1890 ...	16·60	8·89	4·85	1·69	169 16	172 20	46 18	78 3	18·15	8·79	3·83	1·58	169 34	172 58	44 43	69 56
1891 ...	19·00	10·53	5·54	1·42	172 10	173 13	47 40	77 56	19·30	10·45	4·74	2·18	162 31	174 15	47 2	67 48
1892 ...	21·72	10·74	6·01	1·40	169 51	170 43	49 48	75 3	22·11	12·91	6·94	2·48	170 9	171 20	45 52	73 5
1893 ...	28·47	12·67	6·73	2·30	176 46	172 8	46 34	78 29	28·12	14·00	4·90	1·95	177 9	173 3	45 52	70 44
Mean ...	21·16	10·80	5·38	1·58	168 28	172 45	47 40	75 37	21·53	11·04	4·93	2·13	167 8	172 15	44 47	68 47
1894 ...	24·29	10·47	6·17	0·69	176 56	173 42	44 50	76 35	26·49	11·90	5·53	2·34	177 2	178 18	45 16	75 21
1895 ...	23·24	12·32	6·03	1·11	166 30	175 8	47 59	87 30	24·54	11·96	5·51	1·95	170 34	170 32	43 26	72 29
1896 ...	22·42	10·69	5·29	1·87	168 36	176 53	44 16	78 31	21·67	11·55	4·92	1·41	170 43	173 28	44 48	70 10
1897 ...	20·84	10·05	5·39	0·82	172 36	175 37	47 10	72 53	18·55	10·46	3·30	1·94	160 38	176 46	44 32	76 13
1898 ...	20·69	7·50	4·28	2·19	165 22	174 15	46 31	74 51	18·92	9·07	3·38	2·11	166 46	177 7	44 22	65 46
1899 ...	17·04	9·19	4·85	1·88	161 46	171 39	46 17	70 39	17·86	10·11	3·46	1·99	167 33	176 19	49 10	66 42
1900 ...	17·42	7·35	4·78	1·00	163 4	173 55	44 1	76 18	15·95	8·36	3·65	1·56	176 25	**180 35**	50 7	74 22
1901 ...	17·73	8·54	4·56	1·92	170 52	170 1	43 45	70 15	18·01	9·05	4·04	1·89	173 32	175 13	48 9	72 45
1902 ...	16·34	9·42	4·92	1·83	166 18	167 7	43 54	74 30	14·79	8·97	4·24	2·03	167 55	172 51	47 12	70 15
1903 ...	17·68	9·49	4·49	1·21	171 49	173 8	46 36	74 19	19·01	10·09	3·28	1·38	164 30	173 17	48 21	66 0
1904 ...	20·77	10·99	5·47	1·73	169 41	171 9	45 31	75 29	19·73	11·62	4·55	1·81	169 2	173 10	47 40	69 26
Mean ...	19·86	9·64	5·11	1·48	168 30	172 58	45 32	75 37	19·59	10·29	4·17	1·86	169 31	175 14	46 38	70 52
Mean of 33 years ...	21·11	10·37	5·37	1·64	168 31	172 30	46 30	75 27	21·20	10·83	4·88	2·00	168 40	173 28	45 29	69 41

TABLE 272.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of table 267.*

Unity = 1γ = ·00001 C. G. S.

Years.	May.								June.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	°					° ′	° ′	° ′	°
1872 ...	31·99	13·65	5·64	0·96	169 36	168 47	40 49	65 48	25·47	12·81	4·28	0·96	171 56	172 9	47 23	28 53
1873 ...	20·67	10·34	3·44	1·37	169 19	168 51	46 14	57 11	19·31	8·82	2·84	0·68	157 40	174 42	67 31	41 37
1874 ...	21·00	9·67	3·56	0·92	168 57	173 42	45 37	72 5	19·51	9·86	2·33	0·75	171 37	173 17	54 12	74 39
1875 ...	17·73	8·39	3·21	0·82	167 31	171 22	48 49	67 23	17·87	9·71	2·60	0·31	164 56	171 25	50 10	48 28
1876 ...	17·07	8·92	3·01	0·75	163 41	168 22	43 16	60 30	15·13	7·89	1·75	0·26	165 52	176 31	53 24	**115 24**
1877 ...	15·20	8·41	3·34	0·92	165 20	176 30	51 24	66 56	15·03	7·66	1·81	0·46	154 43	171 12	42 34	38 49
1878 ...	15·47	7·67	2·69	0·62	167 2	169 8	48 33	74 51	16·33	8·90	2·75	0·19	164 33	168 58	45 41	**110 30**
1879 ...	16·74	8·76	2·58	0·71	164 52	172 38	46 30	69 3	16·07	9·06	2·21	0·18	163 48	171 31	46 15	77 6
1880 ...	16·83	8·38	3·54	0·64	163 40	172 25	44 11	71 12	18·41	9·77	2·98	0·62	164 27	170 53	49 15	86 33
1881 ...	21·80	10·97	3·15	0·63	168 36	170 10	46 10	55 45	24·03	12·05	2·99	0·67	169 18	172 29	53 17	88 19
1882 ...	22·14	12·36	5·15	1·14	171 57	174 27	50 23	81 0	21·86	9·21	2·99	1·09	172 31	166 5	43 47	59 21
Mean ...	19·69	9·77	3·57	0·86	167 19	171 29	46 32	67 26	19·00	9·61	2·68	0·56	165 35	171 45	50 19	70 1
1883 ...	18·39	10·03	3·01	0·38	166 16	171 45	48 16	79 15	22·48	11·47	2·82	0·42	163 5	171 23	48 10	**118 22**
1884 ...	25·35	12·95	4·31	1·09	171 26	172 8	43 43	69 59	24·79	11·47	3·54	0·54	164 16	170 35	46 53	80 1
1885 ...	20·70	8·58	3·10	1·31	166 5	169 53	39 55	68 3	23·65	12·96	3·49	0·83	162 46	170 41	50 38	61 47
1886 ...	15·95	8·82	3·39	0·08	160 2	169 42	46 16	40 28	15·96	8·80	3·02	0·79	161 57	170 42	48 3	85 59
1887 ...	15·61	8·34	2·52	0·72	157 28	169 29	42 43	54 12	15·59	9·22	1·69	0·64	163 34	174 26	57 6	43 35
1888 ...	14·76	8·15	1·79	1·11	158 31	171 28	32 24	64 41	15·60	8·72	2·47	0·58	159 39	171 9	42 42	83 16
1889 ...	13·41	7·22	3·02	0·22	158 15	168 59	46 28	60 8	17·66	9·63	2·51	0·32	160 34	170 9	47 58	70 47
1890 ...	15·78	7·25	2·67	0·69	167 50	170 19	41 47	63 30	14·67	7·81	2·23	0·02	165 57	169 6	49 20	58 6
1891 ...	21·37	10·93	2·35	1·39	156 54	176 7	51 32	73 53	19·95	9·90	1·95	0·24	171 16	176 42	55 22	65 57
1892 ...	25·11	10·09	5·20	0·34	160 54	172 1	48 25	58 40	25·31	12·93	4·03	0·40	167 29	173 15	50 35	85 7
1893 ...	29·10	14·04	4·10	0·65	175 50	173 34	47 10	71 35	29·00	13·74	4·00	0·14	172 23	171 28	52 13	33 50
Mean ...	19·59	9·67	3·22	0·73	163 36	171 24	44 25	64 2	20·42	10·60	2·89	0·45	164 49	171 47	49 55	71 32
1894 ...	24·10	12·58	4·42	1·40	169 25	171 2	43 5	67 32	26·27	13·68	3·90	0·41	165 5	173 0	50 58	67 14
1895 ...	24·62	11·28	3·73	0·57	167 27	169 45	44 15	65 0	23·20	12·30	3·14	0·40	165 36	172 18	48 7	74 59
1896 ...	21·73	11·67	3·66	0·31	163 42	175 57	50 5	**100 49**	19·06	9·69	1·86	1·25	175 35	177 4	50 59	49 58
1897 ...	16·59	8·63	1·84	1·47	165 2	173 56	47 46	65 55	15·29	7·16	1·91	0·71	164 30	177 20	64 15	35 4
1898 ...	16·36	8·59	2·94	0·41	165 32	174 27	49 15	76 59	17·69	9·33	1·94	0·18	164 43	175 39	55 38	49 35
1899 ...	15·23	8·87	2·49	0·65	154 43	169 31	44 32	62 6	16·11	9·03	2·98	0·31	165 12	171 11	47 42	78 19
1900 ...	14·40	8·23	1·70	0·59	161 10	175 23	42 51	57 53	14·82	8·97	2·29	0·13	171 1	171 0	49 6	**95 22**
1901 ...	14·83	8·75	3·03	0·75	173 57	175 18	49 16	73 17	13·19	8·23	2·36	0·30	167 22	171 53	50 19	80 24
1902 ...	15·09	7·61	2·81	0·78	168 21	175 27	46 13	70 24	14·06	8·51	2·83	0·44	166 32	174 35	50 57	77 6
1903 ...	16·66	8·89	2·68	0·72	171 45	175 44	49 36	66 8	16·25	8·75	2·83	0·54	169 28	178 25	56 10	82 59
1904 ...	18·79	10·18	2·32	0·88	162 26	173 4	48 38	66 23	20·67	11·65	2·98	0·42	161 35	171 18	51 18	31 15
Mean ...	18·04	9·57	2·87	0·78	165 46	173 36	46 52	70 13	17·87	9·75	2·64	0·46	166 58	173 58	52 19	65 40
Mean of 33 years ...	19·11	9·67	3·22	0·79	165 34	172 10	45 56	67 14	19·10	9·99	2·74	0·49	165 47	172 30	50 51	69 4

TABLE 272.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of the table 267.*

Unity = 1γ = ·00001 C. G. S.

Years.	July.								August.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	28·60	14·35	2·27	1·53	166 58	167 4	35 15	51 2	25·52	13·26	4·10	1·29	177 24	175 24	51 46	81 25
1873 ...	20·61	11·41	1·93	0·17	171 53	175 31	53 3	76 0	22·20	11·29	3·39	0·46	169 31	177 48	50 16	73 47
1874 ...	19·32	10·42	3·77	1·18	171 39	**181 13**	61 17	87 59	19·00	9·20	4·40	0·86	169 4	**180 43**	52 59	84 33
1875 ...	16·33	7·27	2·20	0·70	166 11	176 7	58 12	**97 47**	15·30	8·12	2·75	0·80	173 59	175 59	53 18	69 42
1876 ...	17·29	9·35	2·19	0·33	168 28	173 9	48 49	68 16	14·34	8·27	2·31	0·47	170 20	178 30	51 30	64 45
1877 ...	15·08	8·82	3·38	0·42	168 38	172 16	58 3	88 36	14·19	7·89	2·36	0·32	169 47	176 27	56 18	88 9
1878 ...	13·82	8·45	2·96	0·27	172 50	177 43	58 6	79 25	14·11	7·56	2·59	0·79	179 7	**186 3**	58 36	89 37
1879 ...	16·36	8·11	2·01	0·07	169 31	174 45	53 7	40 13	13·60	7·48	3·14	0·80	168 58	172 20	51 18	80 46
1880 ...	16·44	7·95	2·13	0·15	169 51	175 40	62 8	**124 21**	17·44	8·23	3·20	1·43	165 21	**185 6**	56 2	75 9
1881 ...	25·09	12·55	3·24	0·97	170 52	175 31	56 21	47 3	20·81	10·88	4·49	1·45	175 47	177 44	54 58	81 59
1882 ...	21·07	9·44	3·92	1·60	179 39	179 18	56 53	84 22	18·48	8·22	4·09	1·19	175 7	**185 0**	58 37	76 51
Mean ...	19·09	9·83	2·73	0·67	170 35	175 18	54 39	76 49	17·73	9·13	3·34	0·90	172 13	179 11	54 9	78 48
1883 ...	22·99	11·06	4·26	0·52	172 27	175 49	61 11	62 15	19·57	10·43	4·92	0·68	178 47	**181 46**	56 53	**95 2**
1884 ...	18·81	9·76	2·98	0·42	166 0	178 40	47 18	71 33	18·39	10·73	4·00	0·77	177 50	**180 54**	56 44	75 21
1885 ...	23·54	11·19	2·77	0·36	171 19	177 37	56 38	**114 14**	18·24	9·69	2·70	0·58	157 48	176 19	53 46	45 18
1886 ...	14·84	7·44	2·39	0·51	165 38	178 53	62 6	**116 31**	12·56	7·90	4·72	0·92	164 6	**186 31**	60 53	**90 2**
1887 ...	16·75	9·25	2·57	0·32	162 43	171 29	50 45	**96 55**	15·44	8·18	3·65	0·30	161 6	175 1	46 8	84 20
1888 ...	14·34	7·88	2·04	0·64	163 59	171 26	49 53	34 49	12·23	7·42	2·45	0·49	164 16	177 35	53 25	88 7
1889 ...	15·40	8·65	3·12	0·43	164 46	175 0	53 17	76 57	15·44	8·38	1·81	0·37	160 2	176 3	52 0	50 27
1890 ...	15·85	8·32	2·17	0·22	169 2	176 34	54 17	71 24	13·72	7·63	3·29	0·82	167 51	176 2	52 28	77 22
1891 ...	22·53	11·47	3·05	0·09	170 37	177 13	53 51	**100 52**	17·63	8·06	2·74	0·56	168 52	177 0	53 10	82 0
1892 ...	22·26	12·96	2·02	0·74	169 35	173 41	64 56	**93 38**	22·67	11·34	4·57	0·93	176 38	171 10	52 29	73 23
1893 ...	27·36	11·80	2·76	0·72	175 51	175 32	52 36	69 52	25·60	11·93	4·38	0·43	177 44	**183 37**	56 39	73 10
Mean ...	19·52	9·98	2·74	0·45	168 22	175 38	55 10	82 38	17·41	9·24	3·57	0·62	168 38	178 22	54 3	75 52
1894 ...	26·22	13·54	3·42	0·72	160 23	177 53	58 15	**118 37**	19·37	11·28	4·48	0·57	158 50	166 55	49 18	**97 47**
1895 ...	20·72	10·37	2·72	0·43	165 21	176 47	54 6	77 10	18·74	9·10	3·54	0·77	172 31	176 42	55 58	70 43
1896 ...	18·93	10·27	3·09	0·85	169 53	**180 52**	56 47	**96 5)**	13·84	7·95	2·74	1·46	165 27	**181 17**	51 14	78 48
1897 ...	16·17	8·68	1·74	0·13	168 12	176 21	52 47	**104 6**	14·46	7·65	2·77	0·91	173 46	**180 22**	52 53	77 47
1898 ...	15·22	9·09	1·97	0·24	169 17	173 29	59 9	**127 27**	11·54	6·30	2·20	0·32	172 0	**181 40**	53 50	70 12
1899 ...	15·92	8·83	2·31	0·65	164 51	176 20	49 31	80 7	14·69	8·30	1·87	0·28	163 33	177 43	52 35	**105 37**
1900 ...	18·47	9·57	2·83	0·38	171 22	176 5	53 21	69 0	15·70	8·37	2·45	0·43	172 12	174 50	49 22	64 5
1901 ...	15·19	8·38	1·93	0·17	166 15	173 27	53 51	87 15	13·62	7·89	2·08	0·26	167 5	173 41	50 55	68 40
1902 ...	12·90	8·06	2·16	0·59	171 50	174 46	51 30	80 56	12·95	7·63	2·62	0·65	178 26	**180 59**	54 26	84 49
1903 ...	16·91	9·64	2·77	0·41	171 6	177 24	56 47	89 44	14·12	8·48	2·87	1·21	164 37	**180 25**	58 31	78 58
1904 ...	19·47	11·69	3·38	0·79	172 10	176 54	55 28	**97 36**	17·07	8·56	3·64	1·66	177 12	**186 17**	54 26	81 18
Mean ...	17·83	9·83	2·57	0·49	168 15	176 23	54 41	93 32	15·10	8·32	2·84	0·77	169 36	178 16	53 3	79 53
Mean of 33 years ...	18·81	9·88	2·68	0·54	169 4	175 46	54 50	84 20	16·75	8·90	3·25	0·76	170 9	178 36	53 45	78 11

TABLE 272.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of table 267.*

Unity = 1γ = ·00001 C. G. S.

Years.	September.								October.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	26·92	12·22	6·07	2·27	179 47	3 6	51 8	69 50	21·10	11·88	8·23	3·56	147 47	173 53	45 5	74 24
1873 ...	20·41	10·46	4·64	1·63	168 58	3 23	52 42	80 13	18·83	8·57	4·27	0·96	157 15	172 26	44 10	75 47
1874 ...	15·87	8·00	5·60	2·66	174 44	2 13	51 13	78 55	13·50	8·21	4·16	2·12	161 44	172 54	43 52	80 49
1875 ...	11·59	6·83	3·74	1·43	158 16	2 15	53 3	77 51	14·04	8·64	3·59	0·97	159 41	167 6	45 35	77 34
1876 ...	10·24	6·37	3·39	1·34	173 33	1 59	52 33	75 19	13·21	7·11	3·60	2·03	162 51	175 55	46 24	83 37
1877 ...	12·02	6·85	3·40	1·48	173 5	0 44	52 20	73 36	15·44	8·44	4·20	1·30	163 46	172 8	47 47	75 18
1878 ...	11·31	6·72	4·32	1·03	166 35	**0 14**	55 30	80 11	13·75	6·70	3·42	1·30	166 9	169 51	39 53	70 45
1879 ...	13·65	7·42	4·22	1·85	172 0	0 16	53 18	78 19	14·84	7·98	3·98	1·70	167 19	171 52	44 38	78 2
1880 ...	16·73	9·35	4·72	1·93	164 15	**1 15**	49 16	75 51	20·40	10·28	5·28	2·40	162 8	174 12	47 50	75 37
1881 ...	18·31	8·92	6·23	2·86	178 17	**1 28**	44 36	72 12	19·59	9·23	5·81	2·30	168 20	173 12	46 51	80 48
1882 ...	17·85	9·08	4·55	1·24	175 17	**1 20**	50 54	75 16	20·39	9·86	4·82	1·62	159 5	173 45	41 28	74 18
Mean ...	15·90	8·38	4·63	1·79	171 21	0 53	51 30	76 8	16·83	8·81	4·67	1·84	161 28	172 29	44 52	77 0
1883 ...	17·98	9·91	4·62	0·89	172 9	**0 56**	55 14	71 45	23·39	11·45	6·79	2·01	175 10	174 4	47 36	77 59
1884 ...	16·34	8·67	4·33	2·07	178 23	2 28	52 30	79 48	19·66	9·43	6·30	2·08	162 16	175 23	47 37	78 33
1885 ...	15·12	8·46	4·92	2·72	164 7	1 36	56 58	78 19	20·88	9·05	5·50	2·46	160 28	177 2	49 8	87 12
1886 ...	12·32	6·73	5·11	1·03	170 40	3 14	55 30	81 25	14·33	7·85	4·54	2·06	156 26	174 43	49 9	81 27
1887 ...	11·04	8·61	4·67	1·43	151 29	**2 48**	51 38	73 9	15·70	7·63	4·09	1·42	158 42	171 32	53 27	70 13
1888 ...	11·32	7·37	3·97	2·18	164 49	5 29	53 10	80 56	13·85	7·79	4·10	1·61	163 38	178 52	52 24	79 34
1889 ...	10·31	7·00	4·08	2·21	164 31	0 11	51 44	80 23	13·32	7·67	4·39	1·44	168 15	175 50	48 7	79 11
1890 ...	13·44	8·06	5·09	1·61	172 23	2 17	54 7	79 49	16·31	9·42	4·70	1·65	157 21	174 35	48 36	82 24
1891 ...	15·78	10·86	5·14	1·72	158 27	**1 30**	53 48	86 30	18·19	10·69	5·40	1·49	165 30	177 15	49 25	85 2
1892 ...	19·44	10·00	5·01	2·08	173 34	2 8	51 25	80 55	21·98	13·08	6·15	2·20	161 47	178 39	52 9	81 5
1893 ...	19·56	11·03	5·90	1·47	174 23	4 8	56 8	85 6	23·68	11·33	5·18	2·20	167 52	173 12	44 32	80 35
Mean ...	14·79	8·79	4·80	1·76	167 43	1 29	53 50	79 50	18·30	9·58	5·19	1·87	163 24	175 33	49 17	80 18
1894 ...	19·97	10·89	4·66	2·29	174 28	5 6	54 13	76 40	21·47	11·82	6·40	1·83	170 35	171 58	46 25	82 52
1895 ...	17·70	11·04	5·45	2·54	174 54	1 58	54 15	77 43	18·96	9·90	5·72	2·29	158 28	171 27	42 37	78 35
1896 ...	16·70	8·53	5·44	2·22	164 1	0 5	50 42	79 5	20·50	10·48	4·78	2·54	163 10	174 55	42 13	74 10
1897 ...	15·33	9·03	4·44	1·74	175 8	4 44	56 33	76 35	14·74	8·33	4·06	2·14	164 0	171 6	47 35	81 38
1898 ...	11·80	6·24	3·68	1·89	176 58	5 51	50 5	81 58	14·46	7·59	3·97	1·45	162 25	174 12	46 36	75 6
1899 ...	11·01	8·48	3·96	1·02	162 51	**0 47**	56 48	77 12	11·93	6·83	3·78	1·30	166 48	174 22	47 45	76 42
1900 ...	12·82	7·64	3·86	1·45	177 16	0 9	49 49	77 41	13·49	7·43	3·90	1·81	169 5	172 32	47 17	77 17
1901 ...	10·99	6·65	3·74	1·73	176 12	1 58	51 10	76 46	12·34	7·49	3·63	1·59	165 55	171 32	45 12	74 59
1902 ...	11·80	6·63	4·04	1·56	181 42	5 37	54 16	80 5	14·39	7·59	4·26	1·89	168 0	173 27	46 47	77 5
1903 ...	10·82	7·95	4·20	1·65	168 3	1 19	51 12	75 56	20·61	11·38	5·75	3·23	151 6	**184 5**	52 10	80 32
1904 ...	13·80	8·59	5·19	2·15	177 47	3 20	53 52	76 57	15·90	8·33	4·10	1·86	164 36	179 12	48 14	80 12
Mean ...	13·89	8·33	4·42	1·84	173 35	2 40	53 0	77 53	16·25	8·83	4·58	1·99	164 1	174 26	46 37	78 6
Mean of 33 years. ...	14·92	8·50	4·62	1·80	170 53	1 41	52 47	77 57	17·13	9·07	4·85	1·90	162 58	174 9	46 55	78 28

TABLE 272.—*Monthly Values of the Amplitude P and of the first Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of the year and for each year, from 1872 to 1904, calculated from the values of p and q of table 267.*

Unity = ·1γ = ·00001 C. G. S.

Years.	November.								December.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	25·18	10·75	4·72	1·37	159 1	170 52	38 35	84 18	23·35	7·30	4·25	1·08	170 49	174 23	47 22	77 19
1873 ...	18·02	7·56	2·44	0·81	158 21	164 51	40 52	81 5	15·74	5·21	2·90	0·21	164 44	169 18	41 11	**92 57**
1874 ...	16·69	7·17	3·05	1·43	159 30	170 0	38 55	63 14	14·90	7·19	2·09	0·37	165 18	169 49	45 27	**106 14**
1875 ...	14·80	7·55	3·21	0·90	157 7	163 6	40 7	71 54	12·12	5·45	2·07	0·29	164 29	162 51	42 57	**93 27**
1876 ...	15·70	8·11	2·90	0·52	154 23	166 43	45 17	78 45	12·82	6·09	1·98	0·38	157 32	168 49	41 52	65 8
1877 ...	12·32	5·88	2·59	0·74	153 2	159 51	45 55	57 4	11·88	4·75	2·06	1·37	162 6	169 10	41 39	72 25
1878 ...	15·80	7·58	3·46	1·33	157 0	165 43	36 5	74 10	11·66	5·32	1·89	1·13	161 24	170 39	48 2	72 56
1879 ...	14·74	6·99	3·72	1·01	157 52	162 30	37 19	71 12	15·40	5·63	2·87	0·83	164 19	160 26	35 25	76 7
1880 ...	16·97	6·84	3·41	0·13	153 42	161 13	39 40	**120 15**	15·38	4·74	1·76	0·57	157 19	170 15	37 48	79 56
1881 ...	18·26	9·38	4·37	1·12	156 51	165 35	41 18	72 22	17·07	6·95	3·16	0·77	159 31	165 47	37 40	76 40
1882 ...	21·30	10·67	3·53	1·26	147 2	168 25	55 57	47 28	15·25	7·26	3·69	0·60	159 29	169 34	45 48	82 39
Mean ...	17·25	8·04	3·40	0·97	155 48	165 21	41 49	74 42	15·05	5·99	2·61	0·69	162 27	168 16	42 17	81 26
1883 ...	24·42	12·55	4·52	1·84	157 41	167 40	42 12	75 7	15·51	7·32	3·36	1·18	168 1	172 18	47 20	79 18
1884 ...	20·38	9·44	4·22	1·17	155 44	168 12	42 8	79 51	13·54	6·29	3·97	1·58	154 4	162 41	48 27	85 42
1885 ...	19·74	7·62	2·85	0·62	158 51	169 14	44 1	82 4	14·25	5·30	2·08	1·07	165 21	175 43	47 17	87 31
1886 ...	17·06	7·23	3·82	0·25	152 50	168 44	39 26	**106 48**	10·97	4·56	1·75	0·63	152 46	169 3	37 36	**91 25**
1887 ...	15·14	7·76	2·93	0·98	153 44	163 32	38 53	75 23	13·78	5·02	1·65	1·19	154 45	170 2	43 39	74 59
1888 ...	12·82	7·43	3·13	0·80	147 13	162 50	39 0	72 2	12·37	4·47	1·47	0·06	156 31	171 33	38 8	69 22
1889 ...	15·42	6·52	2·82	1·57	153 34	174 10	38 9	77 22	9·58	3·82	1·13	0·68	154 20	175 18	36 6	79 0
1890 ...	14·42	8·25	3·22	1·51	152 3	163 30	37 19	68 6	13·77	4·51	2·17	0·41	163 26	161 37	48 45	80 18
1891 ...	20·63	9·96	3·86	1·48	159 15	169 8	45 12	73 52	17·77	6·34	2·63	0·70	155 29	168 31	39 27	78 46
1892 ...	21·75	8·78	4·09	1·17	169 29	173 36	41 4	77 28	15·01	6·00	1·81	0·55	166 5	**181 29**	42 34	**99 48**
1893 ...	20·33	9·28	4·30	0·63	161 39	167 8	40 43	78 35	20·42	8·52	3·35	0·76	163 15	166 25	44 24	**94 59**
Mean ...	18·37	8·62	3·61	1·09	156 33	167 59	40 44	78 47	14·27	5·65	2·31	0·80	159 28	170 25	43 4	83 44
1894 ...	24·73	6·11	5·57	2·08	164 28	166 10	34 51	82 2	16·37	6·38	2·78	0·13	162 54	170 10	44 32	74 25
1895 ...	19·89	9·89	3·00	1·03	151 54	170 31	39 3	53 53	15·20	6·25	1·61	0·61	160 52	170 55	46 48	56 51
1896 ...	16·47	7·76	3·04	0·23	159 59	168 50	41 9	64 45	13·36	6·62	2·69	0·43	157 43	174 24	53 17	86 15
1897 ...	14·36	6·53	3·27	1·19	153 40	161 56	33 42	72 12	17·57	7·08	1·88	0·54	154 23	174 32	33 13	82 39
1898 ...	16·01	7·41	3·43	0·51	151 6	164 56	38 13	86 41	11·92	5·29	2·29	0·73	155 48	165 31	44 3	83 53
1899 ...	14·45	6·45	2·81	0·47	157 41	163 52	39 42	64 27	11·05	5·09	1·62	0·77	155 22	171 46	39 38	81 21
1900 ...	13·47	6·54	2·81	0·89	160 38	160 40	35 5	66 42	11·14	5·13	1·92	0·42	159 48	164 44	39 40	56 53
1901 ...	11·64	5·57	2·80	0·94	157 13	162 25	37 37	71 44	10·80	5·34	2·48	0·67	157 31	163 15	43 32	74 39
1902 ...	14·04	7·00	2·76	0·58	155 27	162 58	37 19	70 37	10·68	5·42	1·88	0·53	162 56	163 43	39 4	71 45
1903 ...	13·66	7·22	3·39	0·33	152 59	164 22	40 7	85 31	13·85	5·16	2·39	0·34	162 56	173 9	43 11	81 34
1904 ...	17·84	7·85	3·68	1·48	151 24	168 9	35 29	73 15	13·51	6·84	2·86	0·23	152 58	163 44	37 46	56 9
Mean ...	16·05	7·12	3·32	0·88	156 3	164 59	37 29	71 59	13·22	5·87	2·22	0·49	158 28	168 43	42 15	73 19
Mean of 33 years ...	17·22	7·93	3·44	0·98	156 8	166 6	40 1	74 49	14·18	5·84	2·38	0·66	160 8	169 8	42 32	79 10

TABLE 273.—*Horizontal Force Magnetograph—Showing the values of the Amplitude P and of the first Maximum μ, reckoned from midnight for the first four orders of Harmonic Components for the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each half-year—April to September—for each of the years from 1872—1904 derived from table 268.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	28·56	13·37	4·92	1·03	173 34	172 28	46 16	66 17
1873 ...	22·12	10·77	3·71	9·30	169 46	176 1	50 37	68 58
1874 ...	19·80	9·72	3·82	1·25	169 37	177 18	51 14	76 39
1875 ...	16·88	8·53	3·28	0·84	167 4	174 14	51 14	71 51
1876 ...	15·49	8·33	2·66	0·74	169 11	175 17	48 29	69 40
1877 ...	14·62	8·12	3·04	0·77	166 39	175 15	50 17	73 29
1878 ...	14·95	7·83	3·02	0·58	169 31	175 2	51 35	77 24
1879 ...	15·71	8·38	2·99	0·84	168 11	173 53	48 56	74 41
1880 ...	17·69	8·87	3·36	0·91	166 8	175 37	50 36	74 0
1881 ...	21·81	11·14	4·05	0·95	172 28	174 19	49 13	72 20
1882 ...	20·38	9·78	4·03	1·10	170 45	175 21	51 2	74 37
1883 ...	21·00	10·85	3·75	0·52	170 28	175 39	53 5	70 9
1884 ...	21·79	11·26	4·20	1·27	171 50	176 9	49 8	73 55
1885 ...	21·19	10·33	3·61	0·92	165 2	173 32	49 29	70 51
1886 ...	15·12	7·97	3·67	0·52	163 35	175 42	53 11	78 45
1887 ...	15·05	8·81	3·03	0·61	159 6	173 17	48 1	67 35
1888 ...	14·25	7·10	2·96	0·94	157 58	172 33	48 25	79 23
1889 ...	15·10	8·20	3·11	0·71	163 38	173 19	48 16	72 50
1890 ...	15·25	7·88	3·11	0·76	168 45	174 38	49 45	73 36
1891 ...	19·33	10·26	3·28	0·86	164 58	176 39	52 1	75 46
1892 ...	22·73	11·61	4·49	1·00	169 26	173 43	50 26	77 31
1893 ...	26·45	12·56	4·23	0·76	175 34	176 29	51 56	74 32
1894 ...	23·57	12·07	4·25	0·91	167 39	175 15	49 39	75 6
1895 ...	21·55	10·95	3·87	1·07	169 7	174 20	49 39	74 6
1896 ...	18·61	9·89	3·55	0·77	168 24	177 48	50 12	76 24
1897 ...	16·00	8·54	2·53	0·84	167 32	178 14	52 55	73 42
1898 ...	15·22	8·03	2·61	0·65	168 33	177 23	51 0	72 11
1899 ...	15·10	8·87	2·77	0·65	163 17	175 1	50 26	71 35
1900 ...	15·30	8·47	2·77	0·66	171 32	176 14	49 36	72 34
1901 ...	14·27	8·11	2·85	0·83	170 46	175 2	50 16	74 54
1902 ...	13·53	7·81	3·07	[illegible]93	172 2	176 58	50 38	76 0
1903 ...	15·61	8·92	3·04	0·87	168 16	177 34	53 11	74 36
1904 ...	18·14	10·21	3·63	0·93	169 26	176 41	52 4	76 26
1872—1882...	18·90	9·53	3·51	0·89	169 43	174 54	49 52	72 33
1883—1893...	18·75	9·77	3·54	0·79	167 30	174 59	50 22	73 41
1894—1904...	16·98	9·25	3·17	0·82	168 41	176 21	50 46	74 32
1872—1904...	18·20	9·51	3·41	0·88	168 38	175 23	50 18	73 13

TABLE 274.—*Horizontal Force Magnetograph—Showing the mean values of the Amplitude P and of the first Maximum μ, reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each half-year—January to March and October to December—for each of the years from 1872—1904 derived from table 269.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	26·07	9·19	5·88	1·19	166 3	172 12	46 14	78 50
1873 ...	21·39	9·26	4·34	1·36	167 18	173 14	45 56	81 16
1874 ...	18·06	8·08	4·17	1·08	165 52	169 50	44 24	77 30
1875 ...	15·64	7·74	3·24	0·83	162 21	169 23	47 19	77 6
1876 ...	15·36	7·32	3·37	1·09	163 19	171 14	46 12	78 4
1877 ...	13·77	6·53	3·30	1·07	163 0	170 27	47 15	75 54
1878 ...	13·75	6·17	2·76	1·02	164 56	169 21	42 3	72 43
1879 ...	14·65	6·43	3·21	0·92	166 29	168 43	44 15	78 6
1880 ...	17·10	7·27	3·59	0·98	162 57	169 35	44 25	76 50
1881 ...	19·00	8·33	4·52	1·38	165 55	170 11	44 48	79 2
1882 ...	18·54	8·91	4·22	0·82	162 37	171 26	47 57	73 31
1883 ...	20·02	9·74	4·29	1·26	167 44	172 21	47 8	79 20
1884 ...	19·76	9·54	5·27	1·67	166 5	170 18	47 40	82 52
1885 ...	19·11	7·78	3·96	1·27	166 17	174 18	48 7	83 9
1886 ...	16·47	7·62	3·35	0·80	159 42	173 19	48 35	86 0
1887 ...	14·74	6·80	2·74	1·06	158 8	170 0	48 19	76 12
1888 ...	13·99	7·82	2·65	0·90	161 17	174 52	46 47	73 24
1889 ...	12·73	6·14	2·60	1·10	163 31	174 21	41 56	78 19
1890 ...	14·30	6·79	3·33	0·98	162 33	169 52	46 37	78 35
1891 ...	16·98	7·64	3·70	1·95	164 35	171 53	45 47	82 51
1892 ...	19·85	9·78	4·24	1·52	165 24	175 39	50 4	80 29
1893 ...	21·84	9·89	4·61	1·36	169 23	172 29	46 40	81 5
1894 ...	21·06	8·45	4·52	1·05	170 31	172 26	44 48	81 50
1895 ...	18·79	8·89	3·75	0·81	160 35	173 54	45 34	81 5
1896 ...	17·38	8·48	3·69	1·08	161 41	175 18	44 57	80 22
1897 ...	16·99	7·85	3·36	1·21	163 25	172 37	45 17	78 42
1898 ...	15·07	6·39	3·20	0·99	159 58	171 34	44 29	79 4
1899 ...	12·49	6·40	2·84	0·84	159 43	172 48	48 19	76 36
1900 ...	13·52	6·26	2·96	0·87	163 10	170 11	44 32	79 3
1901 ...	13·04	6·32	3·09	1·10	164 57	168 12	43 31	73 41
1902 ...	12·89	6·62	2·94	0·99	164 13	168 10	44 32	76 37
1903 ...	14·64	7·09	3·32	1·07	161 6	174 6	46 27	79 21
1904 ...	15·20	7·33	3·43	1·08	161 49	172 8	45 35	79 7
1872—1882...	17·56	7·74	3·86	1·06	164 47	170 39	45 37	77 26
1883—1893...	17·25	8·06	3·72	1·16	164 14	172 30	47 36	80 27
1894—1904...	15·52	7·26	3·37	1·00	163 3	172 9	45 15	78 45
1872—1904...	16·78	7·69	3·64	1·07	164 5	171 46	46 10	78 52

TABLE 275.—*Horizontal Force Magnetograph—Showing Mean Yearly Values of the Amplitude P and of the first Maximum μ reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each year from 1872 to 1904, derived by averaging the values of P and μ for all the months of the year.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	27·51	11·54	5·51	1·70	169 15	171 33	45 39	74 21
1873 ...	21·89	10·13	4·17	1·32	167 35	174 14	48 42	74 43
1874 ...	18·97	8·95	4·10	1·36	167 36	173 41	47 46	79 21
1875 ...	16·29	8·25	3·33	0·98	164 30	171 41	49 31	75 25
1876 ...	15·48	7·89	3·05	1·02	166 3	173 29	47 25	76 12
1877 ...	14·23	7·42	3·26	1·09	164 43	172 43	48 43	72 52
1878 ...	14·40	7·12	3·00	0·88	167 17	172 12	47 7	70 58
1879 ...	15·22	7·49	3·21	0·97	167 32	171 27	46 47	73 59
1880 ...	17·46	8·19	3·58	1·10	164 35	172 55	47 46	76 56
1881 ...	20·48	9·79	4·39	1·37	169 13	172 42	47 17	74 22
1882 ...	19·71	9·46	4·26	1·23	167 0	173 44	48 51	73 27
1883 ...	20·62	10·35	4·13	1·11	169 22	174 20	49 49	81 10
1884 ...	21·02	10·46	4·74	1·57	168 27	173 20	48 33	79 33
1885 ...	20·28	9·19	3·92	1·32	165 13	173 41	49 0	77 25
1886 ...	15·86	7·93	3·71	0·96	161 17	174 32	50 30	85 21
1887 ...	14·92	7·86	3·00	1·03	158 19	172 17	48 30	73 29
1888 ...	14·19	7·57	2·97	1·13	159 36	173 43	46 39	74 0
1889 ...	13·99	7·22	2·95	1·01	163 20	173 48	46 39	72 40
1890 ...	14·84	7·44	3·32	0·95	165 31	171 43	48 0	75 3
1891 ...	18·26	8·99	3·55	1·16	164 52	174 4	48 35	78 28
1892 ...	21·36	10·77	4·53	1·39	167 24	174 55	50 29	80 5
1893 ...	24·20	11·39	4·52	1·16	172 14	174 38	49 13	74 53
1894 ...	22·44	10·40	4·56	1·20	168 54	173 43	47 37	82 15
1895 ...	20·22	9·99	3·91	1·19	164 52	174 16	47 50	74 22
1896 ...	18·05	9·21	3·69	1·26	164 35	176 39	48 3	80 4
1897 ...	16·60	8·27	3·12	1·21	165 22	175 13	48 34	75 38
1898 ...	15·20	7·31	2·98	0·98	164 58	174 36	47 59	79 21
1899 ...	13·84	7·71	2·94	0·93	161 25	174 8	49 8	78 1
1900 ...	14·46	7·44	2·94	0·94	167 13	173 9	46 50	74 24
1901 ...	13·69	7·27	2·99	0·99	167 39	171 34	47 3	75 45
1902 ...	13·26	7·30	3·07	1·02	168 23	172 49	47 36	76 43
1903 ...	15·21	8·12	3·26	1·04	164 9	175 24	48 38	78 6
1904 ...	16·79	8·92	3·66	1·25	165 47	174 56	48 50	73 33
1872—1882...	18·33	8·75	3·81	1·18	166 51	172 46	47 47	74 47
1883—1893...	18·14	9·02	3·76	1·27	165 3	173 44	48 43	77 28
1894—1904...	16·34	8·36	3·37	1·09	165 45	174 13	48 1	77 7
1872—1904...	17·60	8·68	3·65	1·15	165 53	173 34	48 10	76 27

TABLE 275*a*.—*Horizontal Force Magnetograph—Showing Mean Yearly Values of the Amplitude P and of the first Maximum μ reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each year from 1872 to 1904, derived from the Inequality for each year.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	°	° ′
1872 ...	27·25	11·27	5·41	1·00	169 58	172 22	46 14	73 3
1873 ...	21·73	10·02	4·00	1·04	168 31	174 41	48 8	76 29
1874 ...	18·91	8·83	3·94	1·17	167 52	173 54	47 45	77 8
1875 ...	16·25	8·10	3·23	0·82	164 47	171 54	49 17	74 23
1876 ...	15·41	7·80	3·02	0·88	166 15	173 27	47 15	74 37
1877 ...	14·15	7·30	3·15	0·92	164 43	173 5	48 41	74 34
1878 ...	14·32	6·97	2·80	0·76	167 18	172 33	47 2	74 48
1879 ...	15·16	7·39	3·08	0·86	167 26	171 39	46 35	76 28
1880 ...	17·37	8·03	3·43	0·94	164 32	172 56	47 25	75 28
1881 ...	20·38	9·70	4·25	1·12	169 27	172 33	46 55	76 16
1882 ...	19·41	9·32	4·10	0·96	166 55	173 29	49 25	73 53
1883 ...	20·51	10·27	3·97	0·86	169 11	174 6	49 53	76 36
1884 ...	20·74	10·35	4·73	1·39	169 8	173 30	48 21	79 0
1885 ...	20·14	9·03	3·77	0·98	165 36	173 53	48 45	77 52
1886 ...	15·78	7·78	3·48	0·64	161 35	174 31	50 55	83 25
1887 ...	14·89	7·80	2·88	0·78	158 38	171 48	48 15	72 52
1888 ...	14·12	7·45	2·80	0·91	159 42	173 49	47 38	76 33
1889 ...	13·90	7·18	2·86	0·88	163 37	173 45	47 14	76 0
1890 ...	14·74	7·31	3·21	0·84	165 40	172 23	48 9	76 36
1891 ...	18·16	8·92	3·45	0.97	164 48	174 38	48 42	77 28
1892 ...	21·29	10·69	4·39	1·27	167 32	174 38	50 15	79 8
1893 ...	24·10	11·20	4·36	1·05	172 49	174 41	49 10	78 14
1894 ...	22·30	10·24	4·33	0·96	168 58	174 7	47 9	78 40
1895 ...	20·13	9·89	3·77	0·92	165 7	174 14	47 44	77 13
1896 ...	17·96	9·17	3·59	0·91	165 7	176 39	47 29	78 34
1897 ...	16·47	8·15	2·90	1·01	165 25	175 35	48 35	76 54
1898 ...	15·08	7·17	2·87	0·80	164 18	174 46	47 21	76 8
1899 ...	13·78	7·64	2·79	0·73	161 43	174 2	49 13	74 29
1900 ...	14·37	7·32	2·84	0·74	167 37	173 37	47 2	76 8
1901 ...	13·62	7·17	2·93	0·96	167 59	172 3	46 44	74 5
1902 ...	13·19	7·14	2·98	0·97	168 16	173 1	47 42	76 19
1903 ...	15·10	7·99	3·14	0·94	164 45	176 4	49 40	77 11
1904 ...	16·62	8·74	3·48	1·01	166 0	174 46	48 51	78 0
1872—1882...	18·21	8·61	3·66	0·96	167 21	173 0	47 39	75 16
1883—1893...	17·99	8·91	3·62	0·95	165 56	173 51	48 56	77 42
1894—1904...	16·23	8·23	3·23	0·90	166 1	174 31	47 57	76 47
1872—1904...	17·47	8·58	3·50	0·95	166 26	173 47	48 12	76 19

TABLE 276.—*Summary of Monthly Values of the Amplitude P, and of the first Maximum μ reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of different group of year by different methods of treatment.*

Unity = 1γ = ·00001 C. G. S.

Period.	Method of treatment.	January.								February.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 to 1882 ...	Analysis of the average period ...	15·21	5·79	2·86	1·02	168 8	173 13	48 11	83 51	19·36	7·52	4·44	0·66	170 0	171 27	48 32	81 29
,, ,, ,, ...	Average of the analysis for the period ...	15·24	5·87	2·90	1·16	168 20	172 34	48 15	82 25	19·42	7·74	4·46	0·87	169 9	170 20	48 32	84 25
,, ,, ,, ...	Difference	−0·03	−0·08	−0·04	−0·14	−0 12	+0 39	−0 4	+1 26	−0·06	−0·22	−0·02	−0·21	+0 51	+1 7	0 0	−2 56
1883 to 1893 ...	Analysis of the average period ...	14·00	6·07	2·53	1·03	162 50	172 15	50 36	85 34	18·04	8·09	3·85	1·12	170 27	175 1	51 28	83 5
,, ,, ,, ...	Average of the analysis for the period ...	14·10	6·12	2·56	1·16	162 41	171 46	50 41	85 26	18·11	8·14	3·95	1·26	169 59	174 30	50 54	82 15
,, ,, ,, ...	Difference	−0·10	−0·05	−0·03	−0·13	+0 9	+0 29	+0 5	+0 8	−0·07	−0·05	−0·10	−0·14	+0 28	+0 31	+0·34	+0 50
1894 to 1904 ...	Analysis of the average period	12·39	5·45	2·15	1·00	162 49	174 12	48 45	85 14	15·88	7·25	3·42	0·82	166 7	175 33	49 59	84 48
,, ,, ,, ...	Average of the analysis for the period ...	12·44	5·48	2·23	1·13	162 48	173 56	48 57	84 12	15·95	7·30	3·51	0·94	165 33	175 21	49 41	84 6
,, ,, ,, ...	Difference	−0·05	−0·03	−0·08	−0·13	+0 1	+0 16	−0 12	+1 2	−0·07	−0·05	−0·09	−0·12	+0 34	+0 12	+0 18	+0 42
1872 to 1904 ...	Analysis of the average period ...	13·85	5·76	2·51	1·01	164 46	173 12	49 10	84 59	17·75	7·60	3·90	0·87	169 0	174 0	49 55	83 4
,, ,, ,, ...	Average of the analysis for the period...	13·93	5·82	2·56	1·15	164 36	172 45	49 18	84 1	17·83	7·73	3·97	1·02	168 14	173 24	49 42	83 35
,, ,, ,, ...	Difference	−0·08	−0·06	−0·05	−0·14	+0 10	+0 27	−0 8	+0 58	−0·08	−0·13	−0·07	−0·15	+0 46	+0 36	+0 13	−0 31

Period.	Method of treatment.	March.								April.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period ...	22·25	10·60	5·60	1·80	169 0	171 57	46 21	75 23	22·32	11·14	5·04	2·00	169 50	172 50	45 12	69 30
,, ,, ,, ...	Average of the analysis for the period ...	22·30	10·66	5·63	1·86	168 35	171 46	46 18	75 8	22·48	11·16	5·05	2·02	169 22	172 55	45 3	69 25
,, ,, ,, ...	Difference	−0·05	−0·06	−0·03	−0·06	+0 25	+0 11	+0 3	+0 15	−0·16	−0·02	−0·01	−0·02	+0 28	−0 5	+0 9	+0 5
1883 to 1893 ...	Analysis of the average period ...	21·09	10·75	5·36	1·54	169 0	172 50	47 44	76 0	21·37	11·00	4·90	2·07	168 10	172 21	44 59	68 49
,, ,, ,, ...	Average of the analysis for the period ...	21·16	10·80	5·38	1·58	168 28	172 45	47 40	75 37	21·53	11·04	4·93	2·13	167 8	172 15	44 47	68 47
,, ,, ,, ...	Difference	−0·07	−0·05	−0·02	−0·04	+0 32	+0 5	+0 4	+0 23	−0·16	−0·04	−0·03	−0·06	+1 2	+0 6	+0 12	+0 2
1894 to 1904 ...	Analysis of the average period ...	19·80	9·61	5·08	1·42	168 47	173 1	45 33	75 9	19·54	10·22	4·13	1·79	169 46	175 7	46 26	71 2
,, ,, ,, ...	Average of the analysis for the period ...	19·86	9·64	5·11	1·48	168 30	172 58	45 32	75 37	19·59	10·29	4·17	1·86	169 31	175 14	46 38	70 52
,, ,, ,, ...	Difference	−0·06	−0·03	−0·03	−0·06	+0 17	+0 3	+0 1	−0 28	−0·05	−0·07	−0·04	−0·07	+0 15	−0 7	−0 12	+0 10
1872 to 1904 ...	Analysis of the average period ...	21·05	10·32	5·35	1·58	168 56	172 36	46 36	75 29	21·08	10·78	4·68	1·97	169 15	173 23	45 28	69 44
,, ,, ,, ...	Average of the analysis for the period ...	21·11	10·37	5·37	1·64	168 31	172 30	46 30	75 27	21·20	10·83	4·88	2·00	168 40	173 28	45 29	69 41
,, ,, ,, ...	Difference	−0·06	−0·05	−0·02	−0·06	+0 25	+0 6	+0 6	+0 2	−0·12	−0·05	−0·20	−0·03	+0 35	−0 05	−0 1	+0 3

Period.	Method of treatment.	May.								June.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period ...	19·68	9·75	3·52	0·80	167 42	171 24	46 21	67 5	18·92	9·57	2·53	0·06	166 13	171 44	50 11	51 55
,, ,, ,, ...	Average of the analysis for the period ...	19·69	9·77	3·57	0·86	167 19	171 29	46 32	67 26	19·00	9·61	2·68	0·56	165 35	171 45	50 19	70 1
,, ,, ,, ...	Difference	−0·01	−0·02	−0·05	−0·06	+0 23	−0 5	−0 11	−0 21	−0·08	−0·04	−0·15	−0·50	+0 38	−0 1	−0 8	−18 6
1883 to 1893 ...	Analysis of the average period ...	19·47	9·66	3·14	0·66	164 34	171 42	45 1	67 22	20·38	10·56	2·85	0·18	165 20	171 48	49 42	73 10
,, ,, ,, ...	Average of the analysis for the period ...	19·59	9·67	3·22	0·73	163 36	171 24	44 25	64 2	20·42	10·60	2·89	0·45	164 49	171 47	49 55	71 32
,, ,, ,, ...	Difference	−0·12	−0·01	−0·08	−0·07	+0 58	+0 18	+0 36	+3 20	−0·04	−0·04	−0·04	−0·27	+0 31	+0 1	−0 13	+1 38
1894 to 1904 ...	Analysis of the average period ...	17·98	9·54	2·86	0·71	165 58	173 26	46 46	67 27	17·84	9·70	2·57	0·13	166 49	173 44	51 42	61 30
,, ,, ,, ...	Average of the analysis for the period ...	18·04	9·57	2·87	0·78	165 46	173 36	46 52	70 13	17·87	9·75	2·64	0·46	166 58	173 58	52 19	65 40
,, ,, ,, ...	Difference	−0·06	−0·03	−0·01	−0·07	+0 12	−0 10	−0 6	−2 46	−0·03	−0·05	−0·07	−0·33	−0 9	−0 14	−0 37	−4 10
1872 to 1904 ...	Analysis of the average period ...	19·03	9·64	3·17	0·72	166 5	172 11	46 4	67 21	19·04	9·95	2·64	0·14	166 5	172 24	50 31	73 46
,, ,, ,, ...	Average of the analysis for the period ...	19·11	9·67	3·22	0·79	165 34	172 10	45 56	67 14	19·10	9·99	2·74	0·49	165 47	172 30	50 51	69 4
,, ,, ,, ...	Difference	−0·08	−0·03	−0·05	−0·07	+0 31	+0 1	+0 8	+0 7	−0·06	−0·04	−0·10	−0·35	+0 18	−0 6	−0 20	+4 42

TABLE 276.—*Summary of Monthly Values of the Amplitude P, and of the first Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Horizontal Force at Bombay (Colaba) for each month of different groups of years by different methods of treatment.*

Unity = 1γ = ·00001 C. G. S.

Period.	Method of treatment.	July.								August.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 to 1882 ...	Analysis of the average period ...	19·06	9·73	2·57	0·21	170 33	174 56	55 38	77 29	17·69	9·03	3·31	0·82	172 26	178 56	54 7	79 7
,, ,, ,, ...	Average of the analysis for the period ...	19·09	9·83	2·73	0·67	170 35	175 18	54 39	76 49	17·73	9·13	3·34	0·90	172 13	179 11	54 9	78 48
,, ,, ,, ...	Difference	−0·03	−0·10	−0·16	−0·46	−0 2	−0 22	+0 59	+0 40	−0·04	−0·10	−0·03	−0·08	+0 13	−0 15	−0 2	+0 19
1883 to 1893 ...	Analysis of the average period ...	19·48	9·94	2·64	0·08	169 6	175 37	55 9	81 27	17·20	9·14	3·50	0·39	169 47	178 26	54 30	79 27
,, ,, ,, ...	Average of the analysis for the period ...	19·52	9·98	2·74	0·45	168 22	175 38	55 10	82 38	17·41	9·24	3·57	0·62	168 38	178 22	54 3	75 52
,, ,, ,, ...	Difference	−0·04	−0·04	−0·10	−0·37	+0 44	−0 1	−0 1	−1 11	−0·21	−0·10	−0·07	−0·23	+1 9	+0 4	+0 27	+3 35
1894 to 1904 ...	Analysis of the average period ...	17·78	9·81	2·55	0·25	167 49	176 34	54 57	0 45	15·00	8·20	2·81	0·64	169 20	177 48	53 2	79 1
,, ,, ,, ...	Average of the analysis for the period...	17·83	9·83	2·57	0·49	168 15	176 23	54 41	93 32	15·10	8·32	2·84	0·77	169 36	178 16	53 3	79 53
,, ,, ,, ...	Difference	−0·05	−0·02	−0·02	−0·24	−0 26	+0 11	+0 16	−2 47	−0·10	−0·12	−0·03	−0·13	−0 16	−0 28	−0 1	−0 52
1872 to 1904 ...	Analysis of the average period ...	18·76	9·82	2·59	0·34	169 12	175 42	55 18	71 46	16·62	8·78	3·21	0·62	170 38	178 26	53 57	79 17
,, ,, ,, ...	Average of the analysis for the period ...	18·81	9·88	2·68	0·54	169 4	175 46	54 50	84 20	16·75	8·90	3·25	0·76	170 9	178 36	53 45	78 11
,, ,, ,, ...	Difference	−0·05	−0·06	−0·09	−0·20	+0 8	−0 4	+0 28	+12 34	−0·13	−0·12	−0·04	−0·14	+0 29	−0 10	+0 12	+1 6

Period.	Method of treatment.	September.								October.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period ...	15·81	8·37	4·57	1·74	172 16	180 57	51 10	75 46	16·74	8·79	4·64	1·78	161 2	172 35	45 3	77 12
,, ,, ,, ...	Average of the analysis for the period ...	15·90	8·38	4·63	1·79	171 21	180 53	51 30	76 8	16·83	8·81	4·67	1·84	161 28	172 29	44 52	77 0
,, ,, ,, ...	Difference	−0·09	−0·01	−0·06	−0·05	+0 55	+0 4	−0 20	−0 22	−0·09	−0·02	−0·03	−0·06	−0 26	+0 6	+0 11	+0 12
1883 to 1893 ...	Analysis of the average period ...	14·66	8·75	4·77	1·70	168 39	181 25	53 56	80 7	18·22	9·56	5·16	1·81	163 49	175 36	49 6	80 37
,, ,, ,, ...	Average of the analysis for the period ...	14·79	8·79	4·80	1·76	167 43	181 29	53 50	79 50	18·30	9·58	5·19	1·87	163 24	175 33	49 17	80 18
,, ,, ,, ...	Difference	−0·13	−0·04	−0·03	−0·16	+0 56	−0 4	+0 6	+0 17	−0·08	−0·02	−0·03	−0·06	+0 25	+0 3	−0 11	+0 19
1894 to 1904 ...	Analysis of the average period ...	13·81	8·31	4·39	1·83	173 38	182 39	53 4	77 50	16·18	8·75	4·54	1·94	164 36	174 42	46 30	78 15
,, ,, ,, ...	Average of the analysis for the period ...	13·89	8·33	4·42	1·84	173 35	182 40	53 0	77 53	16·25	8·83	4·58	1·99	164 1	174 26	46 37	78 6
,, ,, ,, ...	Difference	−0·08	−0·02	−0·03	−0·01	+0 3	−0 1	+0 4	−0 3	−0·07	−0·08	−0·04	−0·05	−0 25	+0 16	−0 7	+0 9
1872 to 1904 ...	Analysis of the average period ...	14·75	8·48	4·58	1·75	171 29	181 39	52 46	77 55	17·04	9·01	4·75	1·84	162 53	174 20	46 59	78 39
,, ,, ,, ...	Average of the analysis for the period ...	14·86	8·50	4·62	1·80	170 53	181 41	52 47	77 57	17·13	9·07	4·81	1·90	162 58	174 9	46 55	78 28
,, ,, ,, ...	Difference	−0·11	−0·02	−0·04	−0·05	+0 36	−0 2	−0 1	−0 2	−0·09	−0·06	−0·06	−0·06	−0 5	+0 11	+0 4	+0 11

Period.	Method of treatment.	November.								December.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period ...	17·21	7·99	3·27	0·69	155 47	165 49	41 29	70 28	15·01	5·93	2·55	0·59	162 54	168 27	42 32	77 12
,, ,, ,, ...	Average of the analysis for the period ...	17·25	8·04	3·40	0·97	155 48	165 21	41 49	74 42	15·05	5·99	2·61	0·69	162 27	168 16	42 17	80 26
,, ,, ,, ...	Difference	−0·04	−0·05	−0·13	−0·28	−0 1	+0 28	−0 20	−4 14	−0·04	−0·06	−0·06	−0·10	+0 27	+0 11	+0 15	−3 14
1883 to 1893 ...	Analysis of the average period ...	18·29	8·57	3·58	1·03	157 19	167 55	41 0	75 30	14·21	5·54	2·26	0·71	159 55	170 18	44 3	83 48
,, ,, ,, ...	Average of the analysis for the period ...	18·37	8·62	3·61	1·09	156 33	167 59	40 44	78 47	14·27	5·65	2·31	0·80	159 28	170 25	43 4	83 44
,, ,, ,, ...	Difference	−0·08	−0·05	−0·03	−0·06	+0 46	−0 4	+0 16	−3 17	−0·06	−0·11	−0·05	−0·09	+0 27	−0 7	+0 59	+0 4
1894 to 1904 ...	Analysis of the average period ...	16·00	7·08	3·30	0·73	156 17	165 19	37 11	73 4	13·20	5·79	2·14	0·37	158 29	168 55	42 34	75 14
,, ,, ,, ...	Average of the analysis for the period ...	16·05	7·12	3·32	0·88	156 3	164 59	37 29	71 59	13·22	5·87	2·22	0·49	158 28	168 43	42 15	73 19
,, ,, ,, ...	Difference	−0·05	−0·04	−0·02	−0·15	+0 14	+0 20	+0 18	+1 5	−0·02	−0·08	−0·08	−0·12	+0 1	+0 12	+0 19	+1 55
1872 to 1904 ...	Analysis of the average period ...	17·17	7·88	3·37	0·80	156 29	166 28	39 51	73 28	14·13	5·76	2·32	0·53	160 33	169 12	42 59	79 39
,, ,, ,, ...	Average of the analysis for the period ...	17·22	7·93	3·44	0·98	156 8	166 6	40 1	74 49	14·18	5·84	2·38	0·66	160 8	169 8	42 32	79 10
,, ,, ,, ...	Difference	−0·05	−0·05	−0·07	−0·18	+0 21	+0 22	−0 10	−1 21	−0·05	−0·08	−0·06	−0·13	+0 25	+0 4	+0 27	+0 29

TABLE 277.—*Grubb's Horizontal Force Magnetometer—Showing Mean Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each of the years from 1848 to 1872, derived from the Inequality of each year.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1848 ...	+24·97	+7·31	+8·55	+6·98	+4·22	+1·86	+2·21	+0·57
1849 ...	+23·36	+6·72	+7·24	+6·57	+4·13	+1·68	+1·78	+0·62
1850 ...	+19·75	+3·66	+6·63	+7·27	+3·19	+2·24	+1·78	+0·43
1851 ...	+19·80	+2·04	+6·86	+8·16	+3·21	+3·10	+1·32	+0·81
1852 ...	+16·98	−1·96	+6·27	+7·37	+2·97	+2·02	+1·47	+0·92
1853 ...	+19·12	−0·59	+6·22	+8·43	+2·52	+2·51	+1·77	+0·64
1854 ...	+16·01	−1·02	+5·22	+6·51	+2·15	+2·28	+1·80	+1·01
1855 ...	+14·91	0·00	+4·72	+6·32	+2·07	+1·60	+1·41	+0·84
1856 ...	+17·57	−0·49	+5·85	+5·92	+2·69	+1·32	+1·62	+0·88
1857 ...	+18·75	+1·37	+5·58	+7·05	+2·75	+1·91	+1·23	+0·86
1858 ...	+23·92	+2·01	+7·74	+8·29	+3·72	+2·49	+1·42	+0·99
1859 ...	+30·21	+4·58	+8·92	+10·29	+4·20	+2·42	+2·15	+1·37
1860 ...	+27·82	+5·19	+8·97	+9·95	+4·30	+2·63	+2·06	+1·19
1861 ...	+25·50	+4·88	+8·47	+9·05	+3·85	+2·89	+1·83	+0·90
1862 ...	+23·12	+2·52	+7·80	+8·32	+3·28	+2·49	+1·29	+0·86
1863 ...	+21·04	+0·25	+7·35	+7·42	+3·01	+2·25	+1·33	+0·92
1864 ...	+19·07	−0·73	+6·87	+6·67	+2·97	+1·99	+1·65	+0·63
1865 ...	+18·31	−1·19	+5·84	+6·95	+2·60	+1·53	+1·67	+1·08
1866 ...	+18·54	−2·74	+7·26	+5·84	+2·49	+1·02	+1·32	+0·47
1867 ...	+17·75	−0·69	+7·18	+5·25	+3·13	+1·63	+1·32	+0·52
1868 ...	+17·61	+0·90	+5·97	+5·17	+2·73	+1·85	+0·77	+0·78
1869 ...	+22·63	+4·07	+7·54	+6·73	+3·12	+2·46	+0·62	+1·22
1870 ...	+32·01	+9·21	+9·78	+9·35	+4·65	+3·46	+0·93	+1·47
1871 ...	+29·78	+9·22	+10·04	+8·59	+4·24	+3·31	+0·92	+0·87
1872 ...	+26·66	+7·83	+9·77	+7·12	+4·23	+3·17	+1·22	+0·88
1850—1860...	+20·44	+1·34	+6·63	+7·78	+3·07	+2·23	+1·64	+0·90
1861—1871...	+22·31	+2·34	+7·65	+7·21	+3·28	+2·26	+1·24	+0·88
1850—1871...	+21·41	+1·82	+7·16	+7·51	+3·20	+2·25	+1·45	+0·89

TABLE 278.—*Grubb's Horizontal Force Magnetometer—Showing Mean Values of the Amplitude P and of the first Maximum μ, reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each of the years from 1848 to 1872, derived from table 277.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1848 ...	26·02	11·04	4·61	2·28	171 4	174 22	42 41	68 22
1849 ...	24·31	9·78	4·46	1·88	170 48	175 52	42 8	69 33
1850 ...	20·09	9·84	3·90	1·83	165 15	178 34	46 27	68 9
1851 ...	19·90	10·66	4·46	1·55	160 38	179 44	49 25	72 38
1852 ...	17·09	9·68	3·59	1·73	148 10	179 34	46 9	72 46
1853 ...	19·12	10·48	3·56	1·88	152 59	181 33	49 43	69 43
1854 ...	16·04	8·35	3·13	2·06	151 6	180 24	50 19	72 5
1855 ...	14·91	7·89	2·62	1·64	154 45	181 23	47 19	72 27
1856 ...	17·58	8·32	3·00	1·84	153 9	177 25	43 28	71 53
1857 ...	18·80	8·99	3·35	1·50	158 56	180 34	46 21	73 30
1858 ...	24·00	11·34	4·48	1·73	159 33	178 14	46 1	73 28
1859 ...	30·55	13·62	4·85	2·55	163 22	179 18	44 44	72 53
1860 ...	28·30	13·40	5·04	2·38	165 19	178 44	45 14	72 15
1861 ...	25·96	12·40	4·81	2·04	165 35	178 12	47 3	71 18
1862 ...	23·26	11·40	4·12	1·55	160 58	178 11	47 9	73 10
1863 ...	21·04	10·44	3·76	1·62	155 26	177 23	47 1	73 25
1864 ...	19·08	9·57	3·57	1·77	152 33	176 50	46 1	69 59
1865 ...	18·35	9·08	3·02	1·99	151 2	179 44	44 55	72 58
1866 ...	18·74	9·32	2·69	1·40	146 21	174 10	42 11	69 39
1867 ...	17·76	8·89	3·53	1·42	152 31	172 50	43 55	70 8
1868 ...	17·63	7·90	3·30	1·10	157 41	175 12	46 7	76 6
1869 ...	22·99	10·11	3·97	1·37	164 57	175 38	47 30	80 31
1870 ...	33·31	13·53	5·80	1·74	170 48	176 37	46 58	79 10
1871 ...	31·17	13·22	5·38	1·27	171 57	175 2	47 25	75 36
1872 ...	27·79	12·09	5·29	1·50	171 7	172 48	47 2	73 42
1850—1860...	20·48	10·22	3·79	1·87	158 30	179 32	46 45	71 56
1861—1871...	22·43	10·51	3·98	1·52	160 44	176 24	46 16	73 36
1850—1871...	21·49	10·38	3·91	1·70	159 37	177 56	46 27	72 38

TABLE 279.—*Grubb's Horizontal Force Magnetometer—Showing the Mean Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each month of the years of Sun-spot periods and for the whole period, 1850 to 1871.*

Unity = 1γ = ·00001 C. G. S.

Maximum Sun-spot Period.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	+23·20	+7·80	+ 5·10	+ 6·99	+3·43	+2·85	+0·84	+1·49
February ...	+28·21	+9·93	+ 8·13	+ 8·32	+3·56	+3·34	+1·17	+1·39
March ...	+32·21	+8·69	+10·24	+10·93	+6·07	+3·61	+2·40	+1·63
April ...	+32·77	+8·80	+12·22	+ 9·82	+6·28	+3·25	+3·02	+0·58
May ...	+31·05	+7·14	+11·12	+ 8·55	+4·30	+2·02	+1·61	+0·28
June ...	+26·72	+6·98	+10·91	+ 8·70	+2·55	+2·53	+0·77	+0·13
July ...	+27·62	+5·78	+10·59	+ 8·18	+2·75	+2·20	+0·71	+0·14
August ...	+25·27	+7·62	+ 9·12	+ 8·61	+2·94	+2·79	+1·54	+0·34
September ...	+22·27	+6·44	+ 6·92	+10·34	+4·07	+3·79	+2·50	+1·72
October ...	+28·07	+3·82	+ 7·64	+ 8·96	+6·13	+3·13	+2·49	+2·03
November ...	+28·61	+4·32	+ 9·59	+ 6·58	+5·10	+1·16	+1·43	+1·27
December ...	+24·94	+4·76	+ 6·54	+ 6·17	+3·92	+1·94	+1·02	+0·81
Winter ...	+27·54	+6·55	+ 7·87	+ 7·99	+4·70	+2·67	+1·56	+1·44
Summer ...	+27·62	+7·13	+10·15	+ 9·03	+3·81	+2·76	+1·69	+0·53
Year ...	+27·59	+6·87	+ 9·06	+ 8·48	+4·23	+2·69	+1·61	+1·01

Minimum Sun-spot Period.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	+15·94	−1·63	+ 4·92	+5·52	+2·02	+1·87	+1·25	+1·07
February ...	+17·78	−0·21	+ 4·52	+5·65	+2·17	+1·51	+1·12	+1·00
March ...	+20·08	−0·59	+ 8·82	+7·40	+3·70	+2·30	+2·29	+1·35
April ...	+18·15	−1·38	+ 7·82	+6·87	+3·80	+1·68	+2·68	+0·83
May ...	+18·35	−0·44	+ 6·53	+6·17	+1·92	+1·12	+1·40	+0·27
June ...	+15·85	+0·32	+ 6·38	+5·34	+1·93	+1·20	+0·31	+0·13
July ...	+15·68	+0·91	+ 6·32	+6·03	+1·61	+1·55	+0·67	+0·33
August ...	+13·87	+0·35	+ 4·20	+6·30	+1·68	+1·67	+1·00	+0·83
September ...	+13·25	−1·14	+ 4·91	+6·30	+2·77	+2·72	+2·29	+1·27
October ...	+18·24	−3·42	+ 6·64	+6·94	+3·43	+2·20	+1·85	+1·14
November ...	+19·81	−2·26	+ 7·25	+4·87	+3·02	+0·89	+2·02	+0·01
December ...	+17·38	−2·27	+ 4·54	+4·60	+2·50	+0·47	+1·17	+0·72
Winter ...	+18·20	−1·73	+ 6·11	+5·83	+2·81	+1·54	+1·62	+0·88
Summer ...	+15·86	−0·23	+ 6·03	+6·17	+2·28	+1·66	+1·39	+0·61
Year ...	+17·02	−0·98	+ 6·07	+6·01	+2·53	+1·61	+1·49	+0·74

1850—1871.

January ...	+19·02	+1·62	+ 4·60	+6·51	+2·33	+2·42	+0·91	+1·40
February ...	+21·71	+2·93	+ 5·77	+8·00	+2·89	+2·31	+1·03	+1·37
March ...	+25·12	+3·12	+ 9·61	+8·87	+4·94	+3·16	+2·09	+1·27
April ...	+24·24	+3·20	+ 9·38	+8·52	+4·49	+2·58	+2·68	+0·58
May ...	+23·03	+2·89	+ 8·63	+7·62	+2·82	+1·55	+1·48	+0·12
June ...	+20·99	+2·65	+ 8·53	+7·04	+2·17	+1·97	+0·66	+0·18
July ...	+24·40	+2·61	+ 7·91	+7·25	+2·01	+2·17	+0·72	+0·42
August ...	+18·46	+2·17	+ 5·95	+8·02	+1·99	+2·27	+1·25	+0·71
September ...	+17·17	+0·94	+ 5·39	+8·58	+3·29	+3·37	+2·08	+1·67
October ...	+22·23	+0·16	+ 7·09	+8·06	+4·57	+2·64	+1·84	+1·42
November ...	+23·54	−0·24	+ 7·88	+6·02	+3·99	+1·26	+1·51	+0·70
December ...	+20·33	−0·15	+ 5·19	+5·62	+2·86	+1·40	+1·20	+0·81
Winter ...	+21·99	+1·24	+ 6·69	+7·18	+3·60	+2·20	+1·43	+1·16
Summer ...	+21·38	+2·41	+ 7·63	+7·84	+2·79	+2·32	+1·48	+0·61
Year ...	+21·41	+1·82	+ 7·16	+7·51	+3·20	+2·25	+1·45	+0·89

TABLE 280.—*Grubb's Horizontal Force Magnetometer—Showing Mean Values of the Amplitude P and of the first Maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Horizontal Force at Bombay (Colaba) for each month of the years of Sun-spot periods, and for the whole period 1850 to 1871, derived from table 279.*

Unity = 1γ = ·00001 C. G. S.

Maximum Sun-spot Period.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	24·48	8·65	4·46	1·71	173 20	181 42	47 59	79 54
February ...	29·90	11·63	4·88	1·82	174 9	177 35	49 8	77 14
March ...	33·36	14·98	7·06	2·90	169 51	178 11	45 0	73 18
April ...	33·93	15·68	7·07	3·08	169 47	174 9	43 52	67 28
May ...	31·86	14·03	4·75	1·63	167 42	173 32	43 8	67 23
June ...	27·62	13·95	3·59	0·78	169 24	174 2	49 40	67 9
July ...	28·22	13·38	3·52	0·72	166 34	173 36	47 38	67 32
August ...	26·39	12·54	4·05	1·58	171 32	176 26	49 15	67 52
September ...	23·18	12·44	5·56	3·03	170 53	182 51	49 4	73 23
October ...	28·33	11·78	6·88	3·21	162 30	179 32	43 46	74 33
November ...	28·93	11·63	5·23	1·91	163 20	171 59	39 1	75 9
December ...	25·39	8·99	4·37	1·30	165 33	176 25	43 32	74 22
Winter ...	28·31	11·21	5·41	2·12	168 8	177 28	44 37	75 26
Summer ...	28·52	13·58	4·70	1·77	169 13	175 35	46 43	69 7
Year ...	28·43	12·41	5·01	1·91	168 44	176 18	45 34	72 47

Minimum Sun-spot Period.

					° ′	° ′	° ′	° ′
January ...	16·02	7·39	2·75	1·64	148 55	178 54	49 1	74 54
February ...	17·78	7·23	2·64	1·50	154 4	180 25	46 22	75 12
March ...	20·09	11·51	4·36	2·66	153 4	174 45	45 22	72 23
April ...	18·20	10·40	4·15	2·81	150 24	175 24	42 42	69 3
May ...	18·35	8·98	2·22	1·43	153 23	176 27	44 50	67 31
June ...	15·85	8·32	2·27	0·34	155 54	174 43	45 22	70 26
July ...	15·71	8·73	2·24	0·75	158 4	176 35	49 23	71 18
August ...	13·87	7·57	2·37	1·30	156 12	182 55	49 42	74 41
September ...	13·30	7·99	3·88	2·62	149 50	180 47	49 35	72 0
October ...	18·56	9·61	4·08	2·17	144 8	177 53	45 39	72 40
November ...	19·94	8·73	3·15	2·02	148 14	171 42	40 13	64 49
December ...	17·53	6·46	2·54	1·37	147 19	177 27	38 18	72 39
Winter ...	18·28	8·44	3·20	1·84	149 19	176 35	44 19	71 53
Summer ...	15·86	8·63	2·82	1·52	153 55	177 35	46 46	70 41
Year ...	17·05	8·54	3·00	1·66	151 27	177 7	45 34	71 21

1850—1871.

					° ′	° ′	° ′	″ ′
January ...	19·09	7·97	3·36	1·67	159 37	182 8	50 7	79 0
February ...	21·91	9·86	3·70	1·71	162 26	181 51	47 38	78 1
March ...	25·31	13·08	5·86	2·45	161 50	176 6	45 37	72 34
April ...	24·45	12·67	5·18	2·74	162 16	175 53	44 43	67 48
May ...	23·21	11·51	3·22	1·48	161 54	175 29	44 21	65 55
June ...	21·16	11·06	2·93	0·68	161 57	174 31	48 50	68 34
July ...	24·54	10·73	2·96	0·83	160 51	176 0	50 29	72 19
August ...	18·59	9·99	3·02	1·44	161 27	181 28	51 0	72 9
September ...	17·20	10·13	4·71	2·67	157 53	183 41	49 59	74 27
October ...	22·23	10·74	5·28	2·33	155 10	179 5	44 45	74 10
November ...	23·54	9·92	4·18	1·66	154 10	173 27	40 36	70 58
December ...	20·33	7·65	3·18	1·45	154 20	178 24	43 27	73 15
Winter ...	22·02	9·81	4·22	1·84	157 59	178 16	45 14	74 31
Summer ...	21·51	10·94	3·63	1·69	161 11	177 39	48 0	70 21
Year ...	21·49	10·38	3·91	1·70	159 37	177 56	46 27	72 38

TABLE 281.—*Excess Diurnal Inequality of Horizontal Force for each average month of the period, 1850—1871, over the average year, showing the average seasonal disturbance.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Months. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 2	− 5	−21	−19	−10	0	− 1	+22	+32	+ 9	−14	0	135
1 19	+10	− 5	−22	−24	−14	− 9	− 8	+17	+35	+15	− 6	+11	176
2 19	+13	− 2	−18	−23	−27	−18	−19	+12	+38	+23	+ 5	+17	215
3 19	+13	− 5	−23	−17	−26	−20	−19	+11	**+40**	+26	+ 1	+22	223
4 19	+18	− 4	−21	−17	−27	**−29**	**−20**	+ 8	+39	+26	+ 4	+27	240
5 19	+27	+ 1	−27	−28	**−27**	−28	−19	+ 2	+32	+19	+10	+37	257
6 19	**+38**	+ 7	**−32**	**−42**	−24	−12	− 3	− 3	− 2	+ 7	+25	+44	239
7 19	+ 7	− 2	−26	−27	+16	+23	+19	−17	−68	−14	+49	+38	306
8 19	−30	−21	+10	+13	+32	+18	+ 5	−39	**−76**	+ 6	**+62**	+22	334
9 19	−63	**−23**	+54	+58	**+33**	+ 2	−10	−46	−58	+20	+50	−15	432
10 19	**−63**	−22	+87	**+78**	+26	− 9	−10	**−55**	−44	+18	+29	−38	479
11 19	−42	− 2	**+95**	+68	+13	−11	−13	−48	−54	**+27**	+16	−45	434
12 19	−34	+16	+66	+43	+15	− 5	− 3	−25	−27	+14	− 6	−50	304
13 19	−27	+19	+38	+22	+24	+17	+16	− 3	−20	−12	−31	−46	275
14 19	− 4	+18	+ 8	+12	+19	+18	**+21**	−14	−15	**−27**	**−37**	−27	220
15 19	+13	+21	−11	+ 2	+9	− 2	+11	+21	−16	−22	−24	0	152
16 19	+22	**+23**	−16	0	+ 6	−13	−12	+12	− 4	−17	−13	+ 9	147
17 19	+19	+20	−10	− 6	− 7	−13	−15	+ 3	+17	− 4	−11	+ 9	134
18 19	+28	+12	+17	−21	−20	− 1	− 1	+12	+22	− 9	−19	+11	173
19 19	+26	− 3	−18	−20	−16	+13	+12	+14	+12	−14	−17	+ 8	173
20 19	+17	− 9	−19	− 9	− 2	+19	+15	+17	+13	−19	−19	+ 1	159
21 19	+ 9	+11	−25	−10	+ 3	**+27**	+17	+24	+21	−26	−24	− 6	203
22 19	+ 1	−23	−26	−12	+ 5	+25	+19	**+31**	+28	−18	−21	− 7	216
23 19	0	−14	−25	−12	− 7	+15	+10	+25	+35	−10	−14	− 4	171
Sum without regard to signs...	526	288	715	583	408	347	298	481	748	402	507	494	5797

TABLE 282.—*Excess Diurnal Inequality of Horizontal Force showing the secular difference between the seasonal variations at times of maximum and minimum spot epochs.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Months. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	0	−12	−24	−38	− 3	+ 3	+10	−12	**+27**	− 4	**+38**	+10	181
1 19	+ 3	−26	0	−41	−17	+ 7	+11	−15	+19	+17	+29	+14	199
2 19	+ 8	**−27**	− 4	−28	−12	0	+ 2	−11	+27	+16	+17	+21	173
3 19	+15	−17	+ 5	−29	− 5	+ 3	+ 5	− 3	+25	+27	+ 1	+26	161
4 19	+ 9	−20	+ 6	−35	−19	+ 3	+16	− 1	+ 7	+18	− 2	+19	155
5 19	+ 1	−22	− 3	−30	−16	− 5	+23	−15	+ 9	+25	+20	+ 8	177
6 19	−12	−22	−22	−13	+ 1	+12	+29	− 9	−13	+19	+23	+ 6	181
7 19	+ 1	−20	−13	−10	+ 9	+ 5	+34	+12	−19	−13	+12	+ 8	156
8 19	−32	−21	−16	+20	+26	+ 7	**+46**	**+36**	−29	−19	− 3	−23	278
9 19	−69	− 8	+ 1	+58	**+51**	+ 8	+40	+31	**−33**	−18	−25	**−45**	387
10 19	**−72**	+ 5	+ 2	+66	+44	+10	+23	+23	−31	− 9	−22	−39	346
11 19	−61	+13	+13	**+63**	+30	+16	0	+16	−20	−13	−20	−44	314
12 19	−27	+22	+20	+51	+20	+12	−13	+ 4	+ 7	−24	−34	−40	274
13 19	−16	+23	**+35**	+53	+ 6	+ 7	−11	+ 4	0	**−27**	**−37**	−31	250
14 19	+ 1	+25	+33	+30	− 9	− 1	−15	− 2	+11	−23	−28	−21	199
15 19	+22	+23	+19	+31	−13	− 5	−25	−12	+10	−13	−21	− 9	203
16 19	+45	− 1	+21	+ 7	−14	−23	**−49**	−25	+ 7	**+35**	− 3	− 6	236
17 19	**+59**	+ 1	+28	− 4	**−21**	**−45**	−45	−29	+12	+33	+ 9	+ 4	290
18 19	+49	+22	+19	− 4	−19	−41	−46	**−30**	−12	+14	+24	+19	299
19 19	+47	**+32**	−20	−15	−13	−24	−32	− 8	−11	+ 2	+14	+29	247
20 19	+31	+16	−28	−13	− 9	− 8	−17	0	− 8	− 3	+ 2	**+30**	165
21 19	+17	+ 4	−22	− 9	−12	+15	− 8	+11	+ 4	−22	− 2	+23	149
22 19	+ 5	+17	−39	−36	−18	**+30**	+ 2	+27	+ 8	−14	− 9	+28	233
23 19	+ 5	+10	**−41**	**−49**	−11	+29	+ 7	+19	+23	−18	+18	+14	244
Sum without regard to signs...	607	409	434	738	398	319	509	355	372	426	413	517	5497

TABLE 283.—*Showing for the period 1850—1904 the mean Diurnal Inequality of Horizontal Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	− 96	− 118	− 132	− 129	− 116	− 109	− 108	− 94	− 84	− 96	− 108	− 97	− 107
1 19	− 80	− 104	− 121	− 120	− 106	− 104	− 105	− 86	− 69	− 81	− 90	− 79	− 95
2 19	− 71	− 90	− 106	− 108	− 101	− 100	− 101	− 77	− 55	− 66	− 75	− 65	− 85
3 19	− 60	− 79	− 96	− 95	− 93	− 93	− 93	− 70	− 44	− 53	− 67	− 55	− 75
4 19	− 46	− 68	− 85	− 87	− 88	− 91	− 87	− 63	− 37	− 45	− 57	− 43	− 66
5 19	− 31	− 55	− 82	− 85	− 80	− 82	− 78	− 59	− 34	− 43	− 44	− 25	− 58
6 19	− 9	− 39	− 75	− 81	− 58	− 50	− 49	− 51	− 53	− 44	− 16	− 6	− 44
7 19	+ 13	− 3	− 26	− 32	+ 10	+ 21	+ 10	− 25	− 70	− 16	+ 52	+ 39	− 2
8 19	+ 74	+ 82	+ 103	+ 100	+ 122	+ 115	+ 95	+ 58	+ 12	+ 90	+ 151	+ 112	+ 93
9 19	+ 150	+ 192	+ 259	+ 267	+ 239	+ 222	+ 201	+ 174	+ 153	+ 217	+ 247	+ 184	+ 209
10 19	+ 232	+ 282	+ 377	+ 382	+ 329	+ 309	+ 298	+ 260	+ 261	+ 311	+ 318	+ 251	+ 301
11 19	**+ 272**	**+ 326**	**+ 412**	**+ 397**	**+ 343**	**+ 330**	**+ 326**	+ 295	**+ 292**	**+ 353**	**+ 326**	**+ 266**	**+ 328**
12 19	+ 237	+ 300	+ 350	+ 333	+ 299	+ 295	+ 300	+ 280	+ 273	+ 302	+ 258	+ 220	+ 287
13 19	+ 161	+ 212	+ 235	+ 230	+ 221	+ 228	+ 236	+ 218	+ 199	+ 186	+ 151	+ 142	+ 202
14 19	+ 84	+ 110	+ 111	+ 116	+ 117	+ 124	+ 141	+ 126	+ 102	+ 70	+ 55	+ 67	+ 102
15 19	+ 17	+ 26	+ 5	+ 21	+ 18	+ 16	+ 32	+ 34	+ 10	− 12	− 16	+ 8	+ 13
16 19	− 38	− 41	− 66	− 52	− 55	− 71	− 63	− 47	− 52	− 70	− 74	− 48	− 56
17 19	− 77	− 81	− 100	− 102	− 109	− 118	− 115	− 96	− 79	− 100	− 110	− 87	− 98
18 19	− 97	− 110	− 131	− 143	− 145	− 143	− 140	− 119	− 103	− 129	− 136	− 108	− 125
19 19	− 119	− 137	− 157	− 168	**− 161**	− 150	− 149	− 138	− 132	− 154	− 158	− 129	− 146
20 19	− 133	− 150	− 172	**− 172**	− 161	**− 152**	**− 153**	**− 144**	**− 140**	− 166	**− 165**	− 142	**− 154**
21 19	**− 136**	− 157	**− 177**	− 168	− 154	− 140	− 145	− 138	− 135	**− 168**	− 165	**− 145**	− 152
22 19	− 130	**− 160**	− 170	− 160	− 143	− 130	− 131	− 123	− 123	− 151	− 151	− 134	− 142
23 19	− 113	− 141	− 150	− 138	− 127	− 116	− 118	− 106	− 99	− 125	− 126	− 114	− 123
Range ...	408	486	589	569	504	482	479	439	432	521	491	411	482
Average progressive increase per day.	− 4	− 4	− 4	− 5	− 5	− 4	− 4	− 4	− 4	− 4	− 3	− 2	− 4

TABLE 284.—*Showing the mean Diurnal Inequality of Horizontal Force for each average month of the maximum sun-spot years 1859, 1860, 1868, 1870, 1871, 1872, 1873, 1883, 1884, 1892, 1893, 1894 and for the average year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	−130	−170	−188	−195	−175	−163	−150	−152	−127	−147	−151	−135	−157
1 19	−113	−161	−172	−189	−168	−156	−149	−147	−116	−125	−137	−117	−146
2 19	−104	−149	−157	−169	−159	−156	−144	−135	−101	−107	−121	−97	−133
3 19	−91	−131	−147	−157	−144	−147	−139	−123	−86	−87	−111	−89	−121
4 19	−74	−115	−123	−146	−142	−136	−124	−114	−77	−75	−96	−72	−108
5 19	−61	−96	−122	−144	−131	−127	−109	−110	−72	−73	−75	−51	−98
6 19	−33	−69	−110	−134	−90	−77	−68	−87	−88	−70	−31	−21	−73
7 19	−3	−23	−43	−66	+5	+17	+17	−38	−85	−34	+54	+36	−13
8 19	+71	+96	+118	+119	+156	+148	+140	+88	+28	+110	+175	+119	+114
9 19	+173	+242	+310	+344	+323	+285	+276	+243	+207	+274	+292	+210	+265
10 19	+284	+337	+463	+504	+443	+404	+394	+364	+343	+407	+401	+309	+391
11 19	**+341**	**+439**	**+516**	**+536**	**+464**	**+440**	**+421**	**+404**	**−389**	**+466**	**+420**	**+335**	**+431**
12 19	+309	+411	+457	+460	+408	+404	+388	+385	+378	+400	+349	+288	+386
13 19	+221	+304	+328	+333	+306	+312	+311	+311	+286	+259	+222	+198	+283
14 19	+132	+172	+178	+182	+171	+178	+193	+186	+167	+117	+99	+102	+156
15 19	+49	+58	+38	+56	+44	+41	+54	+64	+53	+12	−9	+26	+42
16 19	−23	−36	−53	−31	−50	−68	−73	−47	−35	−61	−55	−39	−47
17 19	−72	−81	−93	−99	−116	−138	−144	−112	−78	−103	−106	−87	−102
18 19	−97	−114	−138	−146	−161	−171	−179	−136	−121	−144	−139	−107	−138
19 19	−128	−152	−187	−196	−189	−180	−191	−158	−167	−183	−183	−139	−171
20 19	−159	−181	−219	−214	−198	**−188**	**−194**	−173	**−186**	−208	−209	−162	−191
21 19	**−172**	−206	**−230**	−215	**−206**	−177	−192	**−180**	−180	**−228**	**−217**	**−178**	**−199**
22 19	−166	**−225**	−228	**−222**	−200	−174	−173	−168	−169	−212	−206	−170	−193
23 19	−147	−202	−211	−206	−190	−166	−162	−152	−144	−181	−175	+159	−175
Range ...	513	664	746	758	670	628	615	584	575	694	637	513	630
Average progressive increase per day.	− 8	− 8	− 8	− 8	− 9	− 10	− 8	− 6	− 6	− 5	− 4	− 4	− 7

TABLE 285.—*Showing the mean Diurnal Inequality of Horizontal Force for each average month of the minimum sun-spot years, 1854, 1855, 1856, 1866, 1867, 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901, 1902 and for the average year.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	−70	−89	−95	−92	−83	−74	−80	−69	−57	−71	−86	−74	−78
1 19	−60	−76	−93	−83	−74	−71	−79	−64	−50	−64	−73	−61	−71
2 19	−56	−63	−79	−75	−69	−69	−75	−57	−40	−50	−62	−52	−62
3 19	−46	−56	−70	−64	−63	−68	−71	−57	−29	−43	−50	−43	−55
4 19	−31	−44	−63	−59	−57	−69	−69	−54	−22	−34	−43	−33	−48
5 19	−16	−31	−56	−59	−52	−62	−67	−48	−24	−32	−33	−18	−41
6 19	+2	−23	−51	−61	−37	−39	−45	−39	−40	−35	−11	0	−32
7 19	+18	+9	−16	−25	+15	+23	+8	−14	−56	−11	+49	+40	+3
8 19	+71	+76	+91	+77	+104	+98	+79	+52	+2	+74	+135	+103	+80
9 19	+132	+160	+219	+214	+192	+182	+165	+146	+124	+175	+213	+163	+174
10 19	+193	+222	+314	+311	+262	+249	+242	+214	+213	+252	+264	+209	+245
11 19	**+220**	**+257**	**+336**	**+316**	**+272**	**+261**	**+268**	**+240**	**+234**	**+288**	**+265**	**+217**	**+264**
12 19	+182	+235	+279	+259	+228	+232	+245	+224	+210	+242	+202	+172	+226
13 19	+118	+156	+172	+169	+166	+172	+185	+124	+148	+139	+108	+105	+151
14 19	+54	+70	+70	+77	+82	+87	+103	+098	+69	+48	+29	+42	+69
15 19	+2	+6	−11	+2	+1	+1	+15	+21	−3	−15	−25	−5	−1
16 19	−43	−48	−65	−51	−60	−68	−60	−46	−52	−68	−71	−43	−56
17 19	−74	−78	−97	−88	−98	−100	−97	−84	−72	−88	−96	−74	−87
18 19	−89	−101	−123	−123	−128	−120	−118	−103	−86	−114	−119	−95	−110
19 19	−103	−119	−134	**−144**	**−139**	−122	**−122**	−115	**−105**	−129	**−135**	−116	−124
20 19	**−108**	**−123**	−140	−144	−135	**−123**	−121	**−117**	−103	**−130**	−131	**−122**	**−125**
21 19	−103	−120	**−145**	−137	−122	−111	−111	−113	−100	−124	−126	−118	−119
22 19	−101	−122	−126	−119	−107	−103	−100	−101	−88	−114	−111	−103	−108
23 19	−88	−101	−110	−97	−93	−87	−88	−82	−70	−92	−95	−87	−91
Range ...	328	380	481	460	411	384	390	357	339	418	400	339	389
Average progressive increase per day.	− 3	− 3	− 4	− 5	− 5	− 3	− 3	− 4	− 4	− 3	− 3	− 3	− 3

CHAPTER VI

Diurnal Inequality of Declination.

375. The inequalities of Declination derived, as in H, from all days throughout the period 1847—1905, will now be considered.

Examining the phenomenon as registered by the magnetograph series first, it will be seen from the average inequality shown in table 286 that, unlike that of H, it indicates a double wave in 24 hours, the principal maximum occurring at 8 hours and the principal minimum at 12 noon, with the minor maximum during the day falling at about 16 hours.

376. The feature however in the Colaba record which strikes one as being conspicuously marked is the pronounced sweep of the diurnal wave during the summer as contrasted with the ill-defined and completely suppressed, and in some cases even reversed, runs during the winter months. So marked is the disparity in the relation between the two (*vide* first two figures, plate 43) that one is inclined at first to regard the declination inequalities as a significant phenomenon only for the eight months in the year (Marcn to October) and to attach little importance to the progression during the four winter months.

Omitting hence from consideration the winter months, which will be examined later, it will be seen from tables 286 to 298 that the principal minimum, that is, the greatest westerly elongation of the needle, is attained almost invariably at about noon ; while the principal maximum or the greatest easterly elongation occurs at 7 hours from May to September, shifting to a later hour, namely to 8 hours, in the months of March, April and October. This tendency for the culminations for both the maximum and minimum phases to shift to a later hour owing to seasonal change from summer to winter conditions, though considerably masked in the winter months by the suppression of the amplitudes, can be traced fairly distinctly through all the monthly inequalities.

Passing next to the disturbing effects of the 11-year cycle on the constancy of the hours of occurrence of the principal phases, the last three figures in plate 43 show that their incidence does not appreciably affect this constancy, whether the year considered happens to be of the type of the maximum or of the minimum spots epoch.

It will also be observed that this secular action on the range of the diurnal curve at Colaba is very small when compared with that of the seasonal change, but whatever it is, it will be seen from the difference curve (*vide* figures 4, 5 and 6 below in paragraph 393) obtained from the inequalities at the mean maximum and minimum spots epochs that the dominant features of the average inequality as indicated by the principal maximum and minimum phases are all fairly reproduced by the disturbing cause of the 11-year cycle, the minor maximum at 16 hour being the only feature which is very feebly represented in the secular effect.

Annual variation of inequalities as indicated by excess inequalities.

377. The progression of the variation from month to month in the diurnal curve can be readily seen from the excess inequalities or departures of the average inequality of each month from the average of the year (shown in table 299), which also appear charted in figures 1 to 12, plate 39. The excesses, it will be noted, are more regular than in H. The month least disturbed by the seasonal change is October, which

TABLE 286.—*Declination Magnetograph—Showing for the period 1872 to 1904, the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

1872—1904.		Month.												Year.
Bombay Civil Time.		January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H.	m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0	18	+0·15	+0·17	+0·12	+0·23	+0·25	+0·22	+0·12	+0·10	+0·20	+0·22	+0·23	+0·17	+0·18
1	18	+0·08	+0·13	+0·10	+0·28	+0·32	+0·33	+0·25	+0·18	+0·25	+0·22	+0·18	+0·12	+0·20
2	18	−0·02	+0·08	+0·05	+0·27	+0·35	+0·38	+0·33	+0·27	+0·27	+0·17	+0·10	+0·02	+0·18
3	18	−0·18	−0·05	−0·07	+0·18	+0·33	+0·38	+0·37	+0·32	+0·25	+0·05	−0·07	−0·15	+0·12
4	18	−0·35	−0·22	−0·15	+0·10	+0·35	+0·43	+0·45	+0·40	+0·27	−0·07	−0·23	−0·32	+0·05
5	18	−0·53	−0·38	−0·18	+0·13	+0·62	+0·77	+0·77	+0·72	+0·42	−0·12	−0·38	−0·48	+0·12
6	18	**−0·65**	**−0·45**	−0·05	+0·80	+1·62	+1·78	+1·77	+1·88	+1·37	+0·10	**−0·58**	−0·62	+0·58
7	18	−0·62	−0·35	+0·62	+1·65	**+2·17**	**+2·27**	**+2·28**	**+2·55**	**+2·28**	+0·75	−0·45	**−0·82**	+1·03
8	18	+0·15	+0·20	+1·17	**+1·78**	+1·88	+2·02	+2·00	+2·15	+1·98	**+0·97**	−0·03	−0·33	**+1·17**
9	18	**+0·82**	**+0·53**	**+1·20**	+1·22	+0·70	+0·97	+0·97	+0·75	+0·73	+0·52	+0·07	+0·13	+0·72
10	18	+0·58	+0·45	+0·70	+0·20	−0·68	−0·23	−0·22	−0·68	−0·62	−0·22	−0·13	+0·07	−0·07
11	18	−0·22	−0·10	−0·27	−1·07	−1·73	−1·40	−1·37	−1·83	−1·95	−1·07	−0·53	−0·20	−0·98
12	18	−0·42	−0·42	−1·07	**−1·83**	**−2·23**	**−2·08**	**−1·95**	**−2·33**	**−2·58**	**−1·33**	−0·30	−0·08	**−1·38**
13	18	−0·13	−0·23	**−1·17**	−1·77	−1·92	−2·02	−1·95	−2·18	−2·20	−0·87	+0·22	+0·22	−1·17
14	18	0·00	+0·02	−0·60	−1·17	−1·18	−1·52	−1·48	−1·48	−1·15	−0·18	**+0·38**	**+0·33**	−0·67
15	18	+0·17	+0·22	+0·07	−0·45	−0·43	−0·87	−0·78	−0·55	−0·10	+0·35	+0·37	+0·30	−0·15
16	18	+0·30	+0·23	+0·25	+0·07	+0·12	−0·28	−0·20	+0·18	+0·48	+0·42	+0·28	+0·33	+0·18
17	18	+0·12	−0·02	−0·02	+0·08	+0·22	−0·03	+0·05	+0·40	+0·32	−0·03	+0·07	+0·18	+0·12
18	18	+0·07	−0·13	−0·27	−0·17	−0·05	−0·10	−0·02	+0·07	−0·07	−0·10	+0·12	+0·22	−0·03
19	18	+0·18	+0·02	−0·23	−0·32	−0·33	−0·40	−0·40	−0·25	−0·12	−0·05	+0·13	+0·23	−0·13
20	18	+0·15	+0·02	−0·15	−0·27	−0·32	−0·38	−0·42	−0·30	−0·12	−0·02	+0·12	+0·18	−0·12
21	18	+0·13	+0·02	−0·10	−0·13	−0·18	−0·27	−0·33	−0·23	−0·05	0·00	+0·12	+0·15	−0·07
22	18	+0·13	+0·08	−0·03	+0·02	−0·02	−0·08	−0·18	−0·12	+0·02	+0·10	+0·17	+0·17	+0·02
23	18	+0·15	+0·15	+0·07	+0·13	+0·12	+0·08	−0·03	−0·02	+0·12	+0·20	+0·23	+0·18	+0·12
Range ...		1·44	0·95	2·37	3·61	4·40	4·35	4·23	4·88	4·86	2·30	0·96	1·15	2·55

TABLE 287.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year April to September for each of the years 1872 to 1882 and for the whole period of eleven years.*

April to September. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	(Mean) 1872 to 1882.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·22	+0·23	+0·25	+0·22	+0·20	+0·25	+0·25	+0·22	+0·23	+0·18	+0·27	+0·23
1 18	+0·37	+0·37	+0·32	+0·30	+0·28	+0·33	+0·32	+0·27	+0·32	+0·27	+0·35	+0·32
2 18	+0·43	+0·45	+0·35	+0·37	+0·35	+0·37	+0·32	+0·28	+0·35	+0·32	+0·37	+0·37
3 18	+0·47	+0·45	+0·32	+0·35	+0·35	+0·38	+0·30	+0·28	+0·33	+0·28	+0·33	+0·35
4 18	+0·47	+0·45	+0·32	+0·35	+0·35	+0·38	+0·28	+0·30	+0·32	+0·32	+0·30	+0·35
5 18	+0·85	+0·70	+0·48	+0·47	+0·57	+0·53	+0·42	+0·50	−0·47	+0·60	+0·48	+0·47
6 18	+2·22	+1·78	+1·45	+1·30	+1·32	+1·35	+1·18	+1·35	+1·27	+1·72	+1·42	+1·48
7 18	**+2·93**	**+2·52**	**+2·15**	**+1·95**	**+2·15**	**+2·07**	**+1·77**	**+1·93**	**+1·92**	**+2·47**	**+2·07**	**+2·17**
8 18	+2·48	+2·23	+2·00	+1·82	+1·75	+1·95	+1·63	+1·72	+1·85	+2·18	+1·95	+1·78
9 18	+1·00	+1·07	+1·10	+0·80	+0·73	+0·87	+0·77	+0·72	+0·95	+0·95	+1·13	+0·92
10 18	−0·50	−0·37	−0·17	−0·28	−0·52	−0·38	−0·32	−0·43	−0·22	−0·42	−0·07	−0·33
11 18	−1·97	−1·60	−1·33	−1·32	−1·50	−1·63	−1·28	−1·55	−1·35	−1·68	−1·27	−1·50
12 18	**−2·70**	**−2·28**	**−1·98**	**−1·92**	**−1·97**	**−2·22**	**−1·77**	**−2·07**	**−1·98**	**−2·38**	**−1·98**	**−2·12**
13 18	−2·52	−2·10	−1·95	−1·70	−1·82	−1·97	−1·65	−1·85	−1·92	−2·22	−1·90	−1·97
14 18	−1·73	−1·45	−1·42	−1·22	−1·17	−1·28	−1·07	−1·13	−1·33	−1·50	−1·35	−1·33
15 18	−0·80	−0·67	−0·67	−0·50	−0·42	−0·50	−0·42	−0·35	−0·58	−0·60	−0·70	−0·57
16 18	+0·13	−0·17	−0·12	−0·02	+0·08	+0·07	+0·05	+0·22	−0·07	+0·10	−0·23	−0·02
17 18	+0·08	−0·02	+0·02	+0·07	+0·17	+0·17	+0·07	+0·25	+0·07	−0·23	−0·08	+0·10
18 18	−0·05	−0·25	−0·10	−0·18	−0·12	−0·10	−0·18	−0·07	−0·10	0·00	−0·15	−0·12
19 18	−0·42	−0·48	−0·35	−0·33	−0·33	−0·27	−0·37	−0·28	−0·30	−0·33	−0·40	−0·35
20 18	−0·38	−0·45	−0·33	−0·32	−0·33	−0·23	−0·30	−0·30	−0·27	−0·33	−0·35	−0·33
21 18	−0·27	−0·32	−0·23	−0·18	−0·23	−0·13	−0·17	−0·17	−0·17	−0·20	−0·23	−0·22
22 18	−0·10	−0·10	−0·07	−0·03	−0·07	0·00	−0·03	0·00	−0·02	−0·08	−0·03	−0·05
23 18	+0·03	+0·07	+0·10	+0·10	+0·07	+0·15	+0·12	+0·12	+0·10	+0·05	+0·12	+0·10
Range ...	5·63	4·80	4·13	3·87	4·12	4·29	3·54	4·00	3·90	4·85	4·05	4·29

TABLE 288.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year January to March and October to December for each of the years 1872 to 1882 and for the whole period of eleven years.*

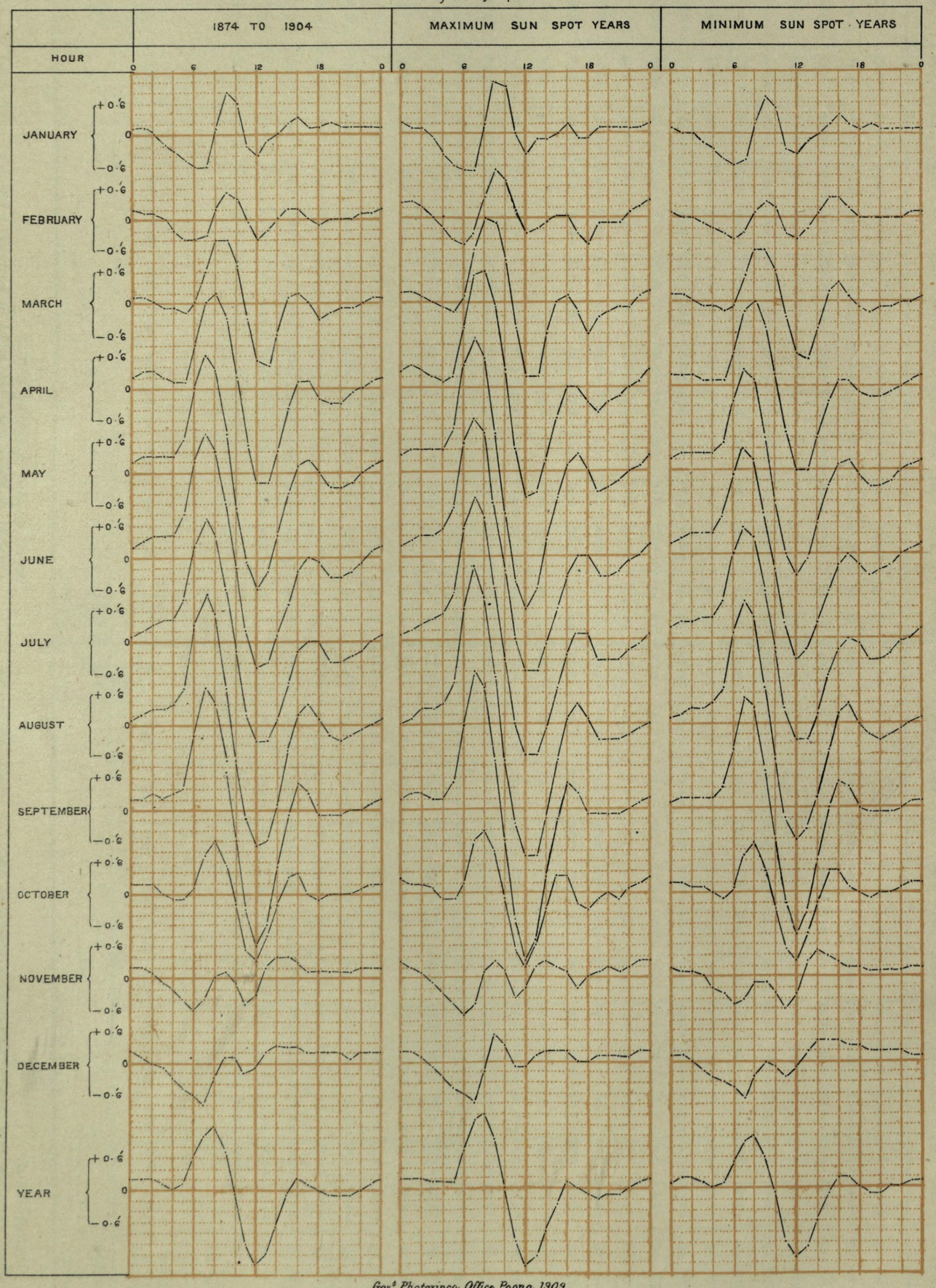
October to March. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	(Mean) 1872 to 1882.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·28	+0·25	+0·25	+0·18	+0·18	+0·15	+0·12	+0·17	+0·17	+0·22	+0·17	+0·20
1 18	+0·23	+0·23	+0·22	+0·13	+0·13	+0·12	+0·07	+0·12	+0·12	+0·17	+0·15	+0·15
2 18	+0·15	+0·18	+0·13	+0·05	+0·07	+0·07	0·00	+0·05	+0·03	+0·07	+0·08	+0·08
3 18	−0·08	+0·02	−0·05	−0·05	−0·05	−0·05	−0·10	−0·07	−0·17	−0·10	−0·10	−0·07
4 18	−0·32	−0·18	−0·22	−0·18	−0·18	−0·17	−0·20	−0·18	−0·32	−0·25	−0·25	−0·22
5 18	−0·48	−0·33	−0·40	−0·30	−0·33	−0·27	−0·27	−0·28	−0·47	−0·40	−0·35	−0·35
6 18	−0·38	−0·38	**−0·45**	−0·35	−0·37	−0·30	−0·25	−0·32	**−0·50**	−0·38	−0·38	−0·37
7 18	−0·03	−0·03	−0·25	−0·13	−0·22	−0·10	−0·02	−0·17	−0·23	−0·07	−0·15	−0·13
8 18	+0·60	+0·48	+0·23	+0·20	+0·18	+0·28	+0·37	+0·18	+0·27	+0·53	+0·45	+0·35
9 18	**+1·00**	**+0·72**	**+0·57**	+0·25	**+0·37**	+0·38	+0·32	+0·30	**+0·53**	**+0·77**	**+0·70**	**+0·53**
10 18	+0·50	+0·20	+0·40	−0·08	+0·10	−0·02	−0·13	+0·05	+0·35	+0·38	+0·38	+0·20
11 18	−0·32	−0·57	−0·17	−0·60	−0·40	−0·55	−0·70	−0·52	−0·18	−0·38	−0·35	−0·43
12 18	**−0·53**	**−0·85**	−0·37	**−0·75**	**−0·55**	**−0·62**	**−0·70**	**−0·60**	−0·45	**−0·70**	**−0·63**	**−0·62**
13 18	−0·25	−0·43	−0·27	−0·35	−0·30	−0·08	−0·25	−0·27	−0·25	−0·42	−0·35	−0·30
14 18	+0·05	−0·07	−0·03	+0·13	−0·03	+0·03	+0·18	+0·12	−0·02	−0·08	−0·08	+0·02
15 18	+0·13	+0·20	+0·08	+0·52	+0·27	+0·33	+0·52	+0·37	+0·22	+0·15	+0·20	+0·27
16 18	+0·07	+0·20	+0·12	**+0·53**	+0·37	**+0·42**	**+0·52**	**+0·40**	+0·32	+0·20	+0·25	+0·30
17 18	−0·33	−0·12	−0·07	+0·15	+0·17	+0·22	+0·17	+0·17	+0·05	−0·07	−0·05	+0·03
18 18	−0·38	−0·20	−0·10	+0·03	+0·08	+0·10	+0·05	+0·08	0·00	−0·10	−0·12	−0·05
19 18	−0·08	+0·05	0·00	+0·07	+0·07	+0·03	+0·05	+0·05	+0·05	+0·03	+0·02	+0·03
20 18	−0·08	+0·12	+0·03	+0·08	+0·05	+0·03	+0·05	+0·03	+0·07	+0·07	+0·03	+0·05
21 18	−0·08	+0·08	+0·07	+0·05	+0·05	+0·03	+0·05	+0·07	+0·10	+0·08	+0·03	+0·05
22 18	+0·15	+0·15	+0·12	+0·10	+0·10	+0·10	+0·08	+0·10	+0·13	+0·10	+0·10	+0·12
23 18	+0·22	+0·25	+0·22	+0·17	+0·15	+0·13	+0·12	+0·13	+0·18	+0·17	+0·18	+0·17
Range ...	1·53	1·57	1·02	1·28	·92	1·04	1·22	1·00	1·03	1·47	1·33	1·15

COLABA OBSERVATORY

Declination Diurnal Inequality

(Magnetograph)

Plate 30



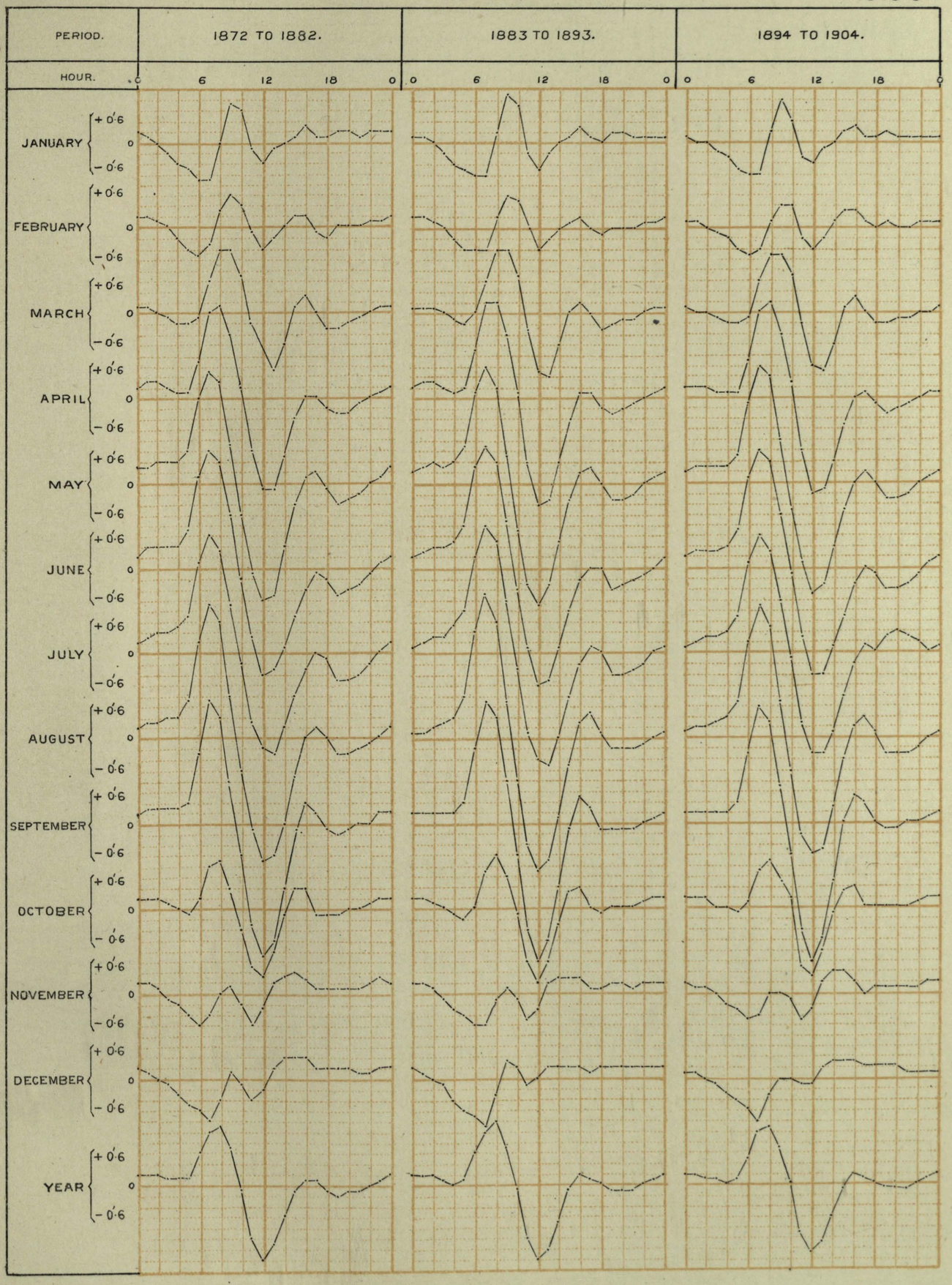
Govt. Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY.

Declination Diurnal Inequality.

(Magnetograph.)

Plate 31



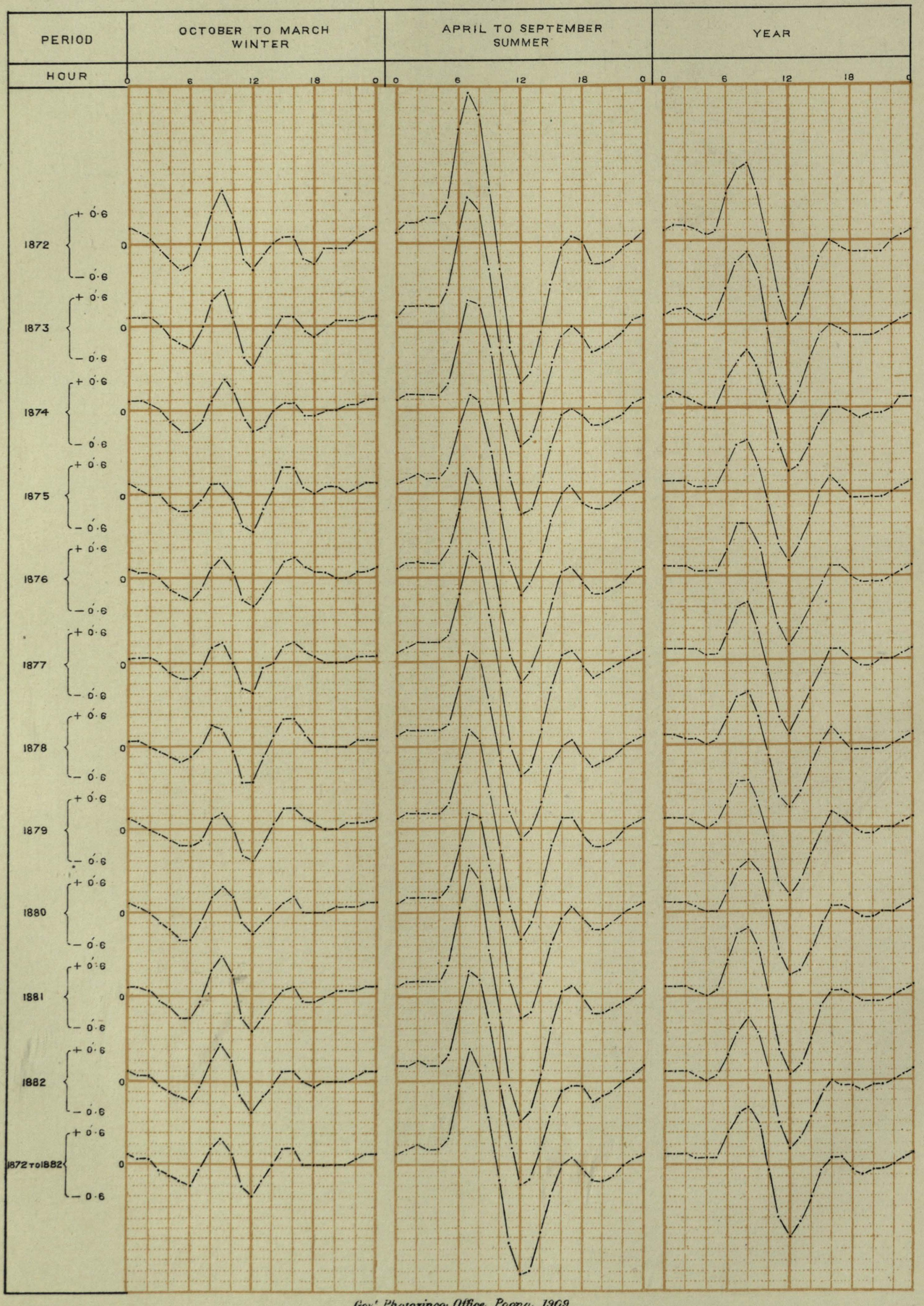
Gov.t Photozinco Office, Poona, 1909

COLABA OBSERVATORY.

Declination Diurnal Inequality

(Magnetograph)

Plate 32.

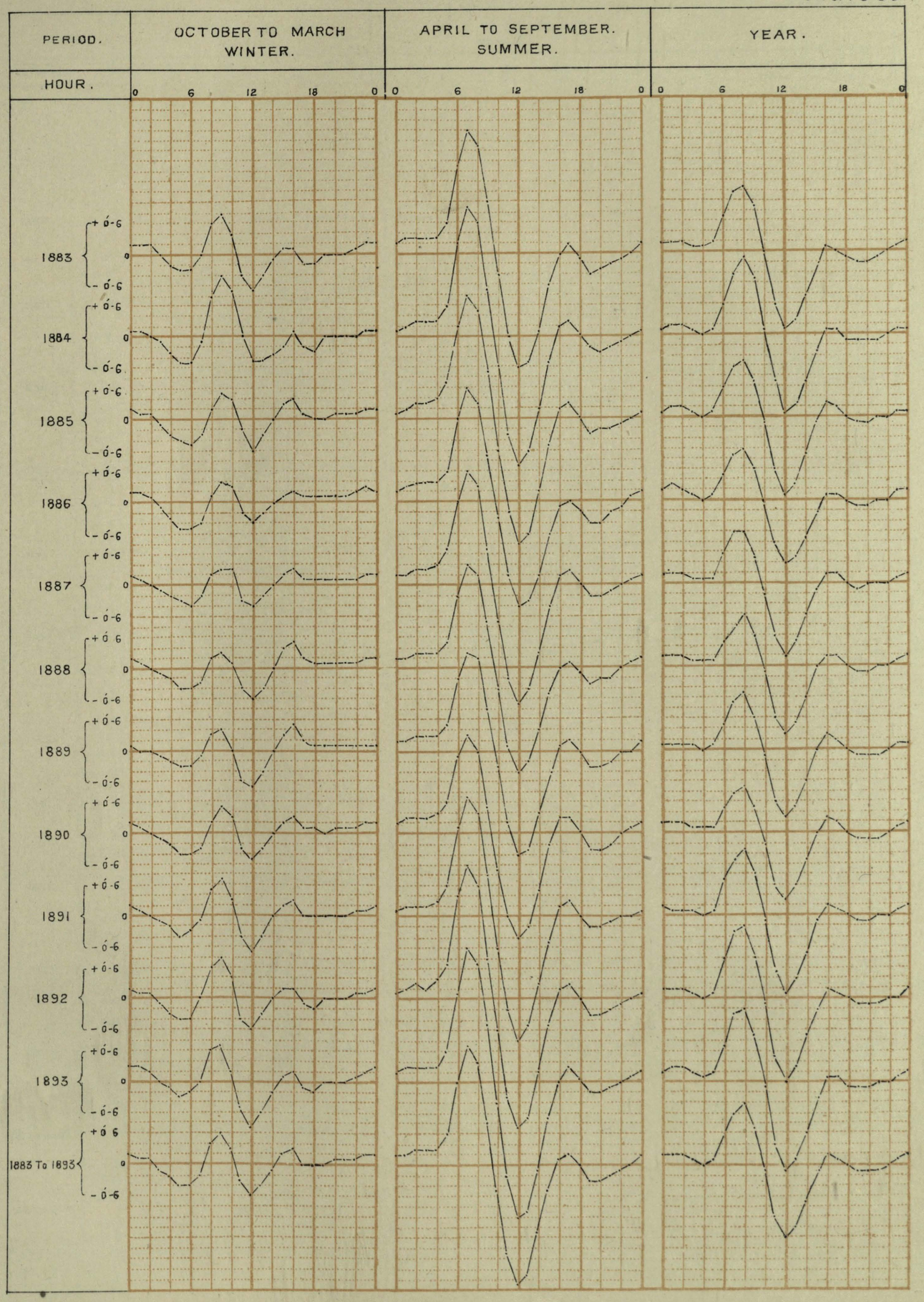


Gov.t Photozinco: Office, Poona, 1909.

COLABA OBSERVATORY.

Declination Diurnal Inequality
(Magnetograph.)

Plate 33.



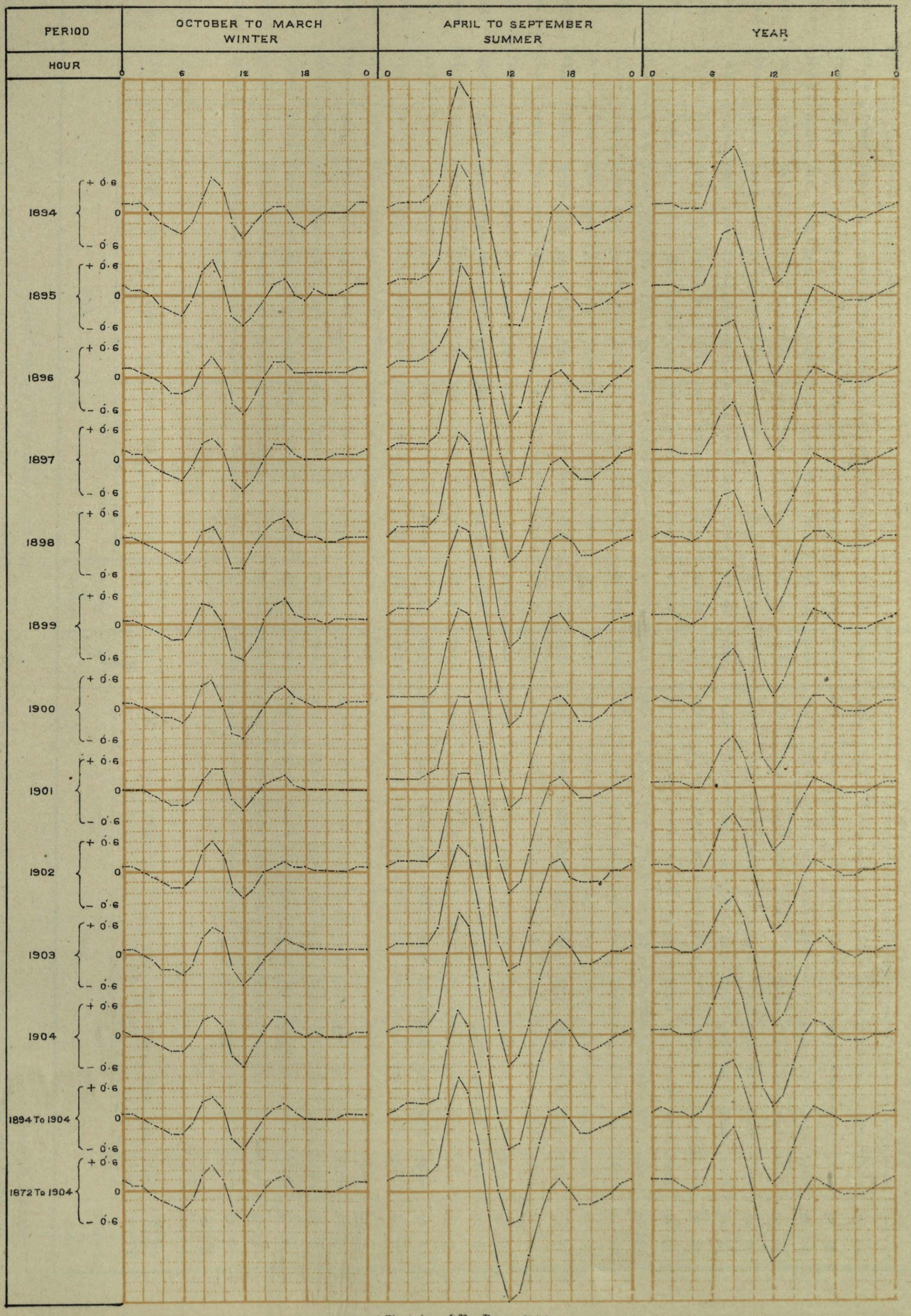
Gov.t Photozinco: Office, Poona. 1909.

COLABA OBSERVATORY

Declination Diurnal Inequality

(Magnetograph.)

Plate 34.



Govt. Photozinco. Office. Poona. 1909.

TABLE 291.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year April to September for each of the years 1894 to 1904 and for the whole period of eleven years and also for the period of thirty-three years from 1872 to 1904.*

April to September. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904.	(Mean) 1872 to 1904.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·12	+0·20	+0·18	+0·20	+0·15	+0·18	+0·18	+0·17	+0·12	+0·12	+0·07	+0·15	+0·18
1 18	+0·20	+0·32	+0·30	+0·30	+0·30	+0·27	+0·23	+0·23	+0·17	+0·18	+0·17	+0·25	+0·27
2 18	+0·23	+0·32	+0·33	+0·33	+0·28	+0·30	+0·25	+0·25	+0·18	+0·22	+0·22	+0·27	+0·32
3 18	+0·25	+0·33	+0·35	+0·32	+0·30	+0·27	+0·25	+0·25	+0·17	+0·23	+0·22	+0·27	+0·30
4 18	+0·33	+0·40	+0·37	+0·33	+0·33	+0·30	+0·25	+0·27	+0·18	+0·25	+0·23	+0·30	+0·33
5 18	+0·63	+0·72	+0·63	+0·55	+0·53	+0·52	+0·45	+0·43	+0·37	+0·50	+0·52	+0·43	+0·52
6 18	+1·78	+1·90	+1·55	+1·43	+1·47	+1·33	+1·27	+1·17	+1·18	+1·47	+1·58	+1·42	+1·52
7 18	**+2·50**	**+2·58**	**+2·18**	**+2·07**	**+2·12**	**+1·95**	**+1·92**	**+1·85**	**−1·92**	**+2·12**	**+2·37**	**+2·15**	**+2·18**
8 18	+2·22	+2·20	+1·92	+1·92	+1·88	+1·80	+1·78	+1·78	+1·92	+1·95	+2·15	+1·80	+1·87
9 18	+1·03	+0·83	+0·85	+0·95	+0·85	+0·77	+0·85	+0·90	+1·03	+0·90	+0·97	+0·90	+0·88
10 18	−0·27	−0·58	−0·30	−0·12	−0·20	−0·27	−0·22	−0·27	−0·17	−0·30	−0·40	−0·28	−0·37
11 18	−1·52	−1·83	−1·48	−1·30	−1·43	−1·38	−1·40	−1·37	−1·37	−1·55	−1·63	−1·45	−1·55
12 18	**−2·25**	**−2·48**	**−2·13**	**−1·97**	**−2·12**	**−2·02**	**−1·97**	**−1·98**	**−1·95**	**−2·22**	**−2·25**	**−2·12**	**−2·17**
13 18	−2·18	−2·25	−2·00	−1·85	−1·93	−1·85	−1·78	−1·82	−1·80	−2·05	−2·08	−1·97	−2·00
14 18	−1·50	−1·50	−1·32	−1·28	−1·27	−1·22	−1·20	−1·20	−1·15	−1·37	−1·40	−1·32	−1·33
15 18	−0·68	−0·60	−0·52	−0·60	−0·50	−0·45	−0·47	−0·45	−0·42	−0·50	−0·53	−0·52	−0·33
16 18	−0·05	+0·08	+0·02	−0·08	+0·02	+0·07	+0·12	+0·08	+0·12	+0·15	+0·15	+0·07	+0·05
17 18	+0·17	+0·20	+0·12	+0·02	+0·15	+0·17	+0·23	+0·17	+0·18	+0·35	+0·30	+0·18	+0·17
18 18	+0·02	−0·02	−0·07	−0·17	−0·05	−0·07	−0·03	−0·02	−0·07	+0·08	+0·10	−0·03	−0·05
19 18	−0·32	−0·30	−0·33	−0·38	−0·30	−0·25	−0·27	−0·20	−0·25	−0·18	−0·20	−0·27	−0·30
20 18	−0·30	−0·30	−0·35	−0·37	−0·32	−0·27	−0·30	−0·25	−0·23	−0·23	−0·28	−0·28	−0·30
21 18	−0·25	−0·22	−0·27	−0·25	−0·25	−0·18	−0·20	−0·13	−0·17	−0·13	−0·22	−0·20	−0·20
22 18	−0·13	−0·10	−0·10	−0·08	−0·10	−0·03	−0·05	−0·03	−0·03	−0·03	−0·12	−0·07	−0·07
23 18	−0·02	+0·07	+0·03	+0·07	+0·05	+0·08	+0·08	+0·08	+0·05	+0·03	0·00	+0·05	+0·07
Range ...	4·75	5·06	4·31	4·04	4·24	3·97	3·89	3·83	3·87	4·34	4·62	4·27	4·35

TABLE 292.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year January to March and October to December for each of the years 1894 to 1904 and for the whole period of eleven years and also for the period of thirty-three years from 1872 to 1904.*

October to March. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904	(Mean) 1872 to 1904.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·23	+0·17	+0·20	+0·18	+0·15	+0·13	+0·12	+0·05	+0·08	+0·10	+0·07	+0·13	+0·17
1 18	+0·22	+0·10	+0·17	+0·15	+0·08	+0·12	+0·10	+0·03	+0·07	+0·08	+0·05	+0·13	+0·13
2 18	+0·18	+0·07	+0·10	+0·08	+0·02	+0·05	+0·03	−0·03	0·00	+0·02	−0·02	+0·10	+0·07
3 18	−0·02	−0·05	−0·02	−0·07	−0·10	−0·10	−0·08	−0·13	−0·08	−0·13	−0·13	−0·05	−0·08
4 18	−0·20	−0·22	−0·15	−0·18	−0·25	−0·22	−0·17	−0·23	−0·22	−0·27	−0·23	−0·22	−0·22
5 18	−0·35	−0·33	−0·30	−0·28	−0·32	−0·32	−0·25	−0·32	−0·28	−0·35	−0·32	−0·32	−0·35
6 18	−0·40	−0·38	−0·33	−0·37	−0·38	−0·30	−0·30	−0·35	−0·32	−0·42	−0·30	−0·35	−0·37
7 18	−0·20	−0·08	−0·20	−0·15	−0·23	−0·03	−0·07	−0·18	−0·12	−0·20	−0·08	−0·13	−0·17
8 18	+0·33	+0·50	+0·25	+0·35	+0·20	+0·37	+0·38	+0·25	+0·37	+0·30	+0·35	+0·33	+0·35
9 18	**+0·68**	**+0·67**	**+0·40**	**+0·45**	+0·28	+0·35	**+0·47**	**+0·45**	**+0·57**	**+0·53**	**+0·45**	**+0·42**	**+0·52**
10 18	+0·52	+0·32	+0·10	+0·17	0·00	0·00	−0·05	+0·42	+0·28	+0·37	+0·18	+0·22	+0·23
11 18	−0·18	−0·43	−0·53	−0·43	−0·50	−0·62	−0·52	−0·23	−0·33	−0·27	−0·45	−0·42	−0·40
12 18	**−0·47**	**−0·65**	**−0·70**	**−0·60**	**−0·55**	**−0·72**	**−0·63**	**−0·42**	**−0·50**	**−0·58**	**−0·60**	**−0·58**	**−0·60**
13 18	−0·25	−0·40	−0·42	−0·37	−0·15	−0·37	−0·32	−0·15	−0·28	−0·38	−0·25	−0·30	−0·32
14 18	0·00	−0·07	0·00	−0·03	+0·18	+0·07	+0·05	+0·08	−0·02	−0·08	+0·13	+0·03	0·00
15 18	+0·15	+0·23	+0·28	+0·27	+0·43	+0·38	+0·30	+0·23	+0·15	+0·15	+0·42	+0·20	+0·22
16 18	+0·08	+0·28	−0·30	+0·33	**+0·47**	**+0·47**	+0·37	+0·28	+0·25	+0·28	+0·40	+0·32	+0·30
17 18	−0·22	−0·03	+0·07	+0·08	+0·18	+0·22	+0·17	+0·12	+0·13	+0·20	+0·02	+0·10	+0·05
18 18	−0·30	−0·10	+0·07	+0·02	+0·12	+0·12	+0·08	+0·05	+0·07	+0·15	+0·02	+0·03	+0·02
19 18	−0·07	+0·07	+0·12	+0·05	+0·07	+0·08	+0·05	0·00	+0·05	+0·10	+0·07	+0·05	+0·05
20 18	0·00	+0·05	+0·12	+0·05	+0·02	+0·03	+0·05	−0·02	+0·05	+0·10	+0·05	+0·05	+0·05
21 18	0·00	+0·03	+0·12	+0·07	+0·03	+0·07	+0·05	0·00	+0·05	+0·10	+0·02	+0·05	+0·05
22 18	+0·05	+0·10	+0·15	+0·10	+0·08	+0·10	+0·08	0·00	+0·05	+0·10	+0·03	+0·08	+0·10
23 18	+0·18	+0·18	+0·20	+0·15	+0·13	+0·12	+0·12	+0·05	+0·08	+0·13	+0·08	+ 0·1	+0·17
Range ...	1·15	1·32	1·10	1·05	1·02	1·19	1·10	·87	1·07	1·11	1·05	1·00	1·12

TABLE 293.—*Declination Magnetograph—Showing for the period 1872 to 1882, the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

1872-1882. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·18	+0·20	+0·13	+0·23	+0·28	+0·25	+0·18	+0·17	+0·25	+0·22	+0·25	+0·18	+0·22
1 18	+0·13	+0·17	+0·10	+0·32	+0·35	+0·38	+0·32	+0·27	+0·28	+0·22	+0·20	+0·12	+0·23
2 18	+0·02	+0·10	+0·03	+0·30	−0·40	+0·43	+0·38	+0·33	+0·32	+0·20	+0·10	+0·03	+0·22
3 18	−0·17	−0·05	−0·07	+0·20	+0·38	+0·43	+0·42	+0·38	+0·30	+0·07	−0·08	−0·13	+0·13
4 18	−0·37	−0·22	−0·17	+0·12	+0·38	+0·43	+0·47	+0·42	+0·28	−0·05	−0·25	−0·30	+0·07
5 18	−0·55	−0·40	−0·22	+0·12	+0·60	+0·73	+0·70	+0·70	+0·40	−0·07	−0·42	−0·48	+0·10
6 18	−0·68	**−0·47**	−0·08	+0·75	+1·58	+1·72	+1·75	+1·82	+1·32	+0·20	−0·60	−0·58	+0·57
7 18	**−0·68**	−0·32	+0·62	+1·60	**+2·15**	**+2·23**	**+2·22**	**+2·53**	**+2·33**	+0·85	−0·45	**−0·78**	+1·03
8 18	+0·03	+0·27	+1·18	**+1·73**	+1·88	+2·02	+1·95	+2·17	+1·98	**+0·95**	+0·02	−0·37	**+1·15**
9 18	**+0·75**	**+0·60**	**+1·23**	+1·20	+0·72	+1·00	+0·95	+0·85	+0·77	+0·43	+0·13	+0·08	+0·73
10 18	+0·60	+0·45	+0·73	+0·23	−0·65	−0·18	−0·22	−0·60	−0·62	−0·37	−0·18	−0·07	−0·07
11 18	−0·13	−0·10	−0·23	−1·00	−1·70	−1·35	−1·32	−1·75	−1·92	−1·10	**−0·60**	−0·37	−0·97
12 18	−0·38	−0·40	−1·07	**−1·75**	**−2·23**	**−2·02**	−1·85	**−2·30**	**−2·53**	**−1·33**	−0·35	−0·18	**−1·37**
13 18	−0·12	−0·20	**−1·13**	−1·70	−1·93	−1·95	**−1·87**	−2·18	−2·18	−0·80	+0·18	+0·23	−1·13
14 18	−0·02	+0·03	−0·57	−1·12	−1·23	−1·48	−1·42	−1·57	−1·17	−0·12	+0·35	**+0·42**	−0·65
15 18	+0·13	+0·17	+0·10	−0·45	−0·45	−0·87	−0·77	−0·70	−0·15	+0·42	**+0·40**	+0·42	−0·15
16 18	+0·28	+0·20	+0·27	+0·02	+0·12	−0·37	−0·27	0·00	+0·37	+0·42	+0·30	+0·40	+0·15
17 18	+0·12	−0·07	−0·05	+0·03	+0·22	−0·10	−0·05	−0·25	+0·22	−0·10	+0·07	+0·20	+0·07
18 18	+0·07	−0·22	−0·33	−0·23	−0·08	−0·17	−0·10	0·00	−0·12	−0·15	+0·13	+0·22	−0·08
19 18	+0·18	−0·02	−0·27	−0·35	−0·38	−0·47	−0·48	−0·30	−0·17	−0·07	+0·13	+0·22	−0·17
20 18	+0·17	0·00	−0·17	−0·30	−0·33	−0·42	−0·48	−0·33	−0·12	−0·02	+0·13	+0·18	−0·13
21 18	+0·13	−0·02	−0·10	−0·15	−0·17	−0·30	−0·38	−0·23	−0·03	−0·02	+0·13	+0·15	−0·08
22 18	+0·17	+0·12	−0·03	+0·02	0·00	−0·10	−0·20	−0·08	+0·05	+0·08	+0.20	+0·15	+0·03
23 18	+0·17	+0·15	+0·08	+0·13	+0·15	+0·10	−0·02	+0·03	+0·17	+0·20	+0·27	+0·20	+0·13
Range ...	1·43	1·07	2·31	3·48	4·38	4·25	4·09	4·83	4·86	2·28	1·00	1·20	2·52

TABLE 294.—*Declination Magnetograph—Showing for the period 1883 to 1893, mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

1883-1893. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·15	+0·17	+0·13	+0·23	+0·25	+0·20	+0·12	+0·07	+0·17	+0·25	+0·25	+0·20	+0·18
1 18	+0·07	+0·17	+0·13	+0·28	+0·35	+0·30	+0·25	+0·13	+0·22	+0·22	+0·18	+0·15	+0·20
2 18	−0·03	+0·10	+0·08	+0·28	+0·38	+0·38	+0·33	+0·23	+0·25	+0·15	+0·10	+0·02	+0·18
3 18	−0·20	−0·02	−0·03	+0·20	+0·35	+0·38	+0·35	+0·27	+0·22	+0·03	−0·07	−0·15	+0·12
4 18	−0·37	−0·18	−0·15	+0·13	+0·40	+0·47	+0·47	+0·38	+0·25	−0·08	−0·27	−0·37	+0·05
5 18	−0·53	−0·37	−0·17	+0·18	+0·73	+0·85	+0·83	+0·77	+0·45	−0·17	−0·43	−0·57	+0·13
6 18	**−0·63**	**−0·43**	0·00	+0·93	+1·75	+1·90	+1·83	+2·02	+1·45	+0·03	**−0·65**	−0·70	+0·63
7 18	−0·60	−0·38	+0·65	+1·77	**+2·20**	**+2·33**	**+2·40**	**+2·68**	**+2·30**	+0·72	**−0·57**	**−0·88**	+1·03
8 18	+0·23	+0·20	**+1·20**	**+1·85**	+1·80	+2·03	+2·08	+2·18	+2·02	**+1·03**	−0·08	−0·28	**+1·18**
9 18	**+0·90**	**+0·57**	+1·18	+1·22	+0·52	+0·88	+0·98	+0·70	+0·77	+0·65	+0·08	**+0·30**	+0·73
10 18	+0·68	+0·50	+0·67	+0·07	−0·92	−0·38	−0·32	−0·80	−0·63	−0·08	−0·10	+0·22	−0·10
11 18	−0·23	−0·03	−0·30	−1·25	−1·93	−1·53	−1·47	−1·98	−1·98	−1·02	−0·50	−0·07	−1·03
12 18	−0·47	−0·38	−1·12	**−2·00**	**−2·33**	**−2·18**	−2·05	**−2·48**	**−2·60**	**−1·37**	−0·28	0·00	**−1·43**
13 18	−0·20	−0·23	**−1·25**	−1·88	−1·92	−2·08	**−2·07**	−2·30	−2·25	−0·97	+0·22	+0·22	−1·23
14 18	−0·03	−0·03	−0·65	−1·20	−1·10	−1·53	−1·57	−1·53	−1·18	−0·28	**+0·35**	+0·25	−0·72
15 18	+0·15	+0·15	+0·03	−0·42	−0·32	−0·83	−0·83	−0·52	−0·10	+0·28	+0·33	+0·18	−0·15
16 18	+0·32	+0·17	+0·23	+0·13	+0·22	−0·22	−0·20	+0·30	+0·55	+0·43	+0·28	+0·23	+0·20
17 18	+0·12	−0·05	−0·02	+0·12	+0·28	+0·05	+0·12	+0·53	+0·35	−0·02	+0·07	+0·13	+0·13
18 18	+0·05	−0·15	−0·27	−0·17	−0·02	−0·05	+0·05	+0·13	−0·07	−0·10	+0·15	+0·18	−0·02
19 18	+0·18	0·00	−0·22	−0·32	−0·32	−0·38	−0·37	−0·20	−0·10	−0·03	+0·18	+0·23	−0·12
20 18	+0·17	+0·02	−0·13	−0·25	−0·30	−0·35	−0·38	−0·25	−0·10	−0·02	+0·17	+0·18	−0·10
21 18	+0·12	+0·02	−0·08	−0·12	−0·17	−0·25	−0·33	−0·20	−0·07	+0·02	+0·13	+0·17	−0·07
22 18	+0·13	+0·07	−0·02	+0·03	−0·02	−0·08	−0·18	0·12	+0·02	+0·12	+0·20	+0·18	+0·03
23 18	+0·15	+0·13	+0·08	+0·13	+0·12	+0·05	−0·05	−0·03	+0·08	+0·22	+0·25	+0·20	+0·12
Range ...	1·53	1·00	2·43	3·77	4·53	4·51	4·47	5·16	4·90	2·40	1·00	1·18	2·61

TABLE 295.—*Declination Magnetograph—Showing, for the period 1894 to 1904, the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

1894-1904.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·10	+0·12	+0·08	+0·20	+0·20	+0·20	+0·08	+0·07	+0·18	+0·20	+0·20	+0·13	+0·15
1 18	+0·05	+0·10	+0·05	+0·25	+0·27	+0·32	+0·18	+0·17	+0·25	+0·20	+0·15	+0·10	+0·17
2 18	−0·02	+0·05	+0·02	+0·23	+0·28	+0·33	+0·27	+0·23	+0·23	+0·17	+0·08	0·00	+0·15
3 18	−0·17	−0·08	−0·08	+0·13	+0·27	+0·35	+0·33	+0·28	+0·23	+0·03	−0·05	−0·15	+0·08
4 18	−0·33	−0·23	−0·17	+0·07	+0·27	+0·38	+0·42	+0·38	+0·25	−0·05	−0·20	−0·30	+0·03
5 18	−0·52	−0·37	−0·18	+0·08	+0·52	+0·73	+0·75	+0·70	+0·42	−0·08	−0·30	−0·43	+0·12
6 18	**−0·62**	**−0·47**	−0·07	+0·73	+1·52	+1·72	+1·73	+1·78	+1·32	+0·07	−0·48	−0·57	+0·55
7 18	−0·58	−0·38	+0·57	+1·58	**+2·18**	**+2·22**	**+2·22**	**+2·47**	**+2·22**	+0·70	−0·40	**−0·78**	+1·00
8 18	+0·18	+0·15	+1·12	**+1·77**	+2·00	+2·00	+1·95	+2·08	+1·93	**+0·93**	−0·03	−0·35	**+1·15**
9 18	**+0·78**	**+0·45**	**+1·15**	+1·23	+0·83	+1·02	+0·98	+0·70	+0·68	+0·47	+0·02	+0·03	+0·70
10 18	+0·45	+0·40	+0·72	+0·28	−0·48	−0·12	−0·13	−0·65	−0·60	−0·20	−0·15	+0·03	0·00
11 18	−0·30	−0·18	−0·25	−0·98	−1·55	−1·32	−1·32	−1·77	−1·97	−1·07	**−0·52**	−0·15	−0·95
12 18	−0·42	−0·45	−1·02	**−1·77**	**−2·13**	**−2·05**	**−1·95**	**−2·22**	**−2·62**	**−1·28**	−0·27	−0·07	**−1·35**
13 18	−0·08	−0·25	**−1·12**	−1·72	−1·90	−2·00	−1·93	−2·07	−2·17	−0·82	+0·23	+0·20	−1·13
14 18	+0·05	+0·08	−0·57	−1·17	−1·22	−1·53	−1·47	−1·35	−1·10	−0·15	**+0·45**	**+0·32**	−0·63
15 18	+0·20	+0·30	+0·08	−0·47	−0·50	−0·90	−0·77	−0·45	−0·05	+0·35	+0·37	+0·32	−0·13
16 18	+0·32	+0·33	+0·27	+0·05	+0·03	−0·27	−0·17	+0·22	+0·52	+0·42	+0·25	+0·35	+0·20
17 18	+0·13	+0·10	+0·03	+0·12	+0·18	−0·03	+0·08	+0·40	+0·38	+0·02	+0·05	+0·23	+0·13
18 18	+0·08	−0·03	−0·20	−0·10	−0·03	−0·12	+0·02	+0·07	+0·02	−0·05	+0·10	+0·25	0·00
19 18	+0·17	+0·08	−0·20	−0·28	−0·30	−0·37	−0·35	−0·27	−0·08	−0·05	+0·10	+0·23	−0·12
20 18	+0·15	+0·05	−0·15	−0·23	−0·32	−0·37	−0·38	−0·33	−0·12	−0·03	+0·08	+0·18	−0·12
21 18	+0·12	+0·05	−0·08	−0·13	−0·22	−0·27	−0·32	−0·27	−0·05	0·00	+0·07	+0·15	−0·08
22 18	+0·12	+0·08	−0·05	0·00	−0·05	−0·07	−0·18	−0·17	+0·02	+0·08	+0·12	+0·15	0·00
23 18	+0·12	+0·13	+0·03	+0·12	+0·10	+0·08	−0·05	−0·03	+0·10	+0·18	+0·18	+0·15	+0·10
Range ...	1·40	·92	2·27	3·54	4·31	4·27	4·17	4·69	4·84	2·21	·97	1·10	2·50

TABLE 296.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the intermediate sun-spot years 1874, 1875, 1880, 1881, 1882, 1885, 1886, 1890, 1891, 1895, 1896, 1897, 1898, 1903, 1904 and for the whole year.*

Bombay Civil Time.	Month.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·15	+0·17	+0·10	+0·25	+0·23	+0·22	+0·10	+0·12	+0·22	+0·22	+0·23	+0·17	+0·18
1 18	+0·07	+0·13	+0·08	+0·30	+0·32	+0·33	+0·22	+0·22	+0·28	+0·22	+0·17	+0·12	+0·20
2 18	−0·03	+0·08	+0·03	+0·28	+0·33	+0·38	+0·32	+0·28	+0·28	+0·15	+0·08	+0·02	+0·18
3 18	−0·18	−0·07	−0·07	+0·20	+0·33	+0·38	+0·37	+0·32	+0·27	+0·02	−0·08	−0·15	+0·12
4 18	−0·37	−0·20	−0·15	+0·13	+0·33	+0·42	+0·43	+0·38	+0·28	−0·08	+0·25	−0·33	+0·05
5 18	−0·57	−0·37	−0·20	+0·13	+0·62	+0·77	+0·77	+0·70	+0·43	−0·13	−0·38	−0·52	+0·10
6 18	**−0·68**	**−0·47**	−0·10	+0·80	+1·67	+1·80	+1·77	+1·83	+1·38	+0·08	**−0·60**	−0·67	+0·57
7 18	−0·65	−0·45	+0·53	+1·62	**+2·22**	**+2·32**	**+2·22**	**+2·53**	**+2·23**	+0·72	−0·48	**−0·90**	+1·00
8 18	+0·12	+0·15	+1·10	**+1·73**	+1·95	+2·07	+1·93	+2·13	+1·93	**+0·93**	−0·03	−0·42	**+1·13**
9 18	**+0·75**	**+0·53**	**+1·18**	+1·15	+0·73	+1·05	+1·00	+0·75	+0·68	+0·47	+0·08	+0·08	+0·70
10 18	+0·53	+0·48	+0·77	+0·13	−0·63	−0·15	−0·15	−0·67	−0·63	−0·22	−0·15	+0·10	−0·05
11 18	−0·25	−0·07	−0·13	−1·10	−1·68	−1·35	−1·25	−1·80	−1·97	−1·02	−0·55	−0·15	−0·95
12 18	−0·43	−0·43	**−0·98**	**−1·85**	**−2·23**	**−2·08**	−1·85	**−2·32**	**−2·57**	**−1·33**	−0·33	−0·08	**−1·37**
13 18	−0·12	−0·27	+1·15	−1·75	−1·97	−2·07	**−1·88**	−2·13	−2·18	−0·83	+0·17	+0·27	−1·17
14 18	+0·05	−0·02	−0·63	−1·17	−1·23	−1·58	−1·45	−1·45	−1·17	−0·15	+0·38	**+0·33**	−0·67
15 18	+0·22	+0·17	+0·05	−0·47	−0·47	−0·90	−0·77	−0·55	−0·12	+0·37	**+0·42**	+0·32	−0·15
16 18	+0·32	+0·22	+0·25	+0·05	+0·10	−0·28	−0·20	+0·13	+0·45	+0·43	+0·33	+0·33	+0·18
17 18	+0·13	0·00	−0·02	+0·10	+0·22	−0·05	+0·03	+0·35	+0·28	−0·02	+0·10	+0·20	+0·12
18 18	+0·10	−0·12	−0·25	−0·15	−0·03	−0·12	−0·03	+0·05	−0·05	−0·07	+0·15	+0·23	−0·02
19 18	+0·18	+0·05	−0·22	−0·28	−0·33	−0·42	−0·42	−0·27	−0·12	−0·03	+0·13	+0·25	−0·12
20 18	+0·17	+0·07	−0·15	−0·22	−0·32	−0·42	−0·45	−0·32	−0·10	0·00	+0·14	+0·20	−0·12
21 18	+0·15	+0·05	−0·08	−0·10	−0·20	−0·32	−0·37	−0·23	−0·03	+0·02	+0·10	+0·17	−0·07
22 18	+0·15	+0·10	−0·02	+0·03	−0·03	−0·12	−0·22	−0·12	+0·05	+0·10	+0·17	+0·17	+0·02
23 18	+0·17	+0·17	+0·07	+0·17	+0·12	+0·05	−0·07	0·00	+0·15	+0·22	+0·23	+0·18	+0·12
Range ...	1·43	1·00	2·16	3·58	4·45	4·40	4·10	4·85	4·80	2·26	1·02	1·23	2·50

TABLE 297.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the maximum sun-spot years 1872, 1873, 1883, 1884, 1892, 1893, 1894, and for the whole year.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·18	+0·28	+0·17	+0·27	+0·28	+0·17	+0·07	+0·03	+0·22	+0·27	+0·28	+0·23	+0·20
1 18	+0·15	+0·28	+0·17	+0·37	+0·38	+0·30	+0·23	+0·15	+0·28	+0·23	+0·25	+0·20	+0·25
2 18	+0·07	+0·23	+0·12	+0·35	+0·42	+0·37	+0·35	+0·27	+0·30	+0·22	+0·15	+0·10	+0·25
3 18	−0·13	+0·05	−0·03	+0·23	+0·38	+0·37	+0·37	+0·33	+0·25	+0·07	−0·07	−0·08	+0·15
4 18	−0·38	−0·22	−0·15	+0·12	+0·45	+0·48	+0·52	+0·42	+0·25	−0·07	−0·28	−0·30	+0·07
5 18	−0·58	−0·43	−0·17	+0·18	+0·78	+0·90	+0·87	+0·83	+0·47	−0·13	−0·48	−0·52	+0·15
6 18	**−0·70**	**−0·52**	+0·13	+1·08	+1·98	+2·12	+2·08	+2·25	+1·65	+0·20	**−0·70**	−0·63	+0·75
7 18	−0·67	−0·32	+0·98	+2·07	**+2·50**	**+2·62**	**+2·72**	**+3·00**	**+2·63**	+0·97	−0·52	**−0·83**	+1·27
8 18	+0·20	+0·45	**+1·63**	**+2·18**	+2·08	+2·27	+2·27	+2·45	+2·27	**+1·20**	+0·08	−0·20	**+1·40**
9 18	**+1·05**	**+0·93**	+1·55	+1·50	+0·73	+0·98	+0·97	+0·85	+0·90	+0·77	**+0·33**	**+0·47**	+0·92
10 18	+0·87	+0·73	+0·77	+0·28	−0·85	−0·35	−0·42	−0·70	−0·63	−0·12	+0·12	+0·28	0·00
11 18	−0·05	+0·10	−0·47	−1·20	−2·07	−1·58	−1·63	−1·92	−2·13	−1·12	−0·42	−0·13	−1·05
12 18	−0·43	−0·33	**−1·37**	**−2·08**	**−2·62**	**−2·25**	**−2·22**	**−2·55**	**−2·88**	**−1·42**	−0·25	−0·12	**−1·54**
13 18	−0·15	−0·25	−1·37	−2·05	−2·18	−2·22	−2·20	−2·48	−2·47	−0·98	+0·23	+0·15	−1·33
14 18	−0·10	−0·12	−0·65	−1·38	−1·35	−1·70	−1·67	−1·77	−1·32	−0·28	+0·27	+0·25	−0·82
15 18	+0·05	−0·03	−0·02	−0·58	−0·50	−1·00	−0·90	−0·70	−0·18	+0·28	+0·18	+0·18	−0·27
16 18	+0·17	−0·05	+0·10	−0·02	+0·13	−0·37	−0·27	+0·15	+0·47	+0·33	+0·10	+0·18	+0·08
17 18	0·08	−0·32	−0·22	0·00	+0·27	+0·03	+0·13	+0·43	+0·28	−0·25	−0·17	−0·05	0·00
18 18	−0·13	−0·48	−0·57	−0·32	+0·03	+0·03	+0·15	+0·13	−0·13	−0·28	−0·02	+0·03	−0·13
19 18	+0·15	−0·12	−0·35	−0·48	−0·38	−·042	−0·37	−0·27	−0·13	−0·08	+0·15	+0·15	−0·18
20 18	+0·15	−0·07	−0·20	−0·35	−0·35	−0·40	−0·42	−0·35	−0·10	−0·05	+0·17	+0·13	−0·15
21 18	+0·12	−0·07	−0·15	−0·20	−0·18	−0·28	−0·38	−0·30	−0·10	0·07	+0·13	+0·10	−0·12
22 18	+0·12	+0·12	−0·08	0·00	−0·02	−0·10	−0·25	−0·20	0·00	+0·08	+0·22	+0·15	0·00
23 18	+0·15	+0·18	+0·08	+0·10	+0·12	+0·03	−0·12	−0·08	+0·10	−0·22	−0·27	+0·23	+0·10
Range ...	1·75	1·45	3·00	4·26	5·12	4·87	4·94	5·55	5·51	2·62	1·03	1·30	2·94

TABLE 298.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the minimum sun-spot years 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901, 1902, and for the whole year.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·12	+0·08	+0·08	+0·17	+0·25	+0·25	+0·18	+0·13	+0·15	+0·20	+0·20	+0·13	+0·13
1 18	+0·05	+0·05	+0·07	+0·20	+0·30	+0·35	+0·28	+0·20	+0·20	+0·20	+0·15	+0·08	+0·17
2 18	−0·03	0·00	+0·02	+0·22	+0·33	+0·42	+0·33	+0·27	+0·22	+0·15	+0·07	−0·03	+0·17
3 18	−0·20	−0·10	−0·08	+0·13	+0·30	+0·40	+0·38	+0·30	+0·22	+0·07	−0·05	−0·17	+0·10
4 18	−0·33	−0·22	−0·15	+0·07	+0·32	+0·40	+0·43	+0·40	+0·23	−0·02	−0·18	−0·32	+0·05
5 18	−0·47	−0·35	−0·18	+0·08	+0·52	+0·68	+0·68	+0·68	+0.40	−0·07	−0·32	−0·43	+0·10
6 18	**−0·57**	−0·38	−0·08	+0·63	+1·32	+1·53	+1·58	+1·68	+1·15	+0·07	−0·47	−0·55	+0·50
7 18	−0·55	−0·32	+0·50	+1·43	**+1·90**	**+1·98**	**+2·08**	**+2·39**	**+2·13**	+0·67	0·43	**−0·72**	+0·92
8 18	+0·18	+0·10	+0·97	**+1·58**	+1·68	+1·78	+1·90	+1·97	+1·87	**+0·87**	−0·13	−0·32	**+1·03**
9 18	**+0·72**	+0·30	**+0·98**	+1·12	+0·60	+0·83	+0·95	+0·70	+0·70	+0·42	−0·10	+0·02	+0·60
10 18	+0·48	+0·22	+0·58	+0·22	−0·65	−0·27	−0·18	−0·72	−0·57	−0·28	−0·30	−0·15	−0·13
11 18	−0·30	−0·27	−0·28	−0·95	−1·57	−1·33	−1·35	−1·82	−1·82	−1·08	**−0·62**	−0·30	−0·97
12 18	−0·40	**−0·43**	−1·00	**−1·65**	**−1·98**	**−1·97**	**−1·92**	**−2·22**	**−2·42**	**−1·28**	−0·27	−0·13	**−1·30**
13 18	−0·13	−0·18	**−1·07**	−1·60	−1·70	−1·80	−1·88	−2·03	−2·05	−0·82	+0·27	+0·20	−1·07
14 18	−0·02	+0·15	−0·52	−1·02	−1·00	−1·32	−1·40	−1·37	−1·03	−0·17	**+0·47**	**+0·37**	−0·57
15 18	+0·17	+0·42	+0·17	−0·33	−0·32	−0·73	−0·75	−0·47	−0·03	+0·37	+0·42	+0·37	−0·07
16 18	+0·37	**+0·43**	+0·37	+0·15	+0·15	−0·23	−0·18	+0·25	+0·53	+0·45	+0·33	+0·40	+0·25
17 18	+0·22	+0·17	+0·13	+0·13	+0·22	−0·05	+0·02	+0·42	+0·37	+0·08	+0·17	+0·32	+0·18
18 18	+0·15	+0·05	−0·10	−0·10	−0·10	−0·18	−0·10	+0·03	−0·02	−0·02	+0·17	+0·28	0·00
19 18	+0·18	+0·05	−0·17	−0·25	−0·28	−0·37	−0·38	−0·23	−0·12	−0·07	+0·13	+0·25	−0·10
20 18	+0·15	+0·03	−0·13	−0·25	−0·28	−0·32	−0·38	−0·27	−0·13	−0·03	+0·12	+0·20	−0·10
21 18	+0·10	+0·02	−0·07	−0·13	−0·17	−0·20	−0·28	−0·18	−0·07	+0·02	+0·10	+0·17	−0·05
22 18	+0·12	+0·05	0·02	0·00	−0·02	−0·02	−0·12	−0·08	+0·02	+0·10	+0·15	+0·17	+0·03
23 18	+0·12	+0·08	+0·05	+0·08	+0·13	+0·15	+0·05	+0·02	+0·08	+0·18	+0·20	+0·15	+0·10
Range ...	1·29	0·86	2·05	3·23	3·88	3·95	4·00	4·61	4·55	2·15	1·09	1·09	2·33

TABLE 299.—*Declination Magnetograph—Showing excess Diurnal Inequality of Declination for each average month of the period 1872 to 1904, over the average year, showing the average seasonal disturbance.*

Bombay Civil Time.	Month.												Sum without regard to signs.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
H. m.	′		′	′	′	′	′	′	′	′	′	′	′
0 18	−0·03	−0·02	−0·07	+0·05	+0·07	+0·03	−0·07	−0·08	+0·02	+0·03	+0·05	−0·02	0·53
1 18	−0·12	−0·07	−0·10	+0·08	+0·12	+0·13	+0·05	−0·02	+0·05	+0·02	−0·02	−0·08	0·85
2 18	−0·20	−·10	−0·13	+0·08	+0·17	+0·20	+0·15	+0·08	+0·08	−0·02	−0·08	−0·17	1·47
3 18	−0·30	−0·17	−0·18	+0·07	+0·22	+0·27	+0·25	+0·20	+0·13	−0·07	−0·18	−0·27	2·30
4 18	−0·40	−0·27	−0·20	+0·05	+0·30	+0·38	+0·40	+0·35	+0·22	−0·12	−0·28	−0·37	3·33
5 18	−0·65	−0·50	−0·30	+0·02	+0·50	+0·65	+0·65	+0·60	+0·30	−0·23	−0·50	−0·60	5·50
6 18	−1·23	−1·03	**−0·63**	**+1·05**	+1·03	+1·20	+1·18	+1·30	+0·78	**−0·48**	−1·17	−1·20	12·30
7 18	**−1·65**	**−1·38**	−0·42	+0·62	**+1·13**	**+1·23**	**+1·25**	**+1·52**	**+1·25**	−0·28	**−1·48**	**−1·85**	14·07
8 18	−1·02	−0·97	0·0	+0·62	+0·72	+0·85	+0·83	+0·98	+0·82	−0·20	−1·20	−1·50	9·70
9 18	+0·10	−0·18	+0·48	+0·50	−0·02	+0·25	+0·25	+0·03	+0·02	−0·20	−0·65	−0·58	3·27
10 18	+0·65	+0·52	**+0·77**	+0·27	−0·62	−0·17	−0·15	−0·62	−0·55	−0·15	−0·07	+0·13	4·65
11 18	+0·77	+0·88	+0·72	−0·08	−0·75	−0·42	−0·38	−0·85	−0·97	−0·08	+0·45	+0·78	7·13
12 18	+0·97	**+0·97**	+0·32	−0·45	**−0·85**	**−0·97**	−0·57	−0·95	**−1·20**	+0·05	+1·08	+1·30	9·67
13 18	**+1·03**	+0·93	0·0	**−0·60**	−0·75	−0·85	−0·78	**−1·02**	−1·03	+0·30	**+1·38**	**+1·38**	10·07
14 18	+0·67	+0·68	+0·07	−0·50	−0·52	−0·85	**−0·82**	−0·82	−0·48	+0·48	+1·05	+1·00	7·93
15 18	+0·32	+0·37	+0·22	−0·30	−0·28	−0·72	−0·63	−0·40	+0·05	**+0·50**	+0·52	+0·45	4·75
16 18	+0·12	+0·05	+0·07	−0·12	−0·07	−0·47	−0·38	0·0	+0·30	+0·23	+0·10	+0·15	2·05
17 18	0·0	−0·13	−0·13	−0·03	+0·10	−0·15	−0·07	+0·28	+0·20	−0·15	−0·05	+0·07	1·37
18 18	+0·10	−0·10	−0·23	−0·13	−0·02	−0·07	+0·02	+0·10	−0·03	−0·07	+0·15	+0·25	1·27
19 18	+0·32	+0·15	−0·10	−0·18	−0·20	−0·27	−0·27	−0·12	+0·02	+0·08	+0·27	+0·37	2·33
20 18	+0·27	+0·13	−0·03	−0·15	−0·20	−0·27	−0·30	−0·18	0·0	+0·10	+0·23	+0·30	2·17
21 18	+0·20	+0·08	−0·03	−0·07	−0·12	−0·20	−0·27	−0·17	+0·02	+0·07	+0·18	+0·22	1·62
22 18	+0·12	+0·07	−0·05	0·0	−0·03	−0·10	−0·20	−0·13	0·0	+0·08	+0·15	+0·15	1·08
23 18	+0·03	+0·03	−0·05	+0·02	0·0	−0·03	−0·15	−0·13	0·0	+0·08	+0·12	+0·07	0·72

TABLE 304.—*Declination Magnetograph—Showing excess Diurnal Inequality of Declination showing secular difference between the seasonal variations at times of maximum and minimum sun-spot epochs.*

Bombay Civil Time.	Month.												Sum without regard to sign.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	0·0	+0·13	+0·02	+0·03	−0·03	−0·15	−0·18	−0·17	0·0	0·0	+0·02	+0·03	0·77
1 18	+0·02	+0·15	+0·02	+0·08	0·0	−0·13	−0·13	−0·13	0·0	−0·05	+0·02	+0·03	0·77
2 18	+0·02	+0·15	+0·02	+0·05	0·0	−0·13	−0·07	−0·08	0·0	−0·02	0·0	+0·05	0·58
3 18	+0·02	+0·10	0·0	+0·05	+0·03	−0·08	−0·07	−0·02	−0·02	−0·05	−0·07	+0·03	0·53
4 18	−0·07	−0·02	−0·02	+0·03	+0·12	+0·07	+0·07	0·0	0·0	−0·07	−0·12	0·0	0·57
5 18	−0·17	−0·13	−0·03	+0·05	+0·22	+0·17	+0·13	+0·10	+0·02	−0·12	−0·22	−0·13	1·48
6 18	−0·38	−0·38	−0·03	+0·20	**+0·42**	+0·33	+0·25	+0·32	**+0·25**	−0·12	**−0·48**	−0·33	3·50
7 18	**−0·47**	−0·35	+0·13	**+0·28**	+0·25	+0·28	+0·28	**+0·35**	+0·15	−0·05	−0·43	**−0·47**	3·50
8 18	−0·35	−0·02	**+0·30**	+0·23	+0·03	+0·12	0·0	+0·12	+0·03	−0·03	−0·15	−0·25	1·63
9 18	+0·02	+0·32	+0·25	+0·07	−0·18	−0·17	−0·30	−0·17	−0·12	+0·03	+0·12	+0·13	1·87
10 18	+0·25	+0·38	+0·05	−0·07	−0·33	**−0·22**	**−0·37**	−0·12	−0·20	+0·03	+0·28	**+0·30**	2·60
11 18	**+0·33**	**+0·45**	−0·10	−0·17	−0·42	−0·17	−0·20	−0·02	−0·23	+0·05	**+0·28**	+0·25	2·67
12 18	+0·15	+0·28	−0·18	**−0·25**	**−0·45**	−0·10	−0·12	−0·15	**−0·28**	+0·05	+0·20	+0·20	2·42
13 18	+0·25	+0·20	−0·03	−0·18	−0·22	−0·15	−0·05	**−0·18**	−0·15	+0·10	+0·23	+0·22	1·97
14 18	+0·17	−0·02	+0·12	−0·12	−0·10	−0·13	−0·02	−0·15	−0·03	**+0·13**	+0·05	+0·13	1·17
15 18	+0·08	−0·25	+0·02	−0·05	+0·02	−0·07	+0·05	−0·03	+0·05	+0·12	−0·03	+0·02	0·78
16 18	−0·03	−0·32	−0·10	0·0	+0·15	+0·03	+0·08	+0·07	+0·10	+0·05	−0·07	−0·05	1·05
17 18	−0·12	−0·30	−0·17	+0·05	+0·23	+0·27	+0·30	+0·20	+0·10	**−0·15**	−0·15	−0·18	2·22
18 18	−0·15	**−0·40**	**−0·33**	−0·08	+0·27	**+0·35**	**+0·38**	+0·23	+0·02	−0·13	−0·05	−0·12	2·52
19 18	+0·05	−0·08	−0·10	−0·15	−0·02	+0·03	+0·10	+0·05	+0·07	+0·07	+0·10	−0·02	0·83
20 18	+0·05	−0·05	−0·02	−0·05	−0·02	−0·03	+0·02	−0·03	+0·08	+0·03	+0·10	−0·02	0·50
21 18	+0·08	−0·02	−0·02	0·0	+0·05	−0·02	−0·03	−0·05	+0·03	−0·02	+0·10	0·0	0·42
22 18	+0·03	+0·10	−0·03	+0·03	+0·03	−0·05	−0·10	−0·08	+0·02	+0·02	+0·10	+0·02	0·62
23 18	+0·03	+0·10	+0·03	+0·02	−0·02	−0·12	−0·17	−0·10	+0·02	+0·03	+0·07	+0·08	0·78

TABLE 300.—*Showing monthly mean values and annual variation of summed ranges of declination in C. G. S. unit.*

Unity = 1γ.

Year.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1848 ...	106	63	155	180	235	228	265	290	248	130	78	81	172
1849 ...	117	132	146	209	235	248	247	263	245	102	71	67	173
1850 ...	85	96	138	181	250	258	252	234	248	119	66	74	167
1851 ...	102	72	106	163	205	234	249	220	200	116	64	75	150
1852 ...	86	79	125	197	241	243	246	248	178	111	64	123	162
1853 ...	93	68	96	213	205	286	259	278	231	86	80	105	167
1854 ...	107	76	90	172	228	232	220	225	214	98	74	82	152
1855 ...	97	69	90	184	218	212	209	204	221	101	93	82	148
1856 ...	100	58	83	171	176	216	210	221	215	91	68	89	142
1857 ...	76	77	76	154	236	197	211	215	240	106	75	69	144
1858 ...	88	63	129	204	231	227	257	270	236	122	75	77	165
1859 ...	99	90	147	258	269	266	242	264	250	140	76	112	184
1860 ...	85	98	147	200	234	289	272	338	256	140	64	62	182
1861 ...	93	82	128	203	225	281	271	270	253	121	66	82	173
1862 ...	82	87	120	194	201	254	225	221	202	98	61	83	152
1863 ..	69	42	103	168	228	221	243	224	192	97	99	97	149
1864 ...	78	59	108	197	216	272	222	241	206	89	69	94	154
1865 ...	140	85	111	184	208	229	197	219	186	97	107	84	154
1866 ...	89	74	94	172	188	218	174	182	170	131	100	112	142
1867 ...	105	57	83	163	193	216	219	199	171	96	99	95	141
1868 ...	58	68	90	204	204	245	200	225	205	97	59	59	143
1869 ...	95	67	102	186	224	272	289	236	233	111	72	71	163
1870 ...	75	110	140	232	258	296	289	322	280	164	89	78	194
1871 ...	93	87	147	247	242	292	278	300	281	146	87	87	188
1872 ...	109	129	143	228	266	252	255	276	266	116	85	81	184
1873 ...	113	75	146	221	239	222	249	255	210	92	70	65	163
1874 ...	82	91	106	167	193	201	202	208	208	90	67	70	140
1875 ...	83	79	84	124	202	203	182	200	190	90	65	71	131
1876 ...	60	52	83	124	184	204	205	201	195	97	64	65	128
1877 ...	68	48	81	138	180	198	225	234	202	84	71	67	133
1878 ..	77	53	90	144	163	185	178	170	160	95	54	94	122
1879 ...	75	49	75	108	187	202	195	211	176	84	74	89	127
1880 ...	78	53	100	144	170	204	195	212	179	92	59	90	131
1881 ...	89	72	101	151	215	241	222	238	223	111	67	73	150
1882 ...	57	81	111	164	215	232	182	221	159	105	85	66	140
1883 ...	81	82	88	168	211	238	230	194	207	110	66	65	145
1884 ...	83	122	127	199	207	231	220	253	214	93	77	77	159
1885 ...	90	51	99	160	210	240	236	258	206	78	78	75	148
1886 ...	86	88	86	159	214	225	209	211	193	100	103	88	147
1887 ...	93	54	96	155	211	200	223	231	194	89	88	84	143
1888 ...	91	53	94	148	170	205	214	198	167	86	74	79	132
1889 ...	71	57	77	179	178	186	177	200	171	84	78	63	127
1890 ...	70	61	72	150	169	190	188	211	190	84	65	71	127
1891 ...	79	47	110	147	224	200	203	222	216	104	62	63	140
1892 ...	75	65	118	190	229	226	251	257	213	112	54	74	155
1893 ...	91	77	155	176	238	247	227	265	228	112	52	80	162
1894 ...	84	69	120	176	225	228	221	225	211	117	68	65	151
1895 ...	81	75	125	199	236	277	226	238	196	92	51	58	154
1896 ...	75	53	91	173	218	206	193	207	186	74	63	74	134
1897 ...	78	69	98	159	201	208	198	203	184	81	56	77	134
1898 ...	78	55	84	150	200	224	188	198	198	81	75	66	133
1899 ...	94	75	92	143	199	192	183	195	159	78	50	64	127
1900 ...	73	51	89	133	164	174	184	208	202	92	65	79	126
1901 ...	72	61	83	124	160	184	180	190	190	74	39	63	118
1902 ...	82	41	91	120	141	179	186	213	182	92	56	65	121
1903 ...	69	52	83	146	169	214	208	206	212	105	62	70	133
1904 ...	82	55	108	163	179	210	220	222	200	82	48	77	137
1905 ..	80	109	101	161	197	215	220	235	233	139	64	44	150
Annual Inequality. 1872—1904...	− 58	− 73	− 39	+ 19	+ 60	+ 74	+ 68	+ 80	+ 57	− 49	− 73	− 66	...
Annual Inequality. Maximum spot years .	− 69	− 71	− 32	+ 34	+ 71	+ 75	+ 77	+ 87	+ 61	− 52	− 93	− 87	..
Annual Inequality. Minimum spot years .	− 50	− 74	− 41	+ 10	+ 48	+ 64	+ 68	+ 77	+ 54	− 41	− 63	− 54	...

TABLE 301.—*Excess Diurnal Inequality of Declination for each year 1872—1904 over the mean of all 33 years.*

*Bombay Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
1872 ...	+0·07	+0·10	+0·12	+0·07	+0·02	+0·07	+0·33	**+0·42**	+0·38	+0·28	+0·07	−0·17	−0·23	−0·22	−0·17	−0·18	−0·22	**−0·25**	−0·18	−0·12	−0·12	−0·12	0·00	+0·02
1873 ...	+ ·07	+ .10	+ ·13	+ ·12	+ ·08	+ 07	+ ·12	+0·20	+ **·20**	+ ·18	− ·02	− ·10	− ·18	− ·10	− ·08	− ·08	− ·17	− ·18	− **·20**	− ·08	− ·05	− ·05	+ ·02	+ ·03
1874 ...	+ ·07	+ ·07	+ ·05	+ ·02	·00	− ·07	− ·08	− ·08	− ·05	+ ·12	+ ·18	+ **·23**	+ ·22	+ ·07	− ·07	− ·15	− **·18**	− ·15	− ·07	− ·03	− ·03	− ·02	·00	+ ·05
1875 ...	+ ·02	+ ·02	+ ·03	+ ·03	+ ·03	− ·03	− ·10	− ·12	− ·17	− **·18**	− ·12	+ ·02	+ ·05	+ ·15	+ ·12	+ **·15**	+ ·08	·00	− ·03	·00	·00	·00	+ ·02	+ ·02
1876 ...	+ ·02	+ ·02	+ ·02	+ ·03	+ ·03	·00	− ·10	− ·07	− **·20**	− ·17	− ·15	+ ·03	+ ·12	+ **·12**	+ ·07	+ ·07	+ ·05	+ ·05	+ ·02	·00	− ·03	− ·02	·00	·00
1877 ...	+ ·02	+ ·02	+ ·03	+ ·05	+ ·05	+ ·02	− ·07	− ·05	− ·05	− ·08	− **·13**	− ·12	− ·03	+ ·05	+ **·13**	+ ·05	+ ·07	+ ·08	+ ·03	+ ·02	+ ·02	+ ·02	+ ·03	+ ·03
1878 ...	·00	− ·02	− ·03	− ·02	·00	− ·03	− ·12	− **·17**	− ·17	− ·17	− ·17	·00	+ ·15	+ ·22	+ **·23**	+ ·20	+ ·10	·00	− ·03	− ·02	− ·02	·00	·00	·00
1879 ...	·00	·00	− ·02	− ·02	·00	·00	− ·07	− ·15	− **·22**	− ·20	− ·13	− ·05	+ ·05	+ ·12	+ ·15	+ **·17**	+ ·13	+ ·10	+ ·03	+ ·02	− ·02	+ ·02	+ ·03	·00
1880 ...	+ ·02	+ ·02	·00	− ·03	− ·05	− ·12	− **·20**	− ·18	− ·12	+ ·02	+ ·13	+ **·22**	+ ·17	+ ·08	·00	− ·03	− ·07	− ·05	− ·02	·00	+ ·02	+ ·03	+ ·03	+ ·03
1881 ...	+ ·02	+ ·02	·00	− ·02	− ·02	− ·02	+ ·08	+ ·17	+ **·18**	+ ·15	+ ·05	− ·05	− ·15	− **·15**	− ·13	− ·07	− ·03	− ·03	− ·02	− ·02	− ·02	− ·02	·00	·00
1882 ...	+ ·03	+ ·05	+ ·05	·00	− ·03	− ·05	− ·07	− ·08	+ ·03	+ ·20	+ **·23**	+ ·17	+ ·08	+ ·05	− ·05	− ·10	− **·18**	− ·18	− ·10	− ·05	− ·03	− ·03	+ ·02	+ ·03
1883 ...	+ ·02	+ ·05	+ ·05	+ ·03	+ ·03	+ ·05	+ ·10	+ ·13	+ ·17	+ **·20**	+ ·05	− ·03	− ·10	− ·10	− **·13**	− ·08	− ·08	− ·12	− ·08	− ·07	− ·05	− ·03	− ·02	·00
1884 ...	− ·03	− ·02	− ·02	− ·03	− ·03	− ·05	+ ·07	+ ·18	+ ·32	+ **·35**	+ ·22	+ ·03	− ·08	− ·18	− **·22**	− ·18	− ·03	− ·03	− ·07	− ·02	− ·02	− ·05	− ·03	− ·03
1885 ...	− ·03	·00	·00	·00	·00	+ ·03	+ ·07	·00	− ·02	·00	− ·05	− ·05	− **·12**	− ·10	− ·08	+ ·05	+ **·12**	+ ·08	·00	+ ·02	+ ·03	+ ·02	+ ·02	·00
1886 ...	+ ·03	+ ·07	+ ·03	+ ·02	·00	− ·05	− ·05	− ·15	− **·17**	− ·08	+ ·05	+ **·18**	+ ·17	+ ·08	− ·02	− ·10	− ·12	− ·03	− ·02	+ ·02	·00	+ ·03	+ ·03	+ ·05
1887 ...	·00	·00	·00	·00	+ ·02	·00	− ·03	− ·12	− ·15	− **·15**	− ·12	− ·07	·00	+ ·03	+ ·03	+ ·03	+ ·07	+ **·10**	+ ·07	+ ·07	+ ·07	+ ·07	+ ·03	+ ·03
1888 ...	·00	− ·02	·00	− ·02	+ ·02	− ·02	− ·10	− **·18**	− ·15	− ·12	− ·07	+ ·02	+ ·07	+ ·05	+ ·07	+ **·10**	+ ·07	+ ·05	+ ·05	+ ·07	+ ·03	+ ·02	+ ·02	·00
1889 ...	− ·05	− ·07	− ·05	− ·05	·00	+ ·02	− ·05	− **·12**	− ·10	− ·10	− ·08	− ·03	+ ·05	+ ·05	+ ·08	+ ·12	+ **·13**	+ ·12	+ ·07	+ ·03	+ ·02	·00	·00	− ·03
1890 ...	·00	− ·02	·00	·00	+ ·02	·00	− ·05	− ·22	- **·27**	− ·22	− ·12	·00	+ ·12	+ **·13**	+ ·13	+ ·13	+ ·13	+ ·10	+ ·05	+ ·02	+ ·02	·00	+ ·02	·00
1891 ...	− ·02	− ·05	− ·03	− ·05	− ·02	+ ·02	+ ·08	+ ·07	+ **·10**	+ ·05	− ·08	− **·15**	− ·15	− ·07	·00	+ ·03	+ ·05	+ ·03	+ ·05	+ ·07	+ ·05	+ ·02	+ ·03	− ·02
1892 ...	− ·02	− ·02	+ ·02	− ·05	·00	+ ·03	+ ·23	+ **·27**	+ ·25	+ ·08	− ·03	− ·17	− **·18**	− ·13	− ·07	− ·02	+ ·02	− ·03	− ·02	− ·02	− ·03	− ·07	− ·03	− ·07
1893 ...	+ ·05	+ ·10	+ ·08	+ ·05	+ ·03	+ ·07	+ ·15	+ **·27**	+ ·25	+ ·17	− ·02	− ·18	− ·35	− **·37**	− ·30	− ·15	− ·05	− ·02	·00	+ ·05	+ ·03	+ ·02	+ ·02	+ ·03
1894 ...	− ·02	+ ·02	+ ·02	·00	+ ·02	+ ·03	+ ·10	+ ·12	+ ·10	+ ·15	+ **·18**	+ ·13	+ ·02	− ·05	− ·08	− ·12	− **·17**	− ·13	− ·10	− ·05	− ·03	− ·05	− ·05	− ·03
1895 ...	·00	+ ·02	+ ·02	+ ·03	+ ·03	+ ·07	+ ·17	+ **·22**	+ ·18	+ ·03	− ·07	− ·15	− **·18**	− ·15	− ·12	− ·03	·00	− ·03	− ·02	+ ·02	·00	− ·03	− ·02	·00
1896 ...	+ ·02	+ ·03	+ ·03	+ ·05	+ **·07**	+ ·05	+ ·03	− ·05	− **·08**	− ·08	− ·03	− ·02	− ·03	− ·05	·00	+ ·03	− ·02	− ·02	+ ·03	+ ·03	·00	− ·02	·00	·00
1897 ...	+ ·02	+ ·03	+ ·02	+ ·02	+ ·03	+ ·02	− ·05	− **·08**	− ·03	− ·02	+ ·10	+ **·12**	+ ·10	+ ·07	·00	− ·02	− ·05	− ·07	− ·05	− ·03	− ·03	− ·03	− ·02	·00
1898 ...	− ·03	·00	− ·03	− ·02	·00	− ·02	− ·05	− ·08	− ·13	− **·15**	− ·03	+ ·02	+ ·05	+ ·13	+ **·13**	+ ·12	+ ·05	+ ·05	+ ·07	+ ·02	− ·03	− ·03	− ·02	− ·02
1899 ...	− ·02	− ·02	− ·02	− ·03	− ·02	− ·02	− ·07	− ·08	− ·08	− **·15**	− ·07	− ·02	+ ·02	+ ·05	+ ·10	+ **·12**	+ ·08	+ ·07	+ ·05	+ ·05	·00	·00	+ ·02	− ·02
1900 ...	− ·03	· ·03	− ·03	− ·03	− ·02	− ·02	− ·10	− **·12**	− ·08	− ·05	− ·07	+ ·02	+ ·08	+ ·12	+ ·08	+ ·07	+ ·07	+ ·08	+ ·05	+ ·03	− ·02	·00	·00	− ·02
1901 ...	− ·07	− ·07	− ·07	− ·05	− ·03	− ·07	− ·17	− **·20**	− ·15	− ·05	+ ·13	+ ·18	+ ·18	+ **·18**	+ ·12	+ ·05	·00	+ ·03	+ ·05	+ ·03	− ·02	·00	·00	− ·02
1902 ...	− ·08	− ·08	− ·08	− ·08	− ·07	− ·08	− **·15**	− ·13	− ·03	+ ·08	+ ·12	+ ·13	+ **·17**	+ ·12	+ ·08	+ ·02	·00	+ ·03	+ ·03	+ ·03	+ ·02	+ ·02	·00	− ·05
1903 ...	− ·07	− ·07	− ·07	− ·07	− ·05	− ·03	− ·07	− **·08**	− ·05	·00	+ ·10	+ ·07	− ·02	− ·05	− ·07	− ·03	+ ·03	+ **·17**	+ ·15	+ ·08	+ ·05	+ ·05	+ ·02	− ·03
1904 ...	− **·12**	− ·08	− ·08	− ·08	− ·05	− ·02	+ ·05	+ ·10	+ ·08	− ·02	− ·05	− ·07	− ·05	·00	+ ·03	+ **·10**	+ ·08	+ ·10	+ ·08	+ ·07	·00	− ·03	− ·02	− ·08
1905 ...	− ·05	− ·03	− ·05	− ·07	− ·05	− ·02	+ ·12	+ ·17	+ ·23	+ ·27	+ ·30	+ ·12	− ·08	− ·22	− ·25	− ·18	− ·13	− ·05	·00	+ ·05	+ ·05	·00	− ·02	− ·03
Variation of Sum without regard to signs.	−0·03	−0·03	−0·03	−0·03	−0·03	−0·03	+0·03	+0·07	**+0·08**	+0·05	+0·03	+0·03	+0·05	+0·05	+0·03	+0·02	+0·02	+0·02	−0·02	−0·03	−0·02	−0·03	**−0·05**	−0·05

* The exact time of tabulation is 18 minutes past the full hour.

TABLE 302.—*Declination Magnetograph—Showing excess Diurnal Inequality of Declination of each month of the group of maximum sun-spot years over the corresponding month of the whole period of 33 years 1872 to 1904.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	+0·03	+0·12	+0·05	+0·03	+0·03	−0·05	−0·05	−0·07	+0·02	+0·05	+0·05	+0·07	+0·02
1 18	+0·07	+0·15	+0·07	+0·08	+0·07	−0·03	−0·02	−0·03	+0·03	+0·02	+0·07	+0·08	+0·05
2 18	+0·08	+0·15	+0·07	+0·08	+0·07	−0·02	+0·02	0·0	+0·03	+0·05	+0·05	+0·08	+0·07
3 18	+0·05	+0·10	+0·03	+0·05	+0·05	−0·02	0·0	+0·02	0·0	+0·02	0·0	+0·07	+0·03
4 18	−0·03	0·00	0·0	+0·02	+0·10	+0·05	+0·07	+0·02	−0·02	0·0	−0·05	+0·02	+0·02
5 18	−0·05	−0·05	+0·02	+0·05	+0·17	+0·13	+0·10	+0·12	+0·05	−0·02	−0·10	−0·03	+0·03
6 18	−0·05	−0·07	+0·18	+0·28	**+0·37**	+0·33	+0·32	+0·37	+0·28	+0·10	−0·12	−0·02	+0·17
7 18	−0·05	+0·03	+0·37	**+0·42**	+0·33	**+0·35**	**+0·43**	**+0·45**	**+0·35**	+0·22	−0·07	−0·02	+0·23
8 18	+0·05	+0·25	**+0·47**	+0·40	+0·20	+0·25	+0·27	+0·30	+0·28	+0·23	+0·12	+0·13	**+0·23**
9 18	+0·23	**+0·40**	+0·35	+0·28	+0·03	+0·02	0·0	+0·10	+0·17	**+0·25**	**+0·27**	**+0·33**	+0·20
10 18	**+0·28**	+0·28	+0·07	+0·08	−0·17	−0·12	−0·20	−0·02	−0·02	+0·10	+0·25	+0·22	+0·07
11 18	+0·17	+0·20	−0.20	−0·13	−0·33	−0·18	−0·27	−0·08	−0·18	−0·05	+0·12	+0·07	−0·07
12 18	−0·02	+0·08	−0·30	−0·25	**−0·38**	−0·17	**−0·27**	−0·22	**−0·30**	−0·08	+0·05	−0·03	−0·10
13 18	−0·02	−0·02	−0·20	**−0·28**	−0·27	**−0·20**	−0·25	**−0·30**	−0·27	−0·12	+0·02	−0·07	**−0·17**
14 18	−0·10	−0·13	−0·05	−0·22	−0·17	−0·18	−0·18	−0·28	−0·17	−0·10	−0·12	−0·08	−0·15
15 18	−0·12	−0·25	−0·08	−0·13	−0·07	−0·13	−0·12	−0·15	−0·08	−0·07	−0·18	−0·12	−0·12
16 18	−0·13	−0·28	−0·15	−0·08	+0·02	−0·08	−0·07	−0·03	−0·02	−0·08	−0·18	−0·15	−0·10
17 18	−0·20	−0·30	−0·20	−0·08	+0·05	+0·07	+0·08	+0·03	−0·03	**−0·22**	**−0·23**	**−0·23**	−0·12
18 18	**−0·20**	**−0·35**	**−0·30**	−0·15	+0·08	+0·13	+0·17	+0·07	−0·07	−0·18	−0·13	−0·18	−0·10
19 18	−0·03	−0·13	−0·12	−0·17	−0·05	−0·02	+0·03	−0·02	−0·02	−0·03	+0·02	−0·08	−0·05
20 18	0·0	−0·08	−0·05	−0·08	−0·03	−0·02	0·0	−0·05	+0·02	−0·03	+0·05	−0·05	−0·03
21 18	−0·02	−0·08	−0·05	−0·07	0·0	−0·02	−0·05	−0·07	−0·05	−0·07	+0·02	−0·05	−0·05
22 18	−0·02	+0·03	−0·05	−0·02	0·0	−0·02	−0·07	−0·08	−0·02	−0·02	+0·05	−0·02	−0·02
23 18	0·00	+0·03	+0·02	−0·03	0·0	−0·05	−0·08	−0·07	−0·02	+0·02	+0·03	+0·05	−0·02

TABLE 303.—*Declination Magnetograph—Showing excess Diurnal Inequality of Declination of each month of the group of minimum sun-spot years over the corresponding month of the whole period of 33 years 1872 to 1904.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.	′	′	′	′	′	′	′	′	′	′	′	′	′
0 18	−0·03	−0·08	−0·03	−0·07	0·0	+0·03	+0·07	+0·03	−0·05	−0·02	−0·03	−0·03	−0·05
1 18	−0·03	−0·08	−0·03	−0·08	−0·02	+0·02	+0·03	+0·02	−0·05	−0·02	−0·03	−0·03	−0·03
2 18	−0·02	−0·08	−0·03	−0·05	−0·02	+0·03	0·0	0·0	−0·05	−0·02	−0·03	−0·05	−0·02
3 18	−0·02	−0·05	−0·02	−0·05	−0·03	+0·02	+0·02	−0·02	−0·03	+0·02	+0·02	−0·02	−0·02
4 18	+0·02	0·0	0·0	−0·03	−0·03	−0·03	−0·02	0·0	−0·03	+0·05	+0·05	0·0	0·0
5 18	+0·07	+0·03	0·0	−0·05	−0·10	−0·08	−0·08	−0·03	−0·02	+0·05	+0·07	+0·05	−0·02
6 18	+0·08	+0·07	−0·03	−0·17	**−0·30**	−0·25	−0·18	−0·20	**−0·22**	−0·03	+0·12	+0·07	−0·08
7 18	+0·07	+0·03	−0·12	**−0·22**	−0·27	**−0·28**	**−0·20**	**−0·25**	−0·15	−0·08	+0·02	+0·10	−0·12
8 18	+0·03	−0·10	−0·20	−0·20	−0·20	−0·23	−0·10	−0·18	−0·12	**−0·10**	−0·10	+0.02	**−0·13**
9 18	**−0·10**	**−0·23**	**−0·22**	−0·10	−0·10	−0·13	−0·02	−0·05	−0·03	−0·10	−0·17	−0·12	−0·12
10 18	−0·10	−0·23	−0·12	+0·02	+0·03	−0·03	+0·03	−0·03	+0·05	−0·07	**−0·17**	**−0·22**	−0·07
11 18	−0·08	−0·17	−0·02	+0·12	+0·17	+0·07	+0·02	+0·02	+0·13	−0·02	−0·08	−0·10	+0·02
12 18	+0·02	−0·02	+0·07	**+0·18**	**+0·25**	+0·12	+0·03	+0·12	**+0·17**	+0·05	+0·03	−0·05	+0·08
13 18	0·0	+0·05	+0·10	+0·17	+0·22	**+0·22**	+0·07	**+0·15**	+0·15	+0·05	+0·05	−0·02	**+0·10**
14 18	−0·02	+0·13	+0·08	+0·15	+0·18	+0·20	**+0·08**	+0·12	+0·12	+0·02	+0·08	+0·03	+0·10
15 18	0·0	**+0·20**	+0·10	+0·12	+0·12	+0·13	+0·03	+0·08	+0·07	+0·02	+0·05	+0·07	+0·08
16 18	+0·07	+0·20	+0·12	+0·08	+0·03	+0·05	+0·02	+0·07	+0·05	+0·03	+0·05	+0·07	+0·07
17 18	**+0·10**	+0·18	+0·15	+0·05	0·0	−0·02	−0·03	+0·02	+0·05	**+0·12**	**+0·10**	**+0·13**	+0·07
18 18	+0·08	+0·18	**+0·17**	+0·07	−0·05	−0·08	−0·08	−0·03	+0·05	+0·08	+0·05	+0·07	+0·03
19 18	0·0	+0·03	+0·07	+0·07	+0·05	+0·03	+0·02	+0·02	0·0	−0·02	0·0	−0·02	+0·03
20 18	0·0	+0·02	+0·02	+0·02	+0·03	+0·07	+0·03	+0·03	−0·02	−0·02	0·0	+0·02	+0·02
21 18	−0·03	0·0	+0·03	0·0	+0·02	+0·07	+0·05	+0·05	−0·02	+0·02	−0·02	+0·02	+0·02
22 18	−0·02	−0·03	+0·02	−0·02	0·0	+0·07	+0·07	+0·03	0·0	0·0	−0·02	0·0	+0·02
23 18	−0·03	−0·07	−0·02	−0·05	+0·02	+0·07	+0·08	+0·03	−0·03	−0·02	−0·03	−0·03	−0·02

clearly marks the quiescent conditions due to the interference effects indicating, as in H, and also in V (see plates 21 and 55), the transition epoch from summer to winter conditions, the excess inequality of September giving a curve which is almost exactly the reverse of that of November. The change back from winter to summer conditions in the character of the excess variations is also definitely indicated between the months of February and April. The months most influenced by seasonal changes are December and January, while the months of August and September are almost equally influenced but with opposite effects.

Seasonal variation of hourly ordinates of diurnal inequality.

378. Figures 25 to 48 in the same plate show the annual variations of the ordinates of each of the 24 hours indicating the disturbance to which they are subject under the action of the average periodic seasonal forces. The hour least disturbed (*vide* column 14, table 299) is the midnight hour. Here also the periodic disturbance effects of the season are confined to the solar hours, the night hours exhibiting more or less quiescent conditions. Unlike however the conditions which have been noted to prevail in H, the subdued runs of the excess variations of the night hours reverse their character *before* and *after* midnight; while in the solar hours the disturbing effects are reversed before and after 9 hour.

Of the 24 hours, 7 hour followed closely by 12 hour and 13 hour, is the most disturbed, but as will be seen from plate 39, figures 32, 37, and 38, the curve of 7 hour denotes a disturbance which is exactly opposite in character to that of 12 hour and 13 hour.

The seasonal march of 7 hour and of the average of 12 and 13 hours can best be examined from the harmonic co-efficients given below.

Co-efficients of 7 hours.		Co-efficients of the average of 12 and 13 hours.	
$c_1 = 1'{\cdot}73$;	$a_1 = 185^\circ\ 19'$:	$c_1 = 1'{\cdot}18$;	$a_1 = 3^\circ\ 4'$
$c_2 = 0'{\cdot}35$;	$a_2 = 78^\circ\ 22'$:	$c_2 = 0'{\cdot}33$;	$a_2 = 167^\circ\ 59'$
$c_3 = 0'{\cdot}26$;	$a_3 = 6^\circ\ 7'$:	$c_3 = 0'{\cdot}28$;	$a_3 = 70^\circ\ 56'$

The amplitude of the first component in either 7 or 12 hour when compared with those of the other components is very large, and indicates that the annual term is clearly the dominent feature in the progression. When however the two hours are intercompared among themselves it will also be seen that the first component is practically the only one which is mainly influenced by the seasonal effect, while the others show no change as the co-efficients of the second and third components of both hours remain unaffected, except in the reversal of their epochs.

Annual variation of diurnal range and summed range.

379. Proceeding to the consideration of the variation of the daily range in its seasonal march it will be seen that the range remains uniformly high from May to September with a feeble tendency to a maximum in August, while the winter months show an uniformly low value with a tendency to a minimum in February. This character of the progression remains practically unaffected by secular changes of the 11-year period.

The summed ranges (see table 300) show that their progression is almost of the same character as that of the ranges. The dominent feature namely the single seasonal wave, in comparison with which the other features become practically insignificant, is clearly indicated by the harmonic co-efficients given below derived from the analysis of the average inequality, and of the inequalities of the maximum and minimum spot years and of the difference curve from the two latter inequalities.

Harmonic co-efficients: Annual variation of Summed Range.

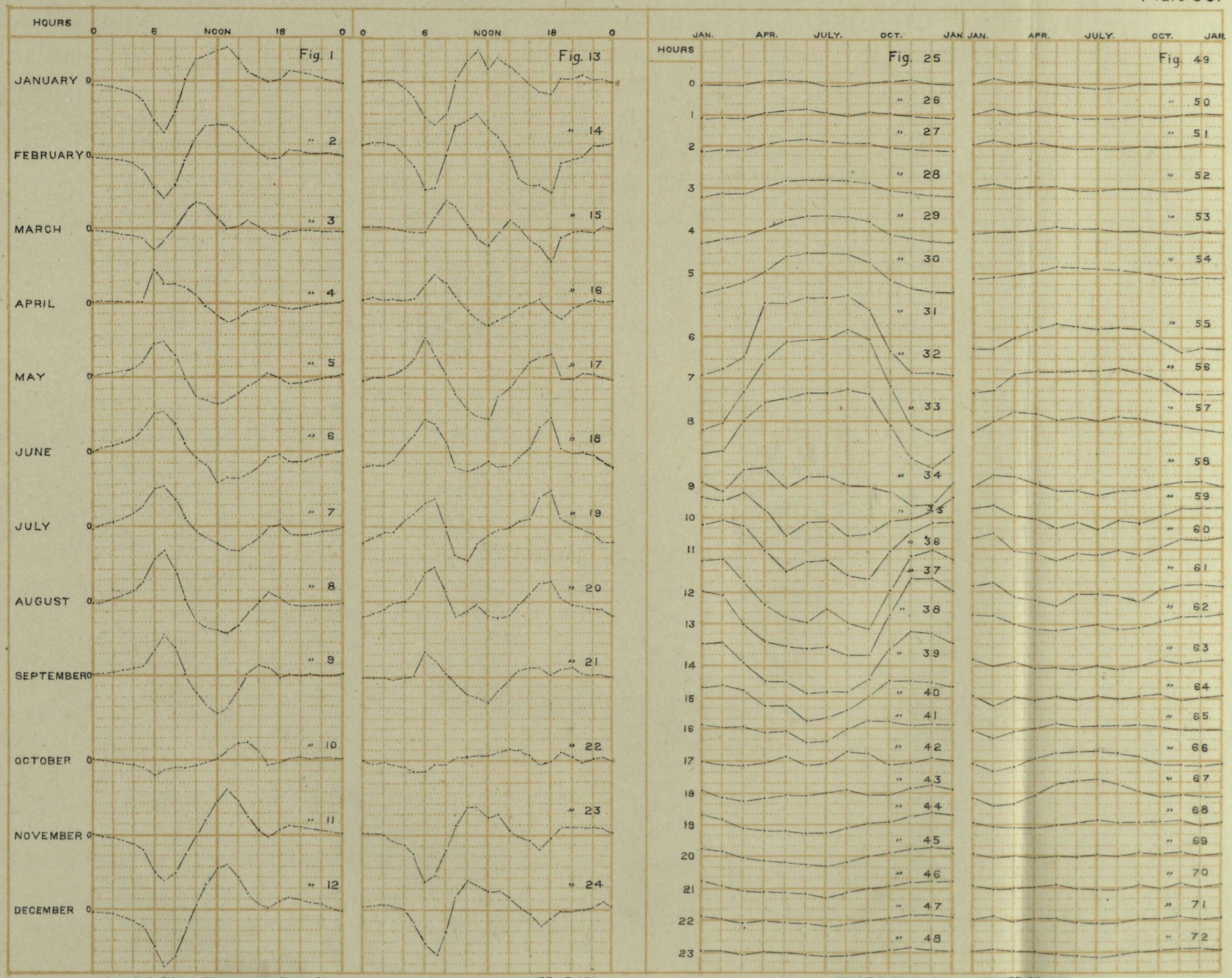
Average	...	$c_1 = 82{\cdot}3\gamma$	$c_2 = 9{\cdot}8\gamma$	$c_3 = 21{\cdot}9\gamma$	$a_1 = 195^\circ\ 47'$	$a_2 = 92^\circ\ 16'$	$a_3 = 2^\circ\ 35'$
Maximum spots	...	$c_1 = 95{\cdot}1\gamma$	$c_2 = 12{\cdot}0\gamma$	$c_3 = 23{\cdot}0\gamma$	$a_1 = 180^\circ\ 11'$	$a_2 = 50^\circ\ 6'$	$a_3 = 3^\circ\ 8'$
Minimum spots	...	$c_1 = 76{\cdot}1\gamma$	$c_2 = 9{\cdot}8\gamma$	$c_3 = 20{\cdot}3\gamma$	$a_1 = 189^\circ\ 7'$	$a_2 = 24^\circ\ 15'$	$a_3 = 0^\circ\ 46'$
Difference curve	...	$c_1 = 23{\cdot}3\gamma$	$c_2 = 9{\cdot}8\gamma$	$c_3 = 3{\cdot}8\gamma$	$a_1 = 149^\circ\ 15'$	$a_2 = 76^\circ\ 35'$	$a_3 = 16^\circ\ 48'$

In passing it may be remarked that initially the declination data were made available for discussion in terms of easterly force and its variations. As it was deemed advisable later to have the data in arc, the entire data had to be re-computed for the requirements. The summed ranges, however, used in the above discussion have been allowed to remain in the unit of force as they are also subsequently used along with similar figures for H and V in the same unit, for purposes of comparison in Chapter XIV.

COLABA OBSERVATORY

Changes in the Diurnal Inequality of Declination due to Average Seasonal and Secular Seasonal effects.

Plate 39.



SCALE 3 SMALL DIVS = 1 MINUTE OF ARC. SCALE 9 SMALL DIVS = 1 MINUTE OF ARC. SCALE 3 SMALL DIVS = 1 MINUTE OF ARC.

Figs:1-12 - Excesses of the average monthly inequalities over the average of the year.
Figs:13-24 - " " " " " due to intermittent secular effects. Figs:25-48 - Annual variation of each hourly ordinate.
Figs:49-72 - Excess annual variation of each hourly ordinate due to secular effects.

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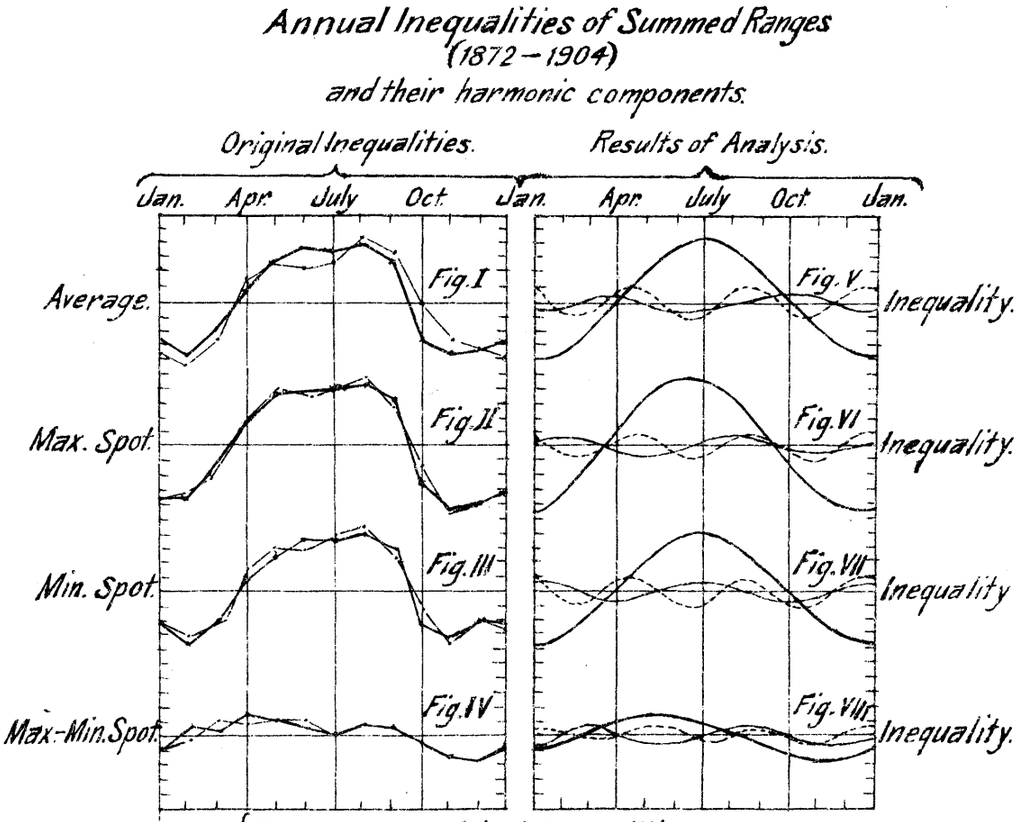
It will be noted that the first component while indicating an increased amplitude in the maximum spot years, and a suppressed movement in the minimum epoch, does not show any appreciable change in the phase. The date of the maximum epoch for the average inequality is 17th July whilst in the minimum spot years, it falls on the 10th July and in the maximum spot years on the 1st July.



The predominance of the first component and the comparative insignificance of the other two components and the slight relative importance of the third as compared with the second component are the distinctive features of the progression.

Variation in the annual inequality of summed range at times of maximum and minimum spots.

380. The influence of the 11-year period disturbance on the diurnal range from year to year will be examined in detail later; but it may be noted here that this secular effect is practically confined to a change in the annual term as seen from figures 5 to 8 above, the first component appearing to be the principal one affected by the transition of conditions from the years of maximum to minimum spots. That the annual term here should be mainly the one affected by the secular change, as also in the seasonal runs of two typical hours of the same day as referred to in paragraph 378, is worthy of note.

381. Comparing the magnitude of the range of the seasonal change, with that of the secular change, it will be seen that unlike the conditions in H where the magnitude of the secular change is almost the same as that of the seasonal, in declination results the latter is by far the more conspicuous of the two phenomena. The range in D in arc changes from 0′·9 to 4′·9 under the action of the seasonal forces while the secular effects induce a change in the range only from 2′·3 to 2′·9.

The secular effects on the seasonal march as indicated by the difference of the curves at the mean maximum and mean minimum sun-spots epochs, as will be seen from figure 4 above, do not run parallel as in H, with the actual annual inequality. The effects are very small and the real progression is undoubtedly masked by irregularities, especially as in the 33 years which represent the period herein considered, the secular change has been notably small. The results, however, of the first 22 years in which we know the secular effects have been very strongly marked, show, as will be noted later, that when the effects are large enough, they do disclose this parallelism very closely, *vide* paragraph 394, figures 4 and 8.

382. The diurnal inequalities given in table below, which are derived from the average of 33 and 55 years, are, it will be seen, identically the same. In the same table are collected the differences of the average diurnal curves of each of the five 11-year groups from the average of 55 years, the whole period under examination, which show the progression in the diurnal wave, of the secular effects due to the larger unknown period. It will be seen that though these departures are very small they nevertheless disclose a variation in the secular energy the character of which is fairly similar to that indicated by the H results.

Normal diurnal inequality.

Diurnal Inequalities of Declination and excesses over average of 55 years.

Unity=0·01 minute of arc.

Hours.		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Inequality from 33 years ...		+18	+20	+18	+12	+5	+12	+58	+103	+117	+72	−7	−98	−138	−117	−67	−15	+18	+12	−3	−13	−12	−7	+2	+12
Inequality from 55 years ...		+21	+23	+21	+14	+7	+15	+63	+108	+121	+75	−8	−101	−143	−122	−73	−20	+13	+7	−5	−13	−11	−6	+3	+14
Excess inequalities of five 11-yearly groups over 55 years.	1850—1860	+4	+5	+3	+2	+2	+2	+5	+8	+11	+9	+1	−2	−7	−9	−10	−12	−10	−6	−5	−1	0	+1	+2	+3
	1861—1871	+2	+5	+5	+6	+6	+7	+9	+7	+2	+1	−8	−8	−9	−8	−7	−6	−6	−5	−2	+1	+1	+2	+1	+2
	1872—1882	+1	0	+1	−1	0	−5	−6	−5	−6	−2	+1	+4	+6	+9	+8	+5	+2	0	−3	−4	−2	−2	0	−1
	1883—1893	−3	−3	−3	−2	−2	−2	0	−5	−3	−2	−2	−2	0	−1	+1	+5	+7	+6	+3	+1	+1	−1	0	−2
	1894—1904	−6	−6	−6	−6	−4	−3	−8	−6	−6	−5	+8	+6	+8	+9	+10	+7	+7	+6	+5	+1	−1	−2	−3	−4

383. In plates 40 and 41 are charted the excess inequalities of each year and of each average month at times of maximum and minimum sun-spot epochs over the respective average inequality of 33 years. These excesses as will be seen from tables 301, 302, 303 are small in this element and have hence been charted on a larger scale for examination.

Secular change in diurnal inequalities under the influence of the 11-year period.

The progression of the discontinuous or intermittent disturbing effects disclosed here notwithstanding their small magnitude, show precisely the same graded phenomenon as that observed in H. A glance at plate 40 will show for example that the excess inequalities for the years 1892, 1893, 1895, appear to be almost good specimens on a reduced scale of the usual normal diurnal curve, while those of the years 1874, 1880, 1886, 1901 typify the same reversed, even the minor maximum at 16 hours being also significantly indicated. The uniform progress of the phenomenon though masked here and there by irregularities, is, however, fairly clearly discerned; and knowing as we do that the declination element at Colaba under the violent disturbing influences of even the largest of storms, is but very slightly affected, the existence under the circumstances of this steadily varying effect is suggestive of its being distinctly a separate manifestation of the effects of the phenomenon.

It will be seen from plates 40 and 42 that the incidence of the transition epochs is fairly the same as that referred to in H results in paragraphs 360 and 362.

384. The change in the diurnal curve which occurs from month to month discontinuously waxing and waning from year to year owing to forces which determine the 11-year period disturbance, and which nearly cuts out in the average seasonal change referred to in paragraph 377, can be derived from tables 302, 303, the results of which are shown charted in plate 41. Taking now the excesses of each month's inequalities over that of the year shown in tables 302 and 303 or of figures 1 to 12 over figure 13 and of figures 14 to 25 over figure 26 in the above-mentioned plate, we secure the excess disturbance inequalities from month to month at the two mean epochs, the secular seasonal change thus disclosed gradually passing from one series to the other as the years progress from mean maximum to mean minimum spots conditions. The difference between the excess inequalities of the two epochs which measures twice the effect of the departures from the average conditions, are charted in plate 39, figures 13 to 24. It will be seen that here too as in H, the characters of the seasonal disturbance of each month on the diurnal curve, when compared with those of the average seasonal changes referred to paragraph 377 and charted in figures 1 to 12, are strikingly similar.

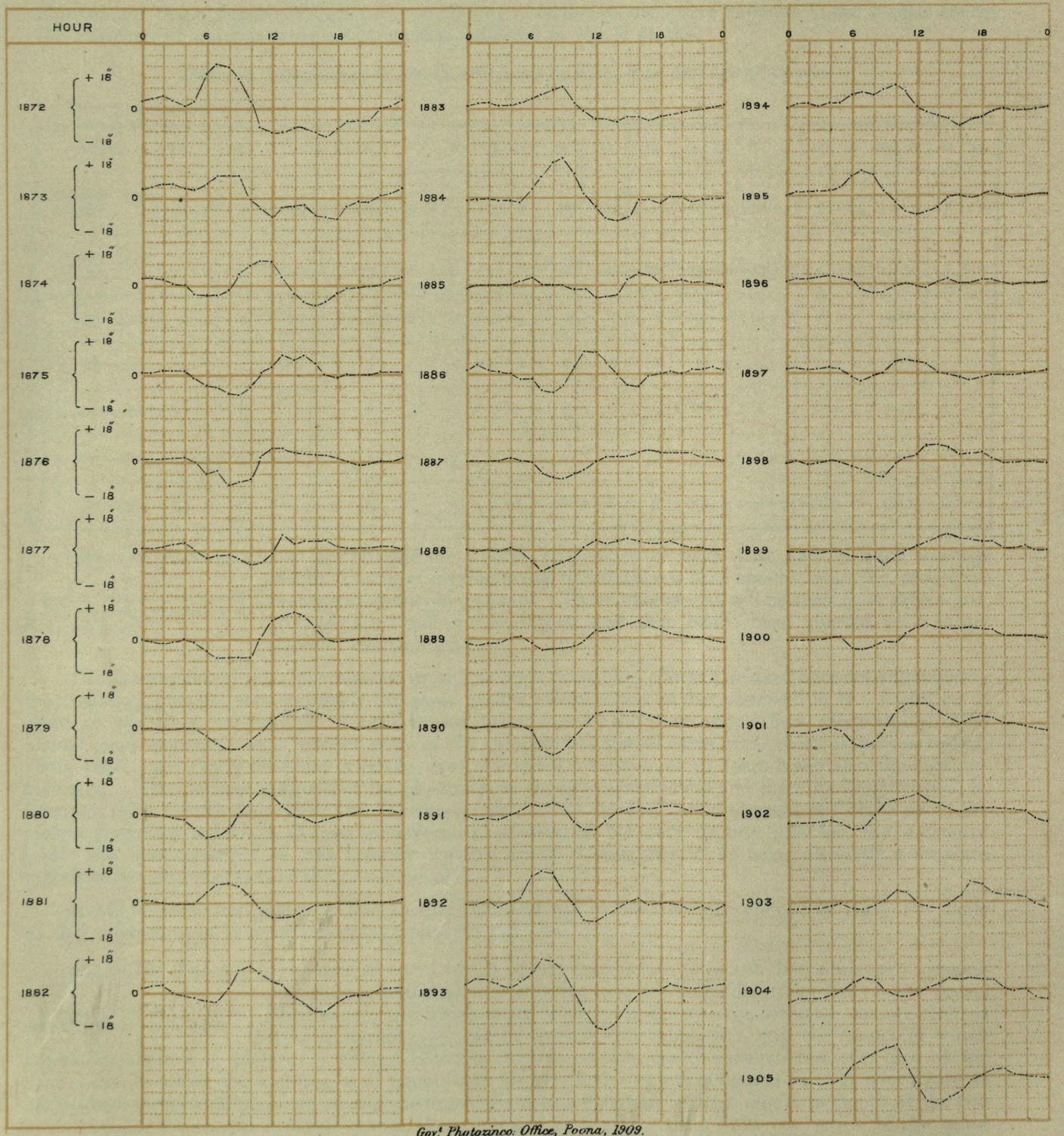
Seasonal variation of diurnal inequality due to secular forces.

COLABA OBSERVATORY

Declination Diurnal Inequality (Magnetograph)

Excesses of each year over the average year.

Plate 40.



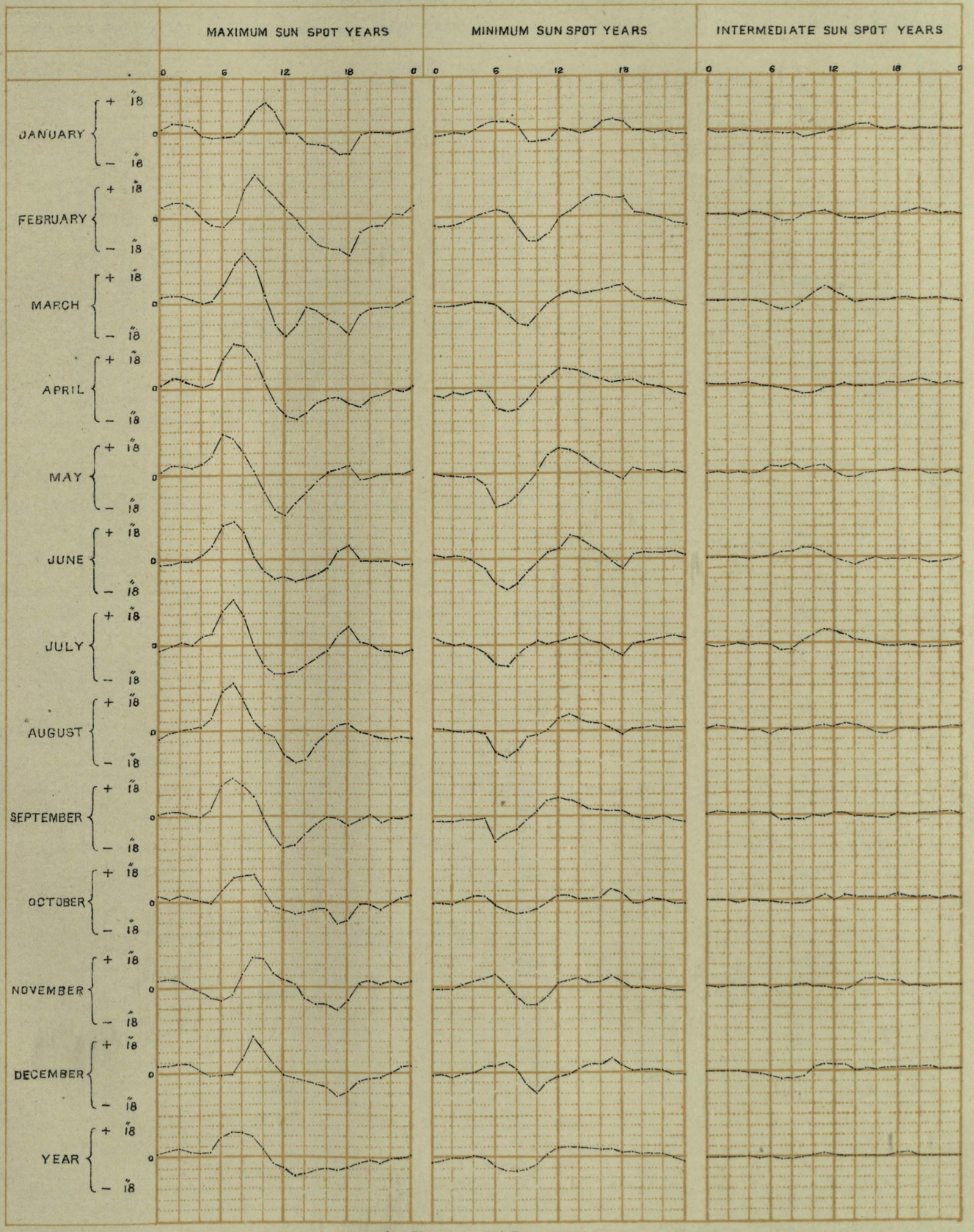
Govt. Photozinco. Office, Poona, 1909.

COLABA OBSERVATORY

Declination Diurnal Inequality (Magnetograph)

Excesses of each average month of the groups of Sun spot years over the average Corresponding month of the whole period (1872 to 1904)

Plate 41



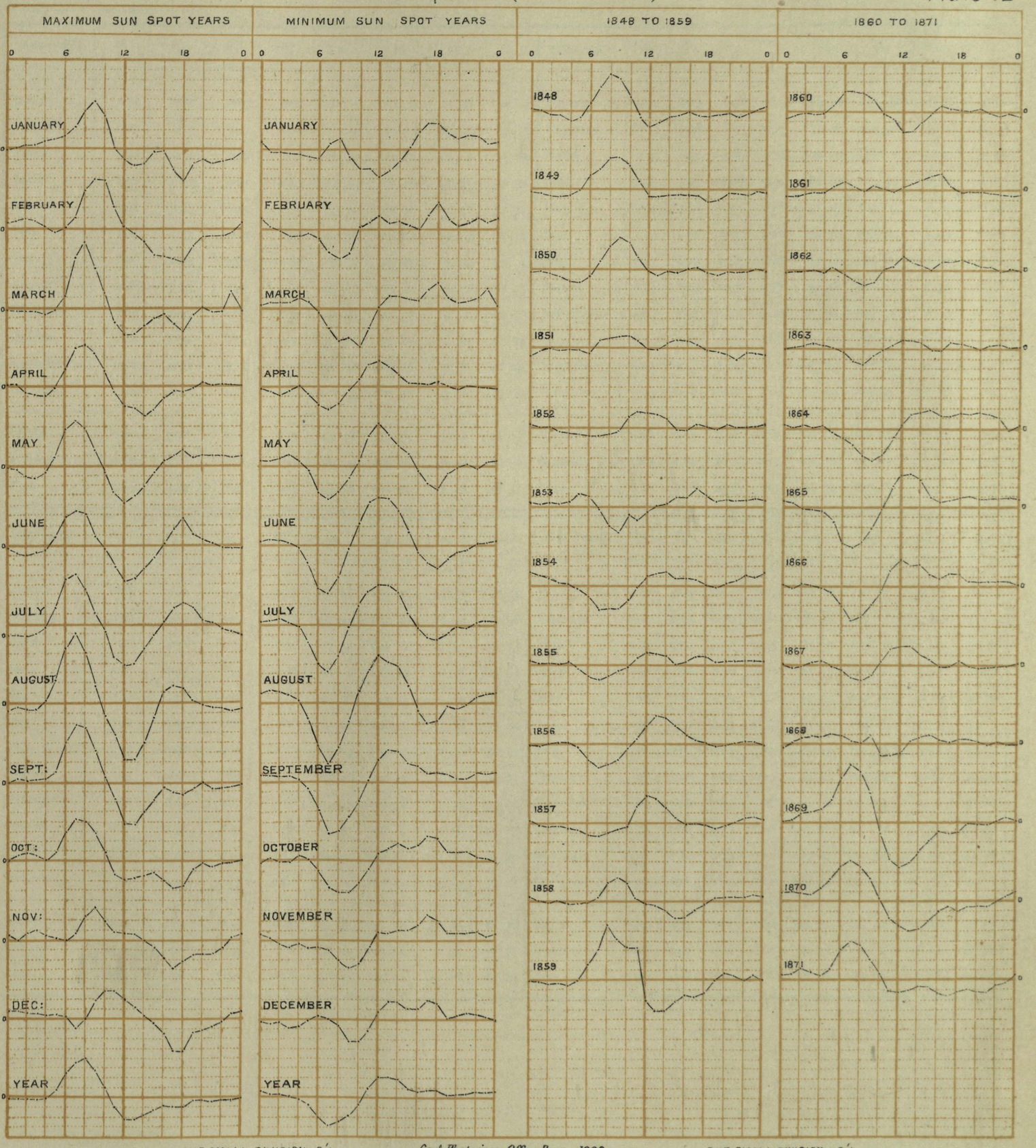
Gov.t Photozinco: Office, Poona, 1909.

COLABA OBSERVATORY.

Declination Diurnal Inequality (Magnetometer)

Excesses of each average month of the groups of Sun Spot years over the average corresponding month and the excesses of each year over the average year of the whole period (1850 to 1871.)

Plate 42



ONE SMALL DIVISION = 0·1

Gov.t Photozinco. Office, Poona, 1909.

ONE SMALL DIVISION = 0·1

TABLE 305.—*Summary of monthly values of the amplitude P and of the first Maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of different groups of years.*

Unity = 1 minute of arc.

1872—1882.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·20	0·20	0·27	0·22	272 6	160 33	21 38	52 7
February ...	0·03	0·15	0·23	0·20	277 28	164 15	15 11	50 5
March ...	0·30	0·35	0·52	0·32	89 42	124 39	11 1	51 24
April ...	0·70	0·63	0·67	0·23	64 57	111 18	7 31	45 51
May ...	0·92	0·87	0·75	0·17	55 13	100 38	1 51	37 52
June ...	1·07	0·85	0·65	0·13	64 36	105 42	4 19	35 0
July ...	1·02	0·83	0·63	0·12	67 39	103 47	4 10	33 4
August ...	1·00	1·03	0·77	0·17	59 25	102 30	2 57	34 45
September ...	0·83	0·95	0·85	0·30	49 56	101 36	2 1	40 51
October ...	0·28	0·32	0·50	0·30	32 18	97 23	0 10	41 20
November ...	0·28	0·12	0·18	0·18	291 46	200 28	3 51	41 29
December ...	0·37	0·15	0·08	0·12	278 52	200 50	13 16	46 38
Winter ...	0·10	0·08	0·28	0·22	317 48	142 54	9 21	46 27
Summer ...	0·92	0·85	0·72	0·17	60 9	103 43	3 42	39 30
Year ...	0·44	0·43	0·48	0·18	53 58	106 11	5 18	43 35

1894—1904.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·20	0·15	0·25	0·23	265 48	153 46	18 21	49 46
February ...	0·13	0·08	0·22	0·20	275 28	160 42	15 7	51 24
March ...	0·25	0·37	0·50	0·28	90 20	122 10	11 47	51 58
April ...	0·65	0·67	0·68	0·22	64 49	111 44	8 12	46 13
May ...	0·87	0·88	0·73	0·18	59 17	103 0	2 45	36 40
June ...	1·02	0·88	0·67	0·12	64 30	106 21	4 44	36 25
July ...	0·95	0·92	0·63	0·10	67 12	104 21	4 42	36 24
August ...	0·88	1·03	0·77	0·17	59 56	100 15	1 58	34 51
September ...	0·77	0·98	0·87	0·28	47 32	100 7	2 9	41 43
October ...	0·25	0·30	0·48	0·28	29 56	99 30	2 29	43 3
November ...	0·23	0·13	0·12	0·15	285 31	207 44	0 17	40 17
December ...	0·35	0·15	0·08	0·08	274 34	195 23	25 33	51 21
Winter ...	0·09	0·06	0·26	0·20	302 30	124 59	10 25	47 59
Summer ...	0·85	0·89	0·72	0·17	61 8	103 40	3 58	39 30
Year ...	0·41	0·48	0·48	0·17	54 34	105 16	5 42	44 30

1883—1893.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·18	0·22	0·32	0·27	262 18	152 27	19 35	51 14
February ...	0·03	0·15	0·22	0·20	285 49	163 20	18 46	51 38
March ...	0·32	0·38	0·53	0·30	79 53	122 1	11 20	51 25
April ...	0·73	0·73	0·73	0·25	61 7	108 36	6 18	45 16
May ...	0·90	0·93	0·78	0·18	51 38	97 33	0 0	35 12
June ...	1·07	0·95	0·68	0·12	61 46	103 38	3 8	33 49
July ...	1·03	0·98	0·68	0·12	65 19	103 41	4 16	32 29
August ...	0·95	1·18	0·83	0·15	56 27	100 16	1 41	34 21
September ...	0·80	1·02	0·88	0·28	49 37	100 36	1 57	41 29
October ...	0·27	0·32	0·52	0·30	32 32	106 7	4 18	44 27
November ...	0·30	0·13	0·12	0·15	289 15	196 12	7 38	42 20
December ...	0·32	0·22	0·13	0·12	272 27	180 21	29 0	50 17
Winter ...	0·09	0·11	0·30	0·22	313 57	141 13	12 29	48 38
Summer ...	0·91	0·96	0·75	0·18	58 10	101 59	2 43	37 54
Year ...	0·44	0·48	0·50	0·18	51 24	105 21	5 16	44 22

1872—1904.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·20	0·18	0·27	0·23	266 36	156 11	19 55	53 4
February ...	0·07	0·13	0·22	0·20	277 46	163 4	16 22	51 4
March ...	0·28	0·37	0·52	0·30	86 37	123 2	11 20	51 37
April ...	0·68	0·68	0·70	0·23	63 35	110 26	7 17	45 44
May ...	0·88	0·88	0·75	0·18	55 30	100 22	1 29	36 26
June ...	1·05	0·90	0·67	0·12	63 39	105 8	4 3	35 1
July ...	1·00	0·92	0·67	0·10	66 43	103 58	4 24	33 45
August ...	0·95	1·08	0·80	0·17	58 35	100 56	2 13	34 38
September ...	0·80	0·98	0·87	0·28	49 2	100 45	2 1	41 22
October ...	0·27	0·32	0·50	0·28	31 44	101 3	2 21	42 57
November ...	0·27	0·12	0·13	0·17	289 22	201 14	3 42	41 26
December ...	0·35	0·17	0·10	0·10	275 45	190 32	23 35	49 5
Winter ...	0·09	0·09	0·26	0·20	313 57	136 44	10 25	47 59
Summer ...	0·88	0·90	0·73	0·17	59 57	103 6	3 43	39 30
Year ...	0·44	0·48	0·50	0·18	53 58	105 16	5 16	43 35

TABLE 306.—*Declination Magnetograph—Showing the Mean Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each month of the years of the sun-spot periods, derived by averaging the values of p and q.*

Unity = 1 minute of arc.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
Maximum sun-spot period.								
January ...	−0·02	+0·10	+0·28	+0·03	+0·25	−0·18	+0·17	−0·22
February ...	+0·05	−0·10	+0·28	+0·10	+0·20	−0·20	+0·12	−0·22
March ...	+0·17	−0·45	+0·22	−0·42	+0·15	−0·60	+0·15	−0·33
April ...	+0·05	−0·88	+0·05	−0·78	+0·10	−0·80	+0·05	−0·27
May ...	−0·18	−1·02	−0·37	−0·98	−0·15	−0·83	−0·08	−0·18
June ...	−0·02	−1.15	−0·17	−1·03	−0·05	−0·72	−0·10	−0·08
July ...	+0·02	−1·12	−0·25	−1·07	−0·03	−0·72	−0·12	−0·08
August ...	−0·05	−1·07	−0·35	−1·22	−0·08	−0·87	−0·10	−0·12
September ...	−0·20	−0·90	−0·30	−1·07	−0·12	−1·12	0·03	−0·32
October ...	−0·08	−0·33	−0·03	−0·33	−0·05	−0·55	0·00	−0·33
November ...	−0·15	+0·13	+0·13	+0·15	+0·05	−0.12	−0·02	−0·20
December ...	−0·12	+0·20	+0·13	+0·18	+0·13	−0·07	+0·07	−0·13
Winter ...	−0·03	−0·07	+0·17	−0·05	+0·12	−0·28	+0·08	−0·24
Summer ...	−0·06	−1·02	−0·23	−1·03	−0·06	−0·84	−0·06	−0·17
Year ...	−0·05	−0·55	−0·03	−0·53	+0·03	−0·57	0·00	−0·20
Minimum sun-spot period.								
January ...	−0·08	+0·20	+0·15	−0·02	+0·18	−0·20	+0·13	−0·17
February ...	−0·07	+0·17	0·00	+0·02	+0.07	−0·20	+0·10	−0·15
March ...	+0·05	−0·18	+0·10	−0·30	+0·17	−0·45	+0·18	−0·20
April ...	0·00	−0·58	+0·02	−0·62	+0·10	−0·63	+0·18	−0·22
May ...	−0·13	−0·77	−0·25	−0·73	−0·12	−0·68	−0·05	−0·17
Jnne ...	−0·07	−0·95	−0·13	−0·77	−0·03	−0·62	−0·05	−0·13
July ...	0·00	−0·95	−0·15	−0·82	0·00	−0·63	−0·03	−0·12
August ...	−0·13	−0·87	−0·32	−0·95	−0·10	−0·75	−0·05	−0·15
September ...	−0·18	−0·68	−0·28	−0·87	−0·10	−0·82	0·00	−0·28
October ...	−0·17	−0·18	−0·13	−0·28	−0·05	−0·47	+0·03	−0·27
November ...	−0·20	+0·05	−0·08	+0·12	−0·05	−0·12	−0·02	−0·13
December ...	−0·20	+0·32	−0·02	+0·12	+0·03	−0·07	+0·03	−0·08
Winter ...	−0·11	+0·09	0·00	−0·06	+0·06	−0·25	+0·07	−0·16
Summer ...	−0·09	−0·80	−0·19	−0·79	−0·04	−0·69	−0·02	−0·17
Year ...	−0·10	−0·37	−0·08	−0·42	0·00	−0·47	+0·03	−0·17
Intermediate sun-spot period.								
January ...	−0·10	+0·20	+0·17	+0·02	+0·18	−0·18	+0·13	−0·18
February ...	0·05	+0·05	+0·13	+0·03	+0·15	−0·17	+0·13	−0·15
March ...	+0·12	−0·25	+0·18	−0·30	+0·20	−0·45	+0·20	−0·22
April ...	−0·05	−0·68	+0·02	−0·67	+0·10	−0·67	+0·05	−0·22
May ...	−0·12	−0·90	−0·27	−0·87	−0·10	−0·75	−0·07	−0·17
June ...	+0·02	−1·07	−0·12	−0·90	0·00	−0.68	−0·05	−0·10
July ...	+0·07	−0·98	−0·17	−0·87	0·00	−0·63	−0·05	−0·08
August ...	−0·10	−0·93	−0·30	−1·02	−0·10	−0·85	−0·08	−0·15
September ...	−0·23	−0·78	−0·30	−0·92	−0·12	−0·83	−0·02	−0·28
October ...	−0·15	−0·20	−0·10	−0·28	−0·07	−0·48	+0·02	−0·28
November ...	+0·20	+0·20	−0·02	+0·12	0·00	−0·15	+0·02	−0·17
December ...	−0·18	+0·33	+0·05	+0·18	+0·10	−0·03	+0·05	−0·08
Winter ...	−0·03	+0·06	+0·07	−0·04	+0·09	−0·25	+0·09	−0·12
Summer ...	−0·07	−0·89	−0·19	−0·87	−0·04	−0·74	−0·03	−0·17
Year ...	−0·05	−0·42	−0·07	−0·32	+0·03	−0·48	+0·03	−0·15

TABLE 307.—*Declination Magnetograph—Showing the Mean Values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each month of the yaers of the sun-spot periods, derived from table 306.*

Unity = 1 minute of arc.

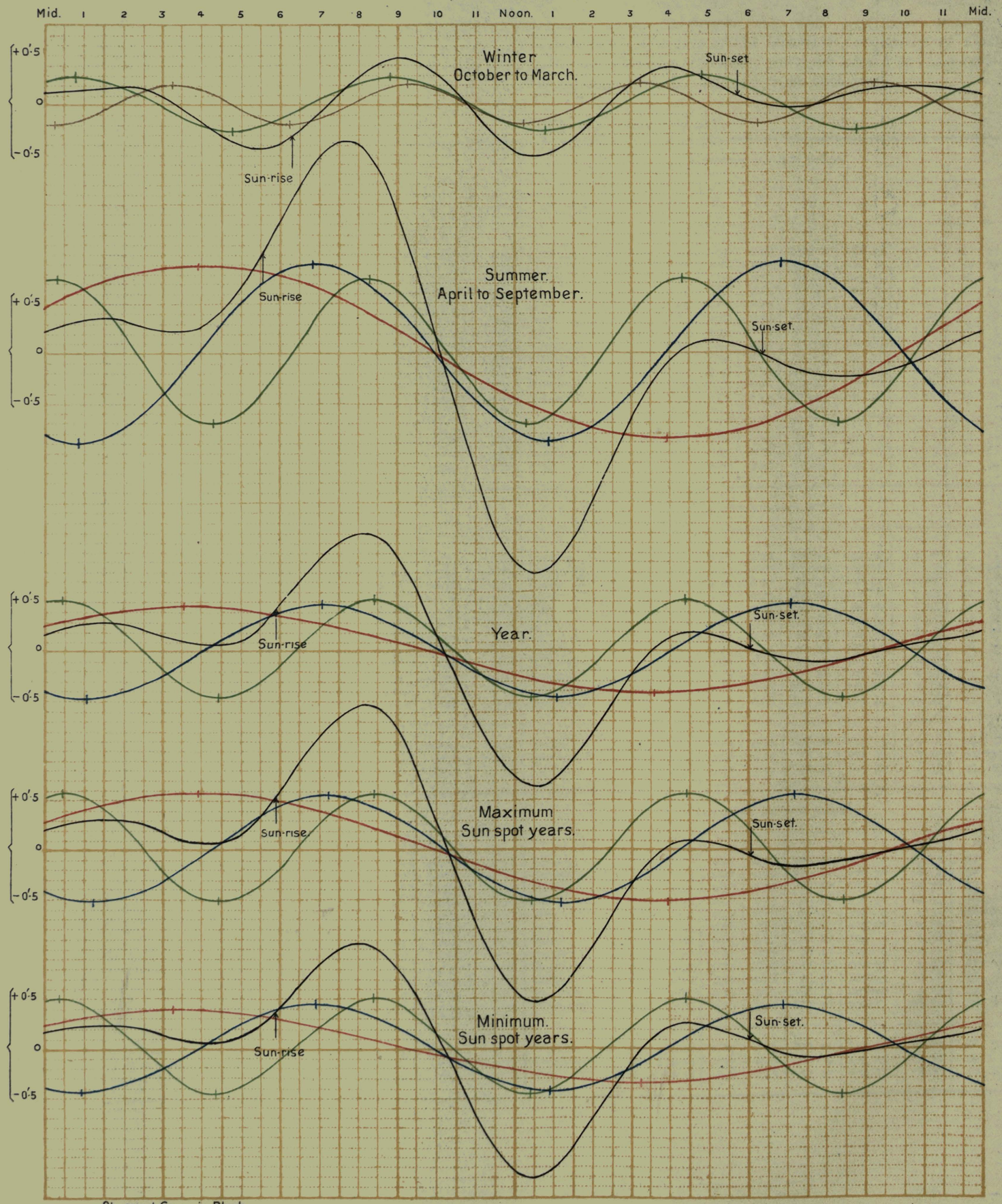
Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
Maximum sun-spot period.					° ′	° ′	° ′	° ′
January ...	0·12	0·28	0·30	0·27	257 2	158 13	22 38	50 57
February ...	0·12	0·30	0·28	0·25	294 43	164 2	19 33	49 35
March ...	0·48	0·47	0·62	0·37	85 29	123 25	9 12	48 7
April ...	0·88	0·78	0·82	0·27	67 51	111 28	6 54	44 39
May ...	1·03	1.05	0·85	0·20	54 6	99 29	0 58	35 23
June ...	1·15	1·05	0·72	0·13	63 57	104 46	3 22	29 26
July ...	1·12	1·10	0·72	0·13	65 44	102 56	3 41	28 5
August ...	1·07	1·27	0·87	0·15	61 39	101 36	2 32	31 56
September ...	0·92	1·12	1·12	0·32	51 47	101 37	2 24	40 26
October ...	0·35	0·33	0·55	0·33	49 21	106 47	2 44	42 12
November ...	0·20	0·18	0·13	0·20	293 59	178 22	13 10	40 39
December ...	0·23	0·23	0·15	0·15	276 40	180 29	24 27	49 4
Winter ...	0·08	0·18	0·32	0·25	43 4	146 19	12 11	46 46
Summer ...	1·02	1·05	0·85	0·18	61 0	103 13	3 13	36 51
Year ...	0·55	0·53	0·57	0·20	59 41	107 53	5 35	42 34
Minimum sun-spot period.								
January ...	0·20	0·15	0·28	0·22	266 24	150 36	19 0	51 13
February ...	0·18	0·02	0·20	0·18	267 26	195 26	11 3	50 24
March ...	0·18	0·32	0·48	0·27	82 35	118 51	11 27	52 35
April ...	0·53	0·60	0·63	0·22	64 24	110 6	7 43	46 57
May ...	0·78	0·77	0·68	0·18	54 3	99 48	1 24	37 24
June ...	0·95	0·78	0·62	0·13	60 38	104 44	3 31	37 22
July ...	0·90	0·83	0·63	0·12	64 23	104 33	0 0	37 57
August ...	0·87	1·00	0·75	0·15	55 55	100 12	1 58	36 53
September ...	0·72	0·92	0·82	0·28	49 1	100 17	2 14	42 17
October ...	0·25	0·32	0·47	0·27	23 28	97 17	2 13	43 45
November ...	0·30	0·15	0·12	0·13	288 45	216 26	3 40	39 21
December ...	0·38	0·12	0·08	0·08	276 58	203 44	13 46	47 5
Winter ...	0·15	0·60	0·25	0·18	296 22	111 15	9 1	48 1
Summer ...	0·80	0·82	0·68	0·17	58 12	102 50	3 26	40 34
Year ...	0·37	0·43	0·47	0·17	48 54	103 25	4 55	44 19
Intermediate sun-spot period.								
January ...	0·22	0·17	0·27	0·23	269 29	157 16	19 1	51 1
February ...	0·08	0·13	0·22	0·20	293 54	160 36	18 1	52 25
March ...	0·27	0·35	0·50	0·30	88 42	125 26	12 36	52 54
April ...	0·70	0·67	0·68	0·23	60 37	110 50	12 45	46 32
May ...	0·90	0·90	0·75	0·18	56 43	101 9	1 51	36 20
June ...	1·07	0·92	0·68	0·12	65 23	105 42	4 16	35 34
July ...	0·98	0·88	0·63	0·10	68 52	104 7	4 38	34 13
August ...	0·95	1·07	0·85	0·17	58 45	101 9	2 21	34 17
September ...	0·82	0·97	0·85	0·28	47 35	100 35	1 53	41 12
October ...	0·25	0·30	0·50	0·28	26 30	100 43	2 8	42 50
November ...	0·28	0·12	0·15	0·17	288 19	203 40	4 23	43 3
December ...	0·38	0·18	0·10	0·10	273 56	191 11	28 14	50 48
Winter ...	0·07	0·08	0·27	0·15	273 14	139 33	11 21	51 37
Summer ...	0·90	0·89	0·73	0·17	60 9	103 25	3 33	39 1
Year ...	0·42	0·32	0·48	0·15	57 43	104 17	5 35	44 51

COLABA OBSERVATORY.

Diurnal Inequality of Declination and its Harmonic Components.

(1872 to 1904.)

Plate 43.



Observed Curve in Black.

Components { 1st – Red. 2nd – Blue. 3rd – Green. 4th – Brown.

Govt. Photozinco. Office, Poona, 1909

When, however, the progression of the *magnitude* of the disturbance from month to month, is considered, it is apparent that the relation between the two phenomena is not completely accordant as the maximum of disturbance in the secular seasonal effects which are due to occur apparently in the month of May, is incident in the average seasonal effect in August. It will be seen, however, later on, when the older series of 22 years in which the secular changes have throughout been very strongly exhibited is considered, that the parallelism lacking here between the two, is throughout much more closely maintained there (*vide* table 324, plate 29) even in the respect of magnitude.

Seasonal variation of each hourly ordinate due to secular influence.

385. The examination of the annual variations similarly of each hour of the day due to secular change and their comparison with the changes due to periodic seasonal changes referred to in paragraph 378 show (*vide* table 304 and figures 49 to 72) that the progressions of the two phenomena also indicate a fairly close parallelism which is noticeable especially in the majority of solar hours. The progression of the quieter night hours, is not quite so concurrent as might be expected. These feeble synchronous oscillations in the annual march as shown by figures 1 to 12 and 13 to 24 in plate 39 and referred to in paragraph 383 are apparently due to the weak incidence of secular effects during the period 1872 to 1904 already referred to.

2. *Harmonic Analysis of the Diurnal Inequality of Declination.*

386. The results of the analysis of the inequalities in Fourier series carried to the fourth order of co-efficients are derived and given in tables 305 to 322.

The sums of the squares of the residuals after subtracting the summed result of the four orders from the observed curve for the average month and year, given below show how far the results of the four orders may be considered sufficient to exhibit correctly in detail the character of the observed variations, obviating the necessity of the components of higher orders. It will be seen, as referred to elsewhere, that the winter months show somewhat larger irregularities on the average than the summer months which are

Unity = 1 minute of arc.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
0·45	0·16	0·10	0·07	0·18	0·19	0·19	0·38	0·24	0·10	0·23	0·25	0·02

of such order of magnitude when compared with the actual variations themselves that the results of analysis require more careful consideration here than in other elements.

387. It will be noted from tables 316 to 318 in which are collected for comparison the results of the analysis of the average variations of inequalities with those of the average of the analysis for the various periods, that as the incidence of the co-efficient, during the winter months specially, is conspicuously irregular, the results as given by the two processes differ considerably from each other. For the purposes of discussion hence the results derived by the first process are accepted as correct unless otherwise contraindicated. The discrepancies wherever noticed are in the main due to the suppression of the amplitudes during the winter months.

388. Table 305 shows that in the diurnal inequality for the average year, the first three components are almost all equally significant having an amplitude of about half a minute of arc. In the average summer inequality this relation is not appreciably disturbed, but in that of the winter months the divergence is markedly large. The first two components are almost completely suppressed* and the third is reduced to about 0·3. The fourth component however remains practically uninfluenced by the seasonal change the value of its amplitude remaining more or less constant at 0·2. It is this sudden suppression of the amplitudes which is in the main responsible for the abrupt fluctuations in the value of μ of the first two components as the transition of seasonal conditions from October to November and from February to March, is clearly evidenced in the large dislocations in the values of μ indicating a sudden and complete reversal of phase from the maximum to the minimum and *vice versâ*.

While therefore the constancy of the co-efficients of the fourth component, small though the magnitude of the movement is, may suggest an indication of the reality of the phenomenon, the erratic behaviour of the co-efficients of the other orders introduces a considerable amount of doubt at any rate as to the

* In figure 1, plate 43, it will be seen that as the first two components are very minute they have not been shown, the third and the fourth alone have been drawn as they are comparatively significant and large.

acceptance of the co-efficient of the analysis as connoting on the whole a definite phenomenon for the winter months, especially as the residuals remaining after the elimination of the four computed orders from the original, here and there show departures of the same magnitude as the amplitudes of the higher components themselves.

390. The possible relationship of the magnetic phenomena to the meteorological, will be examined later, but it may be noted here in connection with the declination co-efficients that the sudden dislocations of conditions as indicated by the abrupt change in their values, particularly in those of μ between February and March and between October and November, have at any rate corresponding parallel and equally abrupt movements in the annual variations of the mean monthly values and of the mean diurnal range of vapour pressure * at Colaba as given below. It will be seen that the greatest changes from month

Table showing the annual variations of monthly means and diurnal range of vapour pressure. (1873—1896.)

Unity = 0·001 inch.

Month.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual Mean.
Annual variation of Vapour pressure	−187	−170	−55	+46	+104	+142	+120	+90	+83	+58	−73	−156	770
Change from month to month	−31	+17	**+115**	+101	+58	+38	−22	−30	−7	−25	**−131**	−83	−31
Annual variation of Diurnal range	+33	+21	−16	−17	−21	−19	−22	−18	−16	−2	+32	+48	61
Change from month to month	−15	−12	**−37**	−1	−4	+2	−3	+4	+2	+14	**+34**	+16	−15

to month in the conditions controlling vapour pressure occur between February and March, and between October and November, indicated by a change of ·115 inch in the monthly means and ·037 inch in the range of the vapour pressure between February and March and by ·131 inch and ·034 inch respectively between October and November.

391. Examining the run of the amplitudes P_1, P_2, P_3 each in its annual growth, the progressions show precisely the same characteristics as those noted in the annual march of the range and the summed range, referred to in paragraph 379. It is of course doubtful if all the components can be taken to represent distinct efficient physical causes, but, the somewhat exceptional behaviour of the fourth component demands a passing reference. Its progression is opposite in character to all the others indicating increased movements in winter months. The magnitude of the amplitudes of this component is admittedly very small; but the phenomenon disclosed is so clearly defined that one is inclined to infer that the peculiar feature of the range increasing as the year progresses from summer to winter conditions can hardly be due to fortuitous circumstances. The almost complete suppression of the annual term allowing the semi-annual term to influence the progression fully, which gives the two well marked maxima at the equinoxes and the two minima falling about the solstices, is a notable feature, which, it will be seen later, is also present precisely similarly in the fourth component of the vertical force variations. It will also appear that this reverse effect appears to be clearly influenced by the 11-year disturbance—*vide* table 307—making it the more pronounced during the year of maximum spots than in the period of minimum spots.

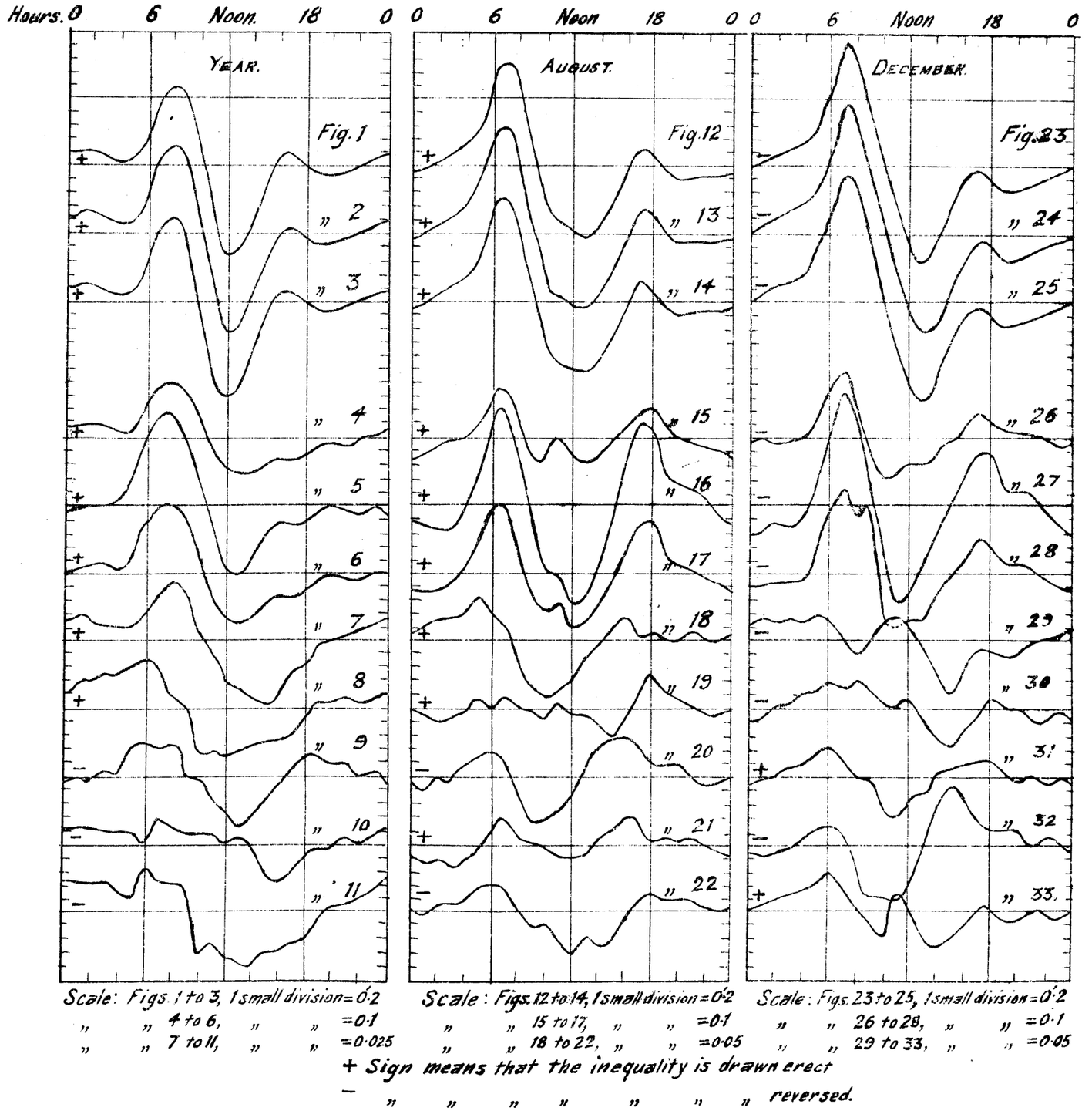
3. Eye Observation Series, 1847—1872.

392. Taking up the older series now for examination, it appears from tables 167 to 178 and 319 to 324 and plates 35 to 38, 42 and 29, that the character of the phenomenon as a whole disclosed during first 22 years, is almost identically the same as that of the last 33 years already discussed except in the intensity of the secular effects, the weaker incidence of which in the later period while not so much appreciably influencing the results of the horizontal force of the two periods, does show a marked divergence in the declination as also in the vertical force results as will presently appear.

* See data published in Appendix C of the Observatory Publication of the year 1898-1899.

393. Viewing the phenomena however in their several details, the results on the whole appear to be the same, and a summary of these have been for convenience of reference charted below precisely on the same lines as the H result in paragraph 374 which readily indicate at a glance how the diurnal phenomenon progresses in its various aspects.

Figures showing Diurnal Inequalities, their seasonal and Secular changes.

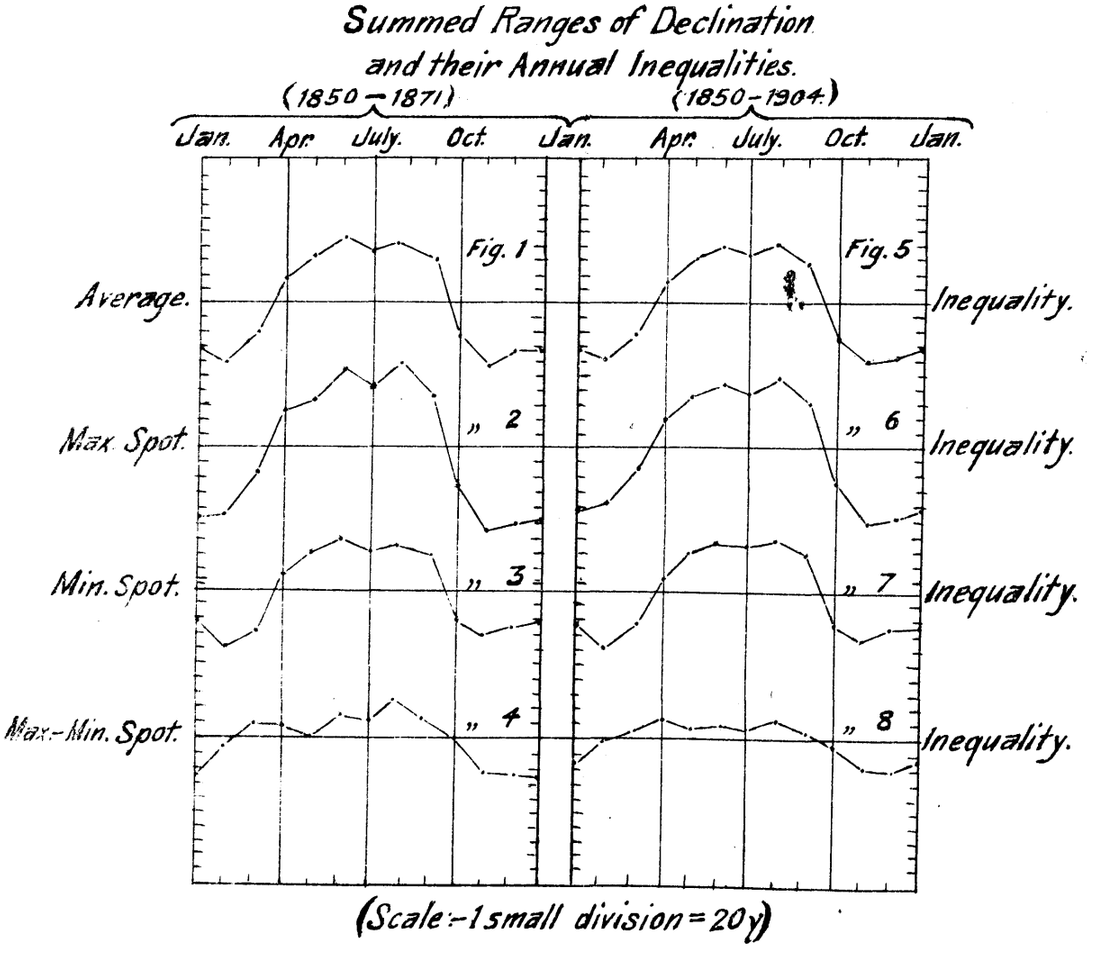


Figures 1 to 3 represent the average inequality distinctive of each of the three periods 33, 22 and 55 years, *vide* tables 325 to 327. Figures 4 to 6 show the annual diurnal curve due to the 11-year period disturbance, while figures 7 to 11 represent the fluctuations of the larger period. Figures 12 to 14 give the average seasonal diurnal wave which is unaffected by the secular effects. Figures 15 to 17 and 18 to 22 respectively represent the fluctuations in the seasonal change due to the two secular periods. Figures

12 to 22 denote the departures of the inequalities for the month of August which measures the greatest maximum seasonal departure from the annual average, while figures 23 to 33 similarly represent the departures for the month of December denoting minimum conditions.

Here too, as in H, the uncertainty in the large period secular effects which are also very small, gives inconsistant results, *vide* figures 10, 21 and 32 in the 11-year group 1883—1893.

394. We have also seen in paragraph 379, figure 4, why the difference curve of the summed range fails, on account of this feeble action of the secular change of even the 11-year period, to indicate the parallelism with the original inequality as might be anticipated. This parallelism, however, is clearly shown in the results of the 22 years, *vide* figures below; and the average result of 55 years also, indicates this in a marked degree. The synchronous progression in the seasonal changes due to the annually periodic and secular effects, which also was defectively exhibited in the results of the last 33 years as referred to in paragraph 384, is clearly shown in those of the first twenty-two years, *vide* plate 29.



395. Viewing the phenomenon hence as a whole, in spite of minor irregularities from which one can hardly expect the results of an element like declination at Colaba to be altogether free, it is difficult to avoid the conclusion that the operation of one single common exciting cause which controls the inequality itself does in all probability also influence the various phases which the normal diurnal wave passes in its seasonal, 11-year, and the larger period changes

TABLE 308.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination of Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of the several months.*

Unity = 1 minute of arc.

Years.	January.								February.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+0·08	+0·22	+0·48	+0·32	+0·37	+0·07	+0·20	−0·02	+0·18	−0·22	+0·60	+0·28	+0·25	−0·15	+0·12	−0·17
1873 ...	−0·22	+0·15	+0·37	−0·12	+0·35	−0·25	+0·20	−0·23	0·00	−0·17	+0·07	0·0	+0·03	−0·32	+0·05	−0·35
1874 ...	−0·10	+0·20	+0·35	+0·18	+0·30	+0·02	+0·17	−0·05	+0·03	−0·03	+0·43	+0·28	+0·22	+0·03	+0·08	−0·05
1875 ...	−0·17	+0·23	−0·05	0·0	+0·03	−0·35	+0·12	−0·30	−0·28	+0·23	−0·22	+0·03	−0·07	−0·27	+0·07	−0·20
1876 ...	−0·03	+0·17	+0·22	+0·07	+0·23	−0·13	+0·15	−0·12	−0·07	+0·27	−0·07	+0·13	+0·02	−0·18	+0·05	−0·13
1877 ...	−0·05	+0·18	+0·18	+0·10	+0·22	−0·18	+0·13	−0·20	−0·13	+0·10	−0·02	+0·02	+0·07	−0·20	+0·08	−0·13
1878 ...	−0·05	+0·18	+0·10	−0·12	+0·13	−0·32	+0·10	−0·23	−0·05	+0·15	−0·02	−0·07	+0·02	−0·25	+0·08	−0·17
1879 ...	−0·20	+0·10	+0·05	−0·13	+0·13	−0·27	+0·12	−0·18	0·00	+0·18	+0·05	+0·07	+0·07	−0·17	+0·12	−0·15
1880 ...	−0·17	+0·42	+0·03	+0·20	+0·10	0·0	+0·10	−0·03	+0·07	+0·02	+0·15	−0·05	+0·20	−0·22	+0·17	−0·15
1881 ...	−0·22	+0·02	+0·20	−0·13	+0·22	−0·28	+0·13	−0·23	−0·05	−0·02	+0·27	0·0	+0·22	−0·18	+0·17	−0·20
1882 ...	+0·08	+0·17	+0·20	+0·10	+0·18	−0·13	+0·10	−0·20	+0·07	−0·15	+0·33	−0·13	+0·28	−0·22	+0·18	−0·18
Mean ...	−0·10	+0·18	+0·20	+0·05	+0·20	−0·17	+0·13	−0·17	−0·02	+0·03	+0·15	+0·05	+0·12	−0·20	+0·12	−0·17
1883 ...	−0·08	0·0	+0·20	−0·12	+0·22	−0·28	+0·17	−0·23	−0·05	−0·08	+0·33	+0·10	+0·28	−0·08	+0·17	−0·15
1884 ...	+0·20	−0·03	+0·38	−0·05	+0·32	−0·25	+0·17	−0·27	+0·30	−0·10	+0·65	+0·10	+0·47	−0·02	+0·22	−0·10
1885 ...	+0·05	+0·30	+0·32	+0·08	+0·28	−0·25	+0·22	−0·20	−0·13	+0·07	−0·12	−0·02	−0·03	−0·22	+0·07	−0·20
1886 ...	−0·05	+0·30	+0·38	+0·12	+0·30	−0·03	+0·18	−0·07	+0·05	+0·15	+0·42	+0·28	+0·25	+0·07	+0·08	−0·03
1887 ...	−0·12	+0·13	+0·28	−0·12	+0·33	−0·20	+0·18	−0·15	−0·10	+0·17	+0·15	+0·12	+0·17	−0·07	+0·15	−0·07
1888 ...	−0·23	+0·23	+0·15	−0·05	+0·17	−0·25	+0·12	−0·20	−0·15	+0·15	−0·15	+0·07	−0·03	−0·23	+0·08	−0·15
1889 ...	+0·02	+0·33	+0·13	+0·05	+0·15	−0·18	+0·15	−0·17	−0·20	+0·03	−0·10	−0·10	+0·05	−0·27	+0·10	−0·18
1890 ...	−0·13	+0·22	+0·17	+0·03	+0·20	−0·13	+0·15	−0·12	+0·03	0·0	+0·23	−0·02	+0·30	−0·12	+0·20	−0·08
1891 ...	+0·02	+0·13	+0·23	−0·10	+0·25	−0·27	+0·17	−0·23	−0·05	+0·12	0·0	+0·07	+0·02	−0·18	+0·10	−0·15
1892 ...	−0·05	+0·17	+0·17	+0·02	+0·17	−0·23	+0·12	−0·28	+0·05	−0·02	+0·15	+0·02	+0·17	−0·27	+0·08	−0·25
1893 ...	−0·27	+0·15	−0·03	−0·02	+0·03	−0·33	+0·10	−0·35	−0·03	−0·17	−0·03	−0·13	+0·02	−0·42	+0·12	−0·30
Mean ...	−0·05	+0·18	+0·22	−0·02	+0·22	−0·22	+0·15	−0·20	−0·03	+0·03	+0·13	+0·05	+0·15	−0·17	+0·12	−0·15
1894 ...	+0·15	+0·10	+0·40	+0·25	+0·30	+0·02	+0·15	−0·17	−0·07	+0·08	+0·18	+0·30	+0·13	−0·12	+0·10	−0·15
1895 ...	+0·03	+0·12	+0·20	−0·12	+0·23	−0·32	+0·17	−0·28	−0·18	+0·10	+0·12	+0·12	+0·07	−0·20	+0·12	−0·23
1896 ...	−0·27	+0·13	+0·15	+0·03	+0·18	−0·15	+0·13	−0·17	−0·10	+0·12	+0·10	+0·08	+0·13	−0·13	+0·17	−0·15
1897 ...	−0·12	+0·08	+0·08	−0·08	+0·10	−0·33	+0·10	−0·30	−0·12	+0·02	+0·08	−0·12	+0·18	−0·28	+0·17	−0·18
1898 ...	−0·17	+0·32	+0·02	+0·05	+0·05	−0·20	+0·08	−0·22	−0·18	+0·15	−0·10	−0·02	0·0	−0·22	+0·12	−0·17
1899 ...	−0·30	+0·18	−0·27	−0·08	−0·08	−0·38	+0·02	−0·32	−0·28	+0·13	−0·18	−0·15	−0·02	−0·32	+0·07	−0·18
1900 ...	−0·02	+0·20	+0·17	−0·07	+0·20	−0·23	+0·12	−0·22	+0·05	+0·12	+0·10	−0·03	+0·13	−0·20	+0·13	−0·15
1901 ...	+0·02	+0·32	+0·20	+0·18	+0·20	+0·03	+0·13	−0·03	+0·13	+0·17	+0·17	+0·05	+0·20	−0·17	+0·17	−0·15
1902 ...	+0·08	+0·08	+0·40	−0·05	+0·40	−0·10	+0·20	−0·08	+0·03	+0·17	+0·07	+0·05	+0·10	−0·12	+0·08	−0·12
1903 ...	−0·07	+0·17	+0·25	−0·07	+0·25	−0·12	+0·13	−0·12	0·00	+0·07	+0·23	−0·02	+0·22	−0·10	+0·13	−0·10
1904 ...	−0·13	+0·27	+0·02	−0·07	0·0	−0·28	+0·08	−0·27	−0·03	+0·10	+0·07	−0·05	+0·13	−0·23	+0·12	−0·18
Mean ...	−0·07	+0·18	+0·15	0·0	+0·17	−0·18	+0·12	−0·20	−0·07	+0·12	+0·08	+0·02	+0·12	−0·18	+0·12	−0·17
Mean of 33 years ...	−0·07	+0·18	+0·18	0·0	+0·20	−0·18	+0·13	−0·18	−0·03	+0·07	+0·12	+0·03	+0·13	−0·18	+0·12	−0·17

TABLE 308.—*Monthly Values of p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of the several months.*

Unity = 1 minute of arc.

Years.	March.								April.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+0·13	−0·48	+0·13	−0·47	+0·02	−0·75	+0·07	−0·38	+0·07	−1·12	+0·05	−0·83	+0·03	−0·85	0·0	−0·22
1873 ...	+0·23	−0·55	+0·20	−0·43	+0·05	−0·67	+0·17	−0·47	+0·20	−1·03	+0·25	−0.70	+0·17	−0·82	+0·07	−0·33
1874 ...	+0·17	−0·33	+0·32	−0·30	+0·25	−0·47	+0·18	−0·27	−0·10	−0·78	−0·02	−0·67	+0·05	−0·68	+0·02	−0·22
1875 ...	+0·10	−0·15	+0·20	−0·20	+0·20	−0·38	+0·23	−0·18	−0·03	−0·50	0·0	−0·52	+0·12	−0·60	+0·07	−0·17
1876 ...	+0·08	−0·17	+0·07	−0·25	+0·15	−0·45	+0·13	−0·17	0·0	−0·55	−0·03	−0·47	+0.07	−0·55	+0·05	−0·20
1877 ...	+0·02	−0·13	−0·02	−0·33	+0·15	−0·45	+0·20	−0·15	−0·03	−0·60	+0·07	−0·65	+0·15	−0·62	+0·08	−0·20
1878 ...	+0·02	−0·17	+0·03	−0·33	+0·12	−0·50	+0·18	−0·25	−0·05	−0·63	+0·02	−0·62	+0·07	−0·67	+0·05	−0·25
1879 ...	+0·07	−0·17	+0·15	−0·28	+0·22	−0·37	+0·22	−0·12	+0·03	−0·42	−0·07	−0·50	+0·03	−0·53	+0·03	−0·15
1880 ...	+0·23	−0·10	+0·33	−0·12	+0·27	−0·38	+0·27	−0·23	−0·05	−0·62	+0·08	−0·58	+0·20	−0·62	+0·15	−0·20
1881 ...	+0·22	−0·32	+0·28	−0·30	+0·20	−0·45	+0·18	−0·28	0·00	−0·65	−0·05	−0·70	+0·07	−0·68	+0·05	−0·23
1882 ...	+0·12	−0·35	+0·27	−0·33	+0·27	−0·50	+0·28	−0·25	+0·02	−0·73	+0·13	−0·67	+0·20	−0·68	+0·10	−0·28
Mean ...	+0·12	−0·27	+0·18	−0·30	+0·17	−0·48	+0·20	−0·25	0·0	−0·70	+0·03	−0·63	+0·10	+0·67	+0·07	−0·22
1883 ...	+0·08	−0·25	+0·15	−0·22	+0·20	−0·40	+0·20	−0·25	+0·03	−0·73	+0·10	−0·70	+0·02	−0·73	+0·07	−0·28
1884 ...	+0·20	−0·43	+0·20	−0·47	+0·15	−0·62	+0·12	−0·33	−0·05	−·085	0·0	−0·97	+0·13	−0.93	+0·03	−0·28
1885 ...	−0·02	−0·27	+0·12	−0·33	+0·27	−0·47	+0·32	−0·15	−0·05	−0·72	+0·10	−0·68	+0·15	−0·70	+0·15	−0·27
1886 ...	+0·02	−0·28	+0·12	−0·27	+0·15	−0·43	+0·12	−0·22	−0·05	−0·75	+0·02	−0·67	+0·03	−0·65	+0·03	−0·18
1887 ...	+0·17	−0·17	+0·22	−0·25	+0·13	−0·48	+0·15	−0·28	−0·05	−0·72	+0·02	−0·65	+0·10	−0·65	+0.07	−0·25
1888 ...	+0·08	−0·22	+0·23	−0·28	+0·32	−0·42	+0·28	−0·15	−0·02	−0·63	−0·08	−0·68	+0·05	−0·70	+0·05	−0·22
1889 ...	−0·08	−0·20	−0·05	−0·35	+0·12	−0·42	+0·17	−0·17	−0·10	−0·77	−0·08	−0·83	+0·07	−0·78	+0·07	−0·25
1890 ...	+0·03	−0·18	+0·05	−0·27	+0·12	−0·38	+0·13	−0·17	−0·20	−0·63	−0·15	−0·58	−0·02	−0·62	+0·02	−0·18
1891 ...	+0·12	−0·33	+0·15	−0·43	+0·17	−0·58	+0·17	−0·23	−0·05	−0·65	+0·03	−0·67	+0·05	−0·67	+0·02	−0·23
1892 ...	+0·25	−0·32	+0·33	−0·27	+0·17	−0·57	+0·13	−0·32	+0·03	−0·83	−0·12	−0·85	+0·02	−0·85	+0·02	−0·28
1893 ...	+0·05	−0·67	+0·27	−0·68	+0·23	−0·65	+0·18	−0·32	+0·03	−0·78	+0·08	−0·77	+0·17	−0·77	+0·10	−0·25
Mean ...	+0·08	−0·30	+0·17	−0·35	+0·18	−0·50	+0·18	−0·23	−0·05	−0·73	−0·02	−0·73	+0·07	−0·73	+0·05	−0·25
1894 ...	+0·27	−0·42	+0·23	−0·35	+0·23	−0·55	+0·22	−0·30	+0·05	−0·83	+0·20	−0·70	+0·18	−0·68	+0·07	−0·22
1895 ...	+0·03	−0·43	+0·18	−0·55	+0·17	−0·62	+0·22	−0·30	−0·05	−0·93	+0·13	−0·93	+0·07	−0·78	−0·02	−0·23
1896 ...	−0·07	−0·33	−0·03	−0·32	−0·02	−0·47	+0·07	−0·27	−0·07	−0·80	+0·03	−0·72	+0·10	−0·73	+0·03	−0·27
1897 ...	+0·03	−0·35	+0·18	−0·38	+0·22	−0·45	+0·23	−0·20	+0·07	−0·73	+0·15	−0·63	+0·17	−0·60	+0·07	−0·22
1898 ...	+0·15	−0·07	+0·20	−0·17	+0·25	−0·38	+0·20	−0·10	−0·08	−0·57	−0·27	−0·60	−0·07	−0·68	+0·02	−0·22
1899 ...	+0·03	−0·22	+0·18	−0·33	+0·23	−0·47	+0·20	−0·20	−0·02	−0·60	+0·07	−0·63	+0·17	−0·63	+0·08	−0·17
1900 ...	0·0	−0·22	+0·15	−0·37	+0·17	−0·47	+0·17	−0·20	+0·02	−0·52	+0·07	−0·58	+0·18	−0·63	+0·13	−0·18
1901 ...	+0·10	−0·13	+0·07	−0·23	+0·15	−0·43	+0·18	−0·22	+0·05	−0·50	+0·12	−0·58	+0·22	−0·57	+0·12	−0·20
1902 ...	+0·15	−0·15	+0·10	−0·33	+0·10	−0·48	+0·12	−0·28	+0·17	−0·40	+0·07	−0·52	+0·10	−0·62	+0·10	−0·23
1903 ...	+0·17	−0·12	+0·22	−0·25	+0·30	−0·35	+0·23	−0·13	−0·08	−0·58	+0·03	−0·68	+0·22	−0·65	+0·12	−0·22
1904 ...	+0·37	−0·10	+0·23	−0·30	+0·22	−0·43	+0·18	−0·22	−0·03	−0·70	−0·02	−0·80	+0·12	−0·73	+0·02	−0·23
Mean ...	+0·12	−0·23	+0·15	−0·33	+0·18	−0·47	+0·18	−0·22	0·00	−0·65	+0·05	−0·67	+0·13	−0·67	+0·07	−0·22
Mean of 33 years ...	+0·10	−0·27	+0·17	−0·33	+0·18	−0·48	+0·18	−0·23	−0·02	−0·70	+0·02	−0·68	+0·10	−0·68	+0·07	−0·23

TABLE 308.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of the several months.*

Unity = 1 minute of arc.

Years.	May.								June.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·17	−1·23	−0·43	−1·17	−0·23	−0·93	−0·08	−0·17	−0·07	−1·23	−0·27	−1·05	−0·07	−0·72	−0·17	−0·05
1873 ...	−0·18	−1·15	−0·33	−0·83	−0·13	−0·78	−0·08	−0·17	+0·18	−1·13	−0·03	−0·73	−0·02	−0·63	−0·13	−0·15
1874 ...	−0·02	−0·93	−0·07	−0·83	−0·02	−0·70	−0·05	−0·17	+0·15	−1·00	+0·03	−0·75	+0·12	−0·58	−0·03	−0·08
1875 ...	−0·20	−0·93	−0·17	−0·87	−0·05	−0·73	−0·03	−0·13	+0·07	−1·03	−0·03	−0·72	+0·05	−0·57	−0·03	−0·12
1876 ...	−0·20	−0·70	−0·45	−0·67	−0·23	−0·73	−0·08	−0·18	−0·05	−1·02	−0·15	−0·83	−0·02	−0·63	−0·05	−0·10
1877 ...	−0·13	−0·80	−0·20	−0·75	−0·05	−0·70	−0·02	−0·17	−0·10	−0·98	−0·17	−0·80	−0·03	−0·62	−0·05	−0·18
1878 ...	−0·10	−0·75	−0·17	−0·60	−0·08	−0·63	−0·05	−0·23	−0·03	−0·92	−0·13	−0·67	−0·10	−0·58	−0·07	−0·12
1879 ...	−0·22	−0·77	−0·30	−0·77	−0·13	−0·72	−0·03	−0·17	−0·10	−0·97	−0·18	−0·87	−0·05	−0·72	−0·03	−0·15
1880 ...	−0·12	−0·77	−0·17	−0·72	−0·07	−0·65	−0·05	−0·15	−0·07	−1·02	−0·07	−0·88	+0·08	−0·68	−0·02	−0·13
1881 ...	−0·18	−0·83	−0·40	−0·98	−0·18	−0·90	−0·05	−0·20	−0·07	−1·20	−0·13	−1·10	−0·02	−0·82	−0·05	−0·17
1882 ...	−0·12	−1·03	−0·18	−0·92	+0·05	−0·72	−0·02	−0·12	+0·10	−1·18	−0·10	−0·77	−0·02	−0·65	−0·08	−0·12
Mean ...	−0·15	−0·90	−0·27	−0·83	−0·10	−0·75	−0·05	−0·17	0·00	−1·07	−0·12	−0·83	0·0	−0·65	−0·07	−0·12
1883 ...	−0·17	−0·97	−0·27	−0·92	−0·13	−0·78	−0·07	−0·20	−0·07	−1·18	−0·22	−1·07	−0·08	−0·73	−0·07	−0·08
1884 ...	−0·17	−0·82	−0·42	−0·93	−0·20	−0·85	−0·12	−0·23	−0·10	−1·08	−0·32	−1·07	−0·13	−0·77	−0·10	−0·08
1885 ...	−0·15	−0·92	−0·32	−0·95	−0·13	−0·80	−0·08	−0·18	−0·18	−1·15	−0·30	−1·08	−0·05	−0·70	−0·10	−0·08
1886 ...	−0·13	−0·98	−0·38	−0·85	−0·20	−0·72	−0·08	−0·15	+0·12	−1·15	−0·05	−0·87	+0·03	−0·67	−0·07	−0·15
1887 ...	−0·33	−0·92	−0·47	−0·82	−0·22	−0·70	−0·10	−0·15	−0·12	−0·98	−0·20	−0·85	−0·05	−0·62	−0·08	−0·13
1888 ...	−0·10	−0·77	−0·35	−0·60	−0·17	−0·57	−0·08	−0·13	−0·05	−1·03	−0·10	−0·83	0·00	−0·60	−0·05	−0·15
1889 ...	−0·08	−0·75	−0·28	−0·73	−0·15	−0·70	−0·05	−0·13	−0·10	−0·93	−0·22	−0·72	−0·05	−0·57	−0·02	−0·10
1890 ...	−0·15	−0·67	−0·42	−0·65	−0·30	−0·67	−0·10	−0·13	+0·02	−0·90	−0·23	−0·72	−0·07	−0·67	−0·02	−0·10
1891 ...	−0·30	−0·97	−0·38	−0·95	−0·15	−0·80	−0·10	−0·22	0·00	−0·95	−0·22	−0·93	−0·10	−0·70	−0·07	−0·13
1892 ...	−0·37	−0·92	−0·57	−0·93	−0·28	−0·82	−0·12	−0·15	−0·03	−1·13	−0·12	−1·05	−0·02	−0·68	−0·07	−0·05
1893 ...	−0·23	−1·00	−0·33	−1·08	−0·07	−0·92	−0·03	−0·08	−0·07	−1·17	−0·18	−1·17	−0·02	−0·82	−0·10	−0·10
Mean ...	−0·20	−0·88	−0·38	−0·85	−0·18	−0·75	−0·08	−0·17	−0·05	−1·07	−0·20	−0·93	−0·05	−0·68	−0·07	−0·10
1894 ...	−0·02	−1·05	−0·17	−1·03	−0·05	−0·82	−0·12	−0·17	+0·07	−1·13	−0·08	−1·15	+0·05	−0·68	−0·03	−0·07
1895 ...	−0·25	−1·00	−0·47	−1·00	−0·23	−0·87	−0·10	−0·17	−0·08	−1·37	−0·18	−1·23	−0·02	−0·88	−0·12	−0·13
1896 ...	−0·13	−1·00	−0·30	−0·90	−0·07	−0·78	−0·07	−0·15	+0·12	−1·05	−0·17	−0·78	−0·02	−0·60	−0·05	−0·03
1897 ...	−0·05	−0·97	−0·15	−0·88	−0·08	−0·73	−0·08	−0.15	+0·10	−1·07	−0·05	−0·75	0·00	−0·55	−0·05	−0·05
1898 ...	−0·08	−0·93	−0·17	−0·88	−0·07	−0·77	−0·07	−0·20	+0·02	−1·00	−0·08	−0·92	+0·08	−0·70	0·00	−0·13
1899 ...	−0·23	−0·88	−0·28	−0·85	−0·12	−0·73	−0·08	−0·15	−0·03	−0·97	−0·07	−0·72	0·00	−0·58	−0·02	−0·12
1900 ...	−0·13	−0·75	−0·12	−0·78	−0·02	−0·65	−0·05	−0·15	−0·02	−0·88	−0·05	−0·60	−0·02	−0·53	−0·05	−0·12
1901 ...	+0·03	−0·73	−0·05	−0·77	+0·02	−0·68	−0·03	−0·22	−0·12	−0·92	−0·12	−0·75	−0·02	−0·58	−0·03	−0·13
1902 ...	−0·03	−0·58	−0·13	−0·65	−0·07	−0·63	−0·02	−0·18	0·00	−0·87	−0·05	−0·80	−0·02	−0·67	−0·03	−0·15
1903 ...	+0·02	−0·75	−0·12	−0·80	−0·03	−0·70	−0·05	−0·15	+0·03	−1·07	−0·03	−0·98	+0·05	−0·73	−0·02	−0·10
1904 ...	0·00	−0·77	−0·18	−0·88	−0·03	−0·75	−0·07	−0·17	−0·10	−0·95	−0·17	−1·05	0·00	−0·75	−0·08	−0·10
Mean ...	−0·08	−0·85	−0·20	−0·85	−0·07	−0·73	−0·07	−0·17	0·00	−1·02	−0·10	−0·88	0·00	−0·67	−0·05	−0·10
Mean of 33 years ...	−0·15	−0·88	−0·28	−0·85	−0·12	−0·75	−0·07	−0·17	−0·02	−1·05	−0·13	−0·88	−0·02	−0·67	−0·05	−0·12

TABLE 308.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of several months.*

Unity = 1 minute of arc.

Years.	July.								August.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·05	−1·20	−0·38	−1·12	−0·08	−0·75	−0·13	−0·10	+0·05	+1·25	−0·33	−1·35	−0·05	−0·90	−0·13	−0·15
1873 ...	+0·08	−1·25	−0·18	−1·02	−0·03	−0·70	−0·15	−0·10	−0·12	−1·18	−0·38	−1·20	−0·10	−0·83	−0·08	−0·12
1874 ...	+0·17	−1·02	−0·03	−0·75	+0·10	−0·60	−0·02	−0·07	−0·05	−0·93	−0·20	−0·98	−0·05	−0·80	−0·08	−0·15
1875 ...	+0·18	−0·93	0·0	−0·57	+0·05	−0·45	−0·03	−0·10	−0·10	−0·90	−0·32	−0·85	−0·12	−0·70	−0·08	−0·15
1876 ...	−0·05	−1·00	−0·27	−0·78	−0·08	−0·62	−0·08	−0·07	−0·07	−0·90	−0·27	−0·93	−0·07	−0·72	−0·07	−0·13
1877 ...	−0·07	−1·12	−0·15	−0·83	−0·02	−0·68	−0·08	−0·15	−0·22	−1·05	−0·28	−1·08	−0·10	−0·85	−0·07	−0·20
1878 ...	+0·07	−0·88	−0·07	−0·68	+0·07	−0·57	+0·02	−0·07	−0·05	−0·75	−0·25	−0·70	−0·08	−0·60	−0·05	−0·10
1879 ...	−0·05	−0·95	−0·15	−0·83	0·0	−0·70	+0·02	−0·12	−0·15	−0·90	−0·33	−0·92	−0·08	−0·78	−0·03	−0·18
1880 ...	+0·10	−0·97	−0·17	−0·73	−0·02	−0·58	−0·08	−0·07	−0·13	−1·05	0·13	−0·90	−0·02	−0·68	−0·07	−0·13
1881 ...	+0·08	−0·97	−0·32	−1·02	−0·07	−0·75	−0·12	−0·05	−0·03	−1·08	−0·23	−1·15	−0·03	−0·88	−0·08	−0·13
1882 ...	+0·15	−0·90	−0·12	−0·65	−0·03	−0·57	−0·05	−0·12	−0·13	−1·07	−0·02	−1·17	+0·02	−0·73	−0·12	−0·13
Mean ...	+0·05	−1·02	−0·17	−0·82	−0·02	−0·63	−0·04	−0·10	−0·08	−1·00	−0·25	−1·00	−0·07	−0·77	−0·08	−0·15
1883 ...	0·0	−1·10	−0·15	−1·05	+0·03	−0·72	−0·08	−0·05	+0·02	−0·92	−0·10	−0·95	+0·05	−0·68	−0·03	−0·07
1884 ...	+0·05	−1·03	−0·33	−0·97	−0·10	−0·70	−0·10	−0·08	−0·15	−1·02	−0·48	−1·23	−0·18	−0·92	−0·13	−0·17
1885 ...	+0·02	−1·10	−0·32	−1·07	−0·07	−0·77	−0·03	−0·10	−0·13	−0·93	−0·63	−1·25	−0·30	−0·95	−0·10	−0·18
1886 ...	+0·22	−1·07	−0·05	−0·77	0·0	−0·57	−0·10	−0·07	−0·08	−0·95	−0·32	−0·97	−0·07	−0·73	−0·07	−0·12
1887 ...	−0·08	−1·07	−0·23	−0·98	−0·05	−0·73	−0·05	−0·13	−0·20	−0·92	−0·45	−1·17	−0·20	−0·87	−0·05	−0·18
1888 ...	−0·02	−1·07	−0·13	−0·92	+0·02	−0·65	−0·05	−0·13	−0·15	−0·85	−0·30	−0·95	−0·07	−0·72	−0·03	−0·13
1889 ...	+0·15	−0·87	−0·07	−0·68	+0·03	−0·57	0·0	−0·10	−0·10	−0·80	−0·33	−0·98	−0·08	−0·75	−0·07	−0·10
1890 ...	−0·10	−0·93	−0·33	−0·80	−0·07	−0·62	−0·05	−0·07	−0·18	−0·85	−0·45	−0·97	−0·17	−0·77	−0·07	−0·13
1891 ...	−0·07	−0·95	−0·15	−1·02	0·0	−0·68	−0·05	−0·10	−0·18	−0·92	−0·33	−1·17	−0·13	−0·82	−0·10	−0·17
1892 ...	+0·12	−1·20	−0·20	−1·20	+0·03	−0·72	−0·15	−0·07	−0·08	−1·05	−0·48	−1·28	−0·25	−0·98	−0·12	−0·15
1893 ...	−0·13	−1·02	−0·20	−1·10	+0·05	−0·73	−0·10	−0·10	−0·20	−1·13	−0·25	−1·42	+0·05	−0·93	−0·10	−0·08
Mean ...	+0·02	−1·03	−0·20	−0·97	−0·02	−0·68	−0·07	−0·08	−0·13	−0·93	−0·38	−1·12	−0·12	−0·83	−0·08	−0·13
1894 ...	+0·10	−1·02	−0·32	−1·05	−0·13	−0·68	−0·10	−0·07	+0·12	−0·95	−0·37	−1·07	−0·13	−0·82	−0·10	−0·10
1895 ...	+0·12	−1·13	−0·17	−0·97	−0·02	−0·63	−0·10	−0·05	−0·18	−0·97	−0·53	−1·07	−0·22	−0·83	−0·12	−0·12
1896 ...	+0·03	−0·92	−0·23	−0·90	+0·03	−0·60	0·0	−0·02	−0·07	−0·92	−0·33	−0·93	−0·12	−0·77	−0·10	−0·17
1897 ...	+0·13	−0·98	−0·07	−0·77	+0·02	−0·60	−0·02	−0·13	−0·10	−0·93	−0·27	−0·88	−0·05	−0·73	−0·03	−0·13
1898 ...	+0·17	−0·92	−0·12	−0·78	+0·07	−0·55	−0·03	−0·03	+0·05	−0·95	−0·15	−0·92	0·0	−0·68	−0·07	−0·12
1899 ...	+0·02	−0·87	−0·27	−0·83	−0·10	−0·65	−0·05	−0·13	−0·02	−0·82	−0·33	−0·92	−0·10	−0·72	−0·05	−0·13
1900 ...	+0·10	−0·88	−0·08	−0·80	+0·05	−0·65	−0·03	−0·10	−0·13	−0·85	−0·35	−0·97	−0·10	−0·75	−0·07	−0·10
1901 ...	−0·10	−0·88	−0·13	−0·80	+0·02	−0·58	−0·02	−0·12	−0·15	−0·78	−0·37	−0·87	−0·13	−0·68	−0·05	−0·13
1902 ...	0·0	−0·93	−0·03	−0·87	+0·05	−0·62	−0·03	−0·13	−0·18	−0·88	−0·28	−1·03	−0·08	−0·82	−0·05	−0·22
1903 ...	−0·12	−0·93	−0·22	−1·03	+0·02	−0·73	−0·02	−0·12	−0·02	−0·78	−0·30	−1·08	−0·07	−0·78	−0·08	−0·12
1904 ...	+0·03	−1·02	−0·18	−1·08	+0·05	−0·73	−0·02	−0·08	−0·08	−0·90	−0·35	−1·12	−0·13	−0·85	−0·10	−0·17
Mean ...	+0·05	−0·95	−0·17	−0·90	0·0	−0·63	−0·03	−0·08	−0·07	−0·88	−0·33	−0·98	−0·10	−0·77	−0·08	−0·13
Mean of 33 years ...	+0·03	−1·00	−0·18	−0·90	0·0	−0·65	−0·05	−0·08	−0·10	−0·95	−0·32	−1·03	−0·10	−0·78	−0·08	−0·13

TABLE 308.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of several months.*

Unity = 1 minute of arc.

Years.	September.								October.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·28	−1·23	−0·18	−1·27	−0·08	−1·07	−0·07	−0·40	+0·02	−0·40	+0·05	−0·43	−0·08	−0·58	−0·08	−0·40
1873 ...	−0·22	−0·78	−0·43	−0·95	−0·23	−0·88	−0·03	−0·32	−0·30	−0·20	−0·22	−0·17	−0·15	−0·43	−0·02	−0·28
1874 ...	−0·25	−0·88	−0·23	−1·00	−0·08	−0·85	−0·05	−0·27	−0·13	−0·30	−0·10	−0·25	−0·03	−0·47	0·0	−0·28
1875 ...	−0·28	−0·72	−0·37	−0·87	−0·18	−0·82	0·0	−0·30	−0·17	−0·22	−0·27	−0·23	−0·13	−0·45	0·0	−0·25
1876 ...	−0·08	−0·83	−0·23	−0·93	−0·12	−0·85	−0·08	−0·28	−0·28	−0·25	−0·13	−0·33	−0·03	−0·47	+0·05	−0·28
1877 ...	−0·23	−0·73	−0·38	−0·92	−0·15	−0·88	+0·02	−0·33	−0·18	−0·18	−0·13	−0·28	−0·07	−0·47	+0·03	−0·25
1878 ...	−0·23	−0·62	−0·28	−0·68	−0·12	−0·68	−0·02	−0·23	−0·22	−0·17	−0·33	−0·18	−0·27	−0·42	−0·03	−0·27
1879 ...	−0·25	−0·65	−0·33	−0·78	−0·12	−0·77	+0·02	−0·23	−0·12	−0·17	−0·17	−0·25	−0·12	−0·47	−0·02	−0·28
1880 ...	−0·17	−0·73	+0·18	−0·88	−0·05	−0·80	0·0	−0·33	−0·07	−0·20	+0·05	−0·30	−0·02	−0·52	−0·02	−0·30
1881 ...	−0·27	−1·03	−0·17	−0·98	0·0	−0·88	−0·03	−0·28	−0·02	−0·35	0·0	−0·40	−0·08	−0·60	−0·03	−0·37
1882 ...	−0·05	−0·72	−0·05	−0·73	−0·07	−0·73	−0·03	−0·28	−0·20	−0·23	−0·02	−0·33	−0·23	−0·52	−0·07	−0·32
Mean ...	−0·22	−0·82	−0·25	−0·92	−0·12	−0·83	−0·02	−0·30	−0·15	−0·23	−0·13	−0·28	−0·12	−0·48	−0·02	−0·30
1883 ...	−0·05	−0·82	−0·28	−0·97	−0·15	−0·95	−0·07	−0·28	0·0	−0·38	+0·08	−0·32	+0·03	−0·55	+0·03	−0·33
1884 ...	−0·23	−0·85	−0·22	−1·07	0·0	−0·95	+0·03	−0·30	−0·05	−0·25	+0·07	−0·32	+0·02	−0·52	+0·03	−0·30
1885 ...	−0·23	−0·83	−0·28	−0·98	−0·13	−0·87	−0·03	−0·30	−0·13	−0·20	+0·05	−0·20	+0·03	−0·37	+0·08	−0·25
1886 ...	−0·32	−0·83	−0·22	−0·80	−0·03	−0·75	+0·05	−0·22	−0·23	−0·25	0·0	−0·35	+0·03	−0·53	+0·08	−0·28
1887 ...	−0·27	−0·62	−0·52	−0·97	−0·22	−0·83	−0·02	−0·27	−0·25	−0·13	−0·17	−0·25	−0·03	−0·48	+0·05	−0·23
1888 ...	−0·12	−0·65	−0·17	−0·85	−0·05	−0·80	−0·02	−0·32	−0·20	−0·12	−0·05	−0·27	+0·03	−0·45	+0·07	−0·25
1889 ...	−0·18	−0·65	−0·27	−0·87	−0·03	−0·77	+0·03	−0·25	−0·13	−0·15	−0·12	−0·30	−0·05	−0·50	+0·05	−0·28
1890 ...	−0·28	−0·73	−0·37	−0·87	−0·12	−0·80	+0·02	−0·25	−0·23	−0·05	−0·22	−0·20	−0·12	−0·45	+0·03	−0·28
1891 ...	−0·25	−0·78	−0·45	−1·15	−0·23	−0·93	−0·02	−0·30	−0·13	−0·27	−0·07	−0·45	−0·02	−0·60	+0·05	−0·35
1892 ...	−0·12	−0·78	−0·38	−1·10	−0·22	−0·98	−0·05	−0·32	−0·07	−0·33	−0·03	−0·50	−0·02	−0·63	+0·03	−0·33
1893 ...	−0·22	−0·98	−0·30	−1·05	−0·10	−0·95	−0·03	−0·30	−0·13	−0·40	0·0	−0·37	0·0	−0·57	+0·02	−0·32
Mean ...	−0·20	−0·78	−0·32	−0·97	−0·12	−0·87	0·0	−0·28	−0·15	−0·23	−0·03	−0·32	0·0	−0·52	+0·05	−0·28
1894 ...	−0·30	−0·83	−0·28	−1·07	−0·08	−0·90	−0·05	−0·30	−0·12	−0·37	−0·18	−0·27	−0·15	−0·55	0·0	−0·37
1895 ...	−0·20	−0·70	−0·40	−0·97	−0·15	−0·90	−0·03	−0·28	−0·13	−0·20	−0·15	−0·32	−0·15	−0·50	0·0	−0·33
1896 ...	−0·20	−0·78	−0·25	−0·88	−0·12	−0·82	0·0	−0·32	−0·07	−0·10	+0·03	−0·23	+0·03	−0·40	+0·02	−0·27
1897 ...	−0·13	−0·70	−0·33	−0·82	−0·10	−0·82	0·0	−0·25	−0·17	−0·15	−0·15	−0·22	−0·07	−0·47	+0·02	−0·22
1898 ...	−0·33	−0·80	−0·30	−0·93	−0·08	−0·85	−0·02	−0·28	−0·20	−0·18	−0·17	−0·20	−0·12	−0·43	−0·05	−0·23
1899 ...	−0·18	−0·67	−0·13	−0·80	0·0	−0·72	+0·02	−0·25	−0·03	−0·20	−0·03	−0·23	0·0	−0·45	+0·07	−0·27
1900 ...	−0·22	−0·72	−0·40	−0·95	−0·13	−0·92	+0·03	−0·32	−0·15	−0·27	−0·15	−0·33	−0·07	−0·52	+0·03	−0·30
1901 ...	−0·22	−0·70	−0·32	−0·92	−0·10	−0·87	+0·02	−0·28	−0·10	−0·20	−0·08	−0·28	−0·03	−0·42	0·0	−0·22
1902 ...	−0·10	−0·70	−0·20	−0·95	−0·03	−0·87	+0·03	−0·28	−0·15	−0·23	−0·05	−0·40	0·0	−0·50	+0·03	−0·27
1903 ...	−0·40	−0·72	−0·50	−1·00	−0·22	−0·85	0·0	−0·27	−0·27	−0·10	−0·08	−0·38	−0·02	−0·55	+0·05	−0·28
1904 ...	−0·18	−0·78	−0·37	−1·00	−0·17	−0·88	−0·07	−0·30	−0·17	−0·18	−0·13	−0·30	−0·05	−0·47	+0·05	−0·23
Mean ...	−0·23	−0·73	−0·32	−0·93	−0·10	−0·85	0·0	−0·28	−0·15	−0·20	−0·10	−0·28	−0·05	−0·48	+0·02	−0·27
Mean of 33 years ...	−0·22	−0·78	−0·30	−0·93	−0·12	−0·85	−0·02	−0·28	−0·15	−0·22	−0·08	−0·30	−0·05	−0·50	+0·02	−0·28

TABLE 308.—*Monthly Values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba), for each month of the year from 1872 to 1904, calculated from Mean Hourly Declination of several months.*

Unity = 1 minute of arc.

Years.	November.								December.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·07	+0·20	+0·17	+0·22	+0·05	−0·22	−0·02	−0·30	−0·15	+0·22	−0·07	+0·18	+0·03	−0·20	+0·05	−0·30
1873 ...	−0·27	+0·18	+0·10	+0·22	+0·02	−0·02	−0·05	−0·15	−0·22	+0·18	+0·08	+0·08	+0·13	−0·08	+0·10	−0·12
1874 ...	−0·27	+0·15	−0·02	+0·05	−0·03	−0·18	−0·02	−0·18	−0·08	+0·38	−0·03	+0·20	+0·05	−0·07	+0·03	−0·08
1875 ...	−0·25	+0·13	−0·10	−0·02	−0·05	−0·23	0·0	−0·18	−0·23	+0·35	+0·03	+0·13	+0·07	−0·02	+0·05	−0·05
1876 ...	−0·30	+0·08	−0·02	+0·02	+0·05	−0·15	+0·05	−0·13	−0·18	+0·33	+0·02	+0·18	+0·08	+0·02	+0·07	−0·02
1877 ...	−0·23	+0·25	−0·12	+0·17	−0·07	−0·08	−0·03	−0·07	−0·15	+0·20	−0·12	−0·02	−0·05	−0·22	−0·03	−0·20
1878 ...	−0·08	+0·27	−0·07	+0·17	−0·03	−0·10	0·0	−0·13	−0·35	+0·30	−0·18	+0·03	−0·15	−0·20	−0·05	−0·18
1879 ...	−0·28	+0·18	−0·17	+0·12	−0·12	−0·18	−0·03	−0·18	−0·28	+0·40	−0·07	+0·28	+0·02	0·0	+0·03	−0·05
1880 ...	−0·18	+0·10	+0·20	+0·03	+0·07	−0·17	+0·02	−0·15	−0·35	+0·37	+0·05	+0·18	+0·07	−0·07	+0·03	−0·10
1881 ...	−0·15	+0·22	−0·02	+0·07	0·0	−0·20	+0·02	−0·20	−0·13	+0·33	+0·13	+0·27	+0·13	−0·02	+0·05	−0·08
1882 ...	−0·20	+0·28	+0·03	+0·17	+0·03	−0·23	0·0	−0·22	−0·17	+0·28	+0·08	+0·20	+0·10	−0·02	+0·08	−0·07
Mean ...	−0·20	+0·18	0·0	+0·12	0·0	−0·17	0·0	−0·17	−0·22	+0·30	0·0	+0·15	+0·03	−0·08	+0·03	−0·12
1883 ...	−0·15	+0·13	−0·07	+0·15	−0·12	−0·17	−0·08	−0·23	−0·08	0·0	+0·07	−0·03	+0·08	−0·27	+0·02	−0·28
1884 ...	−0·08	+0·18	+0·33	+0·08	+0·27	−0·12	+0·12	−0·17	−0·02	+0·15	+0·38	+0.12	+0·30	−0·07	+0·12	−0·12
1885 ...	−0·28	+0·25	+0·02	+0·18	+0·03	−0·13	+0·03	−0·18	−0·08	+0·35	+0·18	+0·20	+0·15	+0·02	+0·08	−0·08
1886 ...	−0·42	+0·32	−0·17	+0·17	−0·08	−0·10	−0·05	−0·13	−0·28	+0·47	+0·02	+0·18	+0·13	−0·02	+0·08	−0·02
1887 ...	−0·28	+0·32	−0·05	+0·25	−0·05	−0·08	−0·05	−0·13	−0·17	+0·38	+0·20	+0·23	+0·18	+0·07	+0·05	0·0
1888 ...	−0·25	+0·28	−0·15	+0·10	−0·07	−0·12	−0·02	−0·13	−0·27	+0·37	−0·02	+0·15	+0·05	−0·05	+0·07	−0·07
1889 ...	−0·30	+0·28	−0·07	+0·05	−0·03	−0·13	0·0	−0·15	−0·08	+0·27	+0·08	−0·03	+0·08	−0·15	+0·05	−0·13
1890 ...	−0·17	+0·28	0·0	+0·13	+0·03	−0·12	+0·02	−0·13	−0·13	+0·30	+0·18	+0·13	+0·15	−0·08	+0·10	−0·08
1891 ...	−0·17	+0·17	+0·07	+0·15	+0·07	−0·15	+0·03	−0·17	−0·15	+0·27	+0·08	+0·23	+0·08	0·0	0·0	−0·13
1892 ...	−0·15	+0·07	+0·10	+0·10	+0·07	−0·10	+0·02	−0·17	−0·18	+0·33	+0·08	+0·28	+0·08	0·0	0·0	−0·07
1893 ...	−0·12	+0·08	+0·15	+0·15	+0·12	−0·07	+0·02	−0·15	−0·20	+0·27	+0·18	+0·40	+0·15	+0·10	+0·08	0·0
Mean ...	−0·22	+0·22	+0·02	+0·13	+0·02	−0·12	0·0	−0·15	−0·15	+0·28	+0·13	+0·17	+0·13	−0·03	+0·07	−0·10
1894 ...	−0·28	+0·12	+0·10	+0·10	0·00	−2·12	−0·03	−0·20	0·00	+0·22	+0·23	+0·22	+0·17	+0·02	+0·12	−0·03
1895 ...	−0·07	+0·17	+0·07	+0·23	+0·07	−0·02	+0·02	−0·10	−0·08	+0·23	+0·18	+0·15	+0·15	0·00	+0·05	−0·08
1896 ...	−0·23	+0·13	−0·05	0·00	0·00	−0·20	+0·03	−0·20	−0·32	+0·27	−0·07	+0·05	+0·08	−0·10	+0·12	−0·08
1897 ...	−0·12	+0·22	−0·03	+0·27	−0·05	−0·03	−0·03	−0·10	−0·20	+0·38	+0·07	+0·23	+0·10	+0·05	+0·03	−0·03
1898 ...	−0·23	+0·28	−0·15	+0·15	−0·08	−0·13	+0·02	−0·13	−0·10	+0·33	+0·03	+0·15	+0·07	−0·08	+0·02	−0·15
1899 ...	−0·10	+0·22	+0·05	+0·18	−0·02	−0·05	−0·05	−0·08	−0·13	+0·35	+0·05	+0·07	+0·10	−0·08	+0·07	−0·07
1900 ...	−0·18	+0·20	−0·15	+0·17	−0·13	−0·12	−0·07	−0·15	−0·35	+0·27	−0·17	+0·08	−0·07	−0·05	−0·03	−0·05
1901 ...	−0·05	+0·10	−0·02	+0·03	−0·03	−0·15	−0·03	−0·15	−0·12	+0·33	+0·05	+0·12	+0·10	−0·05	+0·07	−0·05
1902 ...	−0·22	+0·15	−0·12	+0·10	−0·05	−0·10	−0·05	−0·12	−0·17	+0·33	0·00	+0·13	+0·05	−0·03	+0·05	−0·05
1903 ...	−0·15	+0·17	−0·02	−0·03	+0·03	−0·23	+0·05	−0·18	−0·22	+0·30	−0·07	+0·20	+0·08	−0·03	+0·05	−0·03
1904 ...	−0·08	+0·20	−0·07	+0·13	−0·07	−0·10	−0·03	−0·17	−0·25	+0·32	−0·08	+0·18	−0·02	−0·05	+0·03	−0·10
Mean ...	−0·15	+0·18	−0·03	+0·12	−0·03	−0·12	−0·02	−0·15	−0·17	+0·30	+0·02	+0·15	+0·07	−0·03	+0·05	−0·07
Mean of 33 years ...	−0·20	+0·20	0·00	+0·12	0·00	−0·13	0·00	−0·17	−0·18	+0·30	+0·05	+0·15	+0·08	−0·05	+0·05	−0·10

TABLE 309.—*Declination Magnetograph—Showing the mean values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each half-year April to September for each of the years from 1872 to 1904 derived by averaging the values of p and q for the above months.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·07	−1·22	−0·27	−1·13	−0·08	−0·87	−0·10	−0·18
1873 ...	0·00	−1·08	−0·18	−0·90	−0·05	−0·77	−0·07	−0·20
1874 ...	−0·02	−0·92	−0·08	−0·83	+0·02	−0·70	−0·03	−0·15
1875 ...	−0·07	−0·83	−0·15	−0·73	−0·02	−0·65	−0·02	−0·17
1876 ...	−0·08	−0·83	−0·23	−0·77	−0·07	−0·68	−0·05	−0·17
1877 ...	−0·13	−0·88	−0·18	−0·83	−0·03	−0·73	−0·02	−0·20
1878 ...	−0·07	−0·77	−0·15	−0·67	−0·03	−0·63	−0·02	−0·17
1879 ...	−0·12	−0·77	−0·23	−0·78	−0·07	−0·70	0·00	−0·17
1880 ...	−0·08	−0·85	−0·12	−0·78	+0·02	−0·67	−0·02	−0·17
1881 ...	−0·08	−0·97	−0·22	−1·00	−0·03	−0·82	−0·05	−0·17
1882 ...	0·00	−0·93	−0·05	−0·78	+0·02	−0·68	−0·03	−0·17
1883 ...	−0·03	−0·95	−0·20	−0·93	−0·05	−0·77	−0·05	−0·17
1884 ...	−0·10	−0·93	−0·30	−1·03	−0·08	−0·85	−0·07	−0·20
1885 ...	−0·12	−0·93	−0·30	−1·00	−0·08	−0·80	−0·03	−0·18
1886 ...	−0·03	−0·95	−0·17	−0·82	−0·03	−0·68	−0·05	−0·15
1887 ...	−0·17	−0·87	−0·30	−0·90	−0·10	−0·73	−0·03	−0·18
1888 ...	−0·07	−0·83	−0·18	−0·80	−0·03	−0·67	−0·03	−0·18
1889 ...	−0·07	−0·80	−0·20	−0·80	−0·03	−0·68	0·00	−0·15
1890 ...	−0·15	−0·77	−0·32	−0·78	−0·12	−0·68	−0·03	−0·15
1891 ...	−0·13	−0·87	−0·25	−0·98	−0·10	−0·77	−0·05	−0·18
1892 ...	−0·07	−0·98	−0·32	−1·07	−0·12	−0·83	−0·08	−0·17
1893 ...	−0·13	−1·02	−0·20	−1·10	+0·02	−0·85	−0·05	−0·17
1894 ...	0·00	−0·97	−0·17	−1·02	−0·03	−0·77	−0·05	−0·15
1895 ...	−0·10	−1·02	−0·27	−1·03	−0·10	−0·82	−0·08	−0·17
1896 ...	−0·05	−0·92	−0·22	−0·85	−0·03	−0·72	−0·03	−0·15
1897 ...	0·00	−0·90	−0·12	−0·78	0·00	−0·67	−0·02	−0·15
1898 ...	−0·05	−0·87	−0·18	−0·83	−0·02	−0·70	−0·03	−0·17
1899 ...	−0·08	−0·80	−0·17	−0·78	−0·02	−0·67	−0·02	−0·17
1900 ...	−0·07	−0·77	−0·17	−0·78	0·00	−0·68	0·00	−0·15
1901 ...	−0·08	−0·75	−0·15	−0·78	0·00	−0·67	0·00	−0·18
1902 ...	−0·03	−0·73	−0·10	−0·80	0·00	−0·70	0·00	−0·20
1903 ...	−0·10	−0·80	−0·18	−0·93	0·00	−0·73	0·00	−0·17
1904 ...	−0·05	−0·85	−0·22	−0·98	−0·03	−0·78	−0·05	−0·18
1872—1882...	−0·07	−0·92	−0·17	−0·83	−0·03	−0·72	−0·03	−0·17
1883—1893...	−0·10	−0·90	−0·25	−0·93	−0·07	−0·75	−0·05	−0·17
1894—1904...	−0·05	−0·85	−0·18	−0·87	−0·02	−0·72	−0·03	−0·17
1872—1904...	−0·07	−0·88	−0·20	−0·88	−0·03	−0·73	−0·03	−0·17

TABLE 310.—*Declination Magnetograph—Showing the mean values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each half-year January to March and October to December for each of the years from 1872 to 1904 derived by averaging the values of p and q for the above months.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	+0·03	−0·07	+0·23	+0·02	+0·10	−0·30	+0·05	−0·27
1873 ...	−0·13	−0·07	+0·10	−0·07	+0·07	−0·30	+0·08	−0·27
1874 ...	−0·07	+0·02	+0·15	+0·03	+0·13	−0·18	+0·08	−0·15
1875 ...	−0·17	+0·10	−0·07	−0·05	+0·02	−0·28	+0·08	−0·20
1876 ...	−0·13	+0·07	+0·02	−0·03	+0·08	−0·23	+0·08	−0·15
1877 ...	−0·13	+0·07	−0·03	−0·07	+0·03	−0·27	+0·07	−0·17
1878 ...	−0·12	+0·10	−0·08	−0·08	−0·03	−0·30	+0·05	−0·20
1879 ...	−0·13	+0·08	−0·03	−0·03	+0·03	−0·25	+0·07	−0·17
1880 ...	−0·07	+0·10	+0·13	−0·02	+0·12	−0·23	+0·10	−0·15
1881 ...	−0·07	−0·02	+0·15	−0·08	+0·12	−0·28	+0·08	−0·23
1882 ...	−0·05	0·00	+0·13	−0·05	+0·10	−0·27	+0·10	−0·20
1883 ...	−0·05	−0·10	+0·13	−0·07	+0·12	−0·30	+0·08	−0·25
1884 ...	+0·10	−0·08	+0·33	−0.08	+0·25	−0·27	+0·13	−0·22
1885 ...	−0·10	+0·08	+0·10	−0·02	+0·12	−0·23	+0·13	−0·18
1886 ...	−0·15	+0·12	+0·13	+0·02	+0·13	−0·18	+0·08	−0·13
1887 ...	−0·13	+0·12	+0·10	0·00	+0·12	−0·22	+0·08	−0·15
1888 ...	−0·17	+0·12	0·00	−0·05	+0·08	−0·25	+0·10	−0·17
1889 ...	−0·13	+0·10	−0·02	−0·12	+0·05	−0·27	+0·08	−0·18
1890 ...	−0·10	+0·10	+0·07	−0·03	+0·12	−0·22	+0·10	−0·15
1891 ...	−0·07	+0·02	+0·08	−0·08	+0·10	−0·30	+0·08	−0·22
1892 ...	−0·02	−0·02	+0·13	−0·07	+0·10	−0·30	+0·07	−0·23
1893 ...	−0·12	−0·12	+0·08	−0·12	+0·10	−0·32	+0·08	−0·23
1894 ...	−0·02	−0·05	+0·17	+0·03	+0·12	−0·22	+0·10	−0·20
1895 ...	−0·07	0·00	+0·10	−0·08	+0·10	−0·28	+0·10	−0·22
1896 ...	−0·17	+0·03	+0·02	−0·07	+0·07	−0·23	+0·08	−0·18
1897 ...	−0·12	+0·03	+0·03	−0·05	+0·08	−0·25	+0·08	−0·17
1898 ...	−0·12	+0·13	−0·03	−0·02	+0·03	−0·25	+0·07	−0·17
1899 ...	−0·13	+0·08	−0·03	−0·10	+0·03	−0·30	+0·07	−0·18
1900 ...	−0·10	+0·05	−0·02	−0·08	+0·03	−0·27	+0·07	−0·18
1901 ...	0·00	+0·10	+0·07	−0·02	+0·10	−0·20	+0·08	−0·13
1902 ...	−0·05	+0·05	+0·07	−0·08	+0·10	−0·22	+0·08	−0·15
1903 ...	−0·08	+0·08	·08	−0·10	+0·15	−0·23	+0·10	−0·15
1904 ...	−0·05	+0·10	0·00	−0·07	+0·03	−0·27	+0·07	−0·20
1872—1882...	−0·10	+0·03	+0·07	−0·03	+0·07	−0·27	+0·08	−0·20
1883—1893...	−0·08	+0·03	+0·10	−0·05	+0·12	−0·27	+0·10	−0·20
1894—1904...	−0·08	+0·05	+0·03	−0·05	+0·08	−0·25	+0·08	−0·18
1872—1904...	−0·08	+0·03	+0·07	−0·05	+0·08	−0·27	+0·08	−0·20

TABLE 311.—*Declination Magnetograph—Showing mean yearly values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each year from 1872 to 1904 derived by averaging the values of the p and q for all the months of the year.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·02	−0·65	−0·02	−0·55	0·00	−0·58	−0·02	−0·22
1873 ...	−0·07	−0·58	−0·05	−0·48	+0·02	−0·53	0·00	−0·23
1874 ...	−0·03	−0·45	+0·03	−0·40	+0·07	−0·45	+0·02	−0·15
1875 ...	−0·12	−0·37	−0·10	−0·38	0·00	−0·47	+0·03	−0·18
1876 ...	−0·10	−0·38	−0·12	−0·40	0·00	−0·45	+0·02	−0·15
1877 ...	−0·13	−0·40	−0·12	−0·45	0·00	−0·50	+0·02	−0·18
1878 ...	−0·10	−0·33	−0·12	−0·37	−0·03	−0·47	+0·02	−0·18
1879 ...	−0·13	−0·35	−0·13	−0·40	−0·02	−0·47	+0·03	−0·17
1880 ...	−0·08	−0·38	+0·02	−0·40	+0·07	−0·45	+0·05	−0·17
1881 ...	−0·07	−0·48	−0·03	−0·53	+0·03	−0·55	+0·02	−0·20
1882 ...	−0·03	−0·47	+0·03	−0·42	+0·07	−0·47	+0·03	−0·18
1883 ...	−0·05	−0·53	−0·03	−0·50	+0·03	−0·53	+0·02	−0·20
1884 ...	−0·00	−0·52	+0·02	−0·57	+0·08	−0·55	+0·03	−0·20
1885 ..	−0·12	−0·43	−0·10	−0·50	+0·02	−0·52	+0·05	−0·18
1886 ...	−0·10	−0·42	−0·02	−0·40	+0·05	−0·43	+0·02	−0·13
1887 ...	−0·15	−0·38	−0·10	−0·45	0·00	−0·47	+0·03	−0·17
1888 ...	−0·12	−0·37	−0·10	−0·43	+0·02	−0·47	+0·03	−0·17
1889 ...	−0·10	−0·35	−0·12	−0·45	0·00	−0·48	+0·03	−0·17
1890 ...	−0·13	−0·33	−0·13	−0·40	0·00	−0·45	+0·03	−0·15
1891 ...	−0·10	−0·43	−0·08	−0·53	0·00	−0·53	+0·02	−0·20
1892 ...	−0·05	−0·50	−0·08	−0·57	0·00	−0·57	0·00	−0·20
1893 ...	−0·13	−0·57	−0·05	−0·60	+0·05	−0·58	+0·02	−0·20
1894 ...	−0·00	−0·50	0·00	−0·48	+0·05	−0·48	+0·02	−0·18
1895 ...	−0·08	−0·52	−0·08	−0·55	0·00	−0·55	0·00	−0·20
1896 ...	−0·12	−0·43	−0·10	−0·47	+0·02	−0·48	+0·03	−0·17
1897 ...	−0·05	−0·43	−0·03	−0·42	+0·03	−0·47	+0·03	−0·17
1898 ...	−0·08	−0·37	−0·10	−0·42	0·00	−0·48	+0·02	−0·17
1899 ...	−0·10	−0·37	−0·10	−0·45	0·00	−0·48	+0·02	−0·17
1900 ...	−0·08	−0·35	−0·08	−0·43	+0·02	−0·47	+0·03	−0·17
1901 ...	−0·05	−0·33	−0·03	−0·40	+0·05	−0·43	+0·05	−0·17
1902 ...	−0·03	−0·33	−0·02	−0·45	+0·05	−0·47	+0·03	−0·18
1903 ...	−0·10	−0·37	−0·05	−0·52	+0·07	−0·48	+0·05	−0·15
1904 ...	−0·05	−0·38	−0·10	−0·53	0·00	−0·52	0·00	−0·18
1872—1882 ...	−0·08	−0·43	−0·05	−0·43	+0·02	−0·48	+0·02	−0·18
1883—1893 ...	−0·10	−0·43	−0·07	−0·48	+0·02	−0·50	+0·03	−0·18
1894—1904 ...	−0·07	−0·40	−0·07	−0·47	+0·03	−0·48	+0·03	−0·17
1872—1904 ...	−0·08	−0·43	−0·07	−0·47	+0·02	−0·50	+0·02	−0·18

TABLE 312.—*Declination Magnetograph—Showing the mean yearly values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each year from 1872 to 1904 derived from the Inequality for each year.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1872 ...	−0·02	−0·65	−0·02	−0·55	0·00	−0·58	−0·02	−0·22
1873 ...	−0·07	−0·58	−0·05	−0·48	+0·02	−0·53	0·00	−0·23
1874 ...	−0·03	−0·45	−0·03	−0·40	+0·07	−0·45	+0·02	0·15
1875 ...	−0·12	−0·37	−0·10	−0·37	0·00	−0·47	+0·03	−0·18
1876 ...	−0·10	−0·38	−0·12	−0·40	0·00	−0·45	+0·02	−0·15
1877 ...	−0·13	−0·40	−0·12	−0·45	0·00	−0·50	+0·02	−0·18
1878 ...	−0·10	−0·33	−0·12	−0·37	−0·03	−0·47	+0·02	−0·18
1879 ...	−0·13	−0·35	−0·13	−0·40	−0·02	−0·47	+0·03	−0·17
1880 ...	−0·08	−0·38	+0·02	−0·40	+0·07	−0·45	+0·05	−0·17
1881 ...	−0·07	−0·48	−0·03	−0·53	+0·03	−0·55	+0·02	−0·20
1882 ...	−0·03	−0·47	+0·03	−0·42	+0·07	−0·48	+0·03	−0·18
1883 ...	−0·05	−0·53	−0·03	−0·50	+0·03	−0·53	+0·02	−0·20
1884 ...	0·00	−0·52	+0·02	−0·57	+0·08	−0·55	+0·03	−0·20
1885 ...	−0·12	−0·42	−0·10	−0·50	+0·02	−0·52	+0·05	−0·18
1886 ...	−0·10	−0·42	−0·02	−0·40	+0·05	−0·43	+0·02	−0·13
1887 ...	−0·15	−0·38	−0·10	−0·45	0·00	−0·47	+0·03	−0·17
1888 ...	−0·12	−0·37	−0·10	−0·43	+0·02	−0·47	+0·03	−0·17
1889 ...	−0·10	−0·35	−0·12	−0·45	0·00	−0·48	+0·03	−0·17
1890 ...	−0·13	−0·33	−0·13	−0·40	0·00	−0·45	+0·03	−0·15
1891 ...	−0·10	−0·43	−0·08	−0·53	0·00	−0·53	+0·02	−0·20
1892 ...	−0·05	−0·50	−0·08	−0·57	0·00	−0·57	0·00	−0·20
1893 ...	−0·13	−0·57	−0·05	−0·60	+0·05	−0·58	+0·02	−0·20
1894 ...	0·00	−0·50	0·00	−0·48	+0·05	−0·48	+0·02	−0·18
1895 ...	−0·08	−0·52	−0·08	−0·55	0·00	−0·53	0·00	−0·20
1896 ...	−0·12	−0·43	−0·10	−0·47	+0·02	−0·48	+0·03	−0·17
1897 ...	−0·05	−0·43	−0·03	−0·42	+0·03	−0·47	+0·03	−0·17
1898 ...	−0·08	−0·37	−0·10	−0·42	0·00	−0·48	+0·02	−0·17
1899 ...	−0·10	−0·37	−0·10	−0·45	0·00	−0·48	+0·02	−0·17
1900 ...	−0·08	−0·35	−0·08	−0·43	+0·02	−0·47	+0·03	−0·17
1901 ...	−0·05	−0·33	−0·03	−0·40	+0·05	−0·43	+0·05	−0·17
1902 ...	−0·03	−0·33	−0·02	−0·45	+0·05	−0·47	+0·03	−0·18
1903 ...	−0·10	−0·37	−0·05	−0·52	+0·07	−0·48	+0·05	−0·15
1904 ...	−0·05	−0·38	−0·10	−0·53	0·00	−0·52	0·00	−0·18
1872—1882 ...	−0·08	−0·43	−0·05	−0·43	+0·02	−0·48	+0·02	−0·18
1883—1893 ...	−0·10	−0·43	−0·07	−0·48	+0·02	−0·50	+0·03	−0·18
1894—1904 ...	−0·07	−0·40	−0·07	−0·47	+0·03	−0·48	+0·03	−0·17
1872—1904 ...	−0·08	−0·43	−0·07	−0·47	+0·02	−0·50	+0·02	−0·18

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1872 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	January.								February.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° °	° ′	° ′
1872 ...	0·23	0·58	0·37	0·22	223 31	170 36	38 10	63 6	0·28	0·67	0·28	0·22	104 29	167 19	23 53	50 50
1873 ...	0·27	0·38	0·42	0·30	299 43	145 25	22 42	52 8	0·17	0·07	0·32	0·35	**425 7**	154 30	8 4	43 51
1874 ...	0·22	0·40	0·30	0·18	273 44	168 24	36 0	60 0	0·05	0·53	0·23	0·10	117 38	171 17	37 23	57 34
1875 ...	0·28	0·05	0·35	0·33	280 48	**239 30**	6 14	47 26	0·33	0·22	0·27	0·22	295 15	**239 54**	0 18	46 46
1876 ...	0·18	0·23	0·27	0·18	254 7	162 12	24 53	54 25	0·27	0·15	0·18	0·13	259 24	**213 46**	6 24	47 47
1877 ...	0.18	0·22	0·28	0·25	262 24	167 54	21 20	50 21	0·17	0·02	0·20	0·15	296 8	**226 53**	11 10	50 27
1878 ...	0·20	0·15	0·33	0·25	259 12	130 5	12 22	48 6	0·17	0·07	0·25	0·18	265 20	104 6	5 27	48 27
1879 ...	0·22	0·13	0·30	0·22	309 6	119 15	13 36	50 2	0·18	0·08	0·18	0·18	243 56	178 18	12 32	51 53
1880 ...	0·43	0·20	0·10	0·10	266 47	**194 10**	34 9	50 10	0·07	0·17	0·28	0·23	172 56	144 39	18 12	54 4
1881 ...	0·22	0·23	0·37	0·27	329 1	138 38	16 41	49 39	0·05	0·27	0·28	0·27	354 43	154 36	20 40	52 5
1882 ...	0·18	0·22	0·23	0·22	219 59	167 35	23 1	49 12	0·15	0·37	0·35	0·27	**448 22**	144 26	21 30	53 19
Mean ...	0·23	0·25	0·30	0·23	270 46	163 59	22 39	52 14	0·17	0·23	0·27	0·22	271 13	172 42	15 3	50 38
1883 ...	0·08	0·23	0·37	0·28	335 8	139 8	17 16	50 30	0·10	0·35	0·28	0·22	**398 11**	163 9	29 18	54 15
1884 ...	0·22	0·38	0·40	0·32	145 52	150 33	21 44	50 10	0·32	0·67	0·47	0·23	136 26	158 56	33 41	58 34
1885 ...	0·32	0·33	0·38	0·30	236 27	162 22	21 10	53 41	0·15	0·12	0·23	0·22	307 47	**247 52**	1 41	46 2
1886 ...	0·30	0·40	0·30	0·20	253 46	162 31	32 46	59 41	0·17	0·50	0·25	0·10	226 53	171 29	39 36	58 14
1887 ...	0·18	0·32	0·38	0·25	283 42	143 24	24 13	54 37	0·20	0·18	0·18	0·17	276 44	174 16	27 2	58 18
1888 ...	0·32	0·15	0·30	0·23	289 9	145 43	15 52	49 56	0·22	0·17	0·23	0·18	287 13	**231 22**	1 30	48 30
1889 ...	0·33	0·13	0·23	0·22	240 57	165 37	17 21	52 13	0·20	0·15	0·27	0·20	326 36	88 59	7 52	49 37
1890 ...	0·25	0·18	0·23	0·20	277 12	160 1	23 26	54 45	0·03	0·23	0·32	0·22	156 28	153 15	27 4	58 27
1891 ...	0·13	0·25	0·35	0·28	237 43	143 31	18 48	50 54	0·12	0·08	0·18	0·18	267 49	**199 9**	6 42	50 0
1892 ...	0·17	0·17	0·28	0·30	258 50	156 37	16 6	47 41	0·05	0·15	0·32	0·27	136 24	157 3	14 59	47 1
1893 ...	0·30	[0·03	0·33	0·37	304 54	78 5	6 16	46 20	0·17	0·13	0·42	0·32	**410 46**	102 4	5 31	47 6
Mean ...	0·23	0·23	0·33	0·27	260 20	146 8	19 33	51 52	0·15	0·25	0·28	0·22	266 29	167 58	17 43	52 22
1894 ...	0·18	0·47	0·30	0·23	188 39	171 33	35 54	52 58	0·10	0·35	0·18	0·18	281 28	**183 50**	21 50	50 9
1895 ...	0·12	0·23	0·40	0·33	231 55	138 57	16 47	49 44	0·20	0·17	0·22	0·27	306 24	177 42	11 16	48 52
1896 ...	0·30	0·15	0·23	0·20	308 6	160 22	21 44	51 36	0·15	0·13	0·18	0·22	286 42	173 3	19 26	54 2
1897 ...	0·13	0·13	0·35	0·32	295 40	131 51	9 35	46 20	0·12	0·15	0·33	0·25	323 28	126 29	15 51	52 5
1898 ...	0·35	0·05	0·22	0·23	273 23	**190 44**	9 42	46 51	0·23	0·10	0·22	0·20	293 20	**251 39**	4 6	50 51
1899 ...	0·35	0·27	0·38	0·32	301 51	73 54	0 47	42 58	0·32	0·23	0·32	0·20	309 26	83 58	3 1	46 58
1900 ...	0·20	0·18	0·30	0·23	247 58	144 24	17 48	49 15	0·13	0·10	0·25	0·20	223 0	145 22	15 38	52 4
1901 ...	0·32	0·27	0·20	0·13	240 4	175 52	38 25	60 36	0·22	0·18	0·27	0·22	208 10	163 57	21 30	54 18
1902 ...	0·12	0·40	0·42	0·22	197 59	150 44	29 54	58 51	0·18	0·08	0·15	0·13	235 32	170 9	18 20	51 11
1903 ...	0·18	0·27	0·27	0·17	266 44	147 30	26 27	54 21	0·07	0·23	0·25	0·17	246 51	151 51	26 16	55 21
1904 ...	0·30	0·07	0·28	0·28	272 5	114 30	4 59	46 4	0·10	0·10	0·27	0·22	260 31	135 26	14 47	50 30
Mean ...	0·23	0·22	0·30	0·25	256 46	145 29	19 17	50 52	0·17	0·17	0·23	0·20	270 27	160 19	15 38	51 29
Mean of 33 years ...	0·23	0·23	0·32	0·25	262 37	151 53	20 29	51 39	0·17	0·22	0·27	0·20	269 23	167 0	16 8	51 30

Values of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1872 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	March.								April.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	0·50	0·48	0·75	0·38	80 23	117 12	5 0	44 11	1·12	0·83	0·85	0·22	68 14	111 10	5 17	41 35
1873 ...	0·60	0·48	0·67	0·50	86 58	122 11	6 9	47 4	1·05	0·73	0·83	0·33	75 21	119 29	8 25	44 51
1874 ...	0·37	0·43	0·53	0·32	90 41	132 33	14 0	51 6	0·78	0·67	0·68	0·22	57 48	109 7	6 0	42 52
1875 ...	0·17	0·28	0·43	0·28	96 46	131 31	13 45	54 51	0·52	0·52	0·62	0·18	59 50	109 15	7 57	47 27
1876 ...	0·18	0·25	0·47	0·22	87 57	116 46	10 53	51 42	0·55	0·47	0·55	0·20	64 7	107 8	6 43	45 55
1877 ...	0·13	0·33	0·47	0·25	70 40	107 56	10 37	55 0	0·60	0·65	0·63	0·23	61 13	112 9	8 47	47 48
1878 ...	0·17	0·33	0·52	0·30	69 38	113 0	8 41	51 10	0·63	0·62	0·67	0·25	60 24	110 26	6 31	52 27
1879 ...	0·18	0·32	0·43	0·25	87 10	123 12	14 48	57 47	0·42	0·50	0·53	0·17	69 37	105 23	5 25	44 59
1880 ...	0·25	0·35	0·47	0·35	133 16	144 53	16 6	54 15	0·62	0·58	0·65	0·25	59 5	113 26	10 44	51 14
1881 ...	0·38	0·42	0·48	0·33	99 13	131 22	12 33	50 6	0·65	0·70	0·68	0·25	65 4	107 40	6 31	45 8
1882 ...	0·37	0·43	0·57	0·38	81 59	129 21	14 0	54 11	0·73	0·68	0·72	0·30	66 26	115 21	10 11	47 9
Mean ...	0·30	0·37	0·53	0·33	89 31	124 32	11 30	51 57	0·70	0·63	0·67	0·23	64 17	110 58	7 30	46 30
1883 ...	0·27	0·27	0·45	0·32	81 51	127 53	13 17	51 46	0·73	0·72	0·73	0·28	67 10	105 12	4 44	45 21
1884 ...	0·48	0·50	0·63	0·35	89 41	121 20	8 49	46 53	0·85	0·97	0·95	0·28	61 5	109 36	7 2	44 5
1885 ...	0·27	0·35	0·55	0·35	61 17	118 20	14 21	58 10	0·72	0·70	0·72	0·30	60 36	113 34	8 37	49 29
1886 ...	0·28	0·28	0·47	0·25	67 9	120 55	10 49	49 22	0·75	0·67	0·65	0·18	61 11	110 30	5 42	43 58
1887 ...	0·23	0·33	0·50	0·32	111 52	129 55	9 47	48 54	0·73	0·65	0·67	0·27	60 13	110 32	7 11	45 39
1888 ...	0·23	0·37	0·52	0·32	86 18	129 33	16 52	57 3	0·63	0·68	0·70	0·23	63 4	106 10	5 49	45 30
1889 ...	0·22	0·35	0·43	0·23	40 20	105 50	9 58	53 12	0·77	0·83	0·78	0·25	57 36	106 29	6 14	45 26
1890 ...	0·18	0·27	0·40	0·22	75 2	115 37	10 22	51 58	0·67	0·62	0·62	0·18	46 33	102 25	3 51	43 15
1891 ...	0·35	0·47	0·60	0·30	85 2	118 53	9 52	51 10	0·65	0·67	0·67	0·23	59 35	111 11	5 44	43 28
1892 ...	0·40	0·43	0·60	0·35	102 20	134 39	9 56	49 57	0·83	0·85	0·85	0·28	66 59	105 41	5 0	43 3
1893 ...	0·67	0·73	0·68	0·35	68 34	119 51	11 14	49 24	0·78	0·77	0·78	0·27	66 42	112 52	8 33	47 8
Mean ...	0·33	0·40	0·53	0·30	79 2	122 4	11 23	51 37	0·73	0·73	0·73	0·25	60 59	108 34	6 13	45 7
1894 ...	0·50	0·42	0·60	0·37	96 9	126 23	12 2	50 36	0·83	0·73	0·72	0·22	67 30	117 32	9 35	46 22
1895 ...	0·45	0·58	0·65	0·37	69 16	118 26	9 37	50 51	0·95	0·93	0·78	0·23	61 42	113 21	6 9	41 17
1896 ...	0·33	0·32	0·47	0·27	52 6	107 5	4 3	45 30	0·80	0·72	0·75	0·27	59 47	110 33	7 15	43 34
1897 ...	0·35	0·43	0·50	0·30	70 6	122 29	13 3	54 29	0·75	0·65	0·63	0·23	69 11	116 27	9 40	46 20
1898 ...	0·17	0·27	0·45	0·22	130 40	133 52	15 32	57 25	0·58	0·67	0·68	0·22	56 33	97 39	2 28	43 10
1899 ...	0·22	0·38	0·53	0·28	73 32	123 13	13 15	52 53	0·60	0·63	0·65	0·18	62 9	112 13	9 30	49 6
1900 ...	0·22	0·40	0·48	0·27	66 25	120 53	11 27	51 59	0·52	0·58	0·67	0·22	66 21	112 47	9 58	50 39
1901 ...	0·15	0·23	0·47	0·28	100 58	117 0	10 49	52 16	0·50	0·60	0·62	0·22	69 19	115 32	11 20	49 16
1902 ...	0·22	0·35	0·48	0·30	108 39	118 8	8 43	47 48	0·43	0·53	0·63	0·27	87 1	112 49	7 35	47 57
1903 ...	0·20	0·33	0·45	0·28	121 6	130 8	17 53	56 51	0·60	0·72	0·68	0·25	55 40	110 55	10 24	49 15
1904 ...	0·37	0·38	0·48	0·28	139 32	128 22	13 37	52 20	0·70	0·80	0·75	0·23	67 10	109 7	7 27	42 41
Mean ...	0·28	0·37	0·50	0·30	93 30	122 22	11 49	52 5	0·67	0·68	0·68	0·23	65 40	111 43	8 18	46 20
Mean of 33 years ...	0·30	0·38	0·52	0·30	87 21	122 59	11 34	51 53	0·70	0·68	0·70	0·23	63 39	110 25	7 21	45 59

Values of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1872 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	May.								June.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	1·23	1·25	0·97	0·18	56 58	99 19	**−0 14**	35 18	1·25	1·08	0·72	0·17	61 14	102 28	2 43	23 31
1873 ...	1·17	0·90	0·78	0·18	55 33	98 44	1 12	35 30	1·15	0·73	0·63	0·20	73 47	108 0	3 53	31 8
1874 ..	0·93	0·83	0·70	0·17	63 46	107 13	4 9	38 7	1·02	0·75	0·60	0·08	72 49	110 44	8 20	37 38
1875 ...	0·95	0·88	0·73	0·15	52 41	103 57	3 14	38 5	1·03	0·72	0·57	0·12	68 12	107 58	6 13	38 35
1876 ...	0·72	0·80	0·77	0·20	48 45	92 28	**−1 14**	35 29	1·02	0·83	0·63	0·12	61 45	104 32	4 0	35 12
1877 ...	0·82	0·78	0·70	0·17	54 54	101 55	3 8	40 39	0·98	0·82	0·62	0·18	58 22	103 42	3 41	38 18
1878 ...	0·77	0·62	0·63	0·23	57 14	101 31	2 2	39 2	0·90	0·68	0·60	0·13	62 42	104 5	1 30	35 2
1879 ...	0·80	0·82	0·73	0·17	48 50	98 36	0 51	38 28	0·97	0·88	0·73	0·15	58 52	103 39	3 9	38 12
1880 ...	0·78	0·73	0·65	0·17	55 45	102 19	2 19	38 0	1·02	0·88	0·70	0·15	60 31	107 6	6 35	40 53
1881 ...	0·85	1·07	0·92	0·22	51 56	98 24	0 30	38 30	1·20	1·12	0·80	0·13	61 33	106 8	4 14	35 38
1882 ...	1·03	0·93	0 72	0·12	58 16	103 55	5 46	39 16	1·18	0·78	0·65	0·15	69 25	106 4	4 3	33 27
Mean ...	0·92	0·87	0·75	0·18	54 58	100 46	1 58	37 51	1·07	0·85	0·67	0·15	64 28	105 51	4 24	35 14
1883 ...	0·97	0·97	0·78	0·22	54 52	101 2	1 6	37 54	1·18	1·08	0·75	0·10	61 20	103 48	2 30	32 21
1884 ...	0·83	1·02	0·87	0·27	52 47	97 34	0 9	35 15	1·08	1·12	0·78	0·13	59 34	101 13	1 6	28 58
1885 ...	0·92	1·00	0·80	0·20	54 38	100 5	1 19	34 38	1·17	1·12	0·72	0·13	55 26	101 48	2 58	30 1
1886 ...	1·00	0·93	0·75	0·17	56 44	97 28	**−0 33**	34 34	1·15	0.87	0·67	0·15	70 20	107 50	5 21	35 58
1887 ...	0·97	0·93	0·73	0·18	44 24	94 52	**−1 28**	33 8	1·00	0·87	0·62	0.15	57 58	103 1	2 59	33 15
1888 ...	0·78	0·70	0·58	0·15	56 55	94 41	**−0 53**	33 46	1·03	0·83	0·60	0·15	61 30	105 51	4 25	37 51
1889 ...	0·75	0·78	0·72	0·15	58 14	99 3	0 29	36 29	0·93	0·75	0·57	0·10	58 16	101 13	2 49	40 38
1890 ...	0·68	0·77	0·72	0·17	52 25	93 4	**−3 31**	32 44	0·90	0·75	0·67	0·10	66 5	100 11	2 35	38 56
1891 ...	1·00	1·03	0·82	0·23	47 19	98 25	0 58	35 28	0·95	0·97	0·72	0·15	65 0	102 57	1 46	33 41
1892 ...	0·98	1·08	0·87	0·18	42 26	93 55	**−1 54**	32 5	1·13	1·05	0·68	0·08	63 9	106 12	3 57	26 54
1893 ...	1·02	1·13	0·92	0·18	50 56	100 59	3 12	38 46	1·17	1·17	0·82	0·15	61 18	105 11	4 3	30 41
Mean ...	0·90	0·93	0·78	0·18	51 58	97 23	−0 6	34 59	1·07	0·97	0·68	0·13	61 49	103 34	3 8	33 34
1894 ...	1·05	1·03	0·82	0·20	63 24	104 52	3 27	33 10	1·13	1·17	0·68	0·08	67 38	107 21	5 42	35 35
1895 ...	1·02	1·10	0·90	0·20	50 38	96 58	**−0 29**	33 52	1·37	1·25	0·88	0·17	61 9	105 6	4 2	32 18
1896 ...	1·02	0·95	0·78	0·17	57 18	100 20	2 59	35 30	1·05	0·80	0·60	0·07	71 8	103 17	4 0	28 19
1897 ...	0·97	0·90	0·73	0·18	61 59	104 38	2 33	35 18	1·08	0·75	0·57	0·07	69 53	107 50	4 41	31 1
1898 ...	0·93	0·90	0·77	0·20	59 50	104 4	2 42	37 26	1·00	0·92	0·70	0·13	65 14	106 51	6 42	41 54
1899 ...	0·92	0·90	0·73	0·17	49 33	100 8	1 25	35 36	0·98	0·72	0·58	0·12	62 30	107 6	4 21	39 38
1900 ...	0·75	0·80	0·65	0·15	54 11	105 6	3 54	37 53	0·90	0·60	0·53	0·12	63 51	107 2	3 44	36 18
1901 ...	0·73	0·77	0·68	0·22	66 31	107 24	5 4	39 44	0·92	0·77	0·58	0·13	57 6	104 56	4 7	37 58
1902 ...	0·58	0·67	0·63	0·18	60 37	103 35	2 43	40 10	0·87	0·80	0·67	0·15	64 41	107 37	4 3	39 21
1903 ...	0·75	0·82	0·70	0·17	66 7	105 15	3 34	37 45	1·07	0·98	0·73	0·10	66 17	108 31	5 52	40 7
1904 ...	0·77	0·90	0·75	0·18	64 5	103 21	3 26	36 21	0·95	1·07	0·75	0·13	58 51	104 59	4 24	32 1
Mean ...	0·87	0·88	0·75	0·18	59 28	103 15	2 51	36 37	1·03	0·88	0·67	0·12	64 23	106 25	4 42	35 52
Mean of 33 Years ...	0·90	0·90	0·77	0·18	55 28	100 28	1 34	36 29	1·05	0·90	0·67	0 13	63 34	105 17	4 4	34 53

Values of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1872 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	July.								August.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	1·20	1·17	0·77	0·17	62 8	99 56	2 16	28 24	1·25	1·38	0·92	0·20	66 54	102 24	3 24	31 31
1873 ...	1·25	1·03	0·72	0·18	68 36	101 36	3 41	28 2	1·18	1·25	0·83	0·13	59 7	100 40	2 9	33 10
1874 ...	1·02	0·75	0·62	0·07	73 55	108 2	7 48	39 53	0·93	1·00	0·80	0·17	61 26	103 36	3 17	34 14
1875 ...	0·95	0·58	0·45	0·10	75 18	109 35	6 44	37 12	0·90	0·90	0·72	0·17	58 38	99 13	1 19	35 3
1876 ...	1·00	0·82	0·62	0·12	61 21	100 10	2 11	28 47	0·92	0·97	0·72	0·13	59 48	101 44	2 55	35 24
1877 ...	1·13	0·85	0·68	0·18	61 25	104 25	4 4	34 53	1·07	1·12	0·85	0·20	52 27	101 55	2 11	37 6
1878 ...	0·90	0·68	0·58	0·07	68 17	106 59	6 36	46 4	0·75	0·73	0·60	0·10	60 40	99 48	2 0	35 25
1879 ...	0·95	0·85	0·68	0·12	61 46	104 28	4 25	43 24	0·92	0·98	0·78	0·18	54 30	99 24	2 27	39 3
1880 ...	0·97	0·77	0·58	0·12	70 25	102 58	4 0	30 0	1·07	0·90	0·68	0·15	57 31	105 23	4 4	35 10
1881 ...	0·97	1·07	0·75	0·13	69 13	100 51	2 48	25 50	1·08	1·17	0·92	0·17	62 59	103 50	3 40	34 53
1882 ...	0·92	0·65	0·57	0·13	74 16	104 39	3 5	37 2	1·07	1·00	0·73	0·17	57 5	109 10	5 2	31 18
Mean ...	1·02	0·83	0·63	0·12	67 53	104 14	4 20	34 30	1·02	1·03	0·78	0·17	59 11	102 28	2 57	34 45
1883 ...	1·05	1·05	0·72	0·10	64 27	105 15	5 36	26 5	0·92	0·95	0·68	0·08	65 29	106 23	5 44	34 3
1884 ...	1·03	1·02	0·70	0·13	67 35	100 7	1 56	29 34	1·03	1·32	0·93	0·22	55 56	98 45	0 43	32 17
1885 ...	1·08	1·10	0·77	0·10	65 34	101 10	2 55	37 52	0·93	1·40	1·00	0·22	56 37	95 59	**1 22**	34 26
1886 ...	1·10	0·77	0·57	0·12	75 59	105 52	4 45	27 3	0·95	1·02	0·75	0·13	59 23	100 33	2 42	34 51
1887 ...	1·07	1·02	0·75	0·15	59 54	102 38	3 23	36 42	0·93	1·25	0·88	0·18	52 36	99 4	0 9	38 29
1888 ...	1·05	0·93	0·65	0·13	63 48	105 18	4 56	37 14	0·87	1·00	0·72	0·13	54 50	100 50	2 32	36 44
1889 ...	0·88	0·68	0·57	0·12	74 33	106 38	5 32	41 31	0·80	1·03	0·75	0·12	56 47	100 14	2 18	34 27
1890 ...	0·85	0·87	0·62	0·08	57 10	98 26	2 23	32 41	0·87	1·07	0·78	0·15	51 51	97 0	0 30	35 24
1891 ...	0·95	1·03	0·68	0·12	60 55	105 5	4 18	55 31	0·93	1·22	0·83	0·20	53 23	101 30	1 31	34 18
1892 ...	1·20	1·22	0·72	0·17	70 2	104 55	5 18	25 2	1·05	1·37	1·02	0·20	59 50	99 6	**0 11**	32 18
1893 ...	1·02	1·12	0·73	0·15	56 52	104 16	5 58	31 44	1·15	1·43	0·93	0·13	54 34	104 33	5 34	30 10
Mean ...	1·03	0·98	0·68	0·12	65 10	103 36	4 16	32 49	0·95	1·18	0·83	0·17	56 29	100 22	1 50	34 19
1894 ...	1·03	1·10	0·70	0·12	69 48	101 19	1 3	27 41	0·95	1·13	0·82	0·13	71 3	100 10	1 22	30 33
1895 ...	1·13	0·98	0·63	0·10	70 18	104 36	4 2	26 48	0·98	1·20	0·85	0·17	53 38	96 2	**0 17**	30 29
1896 ...	0·92	0·93	0·60	0·02	66 38	102 25	5 29	64 30	0·92	1·00	0·77	0·18	60 23	99 40	1 43	34 33
1897 ...	1·00	0·77	0·60	0·15	72 26	106 47	5 0	39 41	0·93	0·92	0·73	0·13	58 35	101 16	3 24	37 47
1898 ...	0·93	0·80	0·57	0·05	74 38	105 33	6 44	32 47	0·95	0·93	0·68	0·13	67 9	104 55	4 28	34 52
1899 ...	0·87	0·87	0·65	0·13	65 54	100 48	1 36	37 15	0·82	0·98	0·72	0·15	62 53	99 32	2 1	36 33
1900 ...	0·88	0·82	0·65	0·10	71 25	106 20	6 0	37 46	0·87	1·03	0·77	0·12	55 40	99 20	2 5	33 13
1901 ...	0·90	0·82	0·58	0·12	58 35	104 53	5 10	39 59	0·80	0·95	0·70	0·15	53 25	98 9	0 46	36 25
1902 ...	0·93	0·87	0·62	0·15	64 13	108 38	6 17	38 42	0·90	1·08	0·82	0·23	53 13	101 55	2 30	38 35
1903 ...	0·95	1·07	0·73	0·12	57 20	103 46	4 59	39 47	0·77	1·12	0·80	0·15	63 41	101 34	2 45	34 5
1904 ...	1·02	1·10	0·73	0·08	66 31	104 45	5 50	37 39	0·90	1·17	0·87	0·20	59 8	100 51	1 42	34 39
Mean ...	0·97	0·92	0·65	0·10	67 4	104 32	4 45	38 25	0·90	1·05	0·78	0·17	59 53	100 19	2 3	34 42
Mean of 33 years ...	1·00	0·92	0·65	0·12	66 42	104 8	4 27	35 15	0·95	1·08	0·80	0 17	58 31	101 3	2 17	34 35

Values of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1872 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	September.								October.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	1·27	1·28	1·07	0·40	51 27	105 21	2 57	39 48	0·40	0·43	0·60	0·42	67 11	112 38	1 48	38 55
1873 ...	0·82	1·03	0·92	0·32	49 2	97 4	**0 15**	40 51	0·35	0·27	0·47	0·28	8 39	84 10	**1 55**	40 52
1874 ...	0·92	1·03	0·85	0·27	48 21	102 45	2 33	38 56	0·32	0·27	0·47	0·28	41 14	98 23	2 57	42 22
1875 ...	0·77	0·95	0·85	0·30	43 2	98 16	0 24	41 42	0·27	0·35	0·47	0·27	25 19	84 57	**1 22**	41 57
1876 ...	0·85	0·97	0·87	0·30	58 23	102 31	1 47	38 7	0·38	0·37	0·47	0·28	16 10	99 20	2 49	44 39
1877 ...	0·77	0·98	0·90	0·33	46 41	98 13	1 12	42 45	0·27	0·32	0·47	0·25	17 21	96 16	1 38	43 53
1878 ...	0·67	0·75	0·70	0·23	44 30	98 37	1 27	41 54	0·27	0·38	0·48	0·27	12 21	78 17	**6 17**	40 17
1879 ...	0·70	0·85	0·78	0·23	44 11	98 9	1 45	43 33	0·22	0·30	0·48	0·28	29 26	92 29	**0 5**	41 27
1880 ...	0·75	0·90	0·80	0·33	51 6	103 43	3 25	42 5	0·22	0·30	0·52	0·30	48 2	113 46	3 36	41 28
1881 ...	1·07	1·00	0·87	0·28	49 48	104 47	4 23	40 42	0·35	0·42	0·60	0·37	60 59	109 19	1 41	40 58
1882 ...	0·72	0·73	0·73	0·28	60 40	107 38	2 44	40 15	0·30	0·38	0·57	0·32	24 26	95 16	**3 30**	39 15
Mean ...	0·85	0·95	0·85	0·30	49 45	101 33	2 2	40 58	0·30	0·35	0·52	0·30	31 55	96 48	0 7	41 28
1883 ...	0·82	1·02	0·97	0·30	60 30	101 8	1 21	38 32	0·40	0·33	0·55	0·33	64 38	116 56	5 23	43 41
1884 ...	0·88	1·10	0·95	0·32	49 35	103 43	4 28	43 50	0·27	0·32	0·52	0·30	54 58	115 28	5 3	43 49
1885 ...	0·87	1·02	0·87	0·32	49 17	101 25	1 40	40 18	0·23	0·20	0·38	0·27	28 55	117 31	6 17	46 49
1886 ...	0·90	0·83	0·75	0·23	43 47	102 6	3 29	44 46	0·35	0·35	0·53	0·30	21 14	109 26	5 35	46 19
1887 ...	0·67	1·10	0·85	0·27	40 56	95 29	**0 30**	41 24	0·28	0·30	0·48	0·23	1 43	92 44	3 23	44 42
1888 ...	0·67	0·87	0·80	0·32	54 11	104 7	3 13	40 31	0·23	0·28	0·45	0.27	3 39	104 32	5 48	45 44
1889 ...	0·67	0·90	0·77	0·25	48 32	101 6	3 29	43 43	0·20	0·32	0·50	0·28	25 33	99 12	2 33	44 41
1890 ...	0·80	0·93	0·80	0·25	43 1	98 6	1 54	43 12	0·25	0·30	0·47	0·28	**12 12**	85 15	0 0	43 25
1891 ...	0·82	1·23	0·97	0·30	46 11	98 58	**0 17**	41 2	0·28	0·45	0·60	0·35	38 30	105 41	4 9	43 59
1892 ...	0·80	1·17	1·00	0·32	56 32	99 57	0 29	39 52	0·33	0·50	0·63	0·33	53 56	107 55	3 50	43 40
1893 ...	1·00	1·10	0·95	0·30	52 20	101 24	2 32	40 46	0·42	0·38	0·55	0·32	45 42	109 42	4 43	43 6
Mean ...	0·80	1·02	0·88	0·28	49 32	100 41	1 59	41 38	0·30	0·33	0·52	0·30	29 41	105 51	4 15	44 32
1894 ...	0·88	1·10	0·90	0·30	44 10	101 57	2 45	39 38	0·38	0·33	0·57	0·38	46 35	91 46	**0 27**	42 6
1895 ...	0·72	1·05	0·90	0·28	48 3	98 4	1 30	40 23	0·23	0·35	0·52	0·33	31 40	97 7	**0 9**	41 55
1896 ...	0·82	0·92	0·83	0·32	50 42	101 45	1 51	42 15	0·13	0·25	0·40	0·27	29 48	114 19	6 22	43 13
1897 ...	0·72	0·88	0·82	0·25	53 17	98 15	1 59	42 6	0·23	0·27	0·47	0·22	15 52	91 41	2 1	43 7
1898 ...	0·87	0·98	0·85	0·28	41 52	100 21	2 43	40 45	0·27	0·27	0·45	0·25	16 8	89 42	**0 38**	38 57
1899 ...	0·70	0·82	0·72	0·25	49 16	104 39	4 40	43 23	0·20	0·23	0·45	0·27	53 8	105 26	4 35	45 49
1900 ...	0·75	1·03	0·92	0·32	47 37	97 56	1 40	43 10	0·30	0·37	0·52	0·30	34 14	97 0	2 7	43 38
1901 ...	0·73	0·97	0·87	0·30	46 37	100 12	2 24	43 13	0·23	0·30	0·42	0·22	37 56	100 53	3 12	42 11
1902 ...	0·72	0·97	0·85	0·28	56 8	103 34	3 49	43 35	0·32	0·40	0·50	0·27	37 12	106 23	4 41	43 50
1903 ...	0·82	1·12	0·88	0·27	35 41	96 9	**0 12**	41 48	0·28	0·40	0·55	0·28	**3 40**	103 33	3 57	44 30
1904 ...	0·82	1·07	0·90	0·30	51 8	99 29	0 55	39 1	0·25	0·32	0·47	0·25	22 31	97 36	2 31	45 3
Mean ...	0·77	0·98	0·87	0·28	47 41	100 13	2 11	41 45	0·25	0·32	0·48	0·28	29 13	99 35	2 34	43 7
Mean of 33 years ...	0·82	0·98	0·87	0·28	48 59	100 49	2 4	41 27	0·28	0·33	0·50	0·28	30 17	100 45	2 19	43 2

Values of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 313.—*Monthly Values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination at Bombay (Colaba) for each month of the year and for each year from 1672 to 1904 calculated from the values of p and q of the table 308.*

Unity = 1 minute of arc.

Years.	November.								December.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 ...	0·22	0·27	0·23	0·30	261 28	1 3	8 46	41 21	0·27	0·20	0·20	0·32	278 47	30 22	1 11	45 0
1873 ...	0·32	0·23	0·03	0·15	300 3	7 37	13 33	37 54	0·28	0·12	0·17	0·17	293 32	**1 12**	23 18	52 2
1874 ...	0·30	0·07	0·18	0·18	305 5	31 16	1 30	40 45	0·40	0·20	0·08	0·10	257 16	24 49	16 13	48 16
1875 ...	0·28	0·10	0·23	0·18	306 5	69 43	0 37	42 12	0·42	0·15	0·08	0·07	278 54	12 16	29 32	54 23
1876 ...	0·32	0·03	0·17	0·15	318 2	41 26	11 22	46 46	0·38	0·18	0·08	0·07	273 45	15 39	38 34	61 16
1877 ...	0·33	0·20	0·12	0·08	289 23	35 55	**9 49**	34 36	0·25	0·12	0·23	0·20	280 40	68 1	0 2	40 8
1878 ...	0·28	0·18	0·10	0·13	262 9	31 20	**2 48**	41 30	0·47	0·20	0·25	0·20	293 58	58 46	**7 31**	38 7
1879 ...	0·33	0·20	0·22	0·18	300 20	47 21	**6 14**	39 6	0·48	0·30	0·02	0·07	279 39	26 21	33 23	48 27
1880 ...	0·20	0·20	0·18	0·15	304 28	**20 59**	11 45	43 45	0·50	0·18	0·10	0·10	287 35	12 52	19 23	47 39
1881 ...	0·27	0·08	0·20	0·20	280 2	28 10	5 6	43 23	0·35	0·28	0·13	0·10	267 14	5 47	32 51	49 14
1882 ...	0·35	0·17	0·23	0·22	279 27	13 55	7 21	41 32	0·33	0·22	0·10	0·10	274 22	8 11	32 28	54 46
Mean ...	0·30	0·15	0·17	0·18	291 30	26 4	3 45	41 10	0·38	0·20	0·13	0·13	275 58	23 48	19 57	49 2
1883 ...	0·20	0·15	0·20	0·25	292 43	30 35	**6 31**	37 19	0·08	0·08	0·28	0·28	339 13	**36 47**	10 1	42 34
1884 ...	0·20	0·35	0·30	0·20	268 54	**18 59**	26 43	50 29	0·17	0·40	0·30	0·17	253 25	**17 27**	30 43	53 15
1885 ...	0·38	0·18	0·13	0·18	292 5	17 39	8 44	44 57	0·35	0·27	0·15	0·12	258 58	**1 14**	36 58	52 15
1886 ...	0·52	0·23	0·13	0·13	297 18	41 50	**8 43**	36 43	0·55	0·18	0·13	0·08	276 38	16 53	31 48	60 46
1887 ...	0·43	0·25	0·10	0·13	287 9	26 1	**6 10**	37 31	0·42	0·30	0·18	0·05	268 22	**0 56**	41 23	62 45
1888 ...	0·37	0·18	0·13	0·13	285 31	47 37	**4 50**	40 30	0·45	0·15	0·07	0·10	281 14	23 58	21 44	53 37
1889 ...	0·42	0·08	0·13	0·15	290 8	48 9	**0 45**	41 55	0·28	0·08	0·17	0·15	261 22	**36 14**	14 23	46 26
1890 ...	0·33	0·13	0·12	0·15	273 50	21 7	10 13	43 41	0·32	0·22	0·18	0·13	270 3	**6 47**	25 15	54 57
1891 ...	0·25	0·17	0·17	0·18	290 25	8 0	11 46	44 24	0·30	0·25	0·08	0·13	272 13	8 49	35 56	42 12
1892 ...	0·17	0·15	0·12	0·17	312 35	**—3 55**	14 26	42 57	0·38	0·30	0·08	0·07	272 39	11 0	33 54	43 17
1893 ...	0·13	0·22	0·13	0·15	299 17	**4 35**	24 46	42 59	0·33	0·43	0·17	0·08	282 11	7 9	45 45	63 16
Mean ...	0·30	0·18	0·15	0·17	290 0	19 24	6 20	42 8	0·33	0·25	0·17	0·13	276 2	2 52	29 48	52 18
1894 ...	0·30	0·15	0·12	0·20	313 1	**4 1**	4 39	39 43	0·22	0·32	0·17	0·13	246 13	**4 23**	36 57	60 7
1895 ...	0·18	0·25	0·07	0·10	267 13	11 9	27 17	43 39	0·25	0·23	0·15	0·10	261 53	**6 33**	34 45	50 54
1896 ...	0·27	0·05	0·20	0·20	304 9	64 1	5 12	44 3	0·42	0·08	0·13	0·13	294 15	47 6	18 49	55 29
1897 ...	0·25	0·27	0·05	0·10	272 47	22 36	**14 39**	37 21	0·43	0·23	0·10	0·05	271 10	10 53	44 10	53 39
1898 ...	0·37	0·22	0·15	0·13	284 33	43 13	**5 22**	44 30	0·35	0·15	0·12	0·15	260 34	13 26	16 0	44 28
1899 ...	0·23	0·18	0·05	0·10	270 17	12 48	0 51	34 44	0·37	0·08	0·13	0·08	264 11	1 54	20 15	52 24
1900 ...	0·28	0·23	0·18	0·17	285 17	40 52	**12 35**	36 15	0·43	0·18	0·08	0·05	297 13	51 46	**12 29**	35 28
1901 ...	0·10	0·03	0·15	0·17	268 37	38 30	**0 27**	38 37	0·35	0·13	0·10	0·08	263 48	7 59	25 52	54 53
1902 ...	0·25	0·15	0·12	0·13	300 17	43 3	**5 31**	38 42	0·37	0·13	0·07	0·08	271 11	19 30	23 16	52 39
1903 ...	0·23	0·03	0·23	0·20	287 2	99 8	7 14	45 24	0·38	0·22	0·08	0·05	280 35	28 24	26 46	54 46
1964 ...	0·22	0·15	0·12	0·17	268 20	31 14	**6 36**	38 26	0·40	0·20	0·05	0·10	284 0	32 5	**0 58**	46 9
Mean ...	0·25	0·15	0·13	0·15	283 47	36 36	0 0	40 8	0·37	0·18	0·10	0·10	272 17	18 22	21 13	51 0
Mean of 33 years ...	0·28	0·17	0·15	0·17	288 25	27 21	3 21	41 8	0·35	0·20	0·13	0·12	274 46	13 6	23 39	50 46

Value of μ in thick type are either the second, third or fourth maximum which have been specially altered for the purpose of securing a consistant mean of the group of 11 years.

TABLE 314.—*Declination Magnetograph—Showing the mean values of the Amplitude P and of the first maximum μ, reckoned from midnight for the first four orders of Harmonic Components for the Diurnal Inequality of Declination at Bombay (Colaba) for each half-year—April to September—of each of the years from 1872 to 1904 derived from table 309.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	1·22	1·17	0·87	0·20	61 1	103 1	2 41	34 51
1873 ...	1·10	0·92	0·78	0·20	64 10	103 44	3 6	37 18
1874 ...	0·93	0·83	0·70	0·17	63 32	106 29	5 5	45 15
1875 ...	0·83	0·75	0·65	0·17	60 21	103 46	3 51	40 14
1876 ...	0·83	0·80	0·68	0·17	59 9	101 6	2 28	37 24
1877 ...	0·88	0·85	0·73	0·20	55 57	103 10	3 35	40 44
1878 ...	0·77	0·68	0·63	0·17	59 40	103 23	3 20	40 23
1879 ...	0·78	0·82	0·72	0·17	55 39	101 18	2 52	41 17
1880 ...	0·87	0·78	0·67	0·17	59 28	105 31	3 52	41 15
1881 ...	0·97	1·02	0·82	0·18	59 57	103 23	3 33	38 22
1882 ...	0·95	0·78	0·68	0·17	64 20	107 40	5 12	39 21
1883 ...	0·95	0·97	0·77	0·17	62 7	103 44	3 20	38 18
1884 ...	0·95	1·08	0·85	0·20	58 1	101 38	2 41	37 27
1885 ...	0·95	1·05	0·80	0·18	57 9	101 20	2 22	39 27
1886 ...	0·95	0·83	0·68	0·15	62 4	103 53	3 27	37 57
1887 ...	0·88	0·95	0·73	0·18	53 8	100 13	1 43	39 2
1888 ...	0·83	0·83	0·67	0·18	59 24	102 59	3 24	39 50
1889 ...	0·80	0·83	0·68	0·15	59 31	102 17	3 27	41 25
1890 ...	0·78	0·83	0·70	0·15	53 19	98 0	1 11	38 44
1891 ...	0·88	1·02	0·77	0·20	55 21	102 22	2 6	38 5
1892 ...	0·98	1·12	0·85	0·18	60 11	101 24	1 50	35 24
1893 ...	1·02	1·12	0·85	0·18	56 50	104 27	4 51	38 20
1894 ...	0·97	1·02	0·77	0·17	64 17	104 48	3 51	36 54
1895 ...	1·02	1·07	0·82	0·18	58 27	102 1	2 20	35 35
1896 ...	0·92	0·88	0·72	0·17	61 23	102 38	3 46	39 11
1897 ...	0·90	0·80	0·67	0·17	64 16	105 13	4 19	40 21
1898 ...	0·87	0·87	0·72	0·17	61 34	103 26	4 8	39 36
1899 ...	0·80	0·82	0·67	0·17	58 48	103 26	3 51	40 46
1900 ...	0·78	0·80	0·70	0·15	59 54	103 43	4 19	41 25
1901 ...	0·75	0·80	0·63	0·18	57 57	124 18	4 33	41 51
1902 ...	0·73	0·82	0·70	...	62 29	105 45	4 21	...
1903 ...	0·82	0·95	0·73	0·17	57 56	103 45	4 20	41 26
1904 ...	0·85	1·02	0·78	0·18	61 6	103 29	3 48	37 34
1872—1882...	0·92	0·85	0·72	0·17	60 9	103 43	3 42	39 30
1883—1893...	0·91	0·96	0·75	0·18	58 10	101 59	2 43	37 54
1894—1904...	0·85	0·89	0·72	0·17	61 8	103 40	3 58	39 30
1872—1904...	0·88	0·90	0·73	0·17	59 57	103 6	3 43	39 30

TABLE 315.—*Declination Magnetograph—Showing the mean values of the Amplitude P and of the first maximum μ, reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each half-year—January to March and October to December—for each of the year from 1872 to 1905 derived from table 310.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	0·08	0·23	0·32	0·27	88 44	156 29	10 10	45 6
1873 ...	0·15	0·12	0·30	0·28	2 3	136 48	9 12	45 57
1874 ...	0·07	0·17	0·23	0·17	323 21	159 56	15 53	48 53
1875 ...	0·20	0·08	0·28	0·22	304 37	81 26	5 11	47 25
1876 ...	0·15	0·03	0·25	0·17	306 3	122 27	11 24	49 38
1877 ...	0·15	0·07	0·27	0·18	305 48	94 9	7 17	47 10
1878 ...	0·15	0·12	0·30	0·22	296 57	87 50	2 36	45 11
1879 ...	0·17	0·03	0·25	0·18	301 33	90 10	7 19	47 58
1880 ...	0·13	0·13	0·25	0·18	281 7	152 20	13 12	49 51
1881 ...	0·07	0·17	0·32	0·25	351 36	139 32	11 33	47 14
1882 ...	0·05	0·13	0·28	0·23	331 26	143 8	11 39	48 27
1883 ...	0·12	0·15	0·32	0·27	39 26	140 16	11 41	46 42
1884 ...	0·12	0·35	0·37	0·25	113 43	147 8	19 3	49 49
1885 ...	0·13	0·10	0·27	0·22	294 30	151 12	13 34	51 7
1886 ...	0·20	0·13	0·22	0·15	297 15	158 38	16 32	50 38
1887 ...	0·17	0·10	0·25	0·17	291 13	153 14	14 41	49 55
1888 ...	0·20	0·05	0·27	0·18	299 27	110 5	10 16	49 57
1889 ...	0·15	0·12	0·28	0·20	298 18	104 37	8 3	48 20
1890 ...	0·13	0·07	0·25	0·18	292 29	143 28	14 2	51 2
1891 ...	0·07	0·12	0·32	0·23	318 47	130 44	10 26	47 32
1892 ...	0·03	0·15	0·32	0·25	9 12	142 33	10 48	45 59
1893 ...	0·17	0·15	0·33	0·25	21 15	128 29	9 52	46 59
1894 ...	0·05	0·17	0·25	0·23	52 58	161 43	14 6	48 4
1895 ...	0·07	0·13	0·30	0·25	336 57	135 20	10 43	47 50
1896 ...	0·18	0·07	0·25	0·20	323 43	119 4	10 3	48 11
1897 ...	0·12	0·07	0·27	0·20	317 4	127 56	10 27	48 26
1898 ...	0·18	0·03	0·25	0·18	285 28	72 56	6 39	47 14
1899 ...	0·15	0·10	0·30	0·20	304 3	99 23	6 52	46 30
1900 ...	0·12	0·08	0·27	0·18	308 20	105 59	7 17	46 35
1901 ...	0·10	0·15	0·22	0·17	245 35	143 59	13 13	50 5
1902 ...	0·07	0·10	0·23	0·17	285 27	129 24	12 46	48 42
1903 ...	0·12	0·13	0·27	0·18	292 35	131 42	15 5	51 10
1904 ...	0·12	0·07	0·27	0·20	272 46	112 19	7 27	47 2
1872—1882...	0·10	0·08	0·28	0·22	317 48	142 54	9 21	46 27
1883—1893...	0·09	0·11	0·30	0·22	313 57	141 13	12 29	48 38
1894—1904...	0·09	0·06	0·26	0·20	302 30	124 59	10 25	47 59
1872—1904...	0·09	0·09	0·26	0·20	313 57	136 44	10 25	47 59

TABLE 316.—*Declination Magnetograph—Showing mean yearly values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each year from 1872 to 1904 derived by averaging the values of P and μ for all the months of the year.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	0·77	0·80	0·65	0·27	112 44	131 39	7 56	40 17
1873 ...	0·72	0·60	0·57	0·27	119 37	125 6	7 35	40 37
1874 ...	0·60	0·58	0·50	0·18	121 59	135 41	11 41	44 19
1875 ...	0·58	0·47	0·48	0·20	136 44	132 10	6 15	43 48
1876 ...	0·57	0·50	0·48	0·18	130 18	134 48	9 16	43 47
1877 ...	0·57	0·53	0·52	0·20	129 18	125 26	4 50	42 59
1878 ...	0·52	0·45	0·48	0·20	126 22	124 45	2 30	43 8
1879 ...	0·53	0·52	0·48	0·18	132 17	129 43	7 10	44 42
1880 ...	0·57	0·52	0·48	0·20	130 37	132 1	11 11	44 4
1881 ...	0·62	0·65	0·58	0·22	145 59	129 8	9 18	42 10
1882 ...	0·62	0·55	0·52	0·22	112 54	130 26	10 28	43 23
Mean ...	0·60	0·57	0·52	0·21	127 10	130 5	8 1	43 1
1883 ...	0·57	0·60	0·57	0·23	127 8	127 8	7 29	41 12
1884 ...	0·62	0·77	0·65	0·25	107 59	123 24	11 51	43 6
1885 ...	0·62	0·65	0·55	0·22	127 18	121 23	8 46	44 3
1886 ...	0·67	0·58	0·50	0·17	125 52	133 57	11 6	44 21
1887 ...	0·60	0·60	0·53	0·20	128 48	127 35	9 17	44 37
1888 ...	0·57	0·52	0·48	0·20	132 17	123 18	6 25	43 55
1889 ...	0·53	0·52	0·48	0·18	128 14	120 31	6 1	44 11
1890 ...	0·52	0·53	0·50	0·18	143 7	123 8	8 40	44 27
1891 ...	0·58	0·65	0·55	0·22	127 0	130 11	8 26	42 11
1892 ...	0·63	0·70	0·60	0·23	124 38	127 45	8 49	39 29
1893 ...	0·68	0·72	0·62	0·23	116 10	131 48	10 41	42 37
Mean ...	0·60	0·62	0·55	0·22	126 14	126 23	8 52	43 6
1894 ...	0·60	0·68	0·55	0·22	129 38	129 52	11 14	42 23
1895 ...	0·63	0·70	0·58	0·22	126 9	125 55	9 32	40 52
1896 ...	0·58	0·52	0·50	0·20	136 45	137 0	8 14	45 13
1897 ...	0·58	0·53	0·48	0·18	136 12	125 6	8 6	43 16
1898 ...	0·58	0·52	0·48	0·18	135 19	126 37	5 26	42 50
1899 ...	0·55	0·53	0·50	0·18	135 23	115 28	5 31	43 6
1900 ...	0·52	0·53	0·50	0·18	126 6	132 26	4 6	42 18
1901 ...	0·50	0·50	0·47	0·18	122 35	132 43	10 41	45 47
1902 ...	0·48	0·53	0·50	0·20	128 4	133 50	8 52	45 7
1903 ...	0·52	0·60	0·53	0·18	158 37	122 14	11 20	46 10
1904 ...	0·57	0·62	0·53	0·20	134 29	126 49	4 20	41 44
1872—1882...	0·61	0·56	0·52	0·21	127 10	130 5	8 1	43 1
1883—1893...	0·60	0·62	0·55	0·21	126 14	126 23	8 52	43 6
1894—1904...	0·55	0·57	0·51	0·19	133 34	128 0	7 57	43 31
1872—1904...	0·59	0·58	0·53	0·20	128 59	128 9	8 16	43 13

TABLE 317.—*Declination Magnetograph—Showing mean yearly values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Declination at Bombay (Colaba) for each year from 1872 to 1904 derived from the Inequality for each year.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1872 ...	0·65	0·57	0·60	0·22	62 42	108 39	4 41	40 39
1873 ...	0·58	0·48	0·53	0·23	57 57	107 1	4 50	42 17
1874 ...	0·45	0·40	0·45	0·15	59 3	112 1	7 43	43 58
1875 ...	0·38	0·40	0·47	0·18	47 29	101 44	4 14	44 16
1876 ...	0·40	0·42	0·45	0·15	48 55	101 57	4 44	43 23
1877 ...	0·43	0·47	0·53	0·18	46 37	102 32	4 32	43 46
1878 ...	0·35	0·38	0·47	0·18	48 46	101 17	3 3	43 5
1879 ...	0·37	0·42	0·47	0·17	44 23	100 44	4 3	44 37
1880 ...	0·38	0·40	0·45	0·17	53 36	110 22	7 20	45 38
1881 ...	0·52	0·53	0·53	0·20	56 34	107 41	5 48	43 33
1882 ...	0·47	0·42	0·48	0·18	61 20	112 4	7 7	44 34
Mean ...	0·45	0·43	0·50	0·18	53 58	106 11	5 18	43 35
1883 ...	0·53	0·50	0·53	0·20	59 53	107 53	5 43	43 25
1884 ...	0·52	0·57	0·57	0·20	63 53	110 40	7 24	44 14
1885 ...	0·43	0·52	0·52	0·18	49 51	103 58	5 5	45 45
1886 ...	0·43	0·40	0·43	0·13	51 32	108 19	6 30	44 30
1887 ...	0·40	0·47	0·47	0·17	42 40	103 20	4 50	44 9
1888 ...	0·38	0·43	0·47	0·17	46 9	103 20	5 18	44 58
1889 ...	0·37	0·47	0·48	0·17	48 46	102 33	4 45	45 17
1890 ...	0·37	0·42	0·45	0·15	44 2	100 32	4 25	45 28
1891 ...	0·43	0·55	0·53	0·20	51 28	105 1	4 28	43 7
1892 ...	0·50	0·57	0·58	0·20	59 4	105 15	4 15	41 29
1893 ...	0·58	0·60	0·58	0·20	51 58	107 2	6 14	43 24
Mean ...	0·45	0·50	0·52	0·18	51 24	105 21	5 16	44 22
1894 ...	0·50	0·47	0·50	0·18	63 46	109 20	6 13	43 33
1895 ...	0·52	0·57	0·55	0·20	54 50	105 4	4 30	42 32
1896 ...	0·45	0·47	0·48	0·17	50 13	103 48	5 21	44 12
1897 ...	0·43	0·42	0·47	0·17	57 34	106 53	5 58	44 50
1898 ...	0·38	0·43	0·47	0·17	51 19	102 41	4 50	43 41
1899 ...	0·38	0·45	0·48	0·18	48 17	102 57	4 45	43 57
1900 ...	0·37	0·45	0·47	0·17	51 12	103 54	5 10	44 10
1901 ...	0·33	0·40	0·43	0·17	57 0	106 30	6 35	45 49
1902 ...	0·33	0·43	0·47	0·18	58 48	108 22	6 29	45 5
1903 ...	0·37	0·52	0·48	0·17	49 57	106 40	7 10	46 29
1904 ...	0·38	0·53	0·53	0·18	56 58	103 58	4 42	42 34
1872—1882...	0·44	0·43	0·48	0·18	53 58	106 11	5 18	43 35
1883—1893...	0·44	0·48	0·50	0·18	51 24	105 21	5 16	44 22
1894—1904...	0·40	0·47	0·48	0·17	54 34	105 16	5 42	44 30
1872—1904...	0·44	0·48	0·50	0·18	53 58	105 16	5 16	43 35

TABLE 318.—*Summary of monthly values of the Amplitude P and of the First Maximum μ, reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination Force at Bombay (Colaba) for each month of different groups of years by different method of treatment.*

Period.	Method of treatment.	January.								February.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′					°	° ′	° ′	° ′
1872 to 1882 ...	Analysis of the average period ...	0·20	0·20	0·27	0·22	272 6	160 33	21 38	52 7	0·03	0·15	0·23	0·22	277 28	164 15	15 11	50 5
,, ,, ,, ...	Average of the analysis for the period...	0·23	0·25	0·30	0·23	270 46	163 59	22 39	52 14	0·17	0·23	0·27	0·22	271 13	172 42	15 3	50 38
,, ,, ,, ...	Difference	−0·03	−0·05	−0·03	−0·01	+1 20	−3 26	−1 1	−0 7	−0·14	−0·08	−0·04	0·00	+6 15	−8 27	+0 8	−0 33
1883 to 1893 ...	Analysis of the average period	0·18	0·22	0·32	0·27	262 18	152 27	19 35	51 14	0·03	0·15	0·22	0·20	285 49	163 20	18 46	51 38
,, ,, ,, ...	Average of the analysis for the period...	0·23	0·23	0·33	0·27	260 20	146 8	19 33	51 52	0·15	0·25	0·28	0·22	266 29	167 58	17 43	52 22
,, ,, ,, ...	Difference	−0·05	−0·01	−0·01	0·00	+1 58	+6 19	+0 2	−0 38	−0·12	−0·10	−0·06	−0·02	+19 20	−4 38	+1 3	−0 44
1894 to 1904 ...	Analysis of the average period	0·20	0·15	0·25	0·23	265 48	153 46	18 21	49 46	0·13	0·08	0·22	0·20	275 28	160 42	15 7	51 24
,, ,, ,, ...	Average of the analysis for the period ...	0·23	0·22	0·30	0·25	256 46	145 32	19 17	50 52	0·17	0·17	0·23	0·20	270 27	160 19	15 38	51 29
,, ,, ,, ...	Difference	−0·03	−0·07	−0·05	−0·02	+9 2	+8 14	−0 56	−1 6	−0·04	−0·09	−0·01	0·00	+5 1	+0 23	−0 31	−0 5
1872 to 1904 ...	Analysis of the average period	0·20	0·18	0·27	0·23	266 36	156 11	19 55	53 4	0·07	0·13	0·22	0·20	277 46	163 4	16 22	51 4
,, ,, ,, ...	Average of the analysis for the period...	0·23	0·23	0·32	0·25	262 37	151 53	20 29	51 39	0·17	0·22	0·27	0·20	269 23	167 0	16 8	51 30
,, ,, ,, ...	Difference	−0·03	−0·05	−0·05	−0·02	+3 59	+4 18	−0 34	+1 25	−0·10	−0·09	−0·05	0·00	+8 23	−3 56	+0 14	−0 26

Period.	Method of treatment.	March.								April.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period	0·30	0·35	0·52	0·32	89 42	124 39	11 1	51 24	0·70	0·63	0·67	0·23	64 57	111 18	7 31	45 51
,, ,, ,, ...	Average of the analysis for the period ...	0·30	0·37	0·53	0·33	89 31	124 32	11 30	51 57	0·70	0·63	0·67	0·23	64 17	110 58	7 30	46 30
,, ,, ,, ...	Difference	0·00	−0·02	−0·01	−0·01	+0 11	+0 7	−0 29	−0 33	0·00	0·00	0·00	0·00	+0 40	+0 20	+0 1	−0 39
1883 to 1893 ...	Analysis of the average period	0·32	0·38	0·53	0·30	79 53	122 1	11 20	51 25	0·73	0·73	0·73	0·25	61 7	108 36	6 18	45 16
,, ,, ,, ...	Average of the analysis for the period...	0·33	0·40	0·53	0·30	79 2	122 4	11 23	51 37	0·73	0·73	0·73	0·25	60 59	108 34	6 13	45 7
,, ,, ,, ...	Difference	−0·01	−0·02	0·00	0·00	+0 51	−0 3	−0 3	−0 12	0·00	0·00	0·00	0·00	+0 8	+0 2	+0 5	+0 9
1894 to 1904 ...	Analysis of the average period	0·25	0·37	0·50	0·28	90 20	122 10	11 47	51 58	0·65	0·67	0·68	0·22	64 49	111 44	8 12	46 13
,, ,, ,, ...	Average of the analysis for the period ...	0·28	0·37	0·50	0·30	93 30	122 22	11 49	52 5	0·67	0·68	0·68	0·23	65 40	111 43	8 18	46 20
,, ,, ,, ...	Difference	−0·03	0·00	0·00	−0·02	−3 10	−0 12	−0 2	−0 7	−0·02	−0·01	0·00	−0·01	−0 51	+0 1	−0 6	−0 7
1872 to 1904 ...	Analysis of the average period	0·28	0·37	0·52	0·30	86 37	123 2	11 20	51 37	0·68	0·68	0·70	0·23	63 35	110 26	7 17	45 44
,, ,, ,, ...	Average of the analysis for the period ...	0·30	0·38	0·52	0·30	87 21	122 59	11 34	51 53	0·70	0·68	0·70	0·23	63 39	110 25	7 21	45 59
,, ,, ,, ...	Difference	−0·02	−0·01	0·00	0·00	−0 44	+0 3	−0 14	−0 16	−0·02	0·00	0·00	0·00	−0 4	+0 1	−0 4	−0 15

Period.	Method of treatment.	May.								June.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period	0·92	0·87	0·75	0·17	55 13	100 38	1 51	37 52	1·07	0·85	0·65	0·13	64 36	105 42	4 19	35 0
,, ,, ,, ...	Average of the analysis for the period ...	0·92	0·87	0·75	0·18	54 58	100 46	1 58	37 51	1·07	0·85	0·67	0·15	64 28	105 51	4 24	35 14
,, ,, ,, ...	Difference	0·00	0·00	0·00	−0·01	+0 15	−0 8	−0 7	+0 1	0·00	0·00	−0·02	−0·02	+0 8	−0 9	−0 5	−0 14
1883 to 1893 ...	Analysis of the average period	0·90	0·93	0·78	0·18	51 38	97 33	0 0	35 12	1·07	0·95	0·68	0·12	61 46	103 38	3 8	33 49
,, ,, ,, ...	Average of the analysis for the period ...	0·90	0·93	0·78	0·18	51 58	97 23	−0 6	34 59	1·07	0·97	0·68	0·13	61 49	103 34	3 8	33 34
,, ,, ,, ...	Difference	0·00	0·00	0·00	0·00	+0 20	+0 10	+0 6	+0 13	0·00	−0·02	0·00	−0·01	−0 03	+0 4	0 0	+0 15
1894 to 1904 ...	Analysis of the average period	0·87	0·88	0·73	0·18	59 17	103 0	2 45	36 40	1·02	0·88	0·67	0·12	64 30	106 21	4 44	36 25
,, ,, ,, ...	Average of the analysis for the period ...	0·87	0·88	0·75	0·18	59 28	103 15	2 51	36 37	1·03	0·88	0·67	0·12	64 23	106 25	4 42	35 52
,, ,, ,, ...	Difference	0·00	0·00	−0·02	0·00	−0 11	−0 15	−0 6	+0 3	−0·01	0·00	0·00	0·00	+0 7	−0 4	+0 2	+0 33
1872 to 1904 ...	Analysis of the average period	0·88	0·88	0·75	0·18	55 30	100 22	1 29	36 26	1·05	0·90	0·66	0·12	63 39	105 8	4 3	35 1
,, ,, ,, ...	Average of the analysis for the period...	0·90	0·90	0·77	0·18	55 28	100 28	1 34	36 29	1·05	0·90	0·67	0·13	63 34	105 17	4 4	34 53
,, ,, ,, ...	Difference	−0·02	−0·02	−0·02	0·00	+0 2	−0 6	−0 5	−0 3	0·00	0·00	−0·01	−0·01	+0 5	−0 9	−0 1	+0 8

TABLE 318.—*Summary of monthly values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Declination Force at Bombay (Colaba) for each month of different groups of years by different method of treatment.*

Period.	Method of treatment.	July								August.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1872 to 1882 ...	Analysis of the average period	1·02	0·83	0·63	0·12	67 39	103 47	4 10	33 4	1·00	1·03	0·77	0·17	59 25	102 30	2 57	34 45
,, ,, ,, ...	Average of the analysis for the period ..	1·02	0·83	0·63	0·12	67 53	104 14	4 20	34 30	1·02	1·03	0·78	0·17	59 11	102 28	2 57	34 45
,, ,, ,, ...	Difference	0·00	0·00	0·00	0·00	−0 14	−0 27	−0 10	−1 26	−0 02	0·00	−0·01	0·00	+0 14	+0 2	0 0	0 0
1883 to 1893 ...	Analysis of the average period	1·03	0·98	0·68	0·12	65 19	103 41	4 16	32 29	0·95	1·18	0·83	0·15	56 27	100 16	1 41	34 21
,, ,, ,, ...	Average of the analysis for the period ...	1·03	0·98	0·68	0·12	65 10	103 36	4 16	32 49	0·95	1·18	0·83	0·17	56 29	100 22	1 50	34 19
,, ,, ,, ...	Difference	0·00	0·00	0·00	0·00	+0 9	+0 5	0 0	−0 20	0·00	0·00	0·00	−0·02	−0 2	−0 6	−0 9	+0 2
1894 to 1904 ...	Analysis of the average period	0·95	0·92	0·63	0·10	67 12	104 21	4 42	36 24	0·88	1·03	0·77	0·17	59 56	100 15	1 58	34 51
,, ,, ,, ...	Average of the analysis for the period ...	0·97	0·92	0·65	0·10	67 4	104 32	4 45	38 25	0·90	1·05	0·78	0·17	59 53	100 19	2 3	34 42
,, ,, ,, ...	Difference	−0·02	0·00	−0·02	0·00	+0 8	−0 11	−0 3	−2 1	−0·02	−0·02	−0·01	0·00	+0 3	−0 4	−0 5	+0 9
1872 to 1904 ...	Analysis of the average period ...	1·00	0·92	0·67	0·10	66 43	103 58	4 24	33 45	0·95	1·08	0·80	0·17	58 35	100 56	2 13	34 38
,, ,, ,, ...	Average of the analysis for the period ...	1·00	0·92	0·65	0·12	66 42	104 8	4 27	35 15	0·95	1·08	0·80	0·17	58 31	101 3	2 17	34 35
,, ,, ,, ...	Difference	0·00	0·00	+0·02	−0·02	+0 1	−0 10	−0 3	−1 30	0·00	0·00	0·00	0·00	+0 4	−0 7	−0 4	+0 3

Period.	Method of treatment.	September.								October.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period ...	0·83	0·95	0·85	0·30	49 56	101 36	2 1	40 51	0·28	0·32	0·50	0·30	32 18	97 23	0 10	41 20
,, ,, ,, ...	Average of the analysis for the period ...	0·85	0·95	0·85	0·30	49 45	101 33	2 2	40 58	0·30	0·35	0·52	0·30	31 55	96 48	0 7	41 28
,, ,, ,, ...	Difference	−0·02	0·00	0·00	0·00	+0 11	+0 3	−0 1	−0 7	−0·02	−0·03	−0·02	0·00	+0 23	+0 35	+0 3	−0 8
1883 to 1893 ...	Analysis of the average period	0·80	1·02	0·88	0·28	49 37	100 36	1 57	41 29	0·27	0·32	0·52	0·30	32 32	106 7	4 18	44 27
,, ,, ,, ...	Average of the analysis for the period ...	0·80	1·02	0·88	0·28	49 32	100 41	1 59	41 38	0·30	0·33	0·52	0·30	29 41	105 51	4 15	44 32
,, ,, ,, ...	Difference	0·00	0·00	0·00	0·00	+0 5	−0 5	−0 2	−0 9	−0·03	−0·01	0·00	0·00	+2 51	+0 16	+0 3	−0 5
1894 to 1904 ...	Analysis of the average period	0·77	0·98	0·87	0·28	47 32	100 7	2 9	41 43	0·25	0·30	0·48	0·28	29 56	99 30	2 29	43 3
,, ,, ,, ...	Average of the analysis for the period ...	0·77	0·98	0·87	0·28	47 41	100 13	2 11	41 45	0·25	0·32	0·48	0·28	29 13	99 35	2 34	43 7
,, ,, ,, ...	Difference	0·00	0 00	0·00	0·00	−0 9	−0 6	−0 2	−0 2	0·00	−0·02	0·00	0·00	+0 43	−0 5	−0 5	−0 4
1872 to 1904 ...	Analysis of the average period	0·80	0·98	0·87	0·28	49 2	100 45	2 1	41 22	0·27	0·32	0·50	0·28	31 44	101 3	2 21	42 57
,, ,, ,, ...	Average of the analysis for the period ...	0·82	0·98	0·87	0·28	48 59	100 49	2 4	41 27	0·28	0·33	0·50	0·28	30 17	100 45	2 19	43 2
,, ,, ,, ...	Difference	−0·02	0·00	0·00	0·00	+0 3	−0 4	−0 3	−0 5	−0·01	−0·01	0·00	0·00	+1 27	+0 18	+0 2	−0 5

Period.	Method of treatment.	November.								December.							
		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
1872 to 1882 ...	Analysis of the average period	0·28	0·12	0·18	0·18	291 46	20 28	3 51	41 29	0·37	0·15	0·08	0·12	278 52	20 50	13 16	46 38
,, ,, ,, ...	Average of the analysis for the period ...	0·30	0·15	0·17	0·18	291 30	26 4	3 45	41 10	0·38	0·20	0·13	0·13	275 58	23 48	19 57	49 2
,, ,, ,, ...	Difference	−0·02	−0·03	+0·01	0·00	+0 16	−5 36	+0 6	+0 19	−0·01	−0·05	−0·05	−0·01	+2 54	−2 58	−6 41	−2 24
1883 to 1893 ...	Analysis of the average period	0·30	0·13	0·12	0·15	289 15	16 12	7 38	42 20	0·32	0·22	0·13	0·12	272 27	0 21	29 0	50 17
,, ,, ,, ...	Average of the analysis for the period ...	0·30	0·18	0·15	0·17	290 0	19 24	6 20	42 8	0·33	0·25	0·17	0·13	276 2	2 52	29 48	52 18
,, ,, ,, ...	Difference	0·00	−0·05	−0·03	−0·02	−0 45	−3 12	+1 18	+0 12	−0·01	−0·03	−0·04	−0·01	−3 35	+3 13	−0 48	−2 1
1894 to 1904 ...	Analysis of the average period	0·23	0·13	0·12	0·15	285 31	27 44	−0 17	40 17	0·35	0·15	0·08	0·08	274 34	15 23	25 33	51 21
,, ,, ,, ...	Average of the analysis for the period ...	0·25	0·15	0·13	0·15	283 47	36 36	0 0	40 8	0·37	0·18	0·10	0·10	272 17	18 22	21 13	51 0
,, ,, ,, ...	Difference	−0·02	−0·02	−0·01	0·00	+1 44	−8 52	−0 17	+0 9	−0·02	−0·03	−0·02	−0·02	+2 17	−2 59	+4 20	+0 21
1872 to 1904 ...	Analysis of the average period	0·27	0·12	0·13	0·17	289 22	21 14	3 42	41 26	0·35	0·17	0·10	0·10	275 45	10 32	23 35	49 5
,, ,, ,, ...	Average of the analysis for the period ...	0·28	0·17	0·15	0·17	288 25	27 21	3 21	41 8	0·35	0·20	0·13	0·12	274 46	13 6	23 39	50 46
,, ,, ,, ...	Difference	−0·01	−0·05	−0·02	0·00	+0 57	−6 7	+0 21	+0 18	0·00	−0·03	−0·03	−0·02	+0 59	−2 34	−0 4	−1 41

TABLE 319.—*Grubb's Declination Magnetometer—Showing the mean values of the p, q Co-efficients for the first four orders of Harmonic Components of Diurnal Inequality of Declination at Bombay (Colaba) for each of the years 1848 to 1872, derived from inequality of each year.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1848 ...	−0·04	−0·60	+0·02	−0·60	+0·04	−0·62	−0·01	−0·24
1849 ...	+0·01	−0·60	+0·03	−0·58	+0·03	−0·58	+0·02	−0·22
1850 ...	−0·02	−0·53	+0·05	−0·54	+0·08	−0·57	+0·03	−0·22
1851 ...	−0·03	−0·53	−0·04	−0·51	+0·05	−0·55	+0·02	−0·21
1852 ...	−0·09	−0·48	0·00	−0·46	+0·04	−0·48	+0·01	−0·17
1853 ...	−0·19	−0·51	−0·13	−0·51	−0·01	−0·50	+0·01	−0·15
1854 ...	−0·20	−0·48	−0·08	−0·40	0·00	−0·47	+0·01	−0·17
1855 ...	−0·13	−0·48	−0·04	−0·46	+0·04	−0·47	+0·02	−0·17
1856 ...	−0·11	−0·43	−0·08	−0·39	0·00	−0·45	+0·02	−0·19
1857 ...	−0·08	−0·46	−0·01	−0·41	0·00	−0·46	0·00	−0·16
1858 ...	−0·08	−0·59	+0·05	−0·55	+0·06	−0·52	+0·01	−0·21
1859 ...	0·00	−0·68	+0·12	−0·66	+0·09	−0·58	+0·03	−0·22
1860 ...	−0·01	−0·65	+0·02	−0·70	+0·03	−0·59	−0·01	−0·21
1861 ...	−0·09	−0·59	−0·06	−0·63	+0·02	−0·57	+0·01	−0·20
1862 ...	−0·06	−0·50	−0·08	−0·52	0·00	−0·53	+0·02	−0·20
1863 ...	−0·13	−0·48	−0·06	−0·48	+0·03	−0·47	+0·01	−0·16
1864 ...	−0·13	−0·51	−0·06	−0·47	+0·03	−0·46	+0·02	−0·17
1865 ...	−0·22	−0·42	−0·12	−0·47	−0·02	−0·45	−0·01	−0·19
1866 ...	−0·15	−0·36	−0·02	−0·34	+0·04	−0·40	+0·01	−0·16
1867 ...	−0·15	−0·39	−0·07	−0·39	+0·03	−0·43	+0·02	−0·15
1868 ...	−0·08	−0·49	−0·05	−0·43	+0·02	−0·44	+0·01	−0·16
1869 ...	−0·11	−0·56	−0·10	−0·53	0·00	−0·52	0·00	−0·21
1870 ...	−0·10	−0·79	−0·06	−0·74	−0·02	−0·64	−0·02	−0·25
1871 ...	−0·08	−0·75	−0·04	−0·66	+0·01	−0·60	0·00	−0·19
1872 ...	−0·01	−0·70	−0·04	−0·58	0·00	−0·59	−0·04	−0·22
1850—1860.	−0·09	−0·53	−0·01	−0·51	+0·03	−0·51	+0·01	−0·19
1861—1871.	−0·12	−0·53	−0·07	−0·51	+0·01	−0·50	+0·01	−0·19
1850—1871.	−0·10	−0·53	−0·04	−0·51	+0·02	−0·51	+0·01	−0·19

TABLE 320.—*Grubb's Declination Magnetometer—Showing the mean values of the Amplitude P and of the first maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of Diurnal Inequality of Declination for each of the years from 1848 to 1872 derived from table 319.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1848 ...	0·60	0·60	0·62	0·24	60 58	110 19	5 40	41 31
1849 ...	0·60	0·58	0·58	0·22	65 50	111 4	5 39	43 10
1850 ...	0·53	0·54	0·58	0·23	62 7	111 59	7 1	44 5
1851 ...	0·53	0·51	0·55	0·21	60 49	107 9	6 12	43 41
1852 ...	0·49	0·46	0·48	0·17	53 51	109 12	6 15	42 30
1853 ...	0·55	0·53	0·50	0·15	44 7	102 38	4 9	43 2
1854 ...	0·52	0·41	0·49	0·17	42 6	104 8	4 32	42 50
1855 ...	0·50	0·46	0·47	0·17	48 50	106 42	5 58	43 20
1856 ...	0·45	0·40	0·45	0·19	49 50	103 38	4 17	43 13
1857 ...	0·47	0·42	0·49	0·16	54 23	108 28	4 32	42 10
1858 ...	0·60	0·55	0·52	0·21	57 13	112 14	6 42	42 29
1859 ...	0·68	0·67	0·59	0·22	64 30	114 52	7 29	44 3
1860 ...	0·66	0·70	0·59	0·21	63 22	110 11	5 32	41 8
1861 ...	0·59	0·63	0·57	0·20	56 5	106 50	5 10	42 38
1862 ...	0·50	0·52	0·49	0·21	57 46	105 3	4 28	43 15
1863 ...	0·50	0·49	0·47	0·16	49 43	105 40	5 53	43 0
1864 ...	0·53	0·47	0·46	0·17	50 14	106 2	5 49	43 27
1865 ...	0·48	0·48	0·45	0·19	36 52	102 11	3 49	41 14
1866 ...	0·39	0·34	0·40	0·16	41 53	108 0	6 29	42 54
1867 ...	0·42	0·40	0·43	0·16	43 35	104 43	5 56	43 56
1868 ...	0·49	0·44	0·44	0·16	54 43	106 13	5 27	42 44
1869 ...	0·57	0·54	0·51	0·21	52 50	104 20	4 39	42 12
1870 ...	0·80	0·74	0·64	0·25	57 36	106 59	3 53	40 51
1871 ...	0·75	0·66	0·60	0·20	58 33	107 48	4 59	41 51
1872 ...	0·71	0·58	0·57	0·23	63 17	107 32	4 28	39 35
1850—1860.	0·54	0·51	0·51	0·19	54 52	108 57	5 37	41 45
1861—1871.	0·54	0·51	0·50	0·19	51 45	105 36	4 53	42 45
1850—1871.	0·54	0·51	0·51	0·19	53 49	106 16	5 15	41 15

TABLE 321.—*Grubb's Declination Magnetometer—Showing mean values of the p, q Co-effcients for the first four orders of Harmonic Components of Diurnal Inequality of Declination at Bombay (Colaba) for each month of the years of Sun-spot periods.*

Unity = 1 minute of arc.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
Maximum Sun-spot period.								
January ...	+0·06	+0·01	+0·29	−0·02	+0·23	−0·24	+0·18	−0·26
February ...	+0·11	−0·18	+0·38	+0·03	+0·26	−0·18	+0·14	−0·23
March ...	+0·23	−0·53	+0·31	−0·50	+0·15	−0·63	+0·13	−0·35
April ...	−0·02	−1·03	+0·15	−0·93	+0·12	−0·84	+0·02	−0·28
May ...	−0·10	−1·14	−0·26	−1·14	−0·12	−0·90	−0·11	−0·16
June ...	−0·02	−1·32	−0·14	−1·23	+0·03	−0·82	−0·09	−0·10
July ...	0·00	−1·28	−0·27	−1·24	−0·05	−0·79	−0·12	−0·07
August ...	−0·19	−1·27	−0·45	−1·45	−0·14	−0·97	−0·13	−0·12
September ...	−0·24	−1·11	−0·33	−1·25	−0·15	−1·02	−0·05	−0·35
October ...	−0·11	−0·50	0·00	−0·46	−0·10	−0·61	−0·04	−0·37
November ...	−0·09	+0·05	+0·14	+0·21	+0·03	−0·13	−0·02	−0·22
December ...	−0·12	+0·21	+0·14	+0·25	+0·05	−0·05	+0·06	−0·15
Winter ...	+0·01	−0·16	+0·21	−0·08	+0·10	−0·31	+0·07	−0·26
Summer ...	−0·09	−1·19	−0·22	−1·21	−0·05	−0·89	−0·08	−0·18
Year ...	−0·04	−0·67	0·00	−0·65	+0·02	−0·60	0·00	−0·22
Minimum Sun-spot period.								
January ...	−0·22	+0·21	+0·19	−0·08	+0·22	−0·24	+0·15	−0·19
February ...	−0·12	+0·09	+0·22	+0·07	+0·21	−0·11	+0·12	−0·09
March ...	−0·01	−0·29	+0·11	−0·29	+0·13	−0·43	+0·13	−0·22
April ...	−0·03	−0·81	+0·07	−0·69	+0·12	−0·67	+0·06	−0·23
May ...	−0·07	−0·99	−0·19	−0·72	−0·08	−0·62	−0·07	−0·16
June ...	+0·08	−1·13	−0·04	−0·72	+0·04	−0·59	−0·03	−0·12
July ...	+0·05	−1·06	−0·15	−0·72	+0·01	−0·56	−0·05	−0·09
August ...	−0·20	−0·96	−0·33	−0·82	−0·10	−0·65	−0·09	−0·13
September ...	−0·41	−0·72	−0·42	−0·84	−0·16	−0·78	−0·01	−0·26
October ...	−0·29	−0·17	−0·15	−0·30	−0·09	−0·48	+0·01	−0·27
November ...	−0·30	+0·28	+0·01	+0·20	−0·02	−0·10	−0·04	−0·13
December ...	−0·27	+0·39	−0·02	+0·15	−0·03	−0·10	−0·01	−0·12
Winter ...	−0·20	+0·08	+0·06	−0·04	+0·07	−0·24	+0·06	−0·17
Summer ...	−0·10	−0·94	−0·18	−0·75	−0·03	−0·64	−0·03	−0·16
Year ...	−0·15	−0·43	−0·06	−0·40	+0·02	−0·45	+0·01	−0·17
1850—1871.								
January ...	−0·09	+0·16	+0·23	+0·03	+0·20	−0·16	+0·14	−0·18
February ...	−0·04	−0·01	+0·22	+0·02	+0·18	−0·16	+0·12	−0·17
March ...	+0·15	−0·36	+0·21	−0·34	+0·18	−0·47	+0·15	−0·27
April ...	−0·06	−0·91	+0·04	−0·77	+0·10	−0·74	+0·04	−0·26
May ...	−0·10	−1·04	−0·23	−0·93	−0·09	−0·75	−0·09	−0·16
June ...	0·00	−1·25	−0·12	−1·00	+0·01	−0·72	−0·07	−0·11
July ...	+0·01	−1·18	−0·21	−0·96	−0·03	−0·68	−0·08	−0·08
August ...	−0·19	−1·08	−0·38	−1·13	−0·12	−0·80	−0·11	−0·13
September ...	−0·29	−0·89	−0·35	−1·03	−0·15	−0·88	−0·03	−0·29
October ...	−0·19	−0·30	−0·05	−0·36	−0·07	−0·54	+0·01	−0·31
November ...	−0·21	+0·16	+0·07	+0·16	+0·01	−0·11	−0·02	−0·17
December ...	−0·23	+0·29	+0·04	+0·14	+0·04	−0·09	+0·04	−0·15
Winter ...	−0·10	−0·01	+0·12	−0·06	+0·09	−0·25	+0·07	−0·21
Summer ...	−0·10	−1·06	−0·21	−0·97	−0·05	−0·76	−0·06	−0·17
Year ...	−0·10	−0·53	−0·04	−0·51	+0·02	−0·51	+0·01	−0·19

TABLE 322.—*Grubb's Declination Magnetometer—Showing the mean values of the Amplitude P and of the First Maximum μ, reckoned from Midnight for the first four orders of Harmonic Components of Diurnal Inequality of Declination at Bombay (Colaba) for each months of years of Sun-spot periods.*

Unity = 1 minute of arc.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
Maximum Sun-spot period.								
January ...	0·06	0·29	0·33	0·32	168 18	152 38	19 6	50 51
February ...	0·21	0·38	0·32	0·27	96 55	156 49	22 41	49 42
March ...	0·58	0·59	0·65	0·37	88 21	125 18	9 2	46 57
April ...	1·02	0·94	0·85	0·28	63 33	113 59	7 18	42 48
May ...	1·14	1·17	0·91	0·20	59 19	103 6	1 55	33 18
June ...	1·33	1·23	0·82	0·13	63 46	106 16	5 8	31 58
July ...	1·37	1·27	0·79	0·14	64 25	103 21	3 14	27 10
August ...	1·28	1·52	0·98	0·18	55 54	100 51	1 42	30 12
September ...	1·14	1·29	1·03	0·35	52 29	102 9	1 41	39 50
October ...	0·51	0·46	0·62	0·37	52 8	109 48	1 14	40 33
November ...	0·11	0·25	0·13	0·22	307 42	182 28	8 21	40 50
December ...	0·24	0·29	0·07	0·16	275 38	185 20	18 57	47 30
Winter ...	0·16	0·22	0·33	0·27	68 5	144 4	10 28	38 14
Summer ...	1·19	1·23	0·89	0·20	60 10	104 21	3 26	36 1
Year ...	0·67	0·64	0·60	0·22	60 55	109 22	5 14	41 45
Minimum Sun-spot period.								
January ...	0·30	0·21	0·32	0·24	291 30	143 51	18 42	51 35
February ...	0·15	0·23	0·23	0·15	297 15	163 55	24 51	55 21
March ...	0·29	0·31	0·45	0·26	63 6	119 41	10 20	49 26
April ...	0·81	0·69	0·68	0·24	62 14	112 22	7 55	45 44
May ...	1·00	0·74	0·63	0·17	60 18	102 12	2 0	35 53
June ...	1·14	0·72	0·59	0·12	68 32	108 2	5 46	38 21
July ...	1·06	0·73	0·56	0·10	67 6	103 43	4 44	35 14
August ...	0·98	0·89	0·66	0·15	52 58	98 40	1 31	33 27
September ...	0·83	0·94	0·80	0·26	35 0	96 14	0 32	41 11
October ...	0·34	0·34	0·49	0·27	4 41	96 34	0 55	42 29
November ...	0·41	0·20	0·10	0·13	291 45	198 12	1 21	37 44
December ...	0·47	0·15	0·10	0·12	279 32	203 12	0 41	41 18
Winter ...	0·22	0·07	0·25	0·18	312 42	137 39	9 55	46 51
Summer ...	0·95	0·77	0·64	0·16	58 26	102 45	3 36	39 21
Year ...	0·45	0·40	0·45	0·17	45 30	105 25	5 26	43 16
1850—1871.								
January ...	0·19	0·23	0·26	0·23	274 19	158 40	21 39	51 25
February ...	0·04	0·22	0·25	0·21	345 13	156 53	20 26	51 6
March ...	0·39	0·40	0·51	0·31	87 11	125 26	11 26	49 6
April ...	0·91	0·77	0·75	0·27	60 24	111 1	7 6	44 3
May ...	1·05	0·96	0·76	0·18	58 51	102 30	2 18	34 56
June ...	1·23	1·01	0·71	0·13	64 44	106 0	4 49	33 53
July ...	1·19	0·98	0·68	0·11	64 56	103 14	3 46	30 24
August ...	1·10	1·19	0·80	0·17	54 21	100 18	1 36	31 35
September ...	0·94	1·09	0·89	0·29	46 11	100 14	1 17	40 38
October ...	0·36	0·36	0·54	0·30	32 59	105 33	1 59	42 17
November ...	0·27	0·18	0·11	0·17	296 41	188 1	6 2	40 36
December ...	0·37	0·14	0·10	0·15	282 58	190 44	12 21	45 37
Winter ...	0·14	0·13	0·27	0·22	19 30	141 13	11 6	46 36
Summer ...	1·07	0·99	0·76	0·18	59 7	103 24	3 15	37 9
Year ...	0·54	0·51	0·51	0·19	53 49	106 16	5 15	41 15

TABLE 323.—*Declination Magnetometer—Showing excess Diurnal Inequality of Declination for each average month of the period 1850 to 1871 over the average year showing the average seasonal disturbance.*

Unity = 1 minute of arc.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 18	− ·05	− ·02	− ·09	+ ·10	+ ·02	+ ·02	− ·04	− ·06	+ ·01	+ ·07	+ ·07	− ·02	·57
1 18	− ·16	− ·09	− ·13	+ ·15	+ ·09	+ ·13	+ ·08	+ ·01	+ ·03	− ·02	− ·01	− ·13	1·03
2 18	− 1·25	− ·13	− ·16	+ ·21	+ ·17	+ ·24	+ ·20	+ ·12	+ ·07	− ·08	− ·10	− ·23	2·86
3 18	− ·33	− ·20	− ·21	+ ·13	+ ·21	+ ·32	+ ·33	+ ·26	+ ·16	− ·12	− ·24	− ·33	2·84
4 18	− ·48	− ·34	− ·25	+ ·10	+ ·33	+ ·45	+ ·49	+ ·43	+ ·24	− ·17	− ·39	− ·46	4·13
5 18	− ·76	− ·58	− ·37	+ ·10	+ ·59	+ ·76	+ ·81	+ ·77	+ ·43	− ·32	− ·66	− ·71	6·86
6 18	− 1·41	− 1·19	− **·66**	+ ·33	+ 1·12	+ 1·35	+ 1·35	+ 1·40	+ ·88	− **·50**	− 1·32	− 1·35	12·86
7 18	− **1·84**	− **1·53**	− ·41	+ ·75	+ **1·23**	+ **1·41**	+ **1·36**	+ **1·59**	+ **1·30**	− ·26	− **1·71**	− **1·92**	15·31
8 18	− 1·18	− 1·00	+ ·06	+ **·77**	+ ·84	+ 1·01	+ ·84	+ ·93	+ ·80	− ·15	− 1·34	− 1·55	10·47
9 18	+ ·03	− ·06	+ ·52	+ ·58	+ ·10	+ ·40	+ ·16	− ·13	− ·10	− ·19	− ·66	− ·67	3·60
10 18	− ·70	+ ·67	+ **·86**	+ ·21	− ·49	− ·10	− ·24	− ·83	− ·75	− ·19	+ ·03	+ ·07	5·14
11 18	+ ·92	+ 1·06	+ ·78	− ·23	− ·69	− ·46	− ·48	− ·99	− 1·11	− ·12	+ ·60	+ ·70	8·14
12 18	+ 1·15	+ **1·11**	+ ·44	− ·63	− **·82**	− ·77	− ·62	− **1·10**	− **1·33**	+ ·05	+ 1·25	+ 1·24	10·51
13 18	+ **1·17**	+ ·98	+ ·14	− **·75**	− ·79	− ·97	− ·85	− 1·07	− 1·10	+ ·26	+ **1·53**	+ **1·47**	11·08
14 18	+ ·79	+ ·68	+ ·16	− ·61	− ·61	− **1·01**	− **·88**	− ·85	− ·53	+ ·51	+ 1·19	+ 1·21	9·03
15 18	+ ·37	+ ·27	+ ·20	− ·40	− ·41	− ·84	− ·68	− ·45	+ ·11	+ **·53**	+ ·57	+ ·69	5·52
16 18	+ ·17	0	+ ·03	− ·17	− ·18	− ·50	− ·39	+ ·01	+ ·39	+ ·29	+ ·08	+ ·29	2·50
17 18	+ ·06	− ·10	− ·21	− ·08	+ ·07	− ·14	− ·08	+ ·34	+ ·29	− ·10	− ·10	+ ·11	1·68
18 18	+ ·08	− ·12	− ·32	− ·16	+ ·04	− ·06	+ ·01	+ ·22	+ ·02	− ·09	+ ·11	+ ·26	1·49
19 18	+ ·32	+ ·16	− ·14	− ·23	− ·25	− ·33	− ·31	− ·07	+ ·05	+ ·11	+ ·29	+ ·41	2·67
20 18	+ ·31	+ ·19	− ·05	− ·13	− ·25	− ·34	− ·40	− ·13	+ ·07	+ ·14	+ ·27	+ ·37	2·65
21 18	+ ·23	+ ·13	− ·05	− ·04	− ·17	− ·27	− ·33	− ·13	+ ·05	+ ·10	+ ·21	+ ·25	1·96
22 18	+ ·14	+ ·07	− ·07	+ ·02	− ·09	− ·18	− ·22	− ·14	+ ·03	+ ·14	+ ·18	+ ·18	1·46
23 18	+ ·06	+ ·02	− ·21	+ ·06	− ·04	− ·08	− ·17	− ·10	+ ·01	+ ·14	+ ·17	+ ·10	1·16
Sum without regard to signs.	13·96	10·70	6·42	6·94	9·60	12·14	11·32	12·13	9·86	4·65	13·08	14·72	125·52

TABLE 324.—*Declination Magnetometer—Showing excess Diurnal Inequality of Declination showing secular difference between the seasonal variations at times of maximum and minimum sun-spot epochs during the period 1848 to 1872.*

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 18	− ·04	·00	+ ·01	+ ·09	− ·01	− ·02	− ·10	− ·12	− ·04	+ ·08	+ ·05	+ ·14	·70
1 18	+ ·06	+ ·08	− ·06	+ ·10	− ·05	− ·10	− ·12	− ·13	·00	+ ·05	+ ·02	+ ·17	·94
2 18	+ ·09	+ ·14	− ·06	+ ·05	− ·14	− ·12	− ·15	− ·14	·00	+ ·12	+ ·14	+ ·13	1·28
3 18	+ ·09	+ ·16	− ·08	− ·03	− ·21	− ·09	− ·11	− ·12	·00	+ ·08	+ ·21	+ ·17	1·35
4 18	+ ·10	+ ·11	− ·16	− **·11**	− ·11	− ·04	− ·01	·00	+ ·02	− ·03	+ ·09	+ ·13	·91
5 18	+ ·01	− ·13	− ·20	− ·07	·00	+ ·11	+ ·19	+ ·23	+ ·04	− ·06	− ·03	− ·07	1·14
6 18	− ·24	− ·35	− ·19	− ·09	+ ·18	+ ·27	+ ·41	+ ·54	+ ·25	− ·03	− ·36	− ·46	3·37
7 18	− **·47**	− ·28	+ ·08	− ·02	+ ·17	+ ·19	+ ·36	+ **·67**	+ **·49**	+ ·07	− **·46**	− ·53	3·79
8 18	− ·37	+ ·01	+ ·35	− ·06	+ ·01	·00	+ ·02	+ ·32	+ ·41	+ ·09	− ·20	− **·58**	2·42
9 18	+ ·08	+ ·28	+ ·24	− ·09	− ·19	− ·24	− ·33	− ·14	+ ·21	+ ·15	+ ·14	− ·04	2·13
10 18	+ ·36	+ ·27	+ **·35**	− ·09	− ·31	− ·44	− ·44	− ·41	+ ·06	+ ·14	+ ·27	+ ·33	3·47
11 18	+ ·39	+ ·30	+ ·23	− ·10	− ·38	− **·49**	− **·49**	− ·47	·00	+ ·13	+ ·32	+ ·54	3·84
12 18	+ **·60**	+ ·31	+ ·11	− ·05	− **·40**	− ·42	− ·39	− **·62**	− ·23	+ **·17**	+ **·40**	+ **·55**	4·25
13 18	+ ·49	+ **·32**	+ ·04	·00	− ·19	− ·37	− ·36	− ·57	− **·32**	+ ·13	+ ·40	+ ·37	3·56
14 18	+ ·33	+ ·17	+ ·07	− ·04	− ·04	− ·21	− ·20	− ·40	− ·25	+ ·04	+ ·27	+ ·22	2·24
15 18	+ ·18	− ·06	+ ·01	− ·07	+ ·14	− ·03	− ·02	− ·08	− ·16	− ·03	+ ·05	+ ·07	·90
16 18	− ·05	− ·15	− ·01	− ·03	+ ·24	+ ·21	+ ·19	+ ·30	− ·09	− ·22	− ·20	− ·13	1·82
17 18	− ·32	− ·28	− ·17	+ ·08	+ ·44	+ ·50	+ ·45	+ ·51	− ·04	− **·36**	− ·37	− ·34	3·86
18 18	− ·44	− **·46**	− **·35**	+ ·06	+ **·55**	+ **·66**	+ **·51**	+ ·45	− ·08	− ·31	− ·25	− ·32	4·44
19 18	− ·24	− ·20	− ·11	+ ·04	+ ·12	+ ·30	+ ·28	+ ·12	− ·08	− ·10	− ·16	− ·09	1·84
20 18	− ·16	− ·06	·00	+ ·11	+ ·05	+ ·17	+ ·11	+ ·09	+ ·04	− ·05	− ·16	− ·11	1·11
21 18	− ·20	− ·07	− ·03	+ ·09	+ ·07	+ ·15	+ ·13	+ ·05	− ·02	− ·07	− ·11	− ·06	1·05
22 18	− ·14	− ·09	− ·04	+ **·12**	+ ·12	+ ·07	+ ·03	− ·01	− ·07	+ ·03	− ·07	+ ·01	·80
23 18	− ·08	− ·03	+ ·02	+ ·09	+ ·01	+ ·02	− ·06	− ·11	− ·05	+ ·04	+ ·07	+ ·09	·67
Sum without regard to signs.	5·53	4·31	2·97	1·68	4·13	5·22	5·46	6·60	2·95	2·58	4·80	5·65	51·88

TABLE 325.—*Showing for the period 1850—1904, the Mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

Unity = 0′·01

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+ 17	+ 19	+ 13	+ 27	+ 25	+ 24	+ 15	+ 13	+ 22	+ 26	+ 26	+ 19	+ 20
1 18	+ 10	+ 15	+ 12	+ 34	+ 34	+ 36	+ 29	+ 22	+ 27	+ 24	+ 22	+ 13	+ 23
2 18	− 1	+ 10	+ 7	+ 35	+ 38	+ 42	+ 38	+ 31	+ 29	+ 17	+ 12	+ 2	+ 21
3 18	− 17	− 4	− 5	+ 23	+ 35	+ 43	+ 43	+ 37	+ 29	+ 5	− 7	− 15	+ 14
4 18	− 36	− 22	− 15	+ 14	+ 39	+ 48	+ 51	+ 46	+ 30	− 7	− 25	− 33	+ 7
5 18	− 55	− 38	− 18	+ 19	+ 68	+ 84	+ 86	+ 82	+ 50	− 12	− 42	− 50	+ 15
6 18	**− 67**	**− 47**	− 1	+ 89	+ 170	+ 189	+ 188	+ 197	+ 145	+ 14	**− 60**	− 63	+ 63
7 18	− 64	− 36	+ 67	+ 175	**+ 226**	**+ 239**	**+ 238**	**+ 263**	**+ 235**	+ 81	− 49	**− 80**	+ 108
8 18	+ 13	+ 23	+ 123	**+ 188**	+ 197	+ 212	+ 204	+ 217	+ 202	**+ 103**	− 5	− 31	**+ 121**
9 18	**+ 83**	**+ 62**	**+ 125**	+ 129	+ 78	+ 107	+ 97	+ 72	+ 72	+ 56	+ 10	+ 13	+ 76
10 18	+ 58	+ 49	+ 72	+ 16	− 65	− 22	− 27	− 78	− 72	**− 25**	− 11	+ 3	− 9
11 18	− 19	− 6	− 27	− 116	− 174	− 145	− 144	− 192	− 204	− 111	− 50	− 26	− 101
12 18	− 40	− 41	− 107	**− 195**	**− 227**	**− 216**	− 202	**− 244**	**− 268**	**− 138**	− 28	− 16	**− 143**
13 18	− 13	− 27	**− 117**	− 189	− 199	− 212	**− 203**	− 226	− 228	− 94	+ 22	+ 20	− 123
14 18	− 1	− 4	− 62	− 127	− 128	− 164	− 157	− 156	− 123	− 23	**+ 38**	**+ 35**	− 73
15 18	+ 14	+ 13	+ 1	− 54	− 53	− 97	− 85	− 62	− 13	+ 31	+ 34	+ 34	− 20
16 18	+ 27	+ 16	+ 18	− 1	+ 2	− 35	− 26	+ 13	+ 46	+ 39	+ 22	+ 33	+ 13
17 18	+ 10	− 5	− 9	+ 2	+ 16	− 7	0	+ 38	+ 31	− 5	+ 1	+ 16	+ 8
18 18	+ 4	− 16	− 33	− 20	− 5	− 12	− 4	+ 9	− 7	− 13	+ 8	+ 20	− 5
19 18	+ 18	+ 2	− 25	− 34	− 35	− 42	− 42	− 23	− 10	− 4	+ 14	+ 25	− 13
20 18	+ 17	+ 4	− 15	− 26	− 34	− 41	− 46	− 28	− 9	0	+ 14	+ 21	− 12
21 18	+ 15	+ 5	− 10	− 11	+ 19	− 29	− 35	− 21	− 3	+ 2	+ 14	+ 17	− 6
22 18	+ 15	+ 9	− 3	+ 4	− 3	− 10	− 18	− 11	+ 4	+ 13	+ 19	+ 19	+ 3
23 18	+ 17	+ 16	+ 2	+ 16	+ 12	+ 8	− 3	+ 1	+ 14	+ 24	+ 27	+ 21	+ 13
Range ...	150	109	242	383	453	455	441	507	503	241	98	115	264

TABLE 326.—*Showing the Mean Diurnal Inequality of Declination for each average month of the maximum sun-spot years 1859, 1860, 1861, 1870, 1871, 1872, 1873, 1883, 1884, 1892, 1893, 1894 and for the average year.*

Unity = 0′·01

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+ 18	+ 25	+ 15	+ 29	+ 24	+ 21	+ 6	+ 6	+ 21	+ 29	+ 32	+ 28	+ 21
1 18	+ 14	+ 26	+ 14	+ 40	+ 35	+ 32	+ 21	+ 18	+ 29	+ 25	+ 28	+ 23	+ 26
2 18	+ 6	+ 21	+ 11	+ 38	+ 36	+ 40	+ 32	+ 27	+ 30	+ 22	+ 20	+ 10	+ 25
3 18	- 10	+ 4	- 3	+ 23	+ 32	+ 42	+ 37	+ 33	+ 30	+ 9	- 1	- 8	+ 16
4 18	- 33	- 20	- 15	+ 13	+ 41	+ 53	+ 53	+ 47	+ 32	- 5	- 23	- 30	+ 9
5 18	- 51	- 41	- 16	+ 24	+ 80	+100	+100	+ 99	+ 60	- 9	- 43	- 50	+ 22
6 18	**- 62**	- 49	+ 17	+115	+204	+226	+228	+245	+182	+ 33	**- 65**	- 65	+ 85
7 18	- 54	- 27	+106	+216	**+265**	**+279**	**+286**	**+322**	**+282**	+114	- 49	**- 87**	+138
8 18	+ 32	+ 52	**+174**	**+230**	+227	+244	+235	+258	+241	**+137**	+ 14	- 26	**+151**
9 18	**+112**	**+103**	+160	+162	+ 88	+115	+103	+ 85	+ 92	+ 84	**+ 43**	**+ 40**	+ 99
10 18	+ 78	+ 81	+ 86	+ 28	- 76	- 33	- 42	- 88	- 73	- 17	+ 17	+ 26	+ 1
11 18	- 19	+ 9	- 41	-129	-203	-173	-173	-215	-221	-124	- 38	- 8	-111
12 18	- 49	- 38	-134	**-224**	**-264**	**-249**	- 234	**-288**	**-304**	**-157**	- 26	- 9	**-165**
13 18	- 22	- 32	**-140**	-220	-229	-246	**-235**	-274	-264	-113	+ 19	+ 19	-145
14 18	- 10	- 22	- 75	-157	-149	-191	-180	-195	-148	- 39	+ 25	+ 27	- 93
15 18	+ 10	- 14	- 12	- 74	- 63	-114	- 99	- 79	- 25	+ 21	+ 13	+ 21	- 34
16 18	+ 20	- 11	+ 3	- 13	+ 3	- 42	- 28	+ 17	+ 45	+ 27	0	+ 15	+ 3
17 18	- 12	- 34	- 31	- 6	+ 25	+ 3	+ 13	+ 50	+ 26	- 29	- 30	- 12	- 3
18 18	- 22	**- 50**	- 62	- 30	+ 11	+ 7	+ 14	+ 23	- 15	- 35	- 13	- 5	- 15
19 18	+ 11	- 11	- 34	- 42	- 35	- 39	- 34	- 18	- 13	- 8	+ 9	+ 15	- 17
20 18	+ 13	- 1	- 17	- 27	- 34	- 39	- 46	- 27	- 6	- 2	+ 10	+ 14	- 13
21 18	+ 9	- 1	- 14	- 13	- 19	- 28	- 39	- 23	- 9	- 4	+ 10	+ 13	- 10
22 18	+ 11	+ 12	- 7	+ 4	- 4	- 12	- 26	- 17	- 1	+ 12	+ 18	+ 19	0
23 18	+ 15	+ 18	+ 8	+ 16	+ 9	+ 4	- 12	- 5	+ 10	+ 26	+ 31	+ 29	+ 12
Range ...	174	153	314	454	529	528	521	610	586	294	108	127	316

TABLE 327.—*Showing the Mean Diurnal Inequality of Declination for each average month of the minimum sun-spot years 1854, 1855, 1856, 1866, 1867, 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901 and 1902 and for the average year.*

Unity = 0′·01

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+16	+15	+ 11	+ 21	+ 27	+ 27	+ 20	+ 18	+ 21	+ 22	+25	+15	+ 20
1 18	+ 6	+10	+ 11	+ 25	+ 34	+ 38	+ 32	+ 27	+ 26	+ 22	+19	+ 9	+ 22
2 18	- 3	+ 3	+ 6	+ 27	+ 38	+ 46	+ 38	+ 34	+ 27	+ 15	+ 8	- 3	+ 20
3 18	-20	-10	- 5	+ 17	+ 37	+ 44	+ 43	+ 37	+ 27	+ 6	- 8	-19	+ 12
4 18	-35	-25	- 12	+ 12	+ 37	+ 45	+ 48	+ 45	+ 27	- 2	-22	-36	+ 7
5 18	-52	-38	- 16	+ 12	+ 59	+ 71	+ 72	+ 72	+ 44	- 9	-39	-47	+ 11
6 18	**-64**	**-45**	- 6	+ 70	+139	+155	+160	+167	+119	+ 7	-54	-57	+ 49
7 18	-57	-41	+ 51	+151	**+194**	**+201**	**+206**	**+225**	**+206**	+ 66	-50	**-73**	+ 90
8 18	+18	+ 6	+ 98	**+167**	+173	+183	+187	+190	+178	**+ 84**	-18	-33	**+103**
9 18	**+74**	**+36**	**+ 99**	+119	+ 66	+ 94	+ 95	+ 64	+ 59	+ 38	-11	- 2	+ 61
10 18	+45	+33	+ 51	+ 20	- 62	- 18	- 18	- 75	- 72	- 36	-31	-19	- 15
11 18	-31	-16	- 34	- 98	-153	-125	-131	-179	-193	-114	**-59**	-36	- 97
12 18	-48	-38	-102	**-172**	**-195**	**-192**	**-186**	**-219**	**-248**	**-132**	-24	-15	**-131**
13 18	-20	-21	**-106**	-168	-173	-181	-185	-201	-206	- 85	+28	+24	-108
14 18	- 6	+ 8	- 53	-111	-107	-138	-140	-135	-103	- 16	**+47**	**+43**	- 59
15 18	+15	+29	+ 12	- 43	- 43	- 81	- 78	- 50	- 1	+ 37	+41	+41	- 10
16 18	+37	+31	+ 30	+ 7	+ 4	- 32	- 24	+ 17	+ 55	+ 46	+31	+41	+ 20
17 18	+25	+13	+ 8	+ 7	+ 12	- 13	- 5	+ 34	+ 38	+ 10	+16	+31	+ 15
18 18	+18	+ 5	- 12	- 14	- 16	- 25	- 14	0	- 1	0	+18	+29	- 1
19 18	+23	+ 7	- 17	- 28	- 34	- 44	- 42	- 23	- 9	- 3	+16	+26	- 11
20 18	+20	+ 5	- 12	- 26	- 31	- 38	- 43	- 28	- 10	+ 1	+15	+23	- 10
21 18	+17	+ 6	- 5	- 11	- 18	- 25	- 32	- 18	- 4	+ 6	+14	+20	- 4
22 18	+17	+10	+ 1	+ 2	- 4	- 5	- 14	- 7	+ 6	+ 13	+19	+20	+ 5
23 18	+16	+12	+ 7	+ 12	+ 14	+ 13	+ 4	+ 5	+ 13	+ 22	+24	+18	+ 13
Range ...	138	81	205	339	389	393	392	444	454	216	106	116	234

CHAPTER VII.

Diurnal Variation Vertical Force.

396. Prior to the introduction of the magnetographs in 1870, no reliable differential instrument for recording the variations of this magnetic element had existed at Colaba. On this account the variations of this element for the period 1873 to 1905 only are available. The inequalities discussed herein have been derived from all days while those derived from the selected quiet days of the Astromoner Royal (for the last 11-year cycle only 1894—1905) have been examined separately in Chapter XI along with similar variations of H and D.

397. The inequalities of V, as will be seen from tables 328 to 340, are, as must be expected, not so strongly pronounced at Colaba as those of H. The average inequality of the month of September, which gives the largest movements, records a range of about 38γ while that of December, which records the smallest, indicates a range of about 8γ only.

The general run of the average inequality (*vide* plates 50 and 51), is similar in character to that of D, though the seasonal suppression during the winter months so powerfully effective in the declination inequalities, is not nearly so pronounced in the vertical component. Unlike however the conditions in the declination curves in which the forenoon (8 A.M.) maximum is much more pronounced than the afternoon maximum, the two maxima in the force variation, which occur a little after sunrise and at about 3 P.M., respectively, appear to approximate to conditions of equal significance.

The similarity in the runs between D and V variations however ceases here. For if the smaller or minor fluctuations which are superposed on the dominant curve, and which occur when the sun is below the horizon, are neglected, the curve so simplified indicates practically the reversal of the H inequality, the time of occurrence of the principal minimum in V which falls at about 11 A.M. synchronising fairly closely with that of the maximum epoch in H. This constancy of the time of occurrence of the principal maximum and minimum remaining uninfluenced by the disturbing effects of the 11-year cycle is a feature common to all the elements.

398. The seasonal change however appears to have a marked influence on the inequalities of V as in D, which in summer months makes the time of both the principal minimum and maximum to fall *earlier*, and to shift the afternoon maximum to a *later* hour, thus widening the interval during which the solar effects continue to influence the inequality. The influence of the 11-year cycle on the inequality of the vertical force as a whole (the somewhat different effects on the several components being referred to later) will be observed from figures 3, 4 and 5, plate 58. The amplitudes of the movements clearly show fluctuations, specially in the range as measured between the principal (6 A.M.) maximum and (11 A.M.) minimum, which wax and wane with about the same periodicity to which the frequency of sun-spots is subject.

This effect however is not very large and fails to become quite explicit, for example, when the average inequalities of the three 11-year cycles are considered (*vide* tables 335, 336 and 337 and the last three figures in plate 51), as the first group of 11 years is, we have seen, the only one of the three cycles which is at all appreciably well influenced by the secular effects. In the inequalities of V, the year 1872 which is a maximum spot year is not available; and considering that the variations in V are on the whole themselves very small, it is obvious that the omission of such a year as 1872 must to a considerable extent be effective in obliterating the finer differences in the three 11-year groups.

Seasonal variation of vertical force inequalities as indicated by excess variations.

399. The seasonal changes in the normal diurnal inequality are shown in table 341 the results of which are charted in figures 1 to 12, plate 55. They show the progression which indicates a maximum of positive* disturbance in September and negative disturbance in December; the month of October shows signs of

* Positive, because the disturbance is of the same character as the original inequality, the phases being concurrent.

TABLE 328.—*Vertical Force Magnetograph—Showing for the period 1873—1904 the Mean Diurnal Inequality of Vertical Force for each month of the year and for the whole year.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 17	+ 26	+ 24	+ 33	+ 45	+ 40	+ 38	+ 36	+ 41	+ 55	+ 41	+ 24	+ 18	+ 35
1 17	+ 22	+ 23	+ 28	+ 43	+ 39	+ 36	+ 36	+ 42	+ 57	+ 38	+ 21	+ 14	+ 32
2 17	+ 19	+ 19	+ 22	+ 36	+ 36	+ 34	+ 36	+ 44	+ 54	+ 36	+ 17	+ 11	+ 30
3 17	+ 12	+ 11	+ 17	+ 30	+ 33	+ 30	+ 35	+ 42	+ 52	+ 29	+ 10	+ 5	+ 25
4 17	+ 8	+ 8	+ 15	+ 28	+ 37	+ 38	+ 41	+ 49	+ 57	+ 29	+ 9	+ 5	+ 27
5 17	+ 6	+ 4	+ 17	+ 38	+ 65	+ 69	+ 70	+ 77	+ 74	+ 36	+ 9	+ 3	+ 39
6 17	+ 9	+ 7	+ 34	**+ 93**	**+110**	**+107**	**+114**	**+134**	**+139**	**+ 64**	− 7	− 6	**+ 67**
7 17	+ 25	+ 19	+ 55	+ 66	+ 63	+ 73	+ 77	+ 83	+ 93	+ 62	+ 18	+ 4	+ 53
8 17	**+ 62**	**+ 26**	+ 19	− 23	− 41	− 9	− 9	− 42	− 55	− 11	+ 19	**+ 38**	− 2
9 17	+ 22	− 11	− 49	−117	−153	−104	−102	−159	−184	+102	− 21	+ 20	− 81
10 17	− 83	− 57	− 91	−168	**−184**	−153	−157	**−199**	−245	−158	**− 65**	− 29	−132
11 17	**−118**	**− 86**	**−129**	**−179**	−172	**−175**	**−162**	−181	**−246**	**−161**	− 58	**− 47**	**−142**
12 17	− 66	− 45	−107	−125	−120	−134	−123	−124	−163	− 81	− 1	− 19	− 89
13 17	− 22	+ 1	− 30	− 38	− 36	− 60	− 60	− 51	− 45	+ 3	+ 21	− 7	− 27
14 17	− 10	+ 19	+ 45	+ 30	+ 29	+ 1	+ 1	+ 16	+ 52	+ 48	+ 5	− 14	+ 19
15 17	+ 7	+ 16	**+ 56**	+ 60	+ 61	+ 41	+ 40	+ 57	+ 86	+ 45	− 10	− 16	+ 37
16 17	+ 8	− 1	+ 18	+ 51	+ 60	+ 51	+ 51	+ 68	+ 65	+ 4	− 15	− 6	+ 28
17 17	− 15	− 28	− 24	+ 11	+ 28	+ 31	+ 30	+ 32	+ 4	− 35	− 26	− 15	0
18 17	+ 2	− 13	− 19	− 11	− 4	0	− 4	− 12	− 5	− 7	− 4	− 4	− 6
19 17	+ 12	+ 5	+ 4	0	− 4	− 8	− 22	− 8	+ 10	+ 6	0	+ 2	0
20 17	+ 14	+ 7	+ 12	+ 16	+ 13	+ 9	0	+ 6	+ 22	+ 14	+ 2	+ 2	+ 10
21 17	+ 16	+ 8	+ 15	+ 28	+ 24	+ 20	+ 13	+ 18	+ 30	+ 20	+ 8	+ 5	+ 17
22 17	+ 22	+ 18	+ 26	+ 38	+ 36	+ 33	+ 27	+ 30	+ 42	+ 36	+ 22	+ 14	+ 29
23 17	+ 25	+ 25	+ 33	+ 42	+ 38	+ 35	+ 30	+ 35	+ 49	+ 41	**+ 25**	+ 22	+ 33
Range ...	180	112	185	272	294	282	276	333	385	225	90	85	209
Average progressive increase per day.	+ 3	− 2	− 10	− 10	− 8	− 1	+ 3	0	0	0	+ 2	+ 2	− 2

TABLE 329.—*Vertical Force Magnetograph No. 1—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—April to September—for each of the years 1873 to 1883 and for the whole period of eleven years.*

Unity = 1γ = ·000001 C. G. S. Unit.

April to September.	Year.											(Mean) 1873 to 1883.
	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	
H. m.												
0 17	+ 45	+ 45	+ 37	+ 41	+ 38	+ 42	+ 36	+ 41	+ 44	+ 54	+ 49	+ 43
1 17	+ 43	+ 44	+ 36	+ 40	+ 37	+ 39	+ 31	+ 39	+ 43	+ 49	+ 46	+ 41
2 17	+ 37	+ 41	+ 34	+ 42	+ 38	+ 36	+ 31	+ 34	+ 39	+ 45	+ 42	+ 38
3 17	+ 31	+ 37	+ 32	+ 38	+ 35	+ 34	+ 25	+ 32	+ 35	+ 41	+ 39	+ 34
4 17	+ 35	+ 41	+ 34	+ 43	+ 40	+ 37	+ 31	+ 35	+ 43	+ 43	+ 46	+ 39
5 17	+ 61	+ 63	+ 53	+ 63	+ 61	+ 58	+ 53	+ 56	+ 73	+ 66	+ 71	+ 62
6 17	**+114**	**+120**	**+103**	**+111**	**+113**	**+106**	**+106**	**+110**	**+139**	**+125**	**+128**	**+116**
7 17	+ 69	+ 81	+ 69	+ 70	+ 72	+ 69	+ 67	+ 78	+ 87	+ 84	+ 85	+ 76
8 17	- 35	- 16	- 32	- 36	- 35	- 23	- 36	- 25	- 41	- 17	- 21	- 29
9 17	- 137	- 124	- 128	- 150	- 147	- 127	- 140	- 129	- 163	- 124	- 133	- 137
10 17	**- 170**	**- 170**	- 157	**- 185**	- 206	**- 186**	- 170	- 162	**- 196**	- 181	- 189	- 179
11 17	- 159	- 170	**- 160**	- 173	**- 210**	- 181	**- 174**	**- 169**	- 193	**- 194**	**- 190**	**- 179**
12 17	- 119	- 128	- 109	- 114	- 134	- 125	- 119	- 124	- 133	- 145	- 140	- 126
13 17	- 45	- 61	- 43	- 39	- 41	- 46	- 36	- 44	- 44	- 57	- 61	- 47
14 17	+ 20	+ 5	+ 19	+ 25	+ 36	+ 23	+ 31	+ 22	+ 33	+ 9	+ 12	+ 21
15 17	+ 49	+ 44	+ 53	+ 57	+ 73	+ 55	+ 65	+ 59	+ 75	+ 41	+ 54	+ 57
16 17	+ 45	+ 49	+ 55	+ 57	+ 73	+ 55	+ 63	+ 55	+ 73	+ 39	+ 53	+ 56
17 17	+ 10	+ 17	+ 22	+ 19	+ 27	+ 17	+ 27	+ 17	+ 25	+ 9	+ 17	+ 19
18 17	- 17	- 3	- 7	- 8	- 2	- 1	+ 3	- 7	- 13	- 4	- 12	- 6
19 17	- 10	- 11	- 6	- 8	+ 2	+ 1	+ 1	- 10	- 18	- 10	- 12	- 7
20 17	+ 7	+ 11	+ 8	+ 10	+ 19	+ 17	+ 18	+ 8	+ 4	+ 12	+ 10	+ 11
21 17	+ 18	+ 22	+ 19	+ 19	+ 25	+ 24	+ 23	+ 20	+ 18	+ 26	+ 25	+ 22
22 17	+ 35	+ 36	+ 30	+ 31	+ 35	+ 34	+ 33	+ 32	+ 32	+ 42	+ 39	+ 34
23 17	+ 39	+ 41	+ 34	+ 35	+ 33	+ 35	+ 32	+ 36	+ 36	+ 49	+ 45	+ 38
Range ...	284	290	263	296	323	292	280	279	335	319	318	295
Average progressive increase per day ...	- 8	- 7	- 9	- 5	- 2	- 2	0	- 9	- 8	- 5	- 5	- 5

TABLE 330.—*Vertical Force Magnetograph No. 1—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—January to March and October to December—for each of the years 1873 to 1883 and for the whole period of eleven years.*

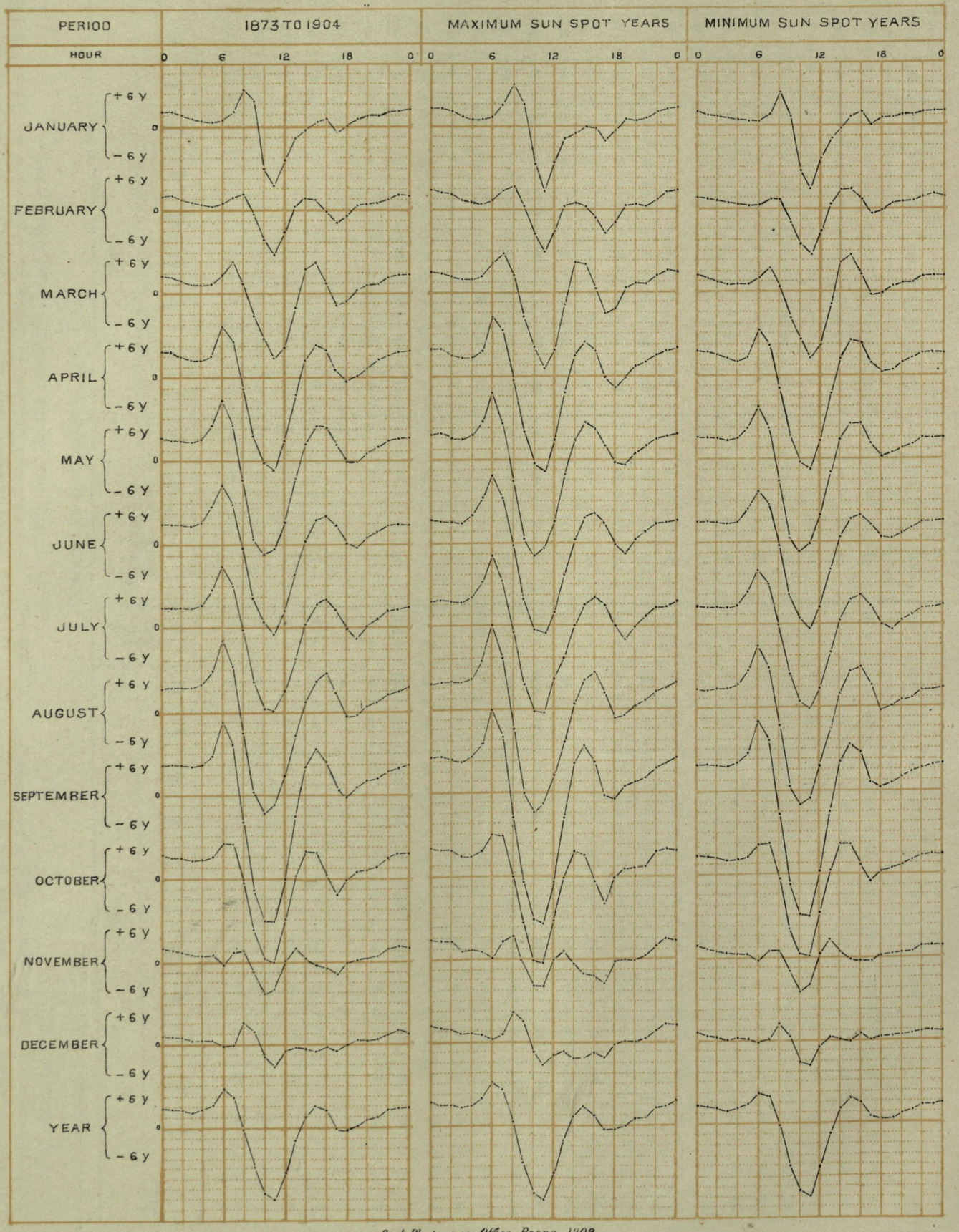
Unity = 1γ = ·000001 C. G. S. Unit.

October to March.	Year.											(Mean) 1873 to 1883.
	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	
H. m.												
0 17	+ 22	+ 27	+ 25	+ 27	+ 25	+ 15	+ 17	+ 21	+ 31	+ 28	+ 34	+ 25
1 17	+ 16	+ 23	+ 17	+ 22	+ 20	+ 10	+ 12	+ 17	+ 26	+ 26	+ 31	+ 20
2 17	+ 13	+ 18	+ 15	+ 19	+ 17	+ 9	+ 9	+ 14	+ 20	+ 24	+ 27	+ 17
3 17	+ 3	+ 9	+ 9	+ 12	+ 8	+ 1	+ 1	+ 7	+ 12	+ 15	+ 16	+ 8
4 17	- 3	+ 6	+ 10	+ 12	+ 11	+ 4	+ 3	+ 8	+ 11	+ 16	+ 15	+ 8
5 17	- 3	+ 6	+ 5	+ 9	+ 8	+ 5	+ 4	+ 9	+ 13	+ 17	+ 16	+ 8
6 17	+ 4	+ 11	+ 13	+ 13	+ 12	+ 11	+ 10	+ 12	+ 22	+ 26	+ 25	+ 14
7 17	+ 24	+ 24	+ 17	+ 21	+ 19	+ 21	+ 22	**+ 28**	**+ 41**	**+ 42**	**+ 42**	**+ 27**
8 17	+ 17	+ 26	- 1	+ 16	+ 9	+ 5	+ 16	+ 24	+ 32	+ 39	+ 40	+ 20
9 17	- 31	- 12	- 46	- 38	- 49	- 53	- 31	- 18	- 28	- 11	- 12	- 30
10 17	- 73	- 50	- 81	- 94	- 112	- 98	- 73	- 47	- 73	- 68	- 80	- 77
11 17	**- 83**	**- 76**	**- 90**	**- 114**	**- 117**	**- 98**	**- 92**	**- 75**	**- 97**	**- 96**	**- 102**	**- 95**
12 17	- 33	- 41	- 36	- 64	- 50	- 36	- 42	- 38	- 52	- 55	- 54	- 46
13 17	+ 16	- 6	+ 18	- 12	+ 2	+ 17	+ 3	+ 6	0	- 8	- 7	+ 3
14 17	**+ 35**	+ 4	**+ 44**	+ 22	+ 30	**+ 45**	**+ 31**	+ 15	+ 17	+ 11	+ 9	+ 24
15 17	+ 30	- 1	+ 38	**+ 31**	**+ 36**	+ 42	+ 30	+ 14	+ 13	+ 11	+ 4	+ 23
16 17	+ 8	- 10	+ 9	+ 20	+ 23	+ 18	+ 15	0	- 6	- 10	- 18	+ 4
17 17	- 25	- 29	- 27	- 9	- 6	- 7	- 8	- 27	- 38	- 39	- 48	- 24
18 17	- 3	- 8	+ 11	+ 4	+ 5	+ 3	+ 6	- 14	- 15	- 20	- 15	- 6
19 17	+ 11	+ 7	+ 2	+ 10	+ 10	+ 5	+ 12	- 3	+ 1	- 5	- 1	+ 4
20 17	+ 10	+ 13	+ 9	+ 20	+ 21	+ 10	+ 19	+ 2	+ 6	- 2	+ 2	+ 10
21 17	+ 7	+ 13	+ 9	+ 19	+ 20	+ 8	+ 15	+ 6	+ 8	+ 6	+ 9	+ 11
22 17	+ 20	+ 25	+ 22	+ 28	+ 26	+ 15	+ 19	+ 18	+ 24	+ 24	+ 28	+ 23
23 17	+ 26	**+ 31**	+ 24	+ 30	+ 26	+ 16	+ 19	+ 22	+ 32	+ 32	+ 36	+ 27
Range ...	118	107	134	145	153	143	123	103	138	138	144	122
Average progressive increase per day ...	- 5	- 2	- 2	+ 1	+ 3	- 1	+ 5	- 3	- 6	- 5	- 6	- 2

COLABA OBSERVATORY

Vertical Force Diurnal Inequality
(Magnetograph)

Plate 50

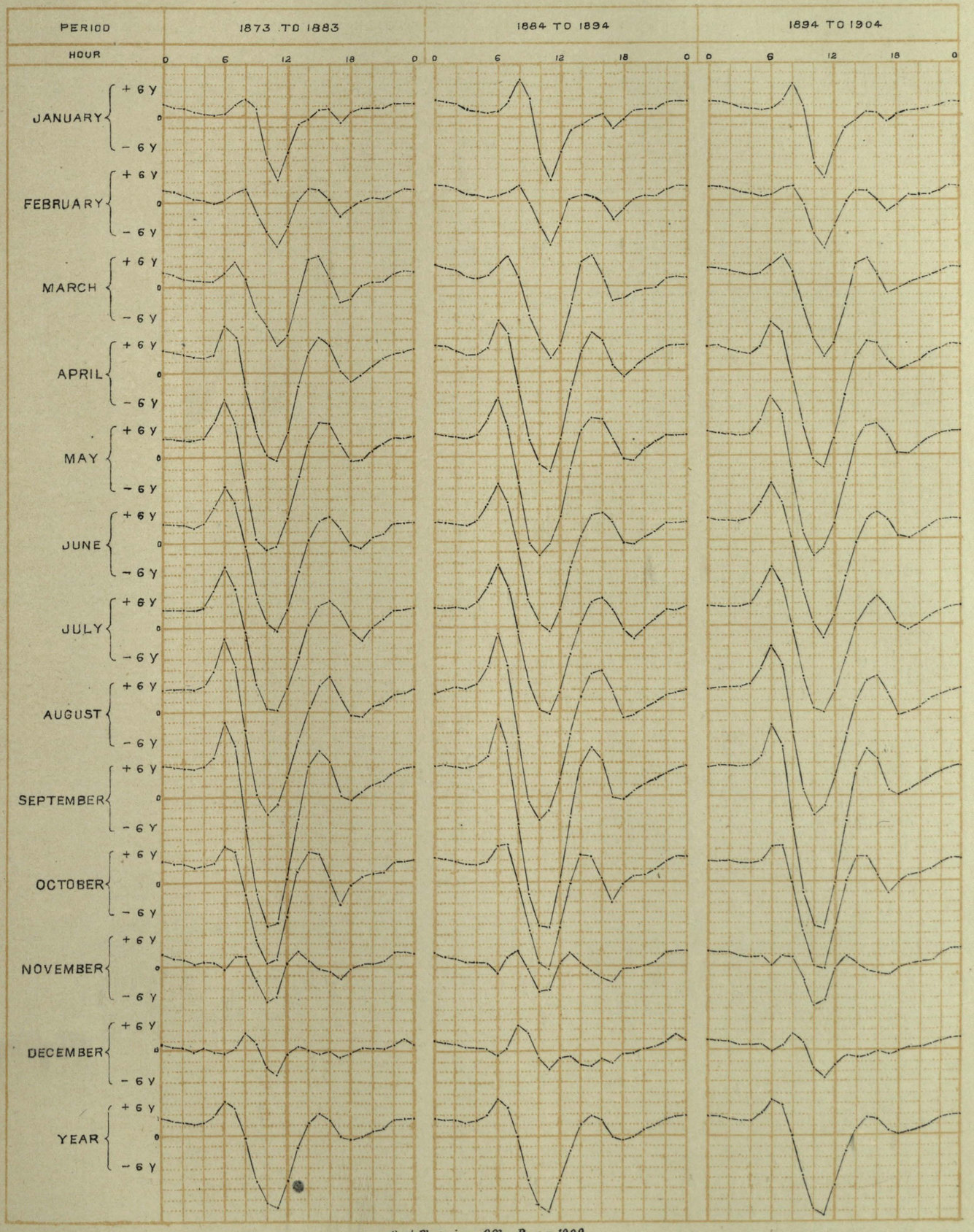


Govt. Photozinco: Office, Poona, 1909.

COLABA OBSERVATORY

Vertical Force Diurnal Inequality
(Magnetograph)

Plate 51.



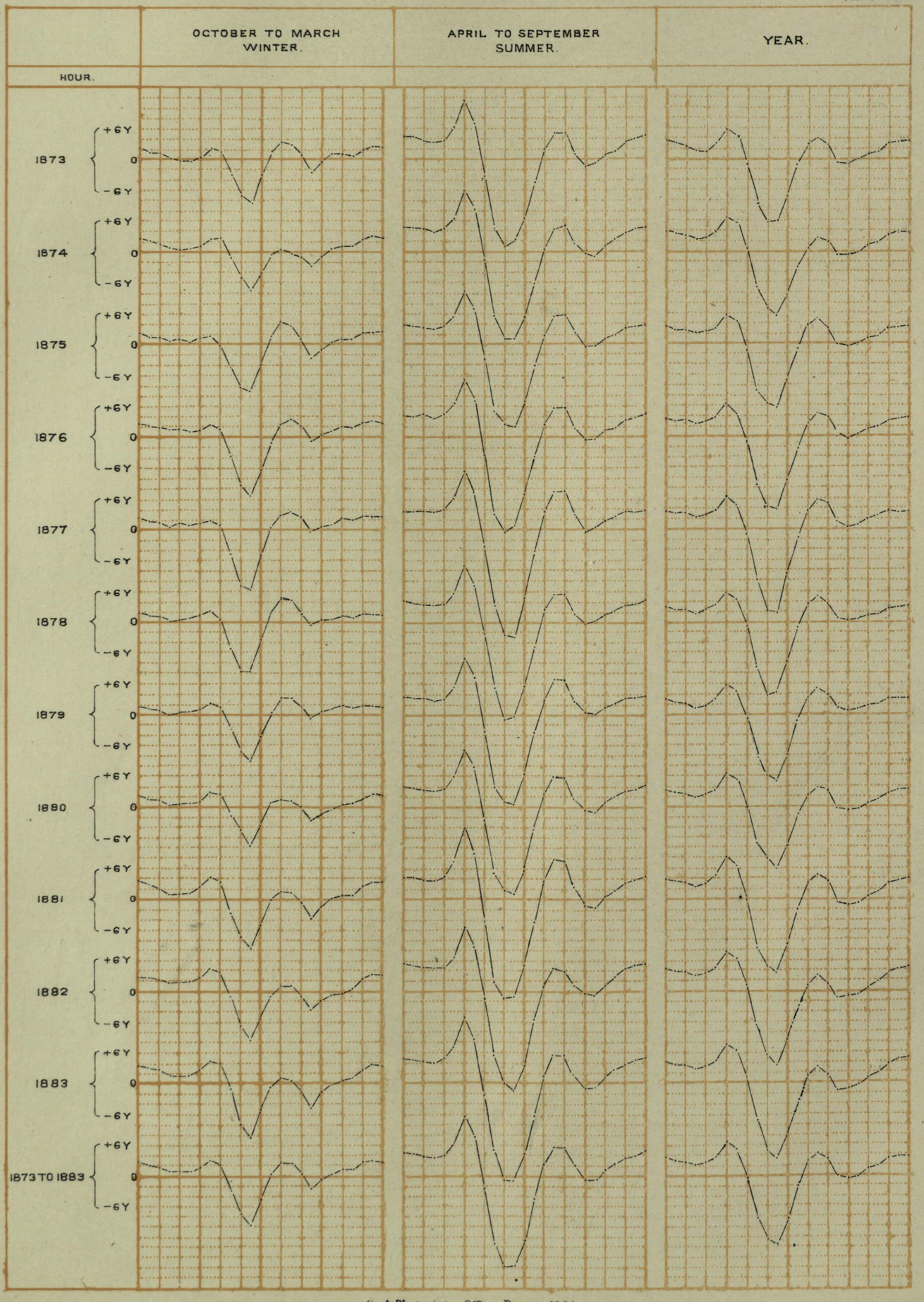
Govt. Photozincn. Office, Poona, 1909.

COLABA OBSERVATORY

Vertical Force Diurnal Inequality.

(Magnetograph No 1)

Plate 52.



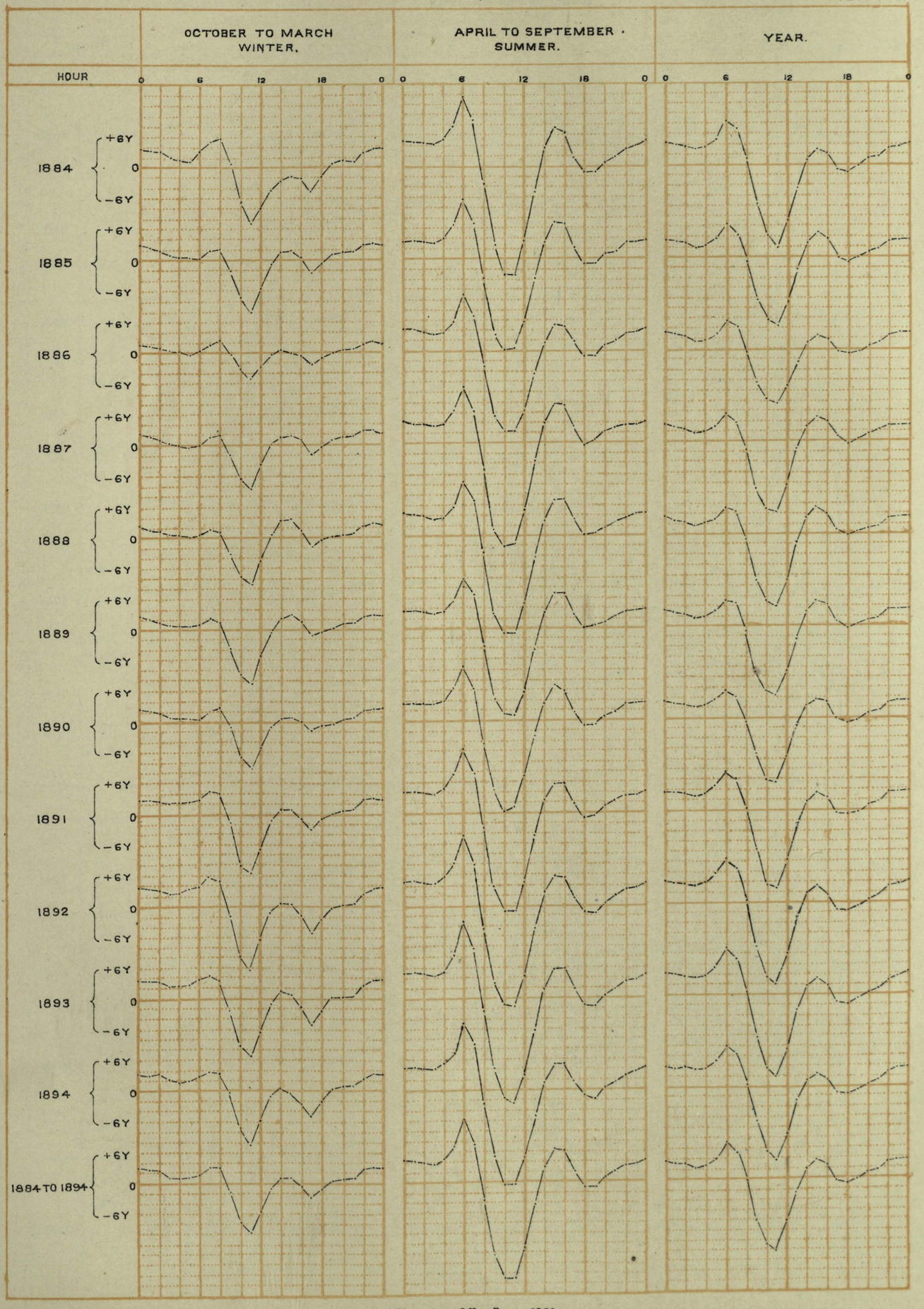
Govt Photozinco Office, Poona, 1909

COLABA OBSERVATORY

Vertical Force Diurnal Inequality

(Magnetograph No 1)

Plate 53.



Govt. Photozinco. Office. Poona, 1909.

COLABA OBSERVATORY.

Vertical Force Diurnal Inequality.

(Magnetograph No. 2.)

Plate 54.

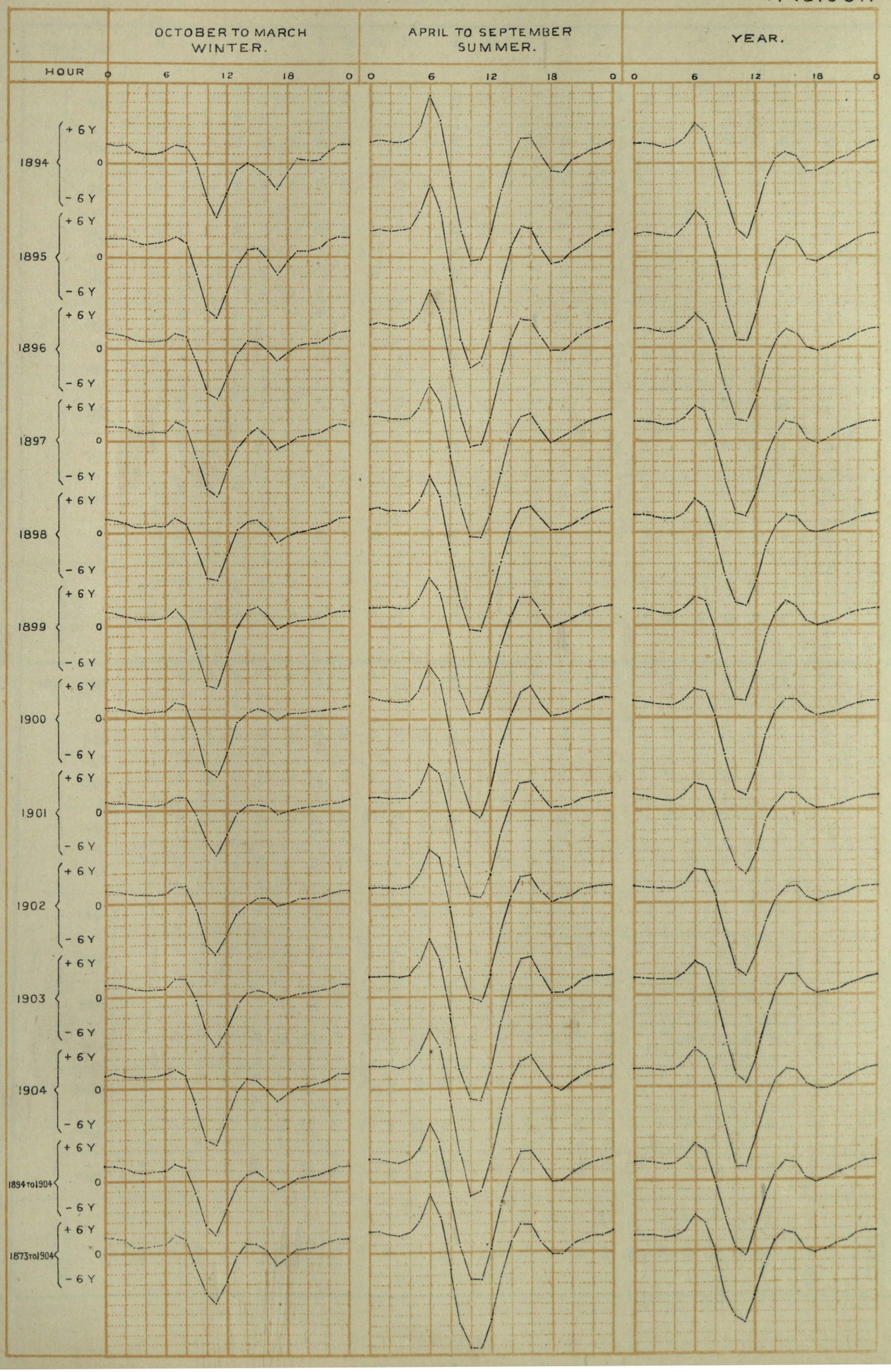


TABLE 331.—*Vertical Force Magnetograph No. 1—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—April to September—for each of the years 1884 to 1894 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

April to September.	Year.											(Mean) 1884 to 1894.
	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	
H. m.												
0 17	+ 48	+ 37	+ 42	+ 42	+ 45	+ 37	+ 38	+ 43	+ 46	+ 47	+ 44	+ 43
1 17	+ 46	+ 38	+ 41	+ 39	+ 41	+ 36	+ 37	+ 42	+ 49	+ 48	+ 45	+ 42
2 17	+ 45	+ 36	+ 38	+ 39	+ 40	+ 32	+ 36	+ 41	+ 47	+ 46	+ 42	+ 40
3 17	+ 43	+ 33	+ 33	+ 35	+ 33	+ 29	+ 35	+ 39	+ 46	+ 45	+ 42	+ 38
4 17	+ 52	+ 40	+ 36	+ 39	+ 37	+ 32	+ 40	+ 46	+ 55	+ 52	+ 51	+ 44
5 17	+ 79	+ 65	+ 57	+ 64	+ 57	+ 54	+ 65	+ 74	+ 83	+ 83	+ 76	+ 69
6 17	**+139**	**+119**	**+108**	**+111**	**+105**	**+ 99**	**+106**	**+123**	**+137**	**+147**	**+135**	**+121**
7 17	+ 89	+ 68	+ 68	+ 64	+ 68	+ 66	+ 62	+ 78	+ 80	+ 96	+ 88	+ 75
8 17	− 36	− 38	− 32	− 53	− 37	− 37	− 41	− 31	− 43	− 23	− 24	− 36
9 17	−153	−146	+127	−166	−152	−139	−135	−140	−149	−137	−132	−143
10 17	−212	**−179**	−158	**−201**	**−193**	−169	**−178**	**−193**	−193	−196	−183	−187
11 17	**−213**	−176	**−159**	−196	−193	**−174**	−169	−193	**−197**	**−207**	**−183**	**−187**
12 17	−145	−121	−117	−132	−134	−124	−112	−132	−138	−149	−134	−131
13 17	− 49	− 38	− 45	− 36	− 42	− 42	− 30	− 44	− 45	− 62	− 52	− 44
14 17	+ 37	+ 36	+ 17	+ 40	+ 32	+ 32	+ 35	+ 23	+ 28	+ 15	+ 14	+ 28
15 17	+ 74	+ 71	+ 48	+ 78	+ 66	+ 68	+ 67	+ 56	+ 58	+ 58	+ 49	+ 63
16 17	+ 65	+ 68	+ 46	+ 76	+ 66	+ 66	+ 59	+ 57	+ 54	+ 59	+ 51	+ 61
17 17	+ 19	+ 21	+ 18	+ 34	+ 31	+ 27	+ 15	+ 19	+ 16	+ 20	+ 18	+ 22
18 17	− 14	− 11	− 6	− 4	+ 2	0	− 13	− 9	− 14	− 14	− 12	− 9
19 17	− 13	− 10	− 7	+ 5	+ 4	+ 2	− 9	− 7	− 16	− 16	− 18	− 8
20 17	+ 7	+ 9	+ 9	+ 21	+ 19	+ 14	+ 7	+ 12	+ 4	+ 5	+ 5	+ 10
21 17	+ 19	+ 17	+ 20	+ 29	+ 27	+ 24	+ 18	+ 23	+ 19	+ 16	+ 17	+ 21
22 17	+ 35	+ 31	+ 32	+ 36	+ 38	+ 34	+ 32	+ 35	+ 33	+ 31	+ 29	+ 33
23 17	+ 40	+ 32	+ 37	+ 38	+ 42	+ 35	+ 35	+ 36	+ 38	+ 38	+ 37	+ 37
Range ...	352	298	267	312	298	273	284	316	334	354	318	308
Average progressive increase per day ...	+ 1	− 3	− 2	− 1	− 1	− 1	− 4	− 4	− 2	− 5	− 1	− 2

TABLE 332.—*Vertical Force Magnetograph No. 1—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—January to March and October to December—for each of the years 1884 to 1894 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S. Unit.

October to March.	Year.											(Mean) 1884 to 1894.
	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	
H. m.												
0 17	+ 38	+ 29	+ 19	+ 24	+ 24	+ 27	+ 26	+ 30	+ 35	+ 38	+ 35	+ 30
1 17	+ 35	+ 24	+ 17	+ 18	+ 19	+ 23	+ 23	+ 30	+ 33	+ 36	+ 32	+ 26
2 17	+ 31	+ 20	+ 11	+ 11	+ 14	+ 18	+ 20	+ 27	+ 31	+ 32	+ 34	+ 23
3 17	+ 21	+ 9	+ 3	+ 4	+ 5	+ 10	+ 12	+ 21	+ 26	+ 24	+ 22	+ 14
4 17	+ 19	+ 7	+ 1	0	+ 4	+ 8	+ 10	+ 21	+ 26	+ 25	+ 19	+ 13
5 17	+ 18	+ 6	− 1	− 2	+ 1	+ 8	+ 9	+ 23	+ 32	+ 26	+ 20	+ 13
6 17	+ 31	+ 5	+ 3	0	+ 3	+ 9	+ 8	+ 28	+ 39	+ 35	+ 26	+ 17
7 17	+ 53	+ 20	+ 17	+ 16	+ 16	+ 22	+ 21	**+ 43**	**+ 57**	**+ 43**	**+ 38**	**+ 31**
8 17	**+ 60**	+ 21	**+ 23**	+ 20	+ 14	+ 19	**+ 28**	+ 41	+ 49	+ 34	+ 35	+ 31
9 17	+ 7	− 20	− 1	− 19	− 33	− 36	− 9	− 15	− 16	− 21	− 4	− 15
10 17	− 66	− 72	− 31	− 63	− 75	− 87	− 69	−101	− 98	− 93	− 73	− 75
11 17	**−109**	**−100**	**− 52**	**− 83**	**− 90**	**−103**	**− 92**	**−117**	**−122**	**−114**	**−103**	**− 99**
12 17	− 78	− 58	− 27	− 37	− 45	− 54	− 48	− 69	− 64	− 63	− 57	− 55
13 17	− 42	− 8	− 4	+ 1	+ 5	− 6	− 6	− 14	− 14	− 6	− 11	− 10
14 17	− 26	+ 17	+ 4	+ 15	+ 35	+ 24	+ 8	+ 10	+ 6	+ 14	+ 5	+ 10
15 13	− 18	+ 20	− 1	+ 16	**+ 38**	**+ 31**	+ 10	+ 8	+ 4	+ 6	− 5	+ 10
16 17	− 20	+ 6	− 6	+ 7	+ 16	+ 18	+ 3	− 9	− 16	− 18	− 25	− 4
17 17	− 43	− 24	− 21	− 16	− 16	− 13	− 16	− 31	− 51	− 52	− 48	− 30
18 17	− 18	− 7	− 10	− 2	− 4	− 5	− 6	− 9	− 21	− 25	− 20	− 12
19 17	+ 8	+ 11	0	+ 6	+ 1	+ 4	− 1	+ 1	− 2	+ 3	+ 4	+ 3
20 17	+ 16	+ 17	+ 5	+ 13	+ 6	+ 12	+ 6	+ 7	+ 1	+ 2	+ 7	+ 8
21 17	+ 14	+ 18	+ 8	+ 16	+ 11	+ 15	+ 11	+ 13	+ 5	+ 5	+ 8	+ 11
22 17	+ 30	+ 29	+ 18	+ 26	+ 23	+ 26	+ 24	+ 30	+ 27	+ 26	+ 25	+ 26
23 17	+ 38	**+ 31**	+ 21	**+ 28**	+ 27	+ 29	+ 26	+ 32	+ 33	+ 37	+ 36	+ 31
Range ...	169	131	75	111	128	134	120	160	179	157	141	130
Average progressive increase per day ...	− 5	− 3	+ 1	− 4	− 1	0	0	0	− 1	− 2	+ 1	− 1

TABLE 333.—*Vertical Force Magnetograph No. 2—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—April to September—for each of the years 1894 to 1904 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S. Unit.

April to September. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904.	(Mean) 1873—1904.
H. m.													
0 16	+ 45	+ 51	+ 50	+ 48	+ 46	+ 39	+ 42	+ 33	+ 37	+ 40	+ 42	+ 43	+ 43
1 16	+ 46	+ 53	+ 51	+ 47	+ 50	+ 37	+ 40	+ 31	+ 37	+ 39	+ 42	+ 43	+ 42
2 16	+ 43	+ 50	+ 46	+ 44	+ 42	+ 36	+ 37	+ 28	+ 35	+ 39	+ 43	+ 40	+ 39
3 16	+ 43	+ 51	+ 44	+ 41	+ 42	+ 32	+ 35	+ 27	+ 34	+ 38	+ 41	+ 39	+ 37
4 16	+ 51	+ 55	+ 47	+ 42	+ 43	+ 34	+ 37	+ 28	+ 37	+ 41	+ 46	+ 42	+ 42
5 16	+ 77	+ 86	+ 69	+ 65	+ 64	+ 55	+ 57	+ 46	+ 58	+ 68	+ 72	+ 65	+ 65
6 16	**+135**	**141**	**+112**	**+110**	**+111**	**+ 93**	**+101**	**+ 91**	**+105**	**+112**	**+117**	**+112**	**+116**
7 16	+ 86	+ 89	+ 67	+ 76	+ 74	+ 65	+ 75	+ 72	+ 89	+ 72	+ 81	+ 77	+ 76
8 16	- 27	- 38	- 37	- 22	- 30	- 28	- 22	- 13	- 5	- 34	- 21	- 25	- 30
9 16	- 132	- 161	- 138	- 124	- 130	- 124	- 115	- 108	- 115	- 141	- 127	- 129	- 136
10 16	**- 187**	**- 219**	**- 193**	- 188	- 186	**- 170**	- 180	- 162	- 181	- 200	**- 208**	- 189	- 185
11 16	- 186	- 207	- 190	**- 189**	**- 190**	- 169	**- 192**	**- 170**	**- 192**	**- 204**	- 199	**- 190**	**- 185**
12 16	- 136	- 148	- 137	- 144	- 140	- 118	- 140	- 126	- 140	- 143	- 138	- 137	- 131
13 16	- 53	- 52	- 55	- 61	- 58	- 43	- 58	- 46	- 56	- 54	- 53	- 54	- 48
14 16	+ 13	+ 20	+ 19	+ 8	+ 6	+ 19	+ 7	+ 17	+ 13	+ 22	+ 15	+ 14	+ 21
15 16	+ 51	+ 60	+ 58	+ 45	+ 44	+ 56	+ 52	+ 54	+ 48	+ 68	+ 53	+ 54	+ 58
16 16	+ 51	+ 57	+ 53	+ 48	+ 51	+ 55	+ 61	+ 59	+ 52	+ 73	+ 62	+ 57	+ 58
17 16	+ 18	+ 20	+ 23	+ 22	+ 27	+ 27	+ 33	+ 29	+ 22	+ 38	+ 31	+ 26	+ 22
18 16	- 12	- 12	- 2	- 1	+ 3	- 2	+ 3	+ 3	+ 1	+ 5	+ 1	- 1	- 5
19 16	- 16	- 10	- 4	+ 3	+ 4	+ 2	+ 6	+ 5	+ 6	+ 4	- 4	0	- 5
20 16	+ 5	+ 8	+ 10	+ 16	+ 15	+ 12	+ 15	+ 13	+ 16	+ 15	+ 8	+ 12	+ 11
21 16	+ 16	+ 23	+ 25	+ 28	+ 29	+ 24	+ 28	+ 23	+ 26	+ 27	+ 21	+ 25	+ 23
22 16	+ 30	+ 36	+ 36	+ 39	+ 39	+ 32	+ 36	+ 29	+ 34	+ 35	+ 33	+ 34	+ 34
23 16	+ 39	+ 46	+ 45	+ 45	+ 44	+ 36	+ 41	+ 31	+ 36	+ 36	+ 38	+ 40	+ 38
Range ...	322	360	305	299	301	263	293	261	297	316	325	302	301
Average progressive increase per day.	- 3	- 5	- 1	- 1	0	- 2	+ 1	+ 1	0	+ 2	+ 1	- 1	- 3

TABLE 334.—*Vertical Force Magnetograph No. 2—Showing the Mean Diurnal Inequality of Vertical Force for the half-year—January to March and October to December—for each of the years 1894 to 1904 and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S. Unit.

October to March. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904.	(Mean) 1873—1904.
H. m.													
0 16	+ 38	+ 36	+ 30	+ 29	**+ 26**	+ 27	+ 25	+ 20	+ 23	+ 23	+ 29	+ 28	+ 28
1 16	+ 35	+ 35	+ 29	+ 27	+ 22	+ 24	+ 24	+ 17	+ 22	+ 23	+ 31	+ 26	+ 24
2 16	+ 35	+ 34	+ 24	+ 24	+ 20	+ 20	+ 20	+ 15	+ 20	+ 21	+ 28	+ 24	+ 21
3 16	+ 23	+ 28	+ 18	+ 18	+ 14	+ 16	+ 17	+ 12	+ 17	+ 15	+ 23	+ 18	+ 13
4 16	+ 19	+ 22	+ 15	+ 18	+ 12	+ 13	+ 15	+ 10	+ 16	+ 14	+ 24	+ 16	+ 12
5 16	+ 19	+ 24	+ 16	+ 18	+ 15	+ 15	+ 17	+ 9	+ 17	+ 15	+ 24	+ 17	+ 13
6 16	+ 25	+ 27	+ 18	+ 16	+ 14	+ 18	+ 16	+ 12	+ 19	+ 18	+ 29	+ 19	+ 17
7 16	+ 37	**+ 39**	+ 27	**+ 35**	+ 26	+ 32	**+ 32**	**+ 23**	+ 30	**+ 33**	**+ 38**	**+ 32**	**+ 30**
8 16	+ 33	+ 25	+ 23	+ 24	+ 18	+ 8	+ 25	+ 22	**+ 31**	+ 32	+ 26	+ 24	+ 25
9 16	0	- 36	- 21	- 32	- 31	- 54	- 32	- 10	- 14	- 12	- 30	- 25	- 23
10 16	- 71	- 103	- 87	- 94	- 88	- 115	- 99	- 60	- 82	- 73	- 104	- 89	- 80
11 16	**- 103**	**- 120**	**- 99**	**- 106**	**- 92**	**- 120**	**- 114**	**- 86**	**- 101**	**- 100**	**- 115**	**- 105**	**- 100**
12 16	- 59	- 70	- 56	- 59	- 43	- 60	- 65	- 46	- 63	- 67	- 61	- 59	- 53
13 16	- 13	- 18	- 7	- 13	+ 4	- 2	- 11	- 2	- 21	- 19	- 5	- 10	- 6
14 16	0	+ 12	+ 16	+ 11	+ 20	+ 32	+ 14	+ 9	- 2	+ 4	+ 18	+ 12	+ 15
15 16	- 9	+ 17	+ 15	+ 22	+ 23	**+ 39**	+ 19	+ 11	+ 8	+ 10	+ 17	+ 16	+ 16
16 16	- 27	- 6	- 5	+ 7	+ 5	+ 20	+ 11	+ 5	+ 9	+ 6	- 2	+ 2	+ 1
17 16	- 49	- 38	- 23	- 19	- 19	- 6	- 2	- 5	- 3	- 5	- 23	- 17	- 24
18 16	- 19	- 11	- 8	- 5	- 6	+ 3	+ 4	0	0	- 1	- 10	- 5	- 8
19 16	+ 8	+ 10	+ 4	+ 5	0	+ 9	+ 9	+ 3	+ 7	+ 3	+ 1	+ 5	+ 4
20 16	+ 5	+ 9	+ 7	+ 9	+ 4	+ 13	+ 12	+ 6	+ 11	+ 7	+ 3	+ 8	+ 9
21 16	+ 7	+ 16	+ 12	+ 14	+ 11	+ 18	+ 18	+ 10	+ 13	+ 12	+ 10	+ 13	+ 12
22 16	+ 25	+ 30	+ 23	+ 22	+ 19	+ 22	+ 21	+ 15	+ 19	+ 18	+ 20	+ 21	+ 23
23 16	**+ 38**	+ 37	**+ 30**	+ 30	+ 24	+ 26	+ 23	+ 19	+ 22	+ 23	+ 29	+ 27	+ 28
Range ...	141	159	129	141	118	159	146	109	132	133	153	137	130
Average progressive increase per day.	- 2	- 1	- 1	+ 1	+ 1	+ 2	+ 1	+ 1	0	+ 1	+ 1	+ 1	- 1

TABLE 335.—*Vertical Force Magnetograph No. 1—Showing for the period 1873 to 1883 the mean Diurnal Inequality of Vertical Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1873 to 1883. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	+ 24	+ 22	+ 28	+ 41	+ 39	+ 39	+ 38	+ 43	+ 56	+ 40	+ 22	+ 14	+ 34
1 17	+ 18	+ 21	+ 21	+ 40	+ 37	+ 35	+ 36	+ 43	+ 55	+ 34	+ 18	+ 7	+ 29
2 17	+ 15	+ 16	+ 16	+ 33	+ 35	+ 32	+ 35	+ 44	+ 52	+ 32	+ 13	+ 6	+ 27
3 17	+ 7	+ 7	+ 11	+ 27	+ 30	+ 26	+ 33	+ 41	+ 50	+ 24	+ 4	− 1	+ 21
4 17	+ 3	+ 5	+ 9	+ 24	+ 34	+ 34	+ 39	+ 47	+ 56	+ 26	+ 6	+ 1	+ 24
5 17	+ 2	0	+ 10	+ 33	+ 63	+ 63	+ 68	+ 74	+ 71	+ 32	+ 5	− 1	+ 35
6 17	+ 3	+ 5	+ 28	+ **89**	**+109**	**+106**	**+114**	**+137**	**+140**	+ **65**	− 8	− 8	+ **65**
7 17	+ 21	+ 18	+ 50	+ 63	+ 61	+ 76	+ 74	+ 85	+ 94	+ 56	+ 19	+ 4	+ 51
8 17	+ **53**	+ 23	+ 15	− 23	− 41	− 6	− 9	− 37	− 56	− 24	+ 19	+ **37**	− 3
9 17	+ 14	− 20	− 49	− 114	− 154	− 105	− 108	− 156	− 185	− 114	− 26	+ 13	− 85
10 17	− 78	− 55	− 73	− 159	**−175**	− 151	− 155	**−194**	**−244**	**−156**	− **69**	− 35	− 128
11 17	**−118**	− **82**	**−112**	**−166**	− 168	**−169**	− **158**	− 177	− 240	− 151	− 60	− **48**	**−137**
12 17	− 65	− 41	− 93	− 114	− 117	− 130	− 117	− 123	− 159	− 66	+ 2	− 9	− 85
13 17	− 18	+ 4	− 16	− 27	− 36	− 58	− 58	− 57	− 45	+ 17	+ 24	+ 5	− 22
14 17	− 2	+ **24**	+ 54	+ 37	+ 30	+ 2	+ 1	+ 8	+ 52	+ 58	+ 10	0	+ 24
15 17	+ 15	+ 23	+ **60**	+ 62	+ 63	+ 40	+ 40	+ 50	+ 84	+ 49	− 4	− 5	+ 40
16 17	+ 17	+ 5	+ 18	+ 48	+ 61	+ 47	+ 50	+ 66	+ 63	+ 1	− 14	0	+ 29
17 17	− 10	− 26	− 29	+ 4	+ 25	+ 27	+ 29	+ 29	+ 2	− 40	− 25	− 13	− 2
18 17	+ 8	− 12	− 23	− 18	− 5	− 2	− 4	− 7	− 5	− 5	− 1	− 2	− 6
19 17	+ 15	+ 4	+ 1	− 5	− 5	− 11	− 26	− 8	+ 9	+ 7	+ 1	+ 3	− 1
20 17	+ 17	+ 8	+ 10	+ 13	+ 14	+ 9	0	+ 8	+ 22	+ 17	+ 4	+ 2	+ 10
21 17	+ 17	+ 7	+ 11	+ 24	+ 24	+ 18	+ 13	+ 19	+ 30	+ 19	+ 10	+ 3	+ 16
22 17	+ 23	+ 18	+ 21	+ 34	+ 37	+ 34	+ 30	+ 32	+ 42	+ 36	+ 24	+ 12	+ 29
23 17	+ 23	+ 23	+ 29	+ 37	+ 37	+ 35	+ 31	+ 36	+ 50	+ 39	+ **25**	+ 21	+ 32
Range ...	171	106	172	255	284	275	272	331	384	221	94	85	202
Average progressive increase per day.	+ 2	− 2	− 12	− 12	− 12	− 3	− 1	− 2	− 2	+ 1	0	0	− 4

TABLE 336.—*Vertical Force Magnetograph No. 1—Showing for the period 1884 to 1894 the mean Diurnal Inequality of Vertical Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1884 to 1894. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	+ 27	+ 27	+ 38	+ 48	+ 39	+ 36	+ 35	+ 40	+ 56	+ 43	+ 24	+ 20	+ 36
1 17	+ 25	+ 26	+ 33	+ 45	+ 39	+ 34	+ 36	+ 42	+ 57	+ 40	+ 20	+ 16	+ 33
2 17	+ 21	+ 21	+ 26	+ 39	+ 36	+ 33	+ 37	+ 45	+ 54	+ 38	+ 16	+ 13	+ 32
3 17	+ 12	+ 11	+ 19	+ 32	+ 33	+ 29	+ 35	+ 43	+ 52	+ 30	+ 7	+ 7	+ 25
4 17	+ 9	+ 8	+ 17	+ 30	+ 40	+ 40	+ 44	+ 52	+ 58	+ 30	+ 6	+ 5	+ 28
5 17	+ 7	+ 5	+ 20	+ 41	+ 68	+ 71	+ 74	+ 83	+ 76	+ 36	+ 5	+ 2	+ 40
6 17	+ 10	+ 8	+ 40	+ **98**	**+111**	**+110**	**+119**	**+144**	**+143**	+ 66	− 12	− 9	+ **69**
7 17	+ 28	+ 18	+ **58**	+ 66	+ 56	+ 73	+ 77	+ 84	+ 94	+ **68**	+ 16	+ 3	+ 52
8 17	+ **72**	+ **29**	+ 18	− 32	− 51	− 15	− 11	− 51	− 54	− 3	+ **26**	+ **47**	− 3
9 17	+ 38	− 4	− 57	− 132	− 162	− 112	− 103	− 170	− 184	− 97	− 7	+ 33	− 81
10 17	− 79	− 51	− 101	− 178	− **186**	− 155	− 158	**−205**	− 242	− 156	− **50**	− 15	− 131
11 17	**−119**	− **84**	**−138**	**−186**	− 168	**−171**	**−166**	− 188	− **247**	**−167**	− 48	− **37**	**−142**
12 17	− 66	− 42	− 116	− 129	− 113	− 129	− 125	− 126	− 161	− 88	+ 3	− 18	− 84
13 17	− 26	+ 3	− 37	− 39	− 25	− 53	− 58	− 47	− 43	− 4	+ 21	− 15	− 27
14 17	− 16	+ 14	+ 45	+ 35	+ 42	+ 9	+ 3	+ 25	+ 57	+ 44	+ 3	− 29	+ 20
15 17	− 1	+ 10	+ 58	+ 67	+ 68	+ 46	+ 42	+ 66	+ 87	+ 42	− 14	− 31	+ 37
16 17	+ 1	− 7	+ 17	+ 56	+ 64	+ 53	+ 51	+ 74	+ 64	+ 2	− 23	− 15	+ 27
17 17	− 22	− 36	− 28	+ 11	+ 26	+ 32	+ 29	+ 36	− 2	− 40	− 34	− 22	− 3
18 17	− 6	− 18	− 21	− 12	− 7	− 2	− 6	− 18	− 9	− 9	− 8	− 8	− 10
19 17	+ 9	+ 3	+ 6	+ 4	− 9	− 12	− 28	− 10	+ 8	+ 6	− 3	− 1	− 2
20 17	+ 12	+ 7	+ 15	+ 20	+ 11	+ 5	− 3	+ 4	+ 20	+ 13	− 1	+ 1	+ 9
21 17	+ 14	+ 6	+ 19	+ 31	+ 21	+ 17	+ 10	+ 15	+ 28	+ 20	+ 4	+ 5	+ 16
22 17	+ 24	+ 20	+ 32	+ 42	+ 35	+ 30	+ 25	+ 28	+ 41	+ 39	+ 21	+ 16	+ 29
23 17	+ 26	+ 27	+ 39	+ 45	+ 37	+ 31	+ 28	+ 33	+ 47	+ 43	+ 24	+ 27	+ 34
Range ...	191	113	196	284	297	281	285	349	390	235	76	84	211
Average progressive increase per day.	+ 4	− 4	− 13	− 13	− 10	− 1	+ 6	+ 2	+ 2	− 1	+ 3	+ 4	− 2

TABLE 337.—*Vertical Force Magnetograph No. 2—Showing for the period 1894 to 1904 the mean Diurnal Inequality of Vertical Force for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1894-1904.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H m.													
0 16	+ 26	+ 24	+ 32	+ 45	+ 41	+ 40	+ 36	+ 40	+ 54	+ 39	+ 26	+ 20	+ 35
1 16	+ 24	+ 23	+ 29	+ 43	+ 40	+ 39	+ 36	+ 42	+ 58	+ 39	+ 24	+ 18	+ 35
2 16	+ 21	+ 21	+ 25	+ 37	+ 36	+ 36	+ 35	+ 43	+ 55	+ 37	+ 23	+ 15	+ 32
3 16	+ 16	+ 15	+ 20	+ 31	+ 35	+ 35	+ 36	+ 43	+ 54	+ 32	+ 18	+ 10	+ 29
4 16	+ 13	+ 11	+ 19	+ 29	+ 38	+ 40	+ 40	+ 47	+ 57	+ 32	+ 15	+ 10	+ 29
5 16	+ 10	+ 8	+ 22	+ 41	+ 64	+ 72	+ 68	+ 74	+ 74	+ 39	+ 16	+ 9	+ 41
6 16	+ 13	+ 8	+ 35	**+ 91**	**+111**	**+106**	**+109**	**+121**	**+133**	+ 62	0	− 1	**+ 66**
7 16	+ 27	+ 21	**+ 57**	+ 69	+ 72	+ 70	+ 79	+ 81	+ 92	**+ 63**	+ 18	+ 6	+ 55
8 16	**+ 61**	+ 25	+ 23	− 15	− 30	− 7	− 7	− 39	− 55	− 6	+ 13	**+ 30**	− 1
9 16	+ 15	− 10	− 40	− 105	− 144	− 95	− 96	− 151	− 182	− 96	− 31	+ 14	− 77
10 16	− 93	− 65	− 100	− 168	**− 192**	− 15	− 158	**− 198**	− 248	− 161	**− 77**	− 37	− 138
11 16	**− 118**	**− 91**	**− 138**	**− 184**	− 179	**− 185**	**− 163**	− 177	**− 252**	**− 164**	− 65	**− 55**	**− 148**
12 16	− 67	− 52	− 112	− 132	− 131	− 142	− 127	− 123	− 170	− 88	− 7	− 29	− 98
13 16	− 23	− 4	− 36	− 48	− 46	− 69	− 63	− 49	− 46	− 3	+ 18	− 11	− 32
14 16	− 13	+ 18	+ 37	+ 18	+ 16	− 8	− 2	+ 15	+ 48	+ 42	+ 3	− 14	+ 13
15 16	+ 7	+ 16	+ 50	+ 51	+ 52	+ 38	+ 38	+ 55	+ 86	+ 43	− 11	− 11	+ 34
16 16	+ 6	0	+ 18	+ 49	+ 56	+ 52	+ 51	+ 65	+ 67	+ 8	− 18	− 3	+ 29
17 16	− 12	− 22	− 16	+ 17	+ 32	+ 33	+ 32	+ 32	+ 12	− 25	− 19	− 10	+ 4
18 16	+ 4	− 9	− 12	− 2	+ 1	+ 5	− 1	− 10	0	− 6	− 4	− 2	− 3
19 16	+ 12	+ 7	+ 4	+ 2	+ 1	0	− 13	− 5	+ 12	+ .6	+ 1	+ 3	+ 2
20 16	+ 13	+ 6	+ 12	+ 16	+ 15	+ 12	+ 2	+ 5	+ 23	+ 12	+ 3	+ 3	+ 10
21 16	+ 16	+ 10	+ 16	+ 29	+ 28	+ 24	+ 15	+ 20	+ 33	+ 20	+ 9	+ 7	+ 19
22 16	+ 20	+ 17	+ 24	+ 38	+ 37	+ 35	+ 26	+ 29	+ 43	+ 33	+ 21	+ 14	+ 28
23 16	+ 25	**+ 25**	+ 30	+ 43	+ 40	+ 38	+ 31	+ 36	+ 50	+ 40	**+ 26**	+ 19	+ 34
Range ...	179	116	195	275	303	291	272	319	385	227	103	85	214
Average progressive increase per day.	+ 2	0	− 4	− 5	− 3	+ 1	+ 3	+ 1	0	0	+ 2	+ 2	0

TABLE 338.—*Vertical Force Magnetographs Nos. 1 and 2—Showing the mean Diurnal Inequality of Vertical Force for each average month of the intermediate sun-spot years, 1874, 1875, 1880, 1881, 1882, 1885, 1886, 1890, 1891, 1895, 1896, 1897, 1898, 1903 and 1904 and for the average year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	+ 25	+ 24	+ 32	+ 45	+ 41	+ 40	+ 36	+ 44	+ 56	+ 41	+ 24	+ 18	+ 35
1 17	+ 22	+ 25	+ 28	+ 43	+ 40	+ 37	+ 37	+ 46	+ 59	+ 38	+ 20	+ 14	+ 33
2 17	+ 19	+ 21	+ 23	+ 36	+ 38	+ 33	+ 37	+ 47	+ 55	+ 36	+ 17	+ 11	+ 31
3 17	+ 12	+ 13	+ 16	+ 31	+ 34	+ 31	+ 35	+ 44	+ 53	+ 29	+ 10	+ 5	+ 26
4 17	+ 9	+ 10	+ 16	+ 30	+ 40	+ 38	+ 39	+ 50	+ 57	+ 30	+ 9	+ 4	+ 28
5 17	+ 7	+ 6	+ 18	+ 40	+ 69	+ 68	+ 70	+ 77	+ 74	+ 37	+ 8	+ 2	+ 39
6 17	+ 9	+ 8	+ 33	**+ 95**	**+114**	**+109**	**+113**	**+133**	**+139**	**+ 66**	− 8	− 9	**+ 66**
7 17	+ 23	+ 20	**+ 57**	+ 66	+ 66	+ 73	+ 75	+ 84	+ 90	+ 61	+ 18	+ 2	+ 52
8 17	**+ 56**	**+ 30**	+ 22	− 24	− 39	− 10	− 7	− 44	− 59	− 12	+ 21	**+ 36**	− 3
9 17	+ 16	− 4	− 42	− 117	− 153	− 102	− 98	− 161	− 187	− 101	− 24	+ 22	− 80
10 17	− 84	− 52	+ 80	− 166	**− 187**	− 156	− 155	**− 201**	**− 244**	− 153	**− 65**	− 24	− 131
11 17	**− 113**	**− 84**	**− 119**	**− 174**	− 177	**− 175**	**− 156**	− 181	− 243	**− 156**	− 59	**− 41**	**− 139**
12 17	− 63	− 49	− 103	− 121	− 126	− 134	− 120	− 126	− 161	− 79	− 3	− 15	− 92
13 17	− 18	− 5	− 33	− 37	− 41	− 63	− 61	− 52	− 42	+ 5	+ 21	− 3	− 27
14 17	− 7	+ 10	+ 37	+ 27	+ 24	− 1	0	+ 13	+ 53	+ 47	+ 8	− 13	+ 17
15 17	+ 8	+ 9	+ 49	+ 57	+ 59	+ 42	+ 39	+ 53	+ 86	+ 43	− 4	− 16	+ 35
16 17	+ 6	− 4	+ 13	+ 48	+ 60	+ 53	+ 49	+ 63	+ 63	+ 1	− 17	− 8	+ 27
17 17	− 15	− 27	− 28	+ 8	+ 29	+ 33	+ 29	+ 31	+ 3	− 37	− 27	− 17	− 2
18 17	+ 2	− 14	− 22	− 12	− 4	+ 2	− 5	− 8	− 5	− 10	− 6	− 6	− 7
19 17	+ 11	+ 4	+ 1	− 2	− 6	− 9	− 25	− 7	+ 10	+ 4	− 3	0	− 2
20 17	+ 13	+ 5	+ 9	+ 14	+ 13	+ 7	− 3	+ 6	+ 22	+ 11	+ 1	0	+ 9
21 17	+ 17	+ 6	+ 14	+ 27	+ 25	+ 19	+ 11	+ 20	+ 31	+ 18	+ 8	+ 4	+ 17
22 17	+ 22	+ 18	+ 25	+ 38	+ 38	+ 33	+ 25	+ 33	+ 43	+ 36	+ 23	+ 13	+ 29
23 17	+ 24	+ 25	+ 32	+ 42	+ 40	+ 35	+ 30	+ 38	+ 51	+ 40	**+ 25**	+ 22	+ 34
Range ...	169	114	176	269	301	284	269	334	383	222	90	77	205
Average progressive increase per day.	+ 3	− 1	− 9	− 9	− 10	− 3	+ 2	− 2	− 1	− 2	0	+ 1	− 2

TABLE 339.—*Vertical Force Magnetographs Nos. 1 and 2—Showing the mean Diurnal Inequality of Vertical Force for each average month of maximum sun-spot years—1873, 1883, 1884, 1892, 1893 and 1894 and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	+ 29	+ 32	+ 39	+ 47	+ 41	+ 40	+ 41	+ 46	+ 62	+ 49	+ 32	+ 26	+ 41
1 17	+ 28	+ 28	+ 34	+ 46	+ 42	+ 37	+ 43	+ 48	+ 63	+ 45	+ 29	+ 23	+ 38
2 17	+ 25	+ 26	+ 27	+ 37	+ 38	+ 36	+ 41	+ 50	+ 60	+ 44	+ 26	+ 20	+ 35
3 17	+ 16	+ 15	+ 23	+ 32	+ 36	+ 32	+ 40	+ 49	+ 58	+ 34	+ 14	+ 13	+ 30
4 17	+ 9	+ 10	+ 21	+ 30	+ 41	+ 46	+ 53	+ 58	+ 65	+ 34	+ 15	+ 12	+ 32
5 17	+ 10	+ 8	+ 26	+ 45	+ 69	+ 81	+ 82	+ 91	+ 86	+ 41	+ 13	+ 9	+ 46
6 17	+ 16	+ 14	+ 51	**+109**	**+121**	**+125**	**+131**	**+159**	**+157**	**+ 78**	− 1	+ 1	**+ 80**
7 17	+ 39	+ 32	**+ 71**	+ 82	+ 65	+ 81	+ 81	+ 94	+101	+ 73	+ 29	+ 14	+ 63
8 17	**+ 76**	**+ 41**	+ 29	− 13	− 44	− 9	− 18	− 46	− 54	− 2	**+ 35**	**+ 57**	+ 3
9 17	+ 39	+ 3	− 53	−114	−157	−113	−119	−163	−178	− 97	− 3	+ 35	− 78
10 17	− 77	− 53	−107	−173	**−187**	−174	−167	**−204**	−248	−165	− 56	− 25	−136
11 17	**−127**	**− 85**	**−146**	**−187**	−173	**−178**	**−170**	−187	**−257**	**−172**	**− 57**	**− 48**	**−149**
12 17	− 74	− 42	−114	−128	−121	−139	−128	−135	−175	− 89	− 5	− 27	− 98
13 17	− 24	+ 1	− 26	− 37	− 32	− 63	− 64	− 67	− 54	− 5	+ 12	− 24	− 32
14 17	− 15	+ 8	+ 52	+ 35	+ 35	+ 1	− 3	+ 8	+ 51	+ 41	− 13	− 36	+ 14
15 17	− 1	+ 3	+ 50	+ 61	+ 66	+ 41	+ 36	+ 55	+ 83	+ 35	− 31	− 35	+ 31
16 17	− 3	− 19	+ 3	+ 43	+ 59	+ 51	+ 47	+ 66	+ 58	− 13	− 37	− 23	+ 19
17 17	− 33	− 49	− 44	− 3	+ 22	+ 32	+ 33	+ 28	− 9	− 59	− 47	− 35	− 14
18 17	− 11	− 29	− 37	− 27	− 10	− 7	− 3	− 20	− 17	− 9	− 7	− 9	− 16
19 17	+ 11	+ 4	+ 5	− 5	− 15	− 21	− 32	− 17	+ 6	+ 10	− 1	0	− 5
20 17	+ 8	+ 5	+ 13	+ 14	+ 7	+ 3	− 5	+ 1	+ 17	+ 11	− 3	0	+ 6
21 17	+ 10	+ 2	+ 13	+ 23	+ 21	+ 18	+ 12	+ 14	+ 24	+ 17	+ 3	+ 5	+ 14
22 17	+ 23	+ 19	+ 28	+ 37	+ 33	+ 33	+ 28	+ 29	+ 42	+ 41	+ 23	+ 19	+ 30
23 17	+ 27	+ 30	+ 40	+ 43	+ 39	+ 34	+ 34	+ 37	+ 54	+ 48	+ 31	+ 32	+ 38
Range ...	203	126	217	296	308	303	301	363	414	250	92	105	229
Average progressive increase per day.	+ 1	− 9	− 14	− 17	− 9	+ 2	+ 3	− 1	− 1	+ 1	+ 1	− 1	− 4

TABLE 340.—*Vertical Force Magnetographs Nos. 1 and 2—Showing the mean Diurnal Inequality of Vertical Force for each average month of the minimum sun-spot years, 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901 and 1902 and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	+ 23	+ 19	+ 29	+ 44	+ 38	+ 37	+ 34	+ 34	+ 49	+ 35	+ 20	+ 14	+ 31
1 17	+ 18	+ 19	+ 23	+ 41	+ 36	+ 35	+ 30	+ 34	+ 48	+ 31	+ 16	+ 7	+ 27
2 17	+ 15	+ 14	+ 18	+ 36	+ 34	+ 34	+ 30	+ 36	+ 47	+ 29	+ 12	+ 5	+ 25
3 17	+ 8	+ 7	+ 13	+ 28	+ 29	+ 28	+ 29	+ 35	+ 45	+ 24	+ 6	0	+ 20
4 17	+ 7	+ 5	+ 10	+ 25	+ 33	+ 32	+ 35	+ 41	+ 51	+ 24	+ 5	+ 2	+ 23
5 17	+ 4	+ 1	+ 10	+ 32	+ 57	+ 60	+ 61	+ 67	+ 66	+ 29	+ 5	0	+ 32
6 17	+ 5	+ 3	+ 24	**+ 81**	**+ 97**	**+ 95**	**+104**	**+120**	**+128**	+ 53	− 10	− 8	**+ 57**
7 17	+ 20	+ 11	+ 43	+ 56	+ 55	+ 67	+ 77	+ 75	+ 95	**+ 57**	+ 9	0	+ 46
8 17	**+ 60**	+ 12	+ 6	− 29	− 45	− 11	− 5	− 39	− 47	− 14	+ 9	**+ 28**	− 6
9 17	+ 15	− 32	− 55	−120	−155	−102	− 98	−156	−181	−107	− 29	+ 5	− 85
10 17	− 91	− 69	− 94	−171	**−181**	−154	−152	**−194**	−241	−158	**− 70**	− 41	−134
11 17	**−123**	**− 91**	**−129**	**−182**	−166	**−173**	**−167**	−176	**−241**	**−159**	− 57	**− 52**	**−142**
12 17	− 68	− 45	−104	−129	−113	−129	−124	−116	−158	− 79	+ 5	− 15	− 89
13 17	− 27	+ 7	− 26	− 39	− 30	− 55	− 58	− 41	− 42	+ 4	**+ 26**	+ 3	− 23
14 17	− 10	+ 35	+ 53	+ 32	+ 34	+ 3	+ 3	+ 25	+ 53	+ 52	+ 10	0	+ 25
15 17	+ 14	**+ 36**	**+ 68**	+ 65	+ 61	+ 40	+ 45	**+ 67**	+ 88	+ 53	− 3	− 2	+ 44
16 17	+ 21	+ 15	+ 33	+ 60	+ 62	+ 46	+ 55	+ 77	+ 70	+ 17	− 7	+ 9	+ 38
17 17	− 1	− 14	− 8	+ 23	+ 29	+ 26	+ 32	+ 40	+ 14	− 16	− 11	− 1	+ 9
18 17	+ 11	− 2	− 5	+ 2	+ 1	+ 3	− 1	− 11	+ 1	+ 1	0	+ 3	+ 1
19 17	+ 15	+ 6	+ 6	+ 8	+ 6	+ 3	− 11	− 2	+ 11	+ 8	+ 3	+ 5	+ 5
20 17	+ 18	+ 10	+ 16	+ 21	+ 19	+ 14	+ 6	+ 10	+ 23	+ 19	+ 6	+ 6	+ 14
21 17	+ 18	+ 13	+ 18	+ 32	+ 25	+ 22	+ 15	+ 19	+ 32	+ 24	+ 9	+ 7	+ 20
22 17	+ 22	+ 19	+ 25	+ 40	+ 37	+ 34	+ 27	+ 28	+ 39	+ 34	+ 20	+ 11	+ 28
23 17	+ 23	+ 22	+ 27	+ 41	+ 37	+ 34	+ 28	+ 30	+ 44	+ 36	+ 20	+ 17	+ 30
Range ...	183	127	197	263	278	268	271	314	369	216	96	80	199
Average progressive increase per day.	+ 3	0	− 8	− 7	− 6	0	+ 3	+ 4	+ 1	+ 1	+ 3	+ 6	0

TABLE 341.—*Vertical Force Magnetographs Nos. 1 and 2—Showing excess Diurnal Inequality of Vertical Force for each average month of the period 1873 to 1904 over the average years, showing the average seasonal disturbance.*

Unity = ·1γ = ·000001 C. G. S.

1873 to 1904. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	− 9	− 11	− 2	+ 10	+ 5	+ 3	+ 1	+ 6	+ 20	+ 6	− 11	− 17	101
1 17	− 10	− 9	− 4	+ 11	+ 7	+ 4	+ 4	+ 10	+ 25	+ 6	− 11	− 18	119
2 17	− 11	− 11	− 8	+ 6	+ 6	+ 4	+ 6	+ 14	+ 24	+ 6	− 13	− 19	128
3 17	− 13	− 14	− 8	+ 5	+ 8	+ 5	+ 10	+ 17	+ 27	+ 4	− 15	− 20	146
4 17	− 19	− 19	− 12	+ 1	+ 10	+ 11	+ 14	+ 22	+ 30	+ 2	− 18	− 22	180
5 17	− 33	− 35	− 22	− 1	+ 26	+ 30	+ 31	+ 38	+ 35	− 3	− 30	− 36	320
6 17	**− 58**	**− 60**	**− 33**	**+ 26**	**+ 43**	**+ 40**	**+ 47**	**+ 67**	**+ 72**	− 3	**− 74**	**− 73**	596
7 17	− 28	− 34	+ 2	+ 13	+ 10	+ 20	+ 24	+ 30	+ 40	+ 9	− 35	− 49	294
8 17	+ 64	+ 28	+ 21	− 21	− 39	− 7	− 7	− 40	− 53	− 9	+ 21	+ 40	350
9 17	**+103**	+ 70	+ 32	− 36	**− 72**	− 23	− 21	**− 78**	**− 103**	− 21	+ 60	**+ 101**	720
10 17	+ 49	**+ 75**	**+ 41**	− 36	− 52	− 21	− 25	− 67	**− 113**	− 26	+ 67	**+ 103**	675
11 17	+ 24	+ 56	+ 13	**− 37**	− 30	− 33	− 20	− 39	− 104	− 19	+ 84	+ 95	554
12 17	+ 23	+ 44	− 18	− 36	− 31	**− 45**	**− 34**	− 35	− 74	+ 8	**+ 88**	+ 70	506
13 17	+ 5	+ 28	− 3	− 11	− 9	− 33	− 33	− 24	− 18	**+ 30**	+ 48	+ 20	262
14 17	− 29	0	+ 26	+ 11	+ 10	− 18	− 18	− 3	+ 33	+ 29	− 14	− 33	224
15 17	− 30	− 21	+ 19	+ 23	+ 24	+ 4	+ 3	+ 20	+ 49	+ 8	− 47	− 53	301
16 17	− 20	− 29	− 10	+ 23	+ 32	+ 23	+ 23	+ 40	+ 37	− 24	− 43	− 34	338
17 17	− 15	− 28	− 24	+ 11	+ 28	+ 31	+ 30	+ 32	+ 4	**− 35**	− 26	− 15	279
18 17	+ 8	− 7	− 13	− 5	+ 2	+ 6	+ 2	− 6	+ 1	− 1	+ 2	+ 2	55
19 17	+ 12	+ 5	+ 4	0	− 4	− 8	− 22	− 8	+ 10	+ 6	0	+ 2	81
20 17	+ 4	− 3	+ 2	+ 6	+ 3	− 1	− 10	− 4	+ 12	+ 4	− 8	− 8	65
21 17	− 1	− 9	− 2	+ 11	+ 7	+ 3	− 4	+ 1	+ 13	+ 3	− 9	− 12	75
22 17	− 7	− 11	− 3	+ 9	+ 7	+ 4	− 2	+ 1	+ 13	+ 7	− 7	− 15	86
23 17	− 8	− 8	0	+ 9	+ 5	+ 2	− 3	+ 2	+ 16	+ 8	− 8	− 11	80
Range ...	161	135	74	63	115	85	81	145	185	65	162	176	...

TABLE 346.—*Vertical Force Magnetographs Nos. 1 and 2—Showing excess Diurnal Inequality of Vertical Force—showing the secular difference between the seasonal variations at times of maximum and minimum sun-spot epochs.*

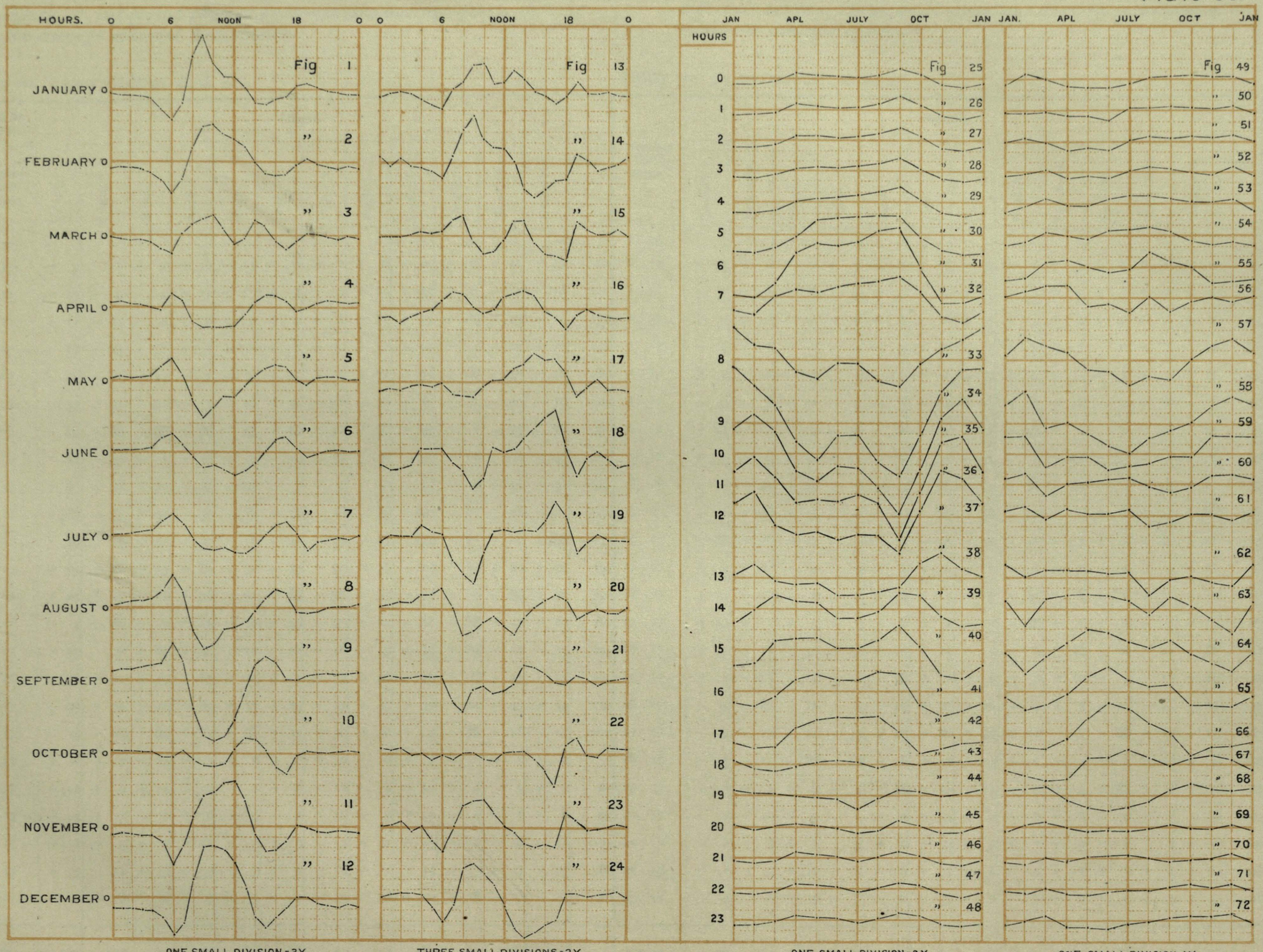
Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 17	− 4	+ 4	0	− 6	− 7	− 7	− 3	+ 2	+ 3	+ 4	+ 2	+ 2	44
1 17	− 1	− 1	0	− 5	− 5	− 9	+ 2	+ 3	+ 4	+ 3	+ 2	+ 5	40
2 17	0	+ 3	0	− 8	− 6	− 8	+ 1	+ 5	+ 3	+ 5	+ 4	+ 6	49
3 17	− 2	− 1	+ 1	− 4	− 3	− 7	+ 1	+ 5	+ 3	0	− 2	+ 5	34
4 17	− 7	− 2	+ 3	− 1	− 1	+ 4	+ 9	+ 9	+ 5	+ 1	+ 1	+ 3	46
5 17	− 9	− 6	+ 2	0	− 3	+ 4	+ 5	+ 9	+ 4	− 4	− 8	− 5	59
6 17	**− 13**	− 11	+ 4	+ 6	0	+ 4	+ 2	**+ 15**	+ 4	0	− **16**	− 14	89
7 17	+ 1	+ 6	+ 11	+ 11	− 8	− 6	− 15	+ 1	− 13	− 3	+ 1	− 3	79
8 17	+ 6	+ 22	**+ 15**	+ 9	− 9	− 10	− 24	− 16	**− 18**	+ 1	+ 15	+ 21	166
9 17	+ 16	**+ 30**	− 4	+ 1	− 10	**− 21**	**− 30**	− 14	− 6	+ 1	+ 17	**+ 24**	174
10 17	**+ 17**	+ 16	− 12	− 2	− 3	− 15	− 11	− 8	− 3	− 3	**+ 18**	+ 17	125
11 17	+ 4	+ 11	− 11	0	+ 1	+ 5	+ 6	− 4	− 7	− 4	+ 9	+ 10	72
12 17	+ 4	+ 10	− 2	+ 8	+ 2	+ 2	+ 7	− 10	− 6	+ 1	+ 1	− 4	57
13 17	+ 13	+ 1	+ 9	+ 9	+ 8	+ 4	+ 5	− **16**	− 1	+ 2	− 3	− 18	89
14 17	+ 7	− 17	+ 10	+ **13**	+ 13	+ 12	+ 7	− 5	+ **11**	+ 2	− 10	− **25**	132
15 17	− 1	− **21**	− 5	+ 8	+ **19**	+ 17	+ 6	+ 2	+ 10	− 3	− 13	− 20	125
16 17	− 5	− 17	− 12	− 1	+ 16	+ 25	+ 11	+ 7	+ 7	− 11	− 11	− 15	138
17 17	− 9	− 13	− 14	− 5	+ 16	+ **30**	+ **24**	+ 10	0	− **20**	− 13	− 13	167
18 17	− 5	− 11	− **16**	− **13**	+ 6	+ 7	+ 15	+ 7	− 1	+ 7	+ 10	+ 4	102
19 17	+ 6	+ 7	+ 9	− 4	− **11**	− 14	− 11	− 5	+ 5	+ **12**	+ 6	+ 5	95
20 17	− 2	+ 2	+ 5	0	− 4	− 3	− 3	− 1	+ 2	0	− 1	+ 2	25
21 17	− 2	− 5	+ 1	− 3	+ 2	+ 2	+ 3	+ 1	− 2	− 1	0	+ 4	26
22 17	− 1	− 2	+ 1	− 5	− 6	− 3	− 1	− 1	+ 1	+ 5	+ 1	+ 6	33
23 17	− 4	0	+ 5	− 6	− 6	− 8	− 2	− 1	+ 2	+ 4	+ 3	+ 7	48
Range ...	30	51	31	26	30	51	54	31	29	32	34	49	...

COLABA OBSERVATORY.

Changes in the Diurnal Inequality of Vertical Force due to Average Seasonal and Intermittent Secular Seasonal effects.

Plate 55.



ONE SMALL DIVISION = 2Y. THREE SMALL DIVISIONS = 2Y. ONE SMALL DIVISION = 2Y. ONE SMALL DIVISION = 1Y.

Figs: 1-12 = Excesses of the average monthly inequalities over the average of the year.
Figs: 13-24 = " " " " " due to intermittent secular effects.

Figs: 25-48 = Annual variation of each hourly ordinate.
Figs: 49-72 = Excess annual variation of each hourly ordinate due to secular effects.

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least disturbance while similarly the transition from negative to positive effects, occurs somewhere between March and April. It will be seen that the seasonal disturbance inequality is practically the same in character as the original inequality.

Annual variation of each hourly ordinate of the diurnal inequality.

400. The data in table 341 are charted in plate 55, figures 25 to 48, which show how each hour fares in the seasonal march from month to month. The night hours from 6 P.M. to 4 A.M. may be practically taken as denoting quiescent conditions, while the rest of the hours of the day appear to be more or less disturbed by forces which influence the seasonal changes, the maximum of disturbance being indicated at 9 hour. The ranges and summed ranges, as will appear later, indicate a seasonal march which is almost nearly typical of the progression of the single ordinate at 6 hour. This progression clearly reverses in character between 7 and 8 hours and, as already remarked elsewhere, the maximum of the disturbance is reached at 9 hour. The character of the curve at that hour hence, if solar action be taken as the principal exciting cause of the whole diurnal phenomenon, determines in the main the true character of the average progression as disclosed by the ranges or the smoother curves of the summed ranges which are examined below.

Annual variation of range and summed range.

401. Referring now to the ranges of the diurnal movement, it will be seen that the maximum of the regular disturbance effect is reached in September. In the range curve as is the case in Declination generally, low values prevail during the winter months with a tendency to a minimum in December followed by high values in summer which culminate to a maximum about September.

Analysing the progression we find from the range figures (*vide* co-efficients given below) that the amplitude of the first component is more than double either the second or the third component, both of which are about the same in magnitude. The amplitudes of the components also indicate the influence of secular effects of the sun-spots period, all being about equally affected by the 11-year disturbance.

Unity = 1γ = ·00001 C. G. S.

Summed ranges.	Average ...	$c_1 = 53{\cdot}2$	$c_2 = 23{\cdot}5$	$c_3 = 22{\cdot}7$	$a_1 = 192\ 50$	$a_2 = 79\ 0$	$a_3 = 11\ 55$
	Maximum spots ...	$c_1 = 52{\cdot}7$	$c_2 = 22{\cdot}7$	$c_3 = 19{\cdot}7$	$a_1 = 194\ 13$	$a_2 = 74\ 22$	$a_3 = 11\ 24$
	Minimum spots ...	$c_1 = 50\ 9$	$c_2 = 23{\cdot}6$	$c_3 = 23{\cdot}6$	$a_1 = 191\ 1$	$a_2 = 80\ 3$	$a_3 = 11\ 3$
	Difference curve ...	$c_1 = 3{\cdot}2$	$c_2 = 4{\cdot}6$	$c_3 = 3{\cdot}9$	$a_1 = 251\ 37$	$a_2 = 26\ 54$	$a_3 = 69\ 19$
Ranges.	Average ...	$c_1 = 11{\cdot}02$	$c_2 = 4{\cdot}25$	$c_3 = 5{\cdot}26$	$a_1 = 192\ 1$	$a_2 = 73\ 20$	$a_3 = 10\ 59$
	Maximum spots ...	$c_1 = 11{\cdot}37$	$c_2 = 4{\cdot}85$	$c_3 = 5{\cdot}44$	$a_1 = 191\ 40$	$a_2 = 71\ 18$	$a_3 = 10\ 15$
	Minimum spots ...	$c_1 = 9{\cdot}87$	$c_2 = 4{\cdot}45$	$c_3 = 4{\cdot}50$	$a_1 = 189\ 54$	$a_2 = 71\ 20$	$a_3 = 12\ 1$
	Difference curve ...	$c_1 = 1{\cdot}54$	$c_2 = 0{\cdot}41$	$c_3 = 1{\cdot}05$	$a_1 = 203\ 32$	$a_2 = 71\ 4$	$a_3 = 2\ 30$
Ordinate at 6 hour.	Average ...	$c_1 = 7{\cdot}09$	$c_2 = 1{\cdot}79$	$c_3 = 2{\cdot}08$	$a_1 = 191\ 1$	$a_2 = 74\ 26$	$a_3 = 8\ 33$
	Maximum spots ...	$c_1 = 7{\cdot}72$	$c_2 = 2{\cdot}15$	$c_3 = 2{\cdot}07$	$a_1 = 191\ 0$	$a_2 = 72\ 41$	$a_3 = 7\ 1$
	Minimum spots ...	$c_1 = 6{\cdot}59$	$c_2 = 1{\cdot}59$	$c_3 = 2{\cdot}00$	$a_1 = 191\ 49$	$a_2 = 72\ 22$	$a_3 = 8\ 28$
	Difference curve ...	$c_1 = 1{\cdot}06$	$c_2 = 0{\cdot}63$	$c_3 = 0{\cdot}23$	$a_1 = 180\ 28$	$a_2 = 73\ 22$	$a_3 = -13\ 3$
Mean ordinate of 9 and 10 hours.	Average ...	$c_1 = 7{\cdot}75$	$c_2 = 3{\cdot}82$	$c_3 = 2{\cdot}88$	$a_1 = 16\ 56$	$a_2 = 177\ 42$	$a_3 = 71\ 38$
	Maximum spots ...	$c_1 = 8{\cdot}82$	$c_2 = 3{\cdot}81$	$c_3 = 2{\cdot}63$	$a_1 = 14\ 12$	$a_2 = 177\ 11$	$a_3 = 72\ 36$
	Minimum spots ...	$c_1 = 6{\cdot}92$	$c_2 = 3{\cdot}67$	$c_3 = 2{\cdot}84$	$a_1 = 16\ 42$	$a_2 = 177\ 40$	$a_3 = 72\ 7$
	Difference curve ...	$c_1 = 1{\cdot}82$	$c_2 = 0{\cdot}19$	$c_3 = 0{\cdot}29$	$a_1 = 2\ 38$	$a_2 = 160\ 55$	$a_3 = 9\ 59$

TABLE 342.—*Vertical Force Magnetograph—Monthly mean values and annual variation of summed ranges.*

Unity = 1γ = ·00001 C. G. S. Unit.

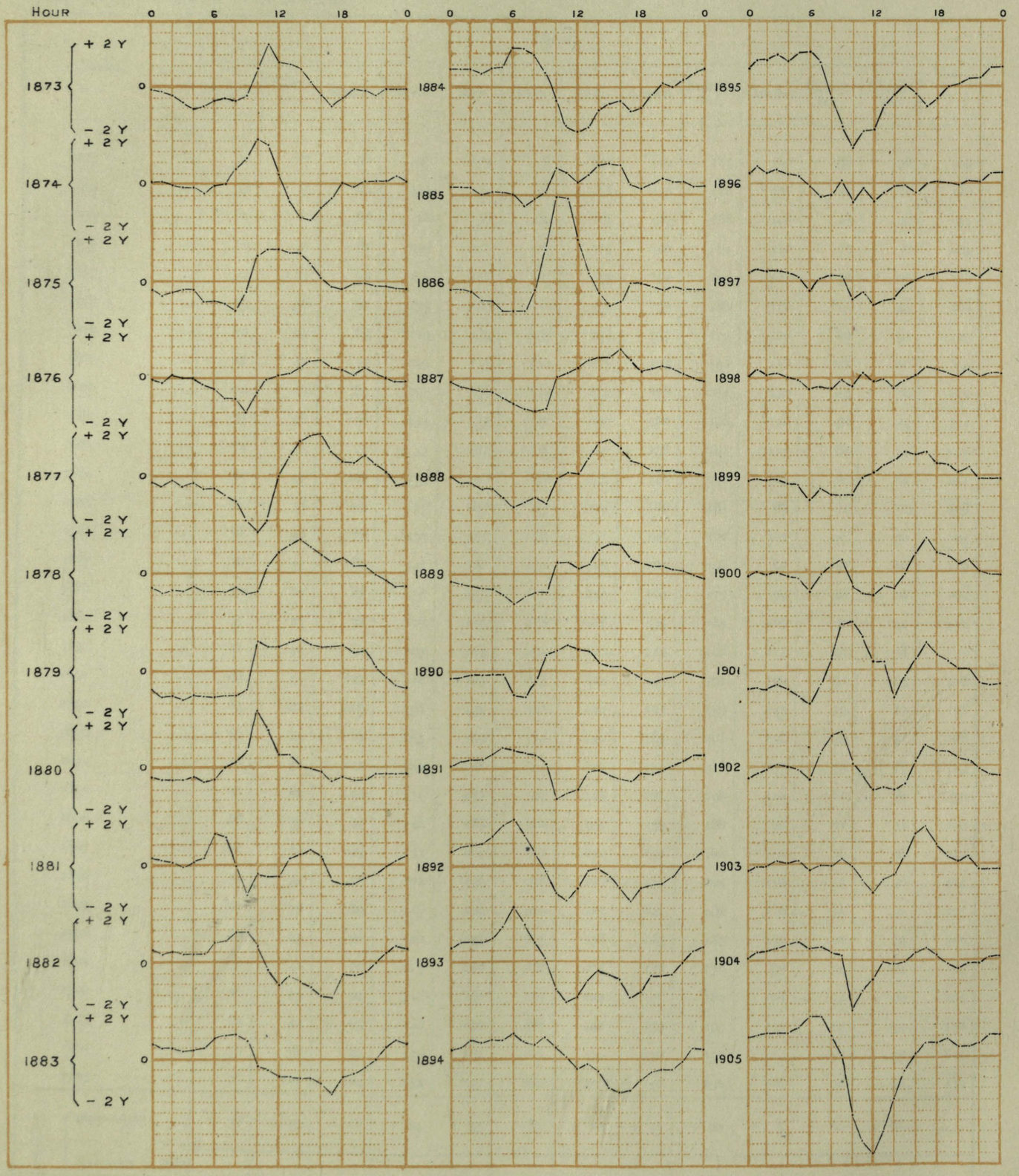
Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1873 ...	72	67	96	108	139	128	192	142	184	102	38	38	109
1874 ...	56	45	83	115	144	113	140	143	190	106	42	26	100
1875 ...	86	61	68	108	131	120	106	127	188	102	45	22	97
1876 ...	66	52	80	102	137	131	119	168	201	140	71	38	109
1877 ...	72	74	95	154	151	131	125	174	195	103	30	66	114
1878 ...	89	56	91	153	123	116	131	136	180	116	41	40	106
1879 ...	70	49	65	110	134	132	123	147	173	105	46	31	99
1880 ...	26	49	55	101	117	107	121	175	191	118	47	26	94
1881 ...	74	62	87	131	156	154	142	177	211	136	43	36	117
1882 ...	53	78	101	145	159	137	137	162	160	112	49	39	111
1883 ...	84	52	74	157	162	137	141	138	191	115	64	64	115
1884 ...	94	97	123	179	147	146	143	196	198	113	70	66	131
1885 ...	61	76	95	135	145	125	129	162	181	88	44	52	108
1886 ...	68	46	67	130	140	99	111	142	166	100	35	32	95
1887 ...	70	37	89	142	160	151	148	161	192	97	40	36	110
1888 ...	59	63	86	158	135	138	139	163	177	99	42	26	107
1889 ...	55	53	92	176	141	108	108	130	169	117	37	44	102
1890 ...	51	46	81	123	124	114	116	159	196	113	38	38	100
1891 ...	92	51	123	144	161	135	124	153	191	130	51	65	118
1892 ...	85	88	106	139	145	142	149	195	199	145	73	42	126
1893 ...	89	83	119	125	169	154	140	185	208	136	59	51	126
1894 ...	78	48	121	122	131	144	144	155	216	135	53	78	119
1895 ...	90	80	122	151	170	196	143	171	198	114	61	64	130
1896 ...	67	37	94	148	165	122	134	155	188	93	71	34	109
1897 ...	101	66	93	133	161	132	114	157	188	115	36	26	110
1898 ...	55	54	70	124	142	138	116	173	204	110	44	36	105
1899 ...	97	78	89	116	140	112	117	141	166	110	42	50	105
1900 ...	82	61	96	140	148	109	138	143	183	112	47	20	107
1901 ...	36	41	70	113	127	118	105	115	176	93	54	24	89
1902 ...	96	43	94	116	128	134	124	146	189	108	34	29	103
1903 ...	62	44	75	140	136	168	142	153	195	114	61	34	110
1904 ...	79	68	87	139	151	125	143	150	196	124	55	38	113
1905 ...	76	122	104	154	177	161	151	176	232	166	76	76	139
Annual Inequality. 1873—1905 ...	− 38	− 49	− 19	+ 24	+ 35	+ 23	+ 22	+ 47	+ 80	+ 5	− 60	− 68	...
Maximum spot years ...	− 37	− 49	− 15	+ 17	+ 28	+ 21	+ 30	+ 47	+ 78	+ 3	− 62	− 65	...
Minimum spot years ...	− 33	− 50	− 19	+ 30	+ 34	+ 20	+ 20	+ 43	+ 77	+ 4	− 61	− 68	...

COLABA OBSERVATORY.

Vertical Force Diurnal Inequality (Magnetograph.)

Excesses of each year over the average year.

Plate 56



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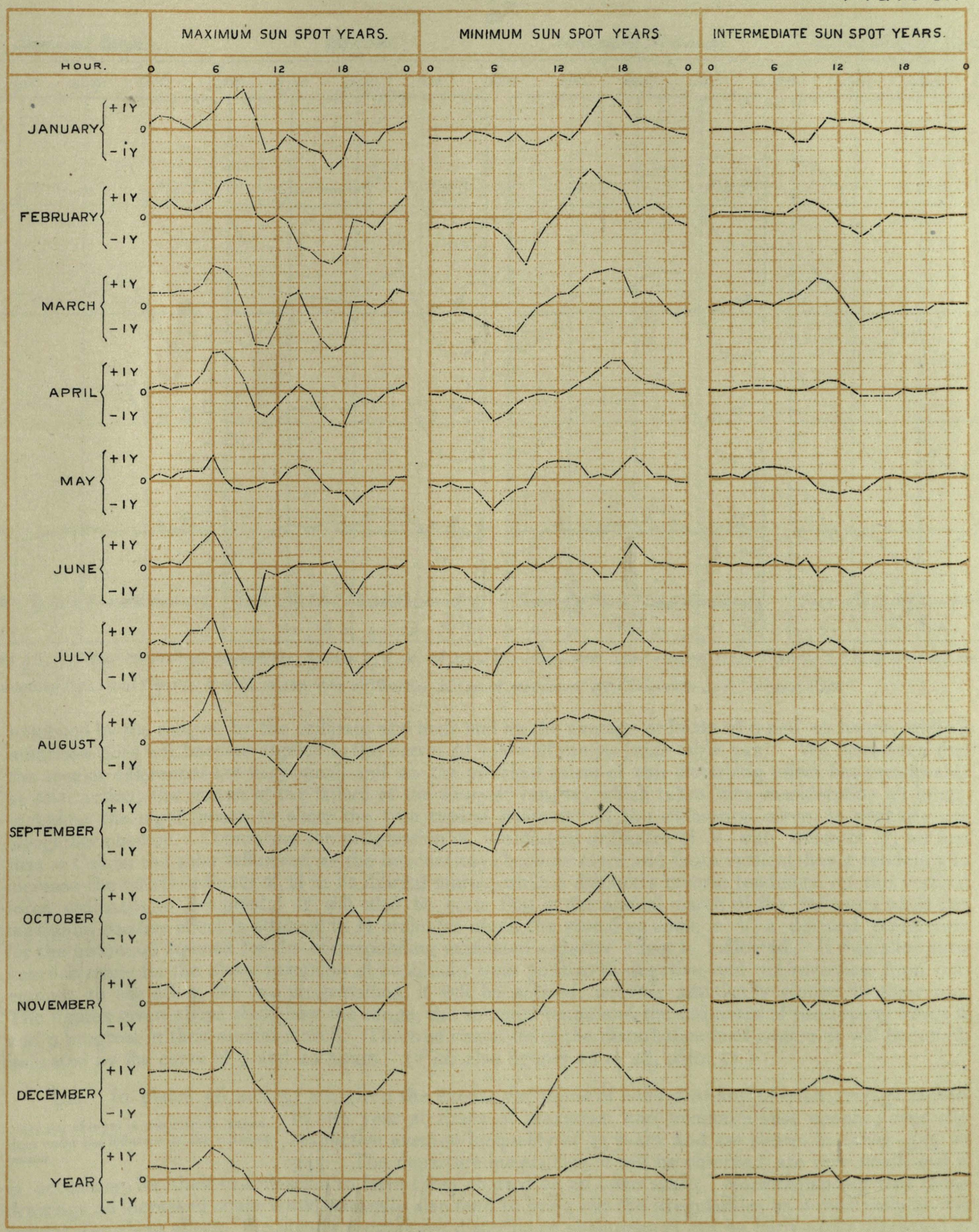
COLABA OBSERVATORY.

Vertical Force Diurnal Inequality (Magnetograph.)

Excesses of each average month of the groups of Sun spot years over the average.

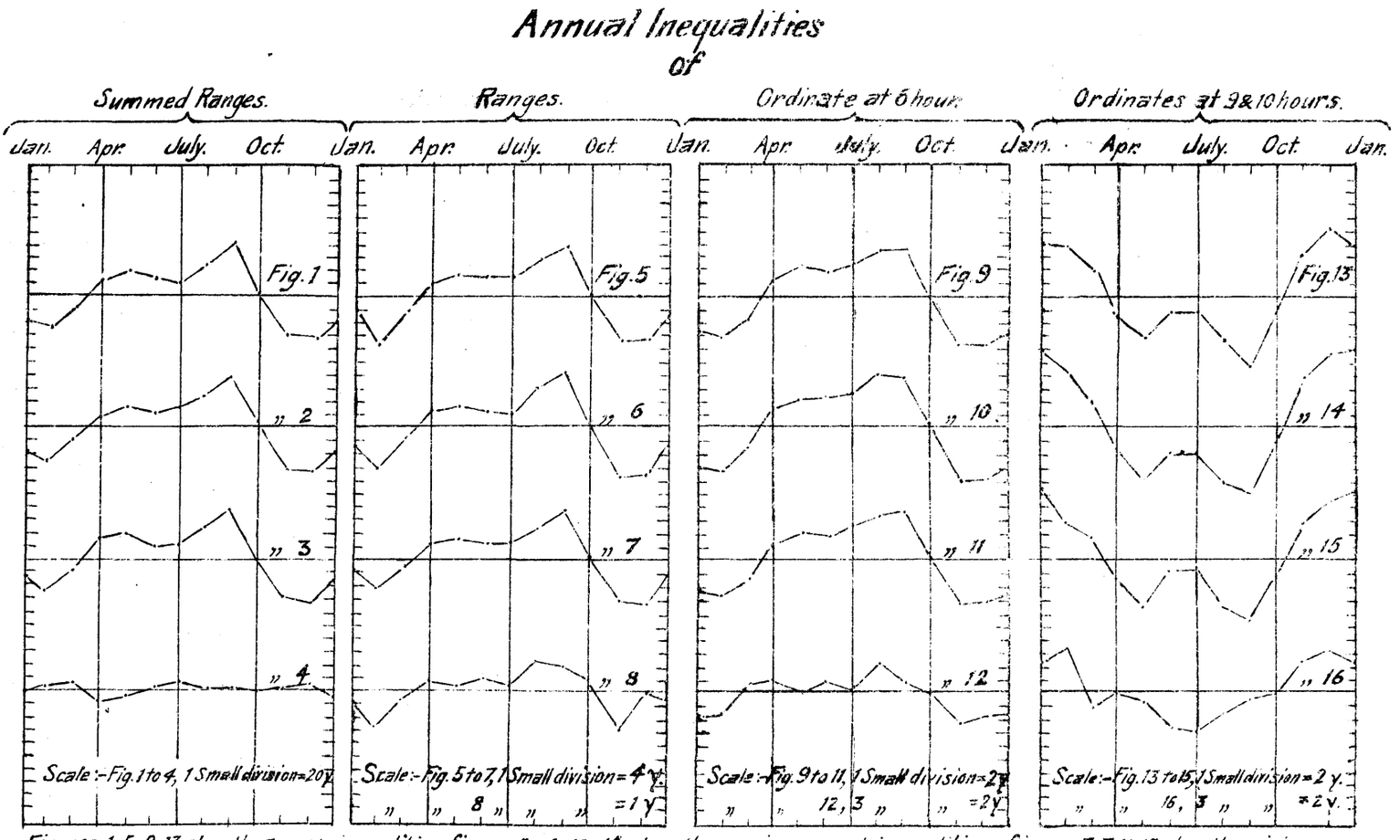
Corresponding month of the whole period (1873 to 1904.)

Plate 57.



Govt. Photozinco: Office Poona. 1908.

The co-efficients given above, as also the figures charted below, show that the parallelism between the variations representing the maximum and minimum spot epochs and their difference curve, is clearly



Figures 1, 5, 9, 13 show the average inequalities; figures 2, 6, 10, 14 show the maximum spot inequalities; figures 3, 7, 11, 15 show the minimum spot inequalities; and figures 4, 8, 12, 16 show the difference between maximum and minimum spot inequalities.

exhibited by the ranges, by the ordinate at 6 hour and by the average ordinate of 9 and 10 hours; while it somehow does not become explicit in the curves of summed ranges (*vide* table 342). We have seen that the secular differences are very small and as the principal cause of this disturbing effect lies presumably in solar action, the reason of the failure of the summed ranges, which takes into consideration all hours, including the night hours, to show the true typical character of the difference curve, is perhaps not altogether obscure. Comparing the progression of the diurnal ordinates of V with those of H, we find that at Colaba the solar influence, as the incident rays become more and more vertical, has a tendency to increase the hourly ordinate of H in its diurnal march, while a distinctly reverse tendency on the vertical force ordinates is exhibited. It will also be seen that in the annual march of the ordinates while the maximum *positive* effect is attained in H ordinates about the vernal equinox, in V a decided preference for the autumnal equinox for the corresponding maximum *negative* effect is indicated. If due allowance hence is made for the above inversion of conditions from positive to negative and the reversion from one equinox to the other, the two progressions, it will be noticed, become practically similar in their run. The figures given above show how the range, the summed range and the ordinates of the typical hours 6 and 9 progress in their annual march. The true character of the disturbance is of course, it will be noted, indicated by the curve of 9 and 10 hours. (*Vide* also figures 25 to 48, plate 55.)

Secular changes in the diurnal inequalities under the influence of the sun-spot period.

402. In plates 56 and 57 are given the excess variations of each year and of each average month of the year at times of maximum and minimum spot epochs, over the respective average inequality of 33 years and are shown in tables 343 to 345. The departure inequalities, it will be observed, are very small, and it is necessary for their examination to have them charted on an open scale. Notwithstanding that these drawings on increased scale would naturally also tend to bring out the irregularities as prominently as the regular disturbing effects, the steady progressive disturbance phenomenon can be fairly easily discerned in its waxing and waning as the years of maximum spot are followed by those of the minimum epoch. The

TABLE 343.—*Vertical Force Magnetographs Nos. 1 and 2—Excess Diurnal Inequality of Vertical Force of each year 1873—1904 over the mean of 33 years (corrected for progressive change).*

Civil hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1873 ...	−1	− 2	− 4	− 7	−10	− 9	− 6	− 5	− 6	− 3	+ 9	+20	+12	+11	+ 8	+ 2	− 3	− 9	− 5	− 1	− 2	− 4	− 1	− 1
1874 ...	+1	+ 1	− 1	− 2	− 2	− 4	1	0	+ 7	+12	+21	+18	+ 4	− 8	−15	−16	−11	− 7	0	− 2	+ 1	+ 1	+ 1	+ 3
1875 ...	−4	− 7	− 5	− 4	− 4	− 9	− 9	−10	−13	− 5	+12	+15	+15	+13	+13	+ 8	+ 2	− 3	− 4	− 2	− 2	− 3	− 3	− 4
1876 ...	−1	− 2	+ 1	0	0	− 3	− 5	− 9	− 9	−15	− 7	− 1	+ 1	+ 2	+ 5	+ 8	+ 9	+ 5	+ 4	+ 1	+ 5	+ 2	0	− 1
1877 ...	−3	− 5	− 2	− 5	− 3	− 6	− 6	− 9	−12	−20	−26	−20	− 1	+ 9	+16	+19	+20	+12	+ 7	+ 6	+ 9	+ 5	+ 2	− 4
1878 ...	−7	− 9	− 8	− 8	− 6	− 8	− 9	− 9	− 7	−10	− 9	+ 3	+ 9	+13	+16	+12	+ 8	+5	+ 7	+ 3	+ 3	− 1	− 4	− 7
1879 ...	−8	− 12	−11	−13	−11	−12	−12	−11	−11	− 8	+13	+11	+11	+13	+15	+12	+11	+11	+12	+ 8	+ 8	+ 2	− 3	− 7
1880 ...	−4	− 5	− 5	− 5	− 4	− 6	− 5	0	+ 3	+ 8	+26	+18	+ 7	+ 7	0	− 1	− 2	− 6	− 5	− 6	− 6	− 4	− 4	− 4
1881 ...	+3	+ 2	+ 1	− 1	+ 1	+ 4	+15	+13	− 1	−14	− 4	− 5	− 5	+ 3	+ 5	+ 7	+ 3	− 7	− 9	− 9	− 6	− 4	− 1	+ 1
1882 ...	+6	+ 4	+ 5	+ 3	+ 3	+ 3	+ 9	+10	+13	+13	+ 7	− 4	−11	− 7	− 9	−12	−15	−16	− 6	− 7	− 5	− 1	+ 4	+ 7
1883 ...	+7	+ 5	+ 5	+ 3	+ 4	+ 5	+10	+11	+12	+ 8	− 3	− 5	− 8	− 8	− 9	− 9	−12	−17	− 8	− 7	− 4	0	+ 5	+ 8
1884 ...	+8	+ 8	+ 8	+ 6	+ 8	+ 9	+17	+17	+14	+ 6	− 6	−18	−21	−19	−12	− 8	− 7	−12	−10	− 3	+ 1	0	+ 3	+ 6
1885 ...	−2	− 2	− 2	− 5	− 4	− 4	− 5	−10	− 7	− 4	+ 7	+ 5	+ 1	+ 4	+ 8	+ 9	+ 8	− 1	− 3	0	+ 2	+ 1	+ 1	− 2
1886 ...	−4	− 4	− 5	− 8	− 9	−13	−13	−13	− 4	+15	+39	+38	+19	+ 3	− 6	−12	− 9	− 2	− 2	− 3	− 4	− 3	− 4	− 4
1887 ...	−2	− 4	− 5	− 6	− 7	− 9	−12	−14	−15	−13	+ 1	+ 3	+ 5	+ 9	+10	+10	+13	+ 9	+ 3	+ 5	+ 6	+ 5	+ 2	0
1888 ...	0	− 3	− 3	− 6	− 6	−10	−14	−12	−10	−13	− 2	+ 1	0	+ 8	+15	+16	+12	+ 7	+ 5	+ 2	+ 2	+ 2	+ 1	+ 1
1889 ...	−3	− 4	− 5	− 6	− 7	−10	−14	−11	− 9	− 9	+ 5	+ 5	+ 2	+ 4	+11	+14	+13	+ 7	+ 4	+ 3	+ 3	+ 2	+ 1	− 1
1890 ...	−3	− 3	− 2	− 2	− 2	− 2	−11	−12	− 5	+ 7	+ 9	+12	+10	+ 9	+ 4	+ 2	+ 2	− 1	− 4	− 5	− 4	− 3	− 1	− 2
1891 ...	+1	+ 3	+ 4	+ 4	+ 6	+ 9	+ 8	+ 7	+ 6	+ 2	− 14	−12	−10	− 2	− 1	− 4	− 5	− 6	− 3	− 3	− 1	+ 1	+ 4	+ 1
1892 ...	+6	+ 8	+ 9	+10	+13	+18	+21	+14	+ 5	− 3	−13	−17	−11	− 3	− 1	− 5	−10	−17	−11	− 9	− 8	− 5	+ 1	+ 3
1893 ...	+7	+ 9	+ 9	+ 9	+11	+16	+25	+17	+ 8	+ 1	−13	−19	−17	− 8	− 4	− 6	− 8	−16	−14	− 7	− 7	− 6	− 1	+ 5
1894 ...	+4	+ 5	+ 8	+ 7	+ 8	+ 8	+12	+ 8	+ 6	+10	+ 5	+ 1	− 5	− 3	− 7	−14	−16	−15	−10	− 7	− 5	− 5	− 2	+ 4
1894 ...	+6	+ 8	+ 9	+ 8	+ 8	+ 9	+13	+ 8	+ 5	+15	+ 3	− 3	− 9	− 6	−12	−16	−16	−15	− 9	− 4	− 5	− 5	− 1	+ 6
1895 ...	+8	+12	+12	+15	+12	+16	+17	+11	− 5	−18	−29	−21	−20	− 8	− 3	+ 1	− 3	− 9	− 5	0	− 1	+ 3	+ 4	+ 8
1896 ...	+5	+ 8	+ 5	+ 6	+ 4	+ 3	− 2	− 6	− 5	+ 1	− 8	− 2	− 8	− 4	− 2	− 1	− 4	0	+ 1	0	− 1	+ 1	0	+ 5
1897 ...	+3	+ 5	+ 4	+ 4	+ 3	+ 2	− 5	+ 1	+ 2	+ 2	− 8	− 5	−11	− 9	− 8	− 3	0	+ 2	+ 3	+ 4	+ 3	+ 4	+ 1	+ 5
1898 ...	+1	+ 4	+ 1	+ 2	0	− 1	− 5	− 4	− 5	− 1	− 4	+ 2	− 2	+ 1	− 5	− 2	+ 1	+ 5	+ 4	+ 2	0	+ 3	0	+ 1
1899 ...	−2	− 1	− 2	− 2	− 4	− 5	−12	− 6	− 9	− 9	− 9	− 1	+ 1	+ 5	+ 7	+11	+10	+11	+ 6	+ 5	+ 2	+ 4	− 2	− 2
1900 ...	−2	0	− 1	0	− 2	− 3	− 9	− 1	+ 3	+ 7	− 7	−10	−12	− 7	− 8	− 1	+ 9	+17	+10	+ 8	+ 4	+ 6	0	− 1
1901 ...	−8	− 8	− 9	− 7	− 9	−12	−16	− 7	+ 5	+21	+22	+15	+ 4	+ 4	−13	− 3	+ 5	+13	+ 7	+ 4	0	0	− 7	− 8
1902 ...	−5	− 3	− 2	+ 1	0	− 2	− 6	+ 6	+14	+16	+ 1	− 4	−12	−10	−12	− 8	+ 2	+10	+ 7	+ 7	+ 3	+ 2	− 2	− 4
1903 ...	−3	− 1	− 1	+ 1	0	+ 1	− 3	− 1	− 1	+ 2	− 2	− 8	−14	− 8	− 5	+ 3	+13	+17	+ 9	+ 3	+ 1	+ 3	− 3	− 3
1904 ...	+1	+ 4	+ 5	+ 6	+ 7	+ 8	+ 5	+ 6	+ 3	+ 2	−23	−14	− 9	− 1	− 2	− 1	+ 3	+ 5	+ 2	− 2	− 4	− 2	− 2	+ 1

TABLES 344 & 345.—*Vertical Force Magnetograph—Excess Diurnal Inequality of Vertical Force of each month of the group of maximum and minimum sun-spot years over the corresponding month of the whole period of 33 years (1873—1904).*
(Corrected for progressive change.)

Maximum sun-spot years.

Unity = ·1γ = ·000001 C. G. S. Unit.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 17	+ 3	+ 9	+ 6	+ 3	+ 1	+ 2	+ 5	+ 5	+ 7	+ 8	+ 8	+ 8	+ 6
1 17	+ 6	+ 6	+ 6	+ 4	+ 3	+ 1	+ 7	+ 6	+ 6	+ 7	+ 8	+ 9	+ 6
2 17	+ 6	+ 8	+ 6	+ 2	+ 2	+ 2	+ 5	+ 6	+ 6	+ 8	+ 9	+ 9	+ 5
3 17	+ 4	+ 5	+ 7	+ 3	+ 3	+ 1	+ 5	+ 7	+ 6	+ 5	+ 4	+ 9	+ 5
4 17	+ 1	+ 4	+ 7	+ 4	+ 4	+ 7	+12	+ 9	+ 8	+ 5	+ 6	+ 8	+ 5
5 17	+ 5	+ 6	+10	+ 9	+ 4	+11	+12	+14	+12	+ 5	+ 4	+ 7	+ 8
6 17	+ 8	+ 9	+18	+18	+11	+17	+17	+25	+18	+14	+ 6	+ 8	+14
7 17	+15	+16	+17	+19	+ 2	+ 7	+ 4	+11	+ 8	+11	+11	+11	+11
8 17	+15	+18	+12	+13	- 3	- 1	- 9	- 4	+ 1	+ 9	+16	+20	+ 6
9 17	+18	+17	- 2	+ 6	- 4	-10	-17	- 4	+ 6	+ 5	+18	+16	+ 4
10 17	+ 5	+ 1	-18	- 8	- 3	-20	-10	- 5	- 3	- 7	+ 9	+ 3	- 5
11 17	-10	- 2	-19	-11	- 1	- 2	- 8	- 6	-11	-11	+ 1	- 2	- 8
12 17	- 9	0	- 9	- 6	- 1	- 4	- 5	-11	-12	- 8	- 4	- 9	-10
13 17	- 3	- 3	+ 3	- 2	+ 4	- 2	- 4	-16	- 9	- 8	- 9	-18	- 6
14 17	- 6	-13	+ 6	+ 3	+ 6	+ 1	- 4	- 8	- 1	- 7	-18	-23	- 6
15 17	- 9	-15	- 7	- 1	+ 5	+ 1	- 4	- 2	- 3	-10	-21	-20	- 7
16 17	-11	-20	-16	-10	- 1	+ 1	- 4	- 2	- 7	-17	-22	-18	- 9
17 17	-18	-22	-21	-15	- 6	+ 2	+ 3	- 4	-13	-24	-21	-21	-14
18 17	-13	-17	-19	-17	- 6	- 7	+ 1	- 8	-12	- 2	- 3	- 5	-10
19 17	- 1	- 2	+ 1	- 6	-11	-13	-10	- 9	- 4	+ 4	- 1	- 2	- 5
20 17	- 6	- 3	+ 1	- 3	- 6	- 6	- 5	- 5	- 5	- 3	- 5	- 2	- 4
21 17	- 6	- 6	- 2	- 5	- 3	- 2	- 1	- 4	- 6	- 3	- 5	0	- 3
22 17	+ 1	+ 1	+ 2	- 1	- 3	0	+ 1	- 1	0	+ 5	+ 1	+ 5	+ 1
23 17	+ 2	+ 5	+ 7	+ 1	+ 1	- 1	+ 4	+ 2	+ 5	+ 7	+ 6	+10	+ 5

Minimum sun-spot years.

Unity = ·1γ = ·000001 C. G. S. Unit.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 17	- 3	- 5	- 4	- 1	- 2	- 1	- 2	- 7	- 6	- 6	- 4	- 4	- 4
1 17	- 4	- 4	- 5	- 2	- 3	- 1	- 6	- 8	- 9	- 7	- 5	- 7	- 5
2 17	- 4	- 5	- 4	0	- 2	0	- 6	- 9	- 7	- 7	- 5	- 7	- 5
3 17	- 4	- 4	- 4	- 3	- 4	- 2	- 6	- 8	- 7	- 5	- 4	- 6	- 5
4 17	- 1	- 3	- 5	- 4	- 4	- 6	- 6	- 9	- 6	- 5	- 4	- 4	- 4
5 17	- 2	- 4	- 8	- 7	- 9	- 9	- 9	-11	- 8	- 7	- 4	- 4	- 8
6 17	- 4	- 5	-11	-13	-14	-12	-10	-15	-11	-11	- 3	- 3	-11
7 17	- 5	- 9	-13	-11	- 9	- 6	0	- 9	+ 2	- 5	- 9	- 5	- 8
8 17	- 2	-15	-14	- 7	- 5	- 2	+ 4	+ 1	+ 8	- 3	-10	-12	- 5
9 17	- 7	-22	- 7	- 4	- 3	+ 2	+ 4	+ 1	+ 3	- 5	- 8	-17	- 5
10 17	- 8	-11	- 2	- 2	+ 4	- 1	+ 5	+ 7	+ 4	0	- 5	-10	- 1
11 17	- 5	- 4	+ 1	- 2	+ 7	+ 2	- 5	+ 7	+ 5	+ 2	+ 1	- 3	+ 1
12 17	- 2	+ 1	+ 4	- 3	+ 8	+ 5	- 1	+10	+ 5	+ 2	+ 6	+ 6	+ 1
13 17	- 5	+ 7	+ 5	0	+ 7	+ 5	+ 2	+11	+ 3	+ 1	+ 5	+11	+ 5
14 17	0	+17	+ 9	+ 3	+ 6	+ 2	+ 2	+10	+ 1	+ 4	+ 5	+15	+ 7
15 17	+ 7	+21	+13	+ 6	+ 1	- 1	+ 5	+11	+ 2	+ 8	+ 7	+15	+ 8
16 17	+13	+16	+15	+10	+ 2	- 5	+ 4	+10	+ 5	+13	+ 8	+16	+10
17 17	+14	+14	+16	+13	+ 1	- 5	+ 2	+ 9	+10	+19	+15	+15	+ 9
18 17	+ 9	+11	+14	+13	+ 5	+ 3	+ 3	+ 2	+ 6	+ 8	+ 4	+ 8	+ 7
19 17	+ 3	+ 1	+ 2	+ 8	+10	+11	+11	+ 6	+ 1	+ 2	+ 3	+ 3	+ 5
20 17	+ 4	+ 3	+ 4	+ 5	+ 6	+ 5	+ 6	+ 4	+ 1	+ 5	+ 4	+ 4	+ 4
21 17	+ 2	+ 5	+ 3	+ 4	+ 1	+ 2	+ 2	+ 1	+ 2	+ 4	+ 1	+ 2	+ 3
22 17	0	+ 1	- 1	+ 2	+ 1	+ 1	0	- 2	- 3	- 2	- 2	- 3	- 1
23 17	- 2	- 3	- 6	- 1	- 1	- 1	- 2	- 5	- 5	- 5	- 5	- 5	- 3

similarity in the run of the excess inequalities to that of the normal diurnal wave is in this element too, clearly exhibited. As the secular effect is small, in order however to correctly bring out the difference curve between the years of maximum and minimum spots quite clearly, a few selected years of the greatest maximum and the greatest minimum only, have been considered instead of, as in H and D, taking all the years round the maximum and minimum epochs which gives the mean maximum and mean minimum conditions. The difference curve so obtained discloses quite markedly, as in the other elements, the parallelism to the original inequality we seek.

Seasonal changes in diurnal wave due to secular force.

403. The diurnal inequality besides passing through the periodic seasonal change is subject, as we have seen elsewhere, to secular changes which cut out in 11 years or thereabouts. These are derived from tables 344 and 345 and from the results charted in plate 57. Taking the excesses of the monthly variations over the average inequality of the year or of figures 1 to 12 over 13 and of figures 14 to 25 over 26 in the same plate, the excess inequalities from month to month at the mean maximum and mean minimum epochs are secured; there is a gradual inversion of the secular seasonal changes as the years progress from the former to the latter epoch. The difference curves derived from these excess inequalities of the two epochs are charted in plate 55, figures 13 to 24; and here too, as in other elements, the disturbance effects are made out unmistakably similar in character to the periodic seasonal changes referred to in paragraph 399 which are charted in figures 1 to 12 in the same plate.

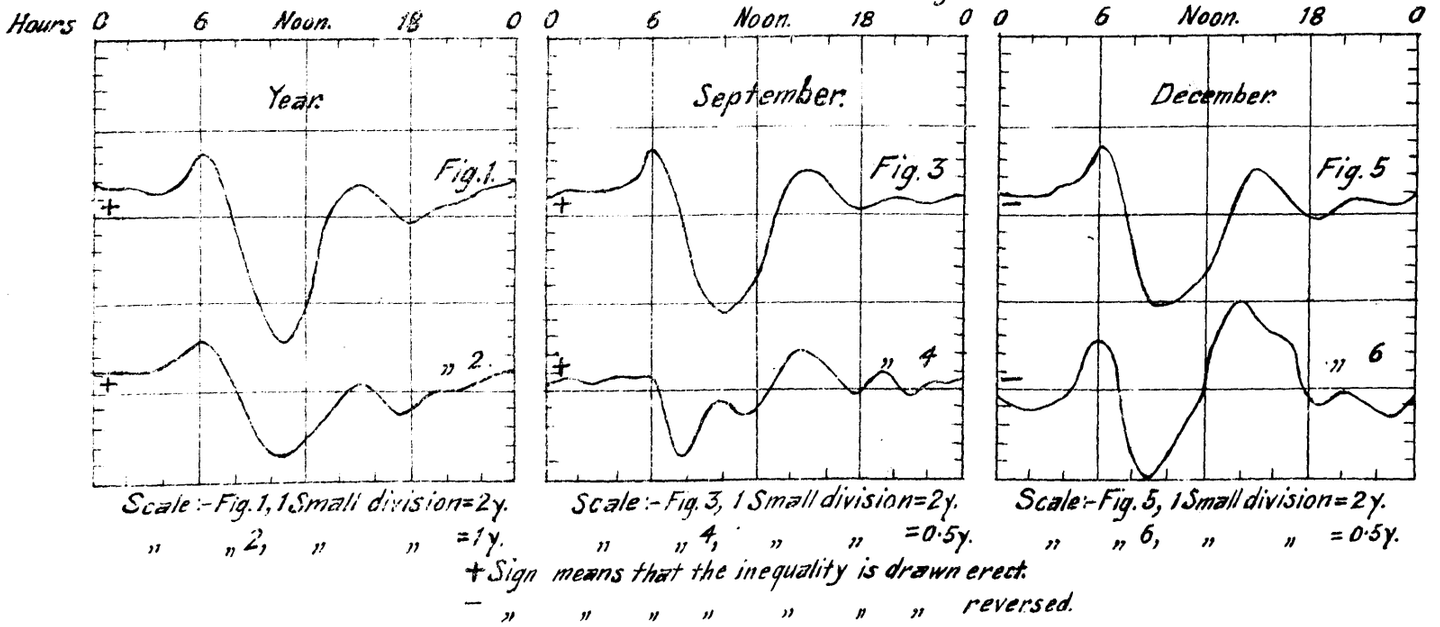
In these results however, as in Declination, the change in the magnitude of the disturbance of the range does not occur apparently concurrent. While September has the greatest disturbance in the periodic seasonal inequality, figure 9, plate 55, the greatest secular seasonal effect is noted in July. Whether this connotes a real phenomenon, appears to be problematic, as in the Declination curves at least we have seen that the feebleness of the secular effects is undoubtedly responsible for a similar discrepancy noted in that element. We have no record of the first 22 years, as in Declination, to prove this in the results of V, but presumably it is not improbable that the discrepancy in the progression as shown by figures 13 to 24 is, in that respect, due to this cause.

Seasonal variation of the hourly ordinates due to sun-spot frequency.

404. The comparison of the annual variation similarly of each hourly ordinate due to secular (11-year) effects, with similar changes due to periodic seasonal changes referred to in paragraph 400, shows (*vide* plate 55, figures 49 to 72) that the progressions appear to be fairly synchronous, the smaller discrepancies noted here and there being presumably due to the feebleness in the secular effects referred to in the preceding paragraph.

The more important of the results above indicated have been charted below for ready reference, enabling the reader to follow at a glance the diurnal phenomenon as it progresses in its seasonal and secular march.

Figures showing Diurnal Inequalities, their Seasonal and Secular Changes.



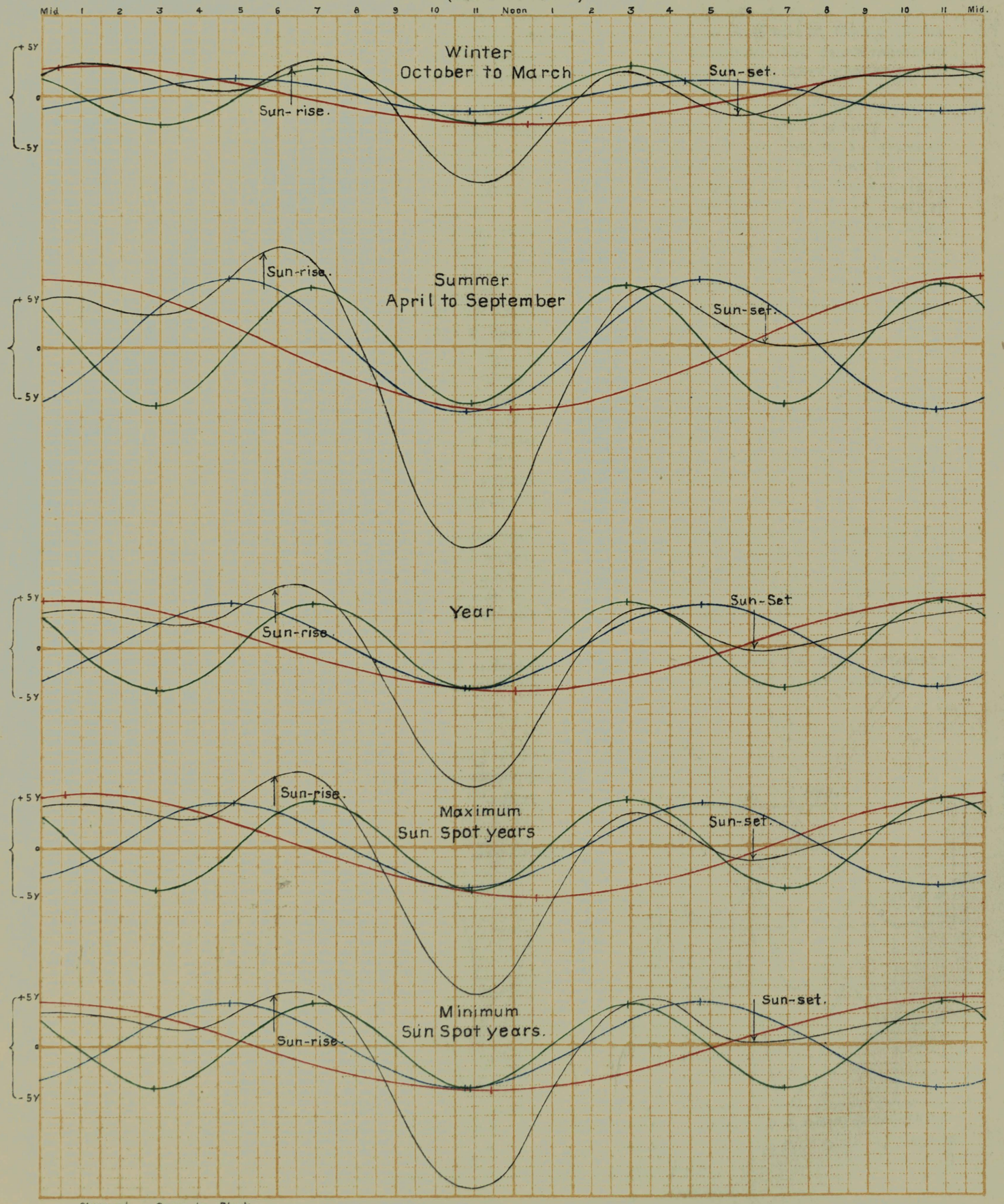
Scale:-Fig. 1, 1 Small division = 2y.
" " 2, " " = 1y.
Scale:-Fig. 3, 1 Small division = 2y.
" " 4, " " = 0·5y.
Scale:-Fig. 5, 1 Small division = 2y.
" " 6, " " = 0·5y.

+ Sign means that the inequality is drawn erect.
− " " " " " " " reversed.

COLABA OBSERVATORY.

Diurnal Inequality of Vertical Force and its Harmonic Components
(1873 to 1904)

Plate 58



Observed Components { 1st — Red. 2nd — Blue. 3rd — Green. } Curve in Black

Govt Photozincn. Office, Poona. 1909.

Figure 1 denotes the average diurnal curve of 33 years; figure 2 shows the secular effect, that is the diurnal curve of maximum epoch less that at the minimum. Figures 3 and 5 show the departure of the diurnal curve for the months of September and December respectively, showing the average periodic seasonal change; while figures 4 and 6 show the aperiodic seasonal change due to secular influences. It will be noted that the general run of the curves is strikingly parallel in all.

2. *Harmonic Analysis of the Diurnal Inequality.*

405. As remarked elsewhere the diurnal variations of the vertical force for the period 1873—1894 derived from the magnetograms of the V. F. No. 1 variation instrument have had to be corrected for instrumental defects. The analysis hence has advisedly been restricted to the average inequalities of each year, group of years and the average months. The period 1894 to 1905 the record of which has been secured by the V. F. No. 2 magnetograph however, has been dealt with more fully.

406. The results of the analysis are shown in tables 347 to 356. When the computed inequalities of the average months are compared with the observed inequalities the sums of the squares of the departures derived from the two series which are given below show how far the results of analysis can be depended upon for the requirements. The departure of the winter months, however, when compared with the ordinate of the actual variations are, it will be seen, not so small as in other months.

Unity = 0·01γ = ·0000001 C. G. S. Unit.

January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
458	133	128	126	215	110	168	418	308	107	274	220	26

407. The average diurnal curve of the year derived from the whole period 1873 to 1904 when analysed shows (*vide* table 348) that the first three components are nearly all equally significant, the amplitudes being 4·7γ, 4·1γ, 4·2γ, respectively, while the amplitude of the fourth component is 1·7γ.

The summer values of the amplitudes of the first three components, which are 6·6γ, 6·7γ and 5·8γ respectively diminish to 2·9γ, 1·6γ and 2·6γ as the seasonal conditions pass to winter. The first three components are affected almost equally by the seasonal changes, the second being more susceptible to this influence than either the first or the third, while the fourth component shows no appreciable signs at all of being affected. The winter value of this component is 1·9γ which, if anything, is appreciably greater than that of summer which is 1·6γ.

408. The annual variation of the amplitudes of the four components (see co-efficients given below) seem to be symmetrical and parallel, but the almost complete suppression of the annual term in the fourth component accentuating the effect of the semi-annual term, obviously differentiates its behaviour from the first three components.

Unity = 1γ.

P_1		P_2		P_3		P_4	
	° ′		° ′		° ′		° ′
c_1 = 2·50	a_1 = 191 11	c_1 = 3·39	a_1 = 191 6	c_1 = 2·22	a_1 = 188 1	c_1 = 0·23	a_1 = 339 1
c_2 = 1·09	a_2 = 82 56	c_2 = 1·05	a_2 = 77 8	c_2 = 1·30	a_2 = 82 0	c_2 = 0·77	a_2 = 82 19
c_3 = 1·08	a_3 = 12 4	c_3 = 1·29	a_3 = 9 18	c_3 = 0·85	a_3 = 14 1	c_3 = 0·36	a_3 = 28 57

The influence of the secular disturbing forces connected with the 11-year period is fairly well marked in the first, the third, and the fourth components (*vide* table 348). The years of maximum spot show amplitudes of 5·2γ, 4·5γ, and 1·8γ, respectively, for the first, third, and fourth components which diminish to 4·5γ, 4·2γ, and 1·6γ during the years of minimum spots. The second component however indicates no change and, if anything, a reverse effect; its amplitude 4·2γ during the minimum epoch is reduced to 4·1γ in the maximum epoch. The difference is hardly appreciable, and even though the secular effects incident during the period considered are admittedly feeble, it may be fairly inferred that the second component which shows greater susceptibility to seasonal changes than any other components, does not readily respond to the secular effect.

Considering now the fluctuations in the values of all the epochs of the first maximum μ reckoned from midnight, in its relation to seasonal and secular changes, it will be seen, notwithstanding, that the magnitudes of the amplitudes are small in all components, that the incidence of the maximum

TABLE 347.—*Vertical Force Magnetograph—Showing the mean values of the p, q Co-efficient of the first four orders of Harmonic Components of Diurnal Inequality of Vertical Force at Bombay (Colaba) for each month of the years of the sun-spot periods, as also for the period 1873 to 1904 derived by averaging the values of p and q.*

Unity = 1γ = ·00001 C. G. S. Unit.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
Maximum Sun-spot Period.								
January ...	−2·22	−2·64	−0·71	−1·73	−1·47	−2·52	−1·32	−2·32
February ...	−1·62	−2·55	−0·37	−0·25	−1·79	−1·36	−1·47	−1·68
March ...	−3·49	−3·10	−2·89	−1·06	−4·22	−2·60	−1·84	−2·55
April ...	−5·49	−3·40	−5·45	−1·50	−5·58	−2·95	−2·04	−1·39
May ...	−5·81	−2·67	−6·75	−1·01	−5·72	−2·17	−1·59	−0·16
June ...	−5·32	−3·55	−6·13	−2·34	−4·91	−2·87	−1·07	−0·15
July ...	−5·13	−3·87	−6·27	−1·97	−4·65	−2·67	−1·01	+0·26
August ...	−6·12	−3·97	−7·63	−1·77	−5·82	−2·46	−1·48	+0·37
September ...	−7·97	−4·12	−8·56	−1·52	−7·39	−2·80	−2·66	−1·16
October ...	−4·86	−3·25	−3·82	−0·42	−5·06	−1·36	−3·03	−1·42
November ...	−1·43	−2·36	+0·32	+0·19	−1·10	−0·33	−1·62	−0·50
December ...	−1·13	−2·56	+0·89	−0·82	−0·06	−1·09	−0·48	−0·79
Winter ...	−2·46	−2·74	−1·10	−0·68	−2·28	−1·54	−1·63	−1·54
Summer ...	−5·97	−3·60	−6·80	−1·68	−5·68	−2·65	−1·64	−0·37
Year ...	−4·22	−3·02	−3·91	−1·09	−4·00	−2·05	−1·60	−0·92
Minimum Sun-spot Period.								
January ...	−2·82	−1·16	−1·42	−1·81	−1·39	−2·37	−0·96	−1·91
February ...	−2·30	−0·21	−1·66	+0·10	−2·10	−1·22	−1·04	−1·46
March ...	−3·54	−0·91	−3·15	−0·82	−3·26	−2·51	−1·01	−2·18
April ...	−6·20	−1·71	−5·56	−1·35	−4·70	−2·72	−1·54	−1·15
May ...	−6·04	−1·69	−6·26	−1·10	−5·14	−1·86	−1·60	−0·20
June ...	−5·41	−2·62	−5·27	−2·19	−4·14	−2·56	−1·22	−0·54
July ...	−4·77	−2·71	−5·53	−2·25	−4·22	−2·83	−1·03	−0·42
August ...	−5·72	−2·06	−7·08	−1·45	−5·45	−2·25	−1·50	−0·07
September ...	−7·62	−2·54	−8·23	−1·64	−6·90	−2·70	−2·56	−1·13
October ...	−4·68	−1·32	−4·23	−0·31	−4·71	−1·35	−2·41	−1·30
November ...	−1·70	−0·37	−0·67	+0·52	−1·47	−0·11	−1·35	−0·35
December ...	−1·15	−0·08	−0·33	−0·25	−0·64	−0·80	−0·50	−0·62
Winter ...	−2·70	−0·67	−1·91	−0·43	−2·26	−1·39	−1·21	−1·30
Summer ...	−5·96	−2·22	−6·32	−1·66	−5·09	−2·49	−1·57	−0·58
Year ...	−4·31	−1·36	−4·08	−1·02	−3·67	−1·89	−1·37	−0·92
1873—1904.								
January ...	−2·53	−1·71	−1·04	−1·58	−1·41	−2·22	−1·10	−1·97
February ...	−1·92	−1·21	−0·95	−0·10	−1·72	−1·25	−1·10	−1·49
March ...	−3·34	−1·98	−2·79	−0·97	−3·41	−2·56	−1·21	−2·23
April ..	−5·77	−2·46	−5·39	−1·32	−4·97	−2·72	−1·67	−1·12
May ...	−5·99	−2·36	−6·48	−1·28	−5·37	−2·13	−1·55	−0·18
June ...	−5·29	−2·98	−5 58	−2·30	−4·33	−2·78	−1·01	−0·37
July ...	−4·76	−3·24	−5·72	−2·03	−4·32	−2·73	−0·97	−0·17
August ...	−5·99	−2·99	−7·21	−1·54	−5·55	−2·27	−1·57	+0·14
September ...	−7·91	−3·12	−7·38	−1·43	−7·07	−2·60	−2·61	−1·08
October ...	−4·62	−2·18	−4·03	−0·20	−4·85	−1·28	−2·61	−1·31
November ...	−1·60	−1·11	−0·38	+0·44	−1·46	−0·25	−1·40	−0·49
December ...	−1·02	−1·19	+0·27	−0·43	−0·32	−0·92	−0·44	−0·72
Winter ...	−2·50	−1·56	−1·49	−0·47	−2·19	−1·41	−1·31	−1·37
Summer ...	−5·95	−2·86	−6·46	−1·65	−5·27	−2·54	−1·56	−0·46
Year ...	−4·22	−2·14	−3·96	−1·02	−3·73	−1·93	−1·43	−0·89

TABLE 348.—*Vertical Force Magnetograph—Showing the mean values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Vertical Force at Bombay (Colaba) for each month of the years of the sun-spot periods as also for the period 1873—1904 derived from table 347.*

Unity = 1γ = ·00001 C. G. S. Unit.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
Maximum Sun-spot Period.					° ′	° ′	° ′	° ′
January ...	3·45	1·87	2·92	2·67	24 11	98 6	114 10	34 21
February ...	3·02	0·45	2·25	2·23	31 49	81 17	106 40	31 27
March ...	4·67	3·08	4·96	3·14	15 52	74 20	104 48	32 48
April ...	6·46	5·65	6·31	2·47	6 1	71 57	103 32	27 49
May ...	6·39	6·83	6·12	1·60	**−1 4**	68 31	101 11	20 41
June ...	6·40	6·56	5·69	1·08	7 58	74 42	104 21	21 15
July ...	6·43	6·57	5·36	1·04	11 17	72 59	104 12	15 38
August ...	7·29	7·83	6·32	1·53	7 13	70 47	101 53	15 44
September ...	8·97	8·69	7·90	2·90	1 35	69 17	101 10	25 9
October ...	5·85	3·84	5·24	3·35	8 1	67 23	99 16	25 32
November ...	2·76	0·37	1·15	1·70	33 2	169 36	99 49	23 32
December ...	2·80	1·21	1·09	0·92	40 26	132 55	**123 12**	33 56
Winter ...	3·68	1·29	2·75	2·24	22 20	80 7	105 36	30 6
Summer ...	6·97	7·00	6·27	1·68	5 20	71 12	102 35	22 26
Year ...	5·19	4·06	4·49	1·85	9 50	72 3	103 18	26 44
Minimum Sun-spot Period.								
January ...	3·05	2·30	2·75	2·14	356 37	90 12	114 7	35 5
February ...	2·31	1·66	2·43	1·79	339 28	62 31	104 18	32 53
March ...	3·66	3·25	4·11	2·40	348 40	71 33	106 47	35 32
April ...	6·43	5·72	5·43	1·92	349 40	71 5	104 16	28 26
May ...	6·27	6·36	5·47	1·61	349 53	69 14	100 53	21 2
June ...	6·01	5·71	4·87	1·33	**360 5**	75 32	104 50	25 13
July ...	5·49	5·97	5·08	1·11	**363 51**	75 19	105 32	24 48
August ...	6·08	7·23	5·90	1·50	354 3	70 2	101 44	19 55
September ...	8·03	8·39	7·41	2·80	352 41	69 53	101 22	25 12
October ...	4·86	4·24	4·90	2·74	350 0	66 21	99 35	26 20
November ...	1·74	0·85	1·47	1·39	346 32	45 20	95 41	22 53
December ...	1·15	0·41	1·02	0·80	338 14	82 50	111 32	32 2
Winter ...	2·78	1·96	2·65	1·78	348 6	70 31	104 42	30 56
Summer ...	6·36	6·53	5·67	1·67	354 36	71 32	102 51	24 14
Year ...	4·52	4·21	4·13	1·65	351 41	71 11	103 15	27 38
1873—1904.								
January ...	3·05	1·89	2·63	2·26	**368 18**	92 35	113 27	34 27
February ...	2·27	0·96	2·13	1·85	**366 28**	67 16	106 15	32 39
March ...	3·88	2·95	4·26	2·54	**364 55**	73 50	106 33	34 38
April ...	6·27	5·55	5·67	2·01	357 20	71 8	103 49	27 43
May ..	6·44	6·60	5·78	1·56	355 45	69 50	101 28	20 54
June ...	6·07	6·04	5·15	1·08	**363 39**	75 27	105 9	24 17
July ...	5·76	6·07	5·11	0·98	**368 29**	74 1	105 1	21 44
August ...	6·70	7·37	6·00	1·58	**360 47**	70 17	101 40	17 58
September ...	8·50	8·50	7·53	2·82	355 47	69 6	100 59	24 52
October ...	5·11	4·03	5·02	2·92	359 31	65 40	99 11	25 55
November ...	1·95	0·58	1·48	1·48	**369 0**	39 39	97 29	24 4
December ...	1·57	0·51	0·97	0·84	**383 39**	125 18	117 51	33 54
Winter ...	2·95	1·56	2·60	1·90	366 8	72 55	105 6	30 44
Summer ...	6·60	6·67	5·85	1·63	359 50	71 20	102 45	23 17
Year ...	4·73	4·09	4·20	1·68	361 8	71 29	103 22	27 14

As the values of μ, are all indicated round about 360°, for uniformity and for the purpose of taking averages the values in thick type are increased by 360°.

TABLE 349.—*Vertical Force Magnetograph—Showing mean monthly values of the p, q Co-efficients for the first four orders of Harmonic Components of Diurnal Inequality of Vertical Force at Bombay (Colaba) for each of the 11-yearly groups of periods (1873 to 1883, 1884 to 1894 and 1894 to 1904).*

Unity = 1γ = ·00001 C. G. S. Unit.

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1873—1883.								
January ...	−2·61	−1·07	−1·17	−1·48	−1·45	−2·19	−1·02	−1·94
February ...	−1·85	−0·82	−1·02	+0·04	−1·82	−1·23	−1·08	−1·43
March ...	−2·66	−1·52	−2·43	−0·57	−3·35	−2·29	−1·16	−2·17
April ...	−5·17	−2·30	−5·12	−0·97	−4·97	−2·53	−1·71	−1·18
May ...	−5·87	−2·35	−6·32	−1·28	−5·36	−2·14	−1·48	−0·21
June ...	−5·10	−2·94	−5·31	−2·21	−4·37	−2·80	−1·12	−0·34
July ...	−4·73	−3·17	−5·58	−1·86	−4·37	−2·67	−0·97	−0·02
August ...	−6·01	−3·15	−6·91	−1·76	−5·35	−2·32	−1·58	+0·25
September ...	−7·83	−3·09	−8·22	−1·39	−7·08	−2·52	−2·63	−0·97
October ...	−4·46	−1·68	−3·95	+0·25	−5·07	−0·78	−2·80	−1·06
November ...	−1·63	−0·77	−0·40	+0·42	−1·67	−0·26	−1·51	−0·51
December ...	−0·82	−0·56	+0·07	−0·23	−0·68	−0·87	−0·63	−0·72
Winter ...	−2·34	−1·07	−1·48	−0·26	−2·34	−1·27	−1·37	−1·30
Summer ...	−5·78	−2·83	−6·24	−1·58	−5·25	−2·50	−1·58	−0·41
Year ...	−4·05	−1·90	−3·84	−0·88	−3·80	−1·84	−1·46	−0·84
1884—1894.								
January ...	−2·32	−2·20	−0·66	−1·69	−1·30	−2·37	−1·08	−2·12
February ...	−1·80	−1·52	−0·61	0·00	−1·65	−1·21	−1·12	−1·49
March ...	−3·87	−2·37	−2·95	−1·09	−3·72	−2·70	−1·31	−2·32
April ...	−6·26	−2·50	−5·78	−1·29	−5·34	−2·68	−1·76	−1·13
May ...	−5·86	−2·16	−6·76	−0·79	−5·66	−1·90	−1·54	−0·10
June ...	−5·06	−2·82	−5·85	−2·04	−4·54	−2·63	−1·05	−0·24
July ...	−4·64	−3·19	−5·91	−1·87	−4·45	−2·69	−0·94	−0·12
August ...	−6·02	−2·93	−7·77	−1·38	−5·96	−2·26	−1·60	+0·19
September ...	−7·73	−3·24	−8·40	−1·32	−7·22	−2·57	−2·66	−1·13
October ...	−4·68	−2·55	−3·91	−0·42	−4·85	−1·52	−2·61	−1·47
November ...	−1·12	−1·23	+0·18	+0·53	−1·17	−0·27	−1·31	−0·57
December ...	−0·86	−1·72	+0·95	−0·55	+0·13	−0·92	−0·23	−0·66
Winter ...	−2·44	−1·93	−1·17	−0·54	−2.09	−1·50	−1·28	−1·44
Summer ...	−5·93	−2·81	−6·74	−1·45	−5·53	−2·45	−1·59	−0·42
Year ...	−4·16	−2·25	−3·93	−0·92	−3·80	−1·92	−1·41	−0·90
1894—1904.								
January ...	−2·69	−1·87	−1·33	−1·62	−1·47	−2·13	−1·19	−1·84
February ...	−2·13	−1·31	−1·23	−0·29	−1·71	−1·33	−1·07	−1·52
March ...	−3·47	−1·90	−2·98	−1·20	−3·17	−2·59	−1·17	−2·18
April ...	−5·87	−2·42	−5·27	−1·68	−4·57	−2·84	−1·54	−1·03
May ...	−6·23	−2·46	−6·35	−1·77	−5·16	−2·32	−1·61	−0·21
June ...	−5·78	−3·19	−5·71	−2·66	−4·20	−2·91	−1·01	−0·49
July ...	−4·89	−3·18	−5·63	−2·25	−4·12	−2·79	−1·02	−0·26
August ...	−5·97	−2·87	−6·97	−1·50	−5·30	−2·26	−1·55	+0·02
September ...	−8·18	−3·05	−8·51	−1·59	−6·93	−2·72	−2·52	−1·16
October ...	−4·69	−2·31	−4·22	−0·46	−4·64	−1·50	−2·45	−1·35
November ...	−2·03	−1·38	−0·86	+0·41	−1·56	−0·14	−1·47	−0·39
December ...	−1·40	−1·33	−0·23	−0·52	−0·42	−0·96	−0·43	−0·74
Winter ...	−2·73	−1·69	−1·81	−0·61	−2·16	−1·45	−1·30	−1·33
Summer ...	−6·15	−2·86	−6·41	−1·90	−5·04	−2·64	−1·54	−0·52
Year ...	−4·44	−2·27	−4·10	−1·25	−3·60	−2·04	−1·42	−0·92

TABLE 350.—*Vertical Force Magnetograph—Showing the mean values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Vertical Force at Bombay (Colaba) for each month of the group of 11-yearly periods 1873 to 1883, 1884 to 1894 and 1894 to 1904 derived from table 349.*

Unity = 1γ = ·00001 C. G. S. Unit.

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1873—1883.								
January ...	2.82	1·89	2·63	2·19	356 32	90 5	113 5	34 49
February ...	2·02	1·02	2·20	1·79	358 9	63 7	105 36	32 29
March ...	3·06	2·50	4·06	2·46	**364 0**	70 51	105 42	34 43
April ...	5·66	5·21	5·58	2·08	358 14	69 37	103 15	27 54
May ...	6·32	6·45	5·77	1·49	356 4	69 59	101 30	21 16
June ...	5·89	5·75	5·19	1·17	**364 13**	75 33	105 8	23 28
July ...	5·69	5·88	5·12	0·97	**368 5**	73 28	104 43	19 33
August ...	6·79	7·13	5·83	1.60	**361 55**	71 24	102 4	17 0
September ...	8.42	8·34	7·52	2·80	355 47	69 3	100 47	24 19
October ...	4·77	3·96	5·13	2·99	354 53	62 26	97 10	24 26
November ...	1·80	0·58	1·69	1·59	359 32	41 3	97 12	23 55
December ...	0·99	0·24	1·10	0·96	**368 35**	117 43	111 35	31 27
Winter ...	2·57	1·50	2·66	1·89	358 49	69 14	103 45	30 8
Summer ...	6·44	6·44	5·81	1·63	**360 20**	71 22	102 44	22 53
Year ...	4·47	3·94	4·22	1·68	359 23	70 42	102 52	26 44
1884—1894.								
January ...	3·20	1·81	2·70	2·38	**377 44**	98 35	114 40	35 0
February ...	2·36	0·61	2·05	1·86	**374 26**	64 15	106 20	32 31
March ...	4·54	3·14	4·60	2·66	**365 44**	74 24	106 14	34 23
April ...	6·74	5·92	5·97	2·09	356 1	70 33	103 8	27 26
May ...	6·25	6·81	5·97	1·54	354 29	67 35	100 26	20 11
June ...	5·79	6·20	5·25	1·08	**363 23**	73 52	104 17	22 28
July ...	5·63	6·20	5·20	0·95	**368 45**	73 2	104 38	21 4
August ...	6·70	7·89	6·37	1·61	**360 12**	69 17	101 10	17 33
September ...	8·38	8·50	7·66	2·89	356 59	68 43	100 47	25 0
October ...	5·33	3·93	5·08	3·00	**362 50**	67 19	100 3	26 36
November ...	1·66	0·56	1·20	1·43	**381 56**	9 52	98 35	25 8
December ...	1·92	1·10	0·93	0·70	**397 41**	139 13	6 56	36 57
Winter ...	3·11	1·29	2·57	1·93	**372 36**	76 38	106 8	31 21
Summer ...	6·56	6·89	6·05	1·64	359 36	70 19	102 13	22 57
Year ...	4·73	4·04	4·26	1·67	**362 39**	70 51	103 11	27 23
1894—1904.								
January ...	3·28	2·10	2·59	2·20	**368 48**	89 19	112 28	33 17
February ...	2·50	1·26	2·17	1·86	**365 35**	70 38	106 38	32 43
March ...	3·96	3·21	4·09	2·47	**362 42**	74 58	107 5	34 27
April ...	6·35	5·53	5·40	1·85	356 24	72 51	104 37	27 27
May ...	6·70	6·59	5·66	1·62	355 33	71 47	102 5	20 52
June ...	6·60	6·30	5·11	1·12	**362 54**	76 30	105 34	25 28
July ...	5·83	6·06	4·98	1·05	**367 2**	74 54	105 22	22 35
August ...	6·62	7·13	5·76	1·55	359 41	70 5	101 42	18 49
September ...	8·73	8·66	7·44	2·77	354 27	69 18	101 9	25 11
October ...	5·23	4·24	4·88	2·80	**360 13**	67 7	99 58	26 13
November ...	2·45	0·95	1·57	1·52	**368 12**	51 15	95 43	22 43
December ...	1·93	0·57	1·05	0·86	**377 32**	97 4	116 7	33 58
Winter ...	3·21	1·91	2·60	1·86	**365 46**	73 19	105 17	30 25
Summer ...	6·78	6·69	5·69	1·63	358 56	72 16	103 13	23 40
Year ...	4·99	4·29	4·14	1·69	**361 5**	72 29	103 51	27 14

TABLE 351.—*Vertical Force Magnetograph—Showing mean values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Vertical Force at Bombay (Colaba) for each of the years from 1873 to 1904, derived by averaging the values of p and q.*

Unity = 1γ = ·00001 C. G. S. Unit.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1873 ...	−3·75	−1·74	−3·49	−0·53	−3·73	−1·66	−1·55	−0·73
1874 ...	−3·87	−2·39	−3·07	−1·13	−3·17	−1·78	−1·25	−0·64
1875 ...	−3·74	−1·48	−3·77	−0·42	−3·73	−1·54	−1·33	−0·77
1876 ...	−4·52	−1·62	−4·29	−0·81	−3·82	−1·75	−1·39	−0·83
1877 ...	−4·87	−1·15	−4·81	−0·93	−4·28	−1·92	−1·63	−1·09
1878 ...	4·07	−1·08	−4·22	−0·77	−3·93	−1·67	−1·60	−0·88
1879 ...	−3·96	−0·86	−3·89	−0·96	−3·63	−1·67	−1·40	−0·81
1880 ...	−3·39	−2·03	−3·39	−0·84	−3·45	−1·86	−1·22	−0·80
1881 ...	−4·08	−2·49	−4·30	−0·93	−4·35	−2·12	−1·64	−0·78
1882 ...	−4·08	−3·02	−3·46	−1·18	−3·75	−2·15	−1·48	−0·97
1883 ...	−4·22	−3·02	−3·60	−1·13	−3·94	−2·12	−1·55	−0·94
1884 ...	−4·52	−3·37	−3·98	−1·58	−3·97	−2·37	−1·56	−1·11
1885 ...	−4·13	−1·62	−3·92	−0·72	−3·77	−1·83	−1·25	−0·94
1886 ...	−3·29	−1·78	−2·78	−0·69	−2·82	−1·53	−1·05	−0·52
1887 ...	−4·45	−1·11	−4·04	−0·66	−3·78	−1·72	−1·30	−0·82
1888 ...	−4·42	−1·15	−4·16	−0·58	−3·85	−1·94	−1·35	−0·94
1889 ...	−4·29	−1·21	−4·02	−0·77	−3·70	−1·94	−1·23	−0·93
1890 ...	−3·80	−1·76	−3·71	−0·56	−3·55	−1·71	−1·18	−0·83
1891 ...	−4·39	−2·70	−4·17	−1·23	−4·07	−1·99	−1·60	−1·02
1892 ...	−4·27	−3·37	−4·38	−1·07	−4·32	−1·99	−1·72	−0·92
1893 ...	−4·29	−3·43	−4·33	−1·18	−4·28	−2·18	−1·72	−0·97
1894 ...	−3·95	−3·25	−3·69	−1·10	−3·72	−1·87	−1·55	−0·86
1894 ...	−4·12	−3·32	−3·68	−1·15	−3·63	−1·94	−1·54	−0·86
1895 ...	−5·10	−3·12	−4·75	−1·10	−4·37	−1·97	−1·74	−0·92
1896 ...	−4·58	−2·37	−4·07	−0·87	−3·62	−1·92	−1·42	−0·87
1897 ...	−4·67	−2·41	−4·01	−1·31	−3·57	−2·07	−1·42	−0·95
1898 ...	−4·46	−2·11	−3·98	−1·02	−3·56	−1·85	−1·42	−0·78
1899 ...	−4·49	−1·47	−4·28	−0·89	−3·75	−1·88	−1·46	−0·91
1900 ...	−4·64	−1·91	−4·14	−1·57	−3·41	−2·22	−1·33	−1·01
1901 ...	−3·60	−1·47	−3·42	−1·29	−2·97	−1·97	−1·13	−0·92
1902 ...	−4·22	−2·24	−3·85	−1·82	−3·27	−2·22	−1·35	−1·07
1903 ...	−4·50	−1·97	−4·38	−1·52	−3·49	−2·26	−1·20	−0·96
1904 ...	−4·48	−2·57	−4·54	−1·25	−3·94	−2·13	−1·62	−0·92
1873—1883...	−4·05	−1·90	−3·84	−0·88	−3·80	−1·84	−1·46	−0·84
1884—1894...	−4·16	−2·25	−3·93	−0·92	−3·80	−1·92	−1·41	−0·90
1894—1904...	−4·44	−2·27	−4·10	−1·25	−3·60	−2·04	−1·42	−0·92
1873—1904...	−4·22	−2·14	−3·96	−1·02	−3·73	−1·93	−1·43	−0·89

TABLE 352.—*Vertical Force Magnetograph—Showing the mean values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of Diurnal Inequality of Vertical Force for each of the years 1873 to 1904 derived from table 351.*

Unity = 1γ = ·00001 C. G. S. Unit.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1873 ...	4·13	3·53	4·08	1·71	359 8	68 34	102 15	25 33
1874 ...	4·55	3·27	3·64	1·40	**365 57**	74 21	104 1	26 2
1875 ...	4·02	3·79	4·04	1·54	355 50	67 26	101 44	26 46
1876 ...	4·80	4·37	4·20	1·62	353 58	69 36	102 27	26 58
1877 ...	5·00	4·90	4·69	1·96	347 32	69 44	102 18	27 42
1878 ...	4·21	4·29	4·27	1·83	349 7	69 25	101 55	26 27
1879 ...	4·05	4·01	4·00	1·62	346 30	71 11	102 29	26 46
1880 ...	3·95	3·49	3·92	1·46	**365 10**	71 13	103 42	27 34
1881 ...	4·78	4·40	4·84	1·82	**365 39**	70 21	102 55	25 37
1882 ...	5·08	3·66	4·32	1·77	**370 46**	73 40	104 12	27 34
1883 ...	5·19	3·77	4·47	1·81	**369 50**	72 58	103 41	27 4
1884 ...	5·64	4·28	4·62	1·91	**370 57**	75 5	104 32	28 7
1885 ...	4·44	3·99	4·19	1·56	355 40	69 27	102 53	28 29
1886 ...	3·74	2·86	3·21	1·17	**362 40**	71 13	103 45	25 50
1887 ...	4·59	4·09	4·15	1·54	348 15	68 54	102 24	27 19
1888 ...	4·57	4·20	4·31	1·65	348 50	68 13	103 10	27 58
1889 ...	4·46	4·09	4·18	1·54	350 0	69 41	103 28	28 32
1890 ...	4·19	3·75	3·94	1·44	359 6	68 33	102 49	28 2
1891 ...	5·15	4·35	4·53	1·90	**365 51**	72 28	102 56	27 23
1892 ...	5·44	4·51	4·76	1·95	**372 32**	71 7	102 30	26 17
1893 ...	5·49	4·49	4·80	1·97	**372 54**	71 53	103 15	26 36
1894 ...	5·12	3·85	4·16	1·77	**373 42**	72 33	103 9	26 30
1894 ...	5·29	3·86	4·12	1·76	**372 52**	72 41	103 22	26 18
1895 ...	5·98	4·88	4·79	1·97	**365 27**	70 31	102 5	25 58
1896 ...	5·16	4·16	4·10	1·67	**361 22**	70 2	103 19	26 53
1897 ...	5·26	4·22	4·13	1·71	**361 18**	73 3	104 2	27 27
1898 ...	4·93	4·11	4·01	1·62	359 19	71 11	103 9	26 12
1899 ...	4·72	4·37	4·20	1·72	352 8	69 53	102 53	26 59
1900 ...	5·02	4·43	4·07	1·67	356 22	74 23	105 1	28 18
1901 ...	3·89	3·66	3·56	1·46	356 13	**74 10**	105 11	28 47
1902 ...	4·78	4·26	3·95	1·72	**361 58**	76 39	105 23	28 36
1903 ...	4·91	4·64	4·16	1·54	357 39	73 34	104 58	28 40
1904 ...	5·16	4·71	4·48	1·86	**363 50**	71 42	103 28	26 24
1873—1883...	4·47	3·94	4·22	1·68	359 23	70 42	102 52	26 44
1884—1894...	4·73	4·04	4·26	1·67	**362 39**	70 51	103 11	27 23
1894—1904...	4·99	4·29	4·14	1·69	**361 5**	72 29	103 51	27 14
1873—1904...	4·69	4·07	4·19	1·68	**360 54**	71 26	103 10	26 46

TABLE 353.—*Summary of monthly values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Vertical Force at Bombay (Colaba) for each month of the group of years 1894—1904 derived by different methods of treatment.*

Unity = 1γ = ·00001 C. G. S.

Months.	Method of Treatment.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′
January ...	Analysis of the average period.	3·28	2·10	2·59	2·20	8 48	89 19	112 28	33 17
	Average of the analysis for the period	3·52	2·83	3·06	2·31	11 53	93 20	115 52	34 29
	Difference	− 0·24	− 0·73	− 0·47	− 0·11	− 3 5	−4 1	− 3 24	−1 12
February ...	Analysis of the average period.	2·50	1·26	2·17	1·86	5 35	70 38	106 38	32 43
	Average of the analysis for the period	2·65	1·78	2·30	1·88	7 53	74 27	107 41	33 4
	Difference	− 0·15	− 0·52	− 0·13	− 0·02	− 2 18	−3 49	− 1· 3	−0 21
March ...	Analysis of the average period.	3·96	3·21	4·09	2·47	2 42	74 58	107 5	34 27
	Average of the analysis for the period	4·05	3·29	4·18	2·55	2 56	75 28	107 19	34 32
	Difference	− 0·09	− 0·08	− 0·09	− 0·08	− 0 14	−0 30	− 0 14	−0 5
April ...	Analysis of the average period.	6·35	5·53	5·40	1·85	356 24	72 51	104 37	27 27
	Average of the analysis for the period	6·37	5·57	5·42	1 89	356 5	72 49	104 39	27 33
	Difference	− 0·02	− 0·04	− 0·02	− 0·04	+ 0 19	+0 2	− 0 2	−0 6
May ...	Analysis of the average period.	6·70	6·59	5·66	1·62	355 33	71 47	102 5	20 52
	Average of the analysis for the period	6·74	6·63	5·68	1·63	355 44	71 58	102 10	20 50
	Difference	− 0·04	− 0·04	− 0·02	− 0·01	− 0 11	−0 11	− 0 5	+0 2
June ...	Analysis of the average period.	6·60	6·30	5·11	1·12	2 54	76 30	105 34	25 28
	Average of the analysis for the period	6·62	6·30	5·11	1·16	2 58	76 27	105 40	25 43
	Difference	− 0·02	0·00	0·00	− 0·04	−0 4	+0 3	− 0 6	−0 15
July ...	Analysis of the average period.	5·83	6·06	4·98	1·05	7 2	74 54	105 22	22 35
	Average of the analysis for the period	5·87	6·14	5·01	1·10	6 34	75 4	105 25	22 47
	Difference	− 0·04	− 0·08	− 0·03	− 0·05	+ 0 28	−0 10	− 0 3	−0 12
August ...	Analysis of the average period.	6·62	7·13	5·76	1·55	359 41	70 5	101 42	18 49
	Average of the analysis for the period	6·64	7·13	5·76	1·57	359 2	70 5	101 45	18 58
	Difference	− 0·02	0·00	0·00	− 0·02	+ 0 39	0 0	− 0 3	−0 9
September...	Analysis of the average period.	8·73	8·66	7·44	2·77	354 27	69 18	101 9	25 11
	Average of the analysis for the period	8·74	8·67	7·45	2·81	354 14	69 21	101 12	25 13
	Difference	− 0·01	− 0·01	− 0·01	− 0·04	+ 0 13	−0 3	− 0 3	−0 2
October ...	Analysis of the average period.	5·23	4·24	4·88	2·80	0 13	67 7	99 58	26 13
	Average of the analysis for the period	5·26	4·40	4·90	2·81	0 10	65 23	100 3	26 11
	Difference	− 0·03	− 0·16	− 0·02	− 0·01	+ 0 3	+1 44	− 0 5	+0 2
November...	Analysis of the average period.	2·45	0·95	1·57	1·52	8 12	51 15	95 43	22 43
	Average of the analysis for the period	2·51	1·11	1·58	1·56	7 57	43 3	95 32	22 35
	Difference	− 0·06	− 0·16	− 0·01	− 0·04	+ 0 15	+8 12	+ 0 11	+0 8
December ...	Analysis of the average period.	1·93	0·57	1·05	0·86	17 32	97 4	116 7	33 58
	Average of the analysis for the period	2·01	0·88	1·16	0·91	12 43	94 30	115 56	34 28
	Difference	− 0·08	− 0·31	− 0·11	− 0·05	+ 4 49	+2 34	+ 0 11	−0 30

TABLE 354.—*Summary of the yearly values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Vertical Force at Bombay (Colaba) for the period 1894—1904 derived from different methods of treatment.*

Unity = 1γ = ·00001 C. G. S.

Years.	Method of Treatment.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
						° ′	° ′	° ′	° ′
1894 ...	Analysis of the average period.	5·29	3·86	4·12	1·76	12 52	72 41	103 22	26 18
	Average of the analysis for the period	5·47	4·69	4·43	2·02	17 58	70 25	106 1	26 4
	Difference	− 0·18	− 0·83	− 0·31	− 0·26	− 5 6	+2 16	− 2 39	+0 14
1895 ...	Analysis of the average period.	5·98	4·88	4·79	1·97	5 27	70 31	102 5	25 58
	Average of the analysis for the period	6·07	5·09	4·93	2·14	7 18	65 27	103 54	25 13
	Difference	− 0·09	− 0·21	− 0·14	− 0·17	− 1 51	+5 4	− 1 49	+0 45
1896 ...	Analysis of the average period.	5·16	4·16	4·10	1·67	1 22	70 2	103 19	26 53
	Average of the analysis for the period	5·21	4·31	4·22	1·79	4 41	63 44	105 1	26 50
	Difference	− 0·05	− 0·15	− 0·12	− 0·12	− 3 19	+6 18	− 1 42	+0 3
1897 ...	Analysis of the average period.	5·26	4·22	4·13	1·71	1 18	73 3	104 2	27 27
	Average of the analysis for the period	5·30	4·42	4·24	1·83	4 9	75 24	105 9	26 55
	Difference	− 0·04	− 0·20	− 0·11	− 0·12	− 2 51	−2 21	− 1 7	+0 32
1898 ...	Analysis of the average period.	4·93	4·11	4·01	1·62	359 19	71 11	103 9	26 12
	Average of the analysis for the period	4·99	4·30	4·10	1·76	360 45	71 19	103 51	25 48
	Difference	− 0·06	− 0·19	− 0·09	− 0·14	− 1 26	−0 8	− 0 42	+0 24
1899 ...	Analysis of the average period.	4·72	4·37	4·20	1·72	352 8	69 53	102 53	26 59
	Average of the analysis for th. period	4·79	4·48	4·28	1·86	350 56	70 44	102 35	26 6
	Difference	− 0·07	− 0·11	− 0·08	− 0·14	+ 1 12	−0 51	+ 0 18	+0 53
1900 ...	Analysis of the average period.	5·02	4·43	4·07	1·67	356 22	74 23	105 1	28 18
	Average of the analysis for the period	5·04	4·56	4·19	1·79	354 54	73 9	105 30	28 19
	Difference	− 0·02	− 0·13	− 0·12	− 0·12	+ 1 28	+1 14	− 0 29	−0 1
1901 ...	Analysis of the average period.	3·89	3·66	3·56	1·46	356 13	74 10	105 11	28 47
	Average of the analysis for the period	3·99	3·93	3·75	1·58	362 14	80 7	108 15	29 38
	Difference	− 0·10	− 0·27	− 0·19	− 0·12	− 6 1	−5 57	− 3 4	−0 51
1902 ...	Analysis of the average period.	4·78	4·26	3·95	1·72	1 58	76 39	105 23	28 36
	Average of the analysis for the period	4·82	4·53	4·22	1·86	3 3	76 55	106 43	28 51
	Difference	− 0·04	− 0·27	− 0·27	− 0·14	− 1 5	−0 16	− 1 20	−0 15
1903 ...	Analysis of the average period.	4·91	4·64	4·16	1·54	357 39	73 34	104 58	28 40
	Average of the analysis for the period	5·00	4·88	4·41	1·72	362 27	79 31	107 54	29 4
	Difference	− 0·09	− 0·24	− 0·25	− 0·18	− 4 48	−5 57	− 2 56	−0 24
1904 ...	Analysis of the average period.	5·16	4·71	4·48	1·86	3 50	71 42	103 28	26 24
	Average of the analysis for the period	5·23	4·87	4·55	1·99	6 34	68 12	102 58	26 18
	Difference	− 0·07	− 0·16	− 0·07	− 0·13	− 2 44	+3 30	+ 0 30	+0 6

TABLE 355.—*Vertical Force Magnetograph—Monthly values of p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Vertical Force at Bombay (Colaba) for each month of the year from 1894 to 1904 calculated from the mean hourly Vertical Force for the several years.*

Unity = 1γ = ·00001 C. G. S.

Years.	January.								February.							
	p_1	q_2	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	−0·96	−3·82	+1·83	−1·47	+0·80	−1·58	−0·93	−1·72	−0·87	−1·90	+1·31	+0·78	−1·07	−0·21	−1·19	−1·15
1895 ...	−3·27	−2·72	−2·14	−1·68	−2·62	−2·86	−1·50	−2·77	−3·35	−1·77	−1·80	+0·62	−2·95	−0·89	−2·07	−1·91
1896 ...	−3·15	−1·76	−0·82	−1·57	−1·12	−2·39	−0·77	−1·80	−0·84	−1·57	+0·27	+0·01	−0·66	−0·95	−0·66	−1·21
1897 ...	−4·49	−2·32	−3·04	−1·36	−3·58	−2·21	−2·17	−2·09	−2·60	−1·53	−1·99	−0·86	−1·96	−2·21	−1·12	−1·80
1898 ...	−2·59	−0·65	−1·65	−0·53	−1·96	−1·57	−1·40	−1·57	−2·02	−0·52	−1·98	+0·54	−2·34	−1·02	−1·03	−1·38
1899 ...	−4·07	+0·07	−4·45	+0·49	−4·40	−1·58	−2·43	−1·97	−3·17	+0·45	−3·41	+0·72	−3·61	−1·01	−1·70	−1·63
1900 ...	−3·29	−2·07	−1·90	−2·57	−1·67	−2·66	−1·52	−1·96	−2·75	−1·32	−1·99	−1·00	−1·85	−1·86	−1·20	−1·74
1901 ...	−0·07	−1·18	+1·22	−1·26	+0·91	−1·20	+0·25	−0·98	−1·59	−1·46	−0·54	−0·73	−0·94	−1·37	−0·72	−1·27
1902 ...	−2·67	−3·27	−0·16	−4·19	+0·92	−3·49	+0·26	−1·87	−1·93	−1·20	−1·03	−0·80	−1·10	−1·28	−0·74	−1·34
1903 ...	−1·93	−1·44	−0·92	−2·49	−0·32	−2·16	−0·74	−1·61	−1·57	−1·48	−0·37	−1·57	−0·12	−1·86	−0·17	−1·19
1904 ...	−3·12	−1·47	−2·69	−1·14	−3·03	−1·82	−2·24	−1·87	−2·82	−2·16	−1·98	−0·92	−2·08	−2·04	−1·25	−1·92
Mean ...	−2·69	−1·88	−1·34	−1·62	−1·46	−2·14	−1·20	−1·84	−2·14	−1·31	−1·23	−0·29	−1·70	−1·34	−1·08	−1·50
	March.								April.							
1894 ...	−4·59	−3·32	−3·42	−1·42	−4·04	−3·18	−1·80	−2·88	−4·92	−2·66	−4·65	−1·61	−4·44	−2·82	−1·43	−1·00
1895 ...	−5·42	−1·67	−4·07	−1·10	−4·29	−2·45	−1·60	−2·45	−6·63	−3·33	−6·07	−2·13	−5·66	−2·70	−2·07	−0·77
1896 ...	−3·50	−1·72	−3·03	+0·52	−4·22	−1·00	−2·14	−1·41	−6·74	−2·87	−5·86	−1·62	−5·18	−2·90	−1·85	−0·89
1897 ...	−3·62	−2·03	−2·71	−1·73	−2·81	−3·02	−0·79	−2·51	−6·34	−3·06	−4·90	−2·19	−4·37	−3·21	−1·67	−1·28
1898 ...	−2·07	−1·89	−1·68	−1·22	−2.21	−2·68	−0·42	−1·86	−5·46	−1·62	−5·26	+0·22	−4·96	−1·40	−1·58	−0·62
1899 ...	−3·46	−1·46	−3·15	−1·46	−3·06	−3·02	−1·02	−2·42	−5·23	−1·38	−4·85	−1·23	−4·09	−2·69	−1·17	−0·95
1900 ...	−4·32	−1·57	−3·55	−1·88	−2·86	−2·67	−0·95	−2·20	−6·63	−2·53	−5·44	−2·45	−3·97	−3·48	−0·97	−1·25
1901 ...	−2·42	−0·32	−2·90	−0·47	−3·06	−2·50	−1·04	−2·18	−5·15	−1·34	−4·66	−1·72	−3·78	−2·87	−1·27	−1·08
1902 ...	−3·80	−1·72	−3·62	−1·00	−3·65	−2·09	−1·65	−1·86	−5·07	−2·71	−4·57	−1·96	−4·31	−2·81	−1·62	−1·53
1903 ...	−2·60	−2·34	−2·02	−1·87	−1·87	−3·14	−0·33	−2·20	−6·47	−2·22	−5·82	−1·94	−4·59	−3·32	−1·52	−1·50
1904 ...	−2·44	−2·97	−2·40	−1·71	−2·81	−2·77	−1·32	−2·02	−5·98	−2·82	−5·85	−1·89	−4·95	−3·00	−1·73	−0·51
Mean ...	−3·48	−1·91	−2·96	−1·21	−3·17	−2·59	−1·19	−2·18	−5·87	−2·41	−5·27	−1·68	−4·57	−2·84	−1·53	−1·03
	May.								June.							
1894 ...	−4·42	−3·20	−5·90	−1·67	−5·29	−2·52	−1·65	+0·07	−4·93	−4·02	−6·44	−3·03	−4·64	−3·58	−0·91	−0·68
1895 ...	−6·67	−2·70	−7·84	−0·45	−6·67	−1·85	−1·81	−0·10	−8·12	−4·66	−8·42	−3·39	−6·22	−3·61	−1·78	−0·13
1896 ...	−7·51	−2·36	−7·26	−1·15	−5·57	−2·40	−1·65	−0·21	−5·13	−2·87	−5·34	−1·30	−3·86	−2·28	−0·67	−0·06
1897 ...	−7·35	−2·64	−6·86	−1·85	−5·32	−2·22	−1·45	−0·11	−5·92	−3·14	−5·34	−2·67	−3·64	−2·77	−0·91	−0·40
1898 ...	−6·32	−2·94	−5·78	−2·34	−4·97	−2·52	−1·62	−0·32	−6·00	−2·94	−5·87	−2·86	−4·07	−3·32	−1·02	−0·52
1899 ...	−6·24	−1·37	−6·47	−0·90	−5·22	−1·70	−1·66	+0·10	−4·82	−2·76	−4·41	−2·27	−3·33	−2·72	−0·76	−0·63
1900 ...	−6·97	−2·39	−5·96	−2·47	−4·44	−2·50	−1·45	−0·20	−4·97	−2·52	−4·12	−2·02	−3·55	−2·02	−1·32	−0·34
1901 ...	−5·43	−2·33	−5·36	−2·42	−4·50	−2·45	−1·78	−0·33	−5·33	−2·64	−4·59	−2·39	−3·57	−2·55	−0·96	−0·62
1902 ...	−5·62	−2·00	−5·60	−1·82	−4·68	−2·19	−1·73	−0·54	−5·70	−3·18	−5·53	−2·91	−4·46	−2·86	−1·37	−0·68
1903 ...	−5·89	−2·06	−6·09	−2·12	−4·97	−2·44	−1·46	−0·39	−7·37	−3·64	−6·90	−3·40	−4·70	−3·37	−0·91	−0·52
1904 ...	−6·28	−3·01	−6·71	−2·19	−5·14	−2·76	−1·48	−0·26	−5·34	−2·82	−5·82	−2·79	−4·00	−3·08	−0·57	−0·82
Mean ...	−6·25	−2·45	−6·35	−1·76	−5·16	−2·32	−1·61	−0·21	−5·78	−3·20	−5·71	−2·64	−4·19	−2·92	−1·02	−0·49

TABLE 355.—*Vertical Force Magnetograph—Monthly values of the p, q Co-efficients for the first four orders of Harmonic Components of the Diurnal Inequality of Magnetic Vertical Force at Bombay (Colaba) for each month of the year from 1894 to 1904 calculated from the mean hourly Vertical Force for the several years.*

Unity = 1γ = ·00001 C. G. S.

Year.	July.								August.							
	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	−4·97	−3·91	−6·67	−1·14	−5·23	−1·84	−1·16	+0·26	−5·40	−4·32	−6·84	−1·48	−5·44	−2·13	−1·42	+0·62
1895 ...	−5·25	−5·28	−5·55	−2·28	−4·32	−2·53	−1·17	+0·22	−6·10	−3·52	−8·02	−0·72	−6·42	−1·89	−1·96	+0·37
1896 ...	−4·95	−2·97	−6·15	−1·62	−4·11	−2·78	−0·47	−0·19	−6·62	−3·37	−7·10	−1·17	−5·13	−1·92	−1·62	+0·35
1897 ...	−4·28	−3·73	−4·40	−2·42	−3·87	−2·69	−1·47	−0·76	−6·84	−3·10	−6·87	−1·68	−5·11	−2·47	−1·67	−0·02
1898 ...	−4·64	−2·92	−4·91	−2·26	−3·40	−2·67	−0·76	+0·01	−7·80	−4·47	−6·59	−2·73	−4·61	−2·38	−1·42	+0·24
1899 ...	−4·37	−1·82	−5·72	−0·90	−4·35	−1·87	−1·02	−0·05	−5·52	−2·47	−6·58	−1·31	−5·10	−2·17	−1·44	−0·17
1900 ...	−5·72	−3·27	−5·62	−3·27	−3·76	−3·70	−0·71	−0·62	−5·57	−2·37	−6·65	−1·57	−4·95	−2·55	−0·97	−0·17
1901 ...	−4·03	−2·05	−4·72	−2·40	−3·43	−2·91	−0·64	−0·64	−4·12	−1·10	−5·91	−1·04	−4·72	−2·05	−1·27	−0·38
1902 ...	−4·64	−3·46	−4·83	−3·32	−3·52	−3·12	−1·18	−0·57	−5·77	−1·97	−6·98	−1·82	−5·75	−2·40	−2·10	−0·51
1903 ...	−5·52	−2·34	−6·82	−2·48	−4·60	−3·19	−1·08	−0·39	−5·80	−1·92	−7·82	−1·43	−5·75	−2·29	−1·45	+0·15
1904 ...	−5·29	−3·27	−6·72	−2·77	−4·72	−3·35	−1·49	−0·17	−5·89	−2·90	−7·18	−1·43	−5·23	−2·58	−1·57	−0·36
Mean ...	−4·88	−3·18	−5·65	−2·26	−4·12	−2·79	−1·01	−0·26	−5·95	−2·86	−6·96	−1·49	−5·29	−2·26	−1·54	+0·01
	September.								October.							
1894 ...	−9·60	−3·82	−9·32	−1·56	−7·35	−2·52	−2·73	−0·72	−5·04	−3·22	−4·38	+0·39	−5·75	−1·17	−3·65	−1·72
1895 ...	−7·92	−3·02	−9·30	−0·97	−7·53	−2·79	−2·57	−1·16	−3·90	−3·06	−3·94	+0·19	−4·97	−0·71	−2·93	−1·21
1896 ...	−8·15	−3·64	−7·96	−1·55	−6·81	−2·62	−2·72	−1·50	−3·67	−2·66	−2·91	−0·54	−3·74	−1·60	−2·29	−1·39
1897 ...	−8·05	−3·56	−8·05	−1·47	−6·75	−2·57	−2·14	−0·97	−4·97	−2·42	−4·42	−0·38	−4·72	−1·45	−2·26	−1·12
1898 ...	−9·17	−3·39	−8·81	−1·80	−6·82	−2·86	−2·84	−1·12	−4·82	−2·10	−4·20	+0·03	−4·82	−0·83	−2·61	−0·56
1899 ...	−7·49	−2·98	−6·78	−1·93	−5·64	−2·63	−2·20	−1·14	−5·14	−1·73	−4·23	−0·87	−4·37	−1·83	−2·16	−1·44
1900 ...	−7·47	−2·34	−8·53	−1·40	−7·26	−2·98	−2·62	−1·42	−4·99	−1·77	−4·72	−0·67	−4·77	−1·85	−2·54	−1·48
1901 ...	−7·47	−2·07	−8·14	−1·92	−6·42	−3·26	−2·21	−1·42	−4·11	−1·52	−3·74	−0·71	−3·74	−1·39	−1·92	−0·97
1902 ...	−7·97	−3·72	−8·17	−3·01	−6·62	−3·70	−2·38	−1·57	−4·89	−2·17	−4·35	−1·22	−4·36	−1·82	−2·18	−1·38
1903 ...	−8·26	−1·60	−9·36	−0·57	−7·29	−1·95	−2·27	−0·95	−4·86	−1·70	−4·82	−0·51	−5·09	−1·98	−2·41	−1·80
1904 ...	−8·38	−3·25	−9·07	−1·12	−7·60	−2·07	−3·23	−0·86	−5·25	−3·03	−4·74	−0·64	−4·76	−1·88	−2·04	−1·63
Mean ...	−8·18	−3·04	−8·50	−1·57	−6·92	−2·72	−2·54	−1·17	−4·69	−2·31	−4·22	−0·45	−4·64	−1·50	−2·45	−1·34
	November.								December.							
1894 ...	−1·60	−2·05	−0·39	+0·59	−1·37	+0·07	−1·97	−0·27	−1·92	−3·89	+0·74	−2·08	+0·39	−1·72	+0·16	−1·05
1895 ...	−2·13	−2·91	+0·09	+0·02	−0·72	−0·59	−0·92	−0·43	−2·41	−2·72	+0·07	−1·42	−0·22	−1·14	−0·44	−0·72
1896 ...	−3·47	−1·70	−2·27	−0·09	−2·52	−0·83	−1·77	−1·10	−1·33	−1·01	−0·62	−0·40	−0·68	−1·35	−0·35	−1·15
1897 ...	−0·64	−0·64	+0·25	+1·01	−0·78	+0·27	−1·10	−0·23	−1·07	−0·93	+0·18	−0·02	+0·07	−0·47	−0·24	−0·28
1898 ...	−1·71	−0·73	−0·91	+1·02	−1·82	−0·02	−1·40	−0·67	−0·92	−1·25	−0·09	−0·58	−0·54	−1·00	−1·07	−0·87
1899 ...	−1·87	−0·90	−0·22	−0·07	−0·82	+0·10	−1·33	+0·21	−2·57	−0·92	−1·32	−1·11	−1·15	−1·45	−0·67	−0·92
1900 ...	−2·16	−0·80	−0·89	+0·64	−1·65	+0·15	−1·59	−0·30	−0·90	+0·06	−0·38	−0·09	−0·37	−0·58	−0·12	−0·57
1901 ...	−2·75	−1·33	−1·60	−0·15	−1·80	−0·48	−1·62	−0·51	−0·76	−0·52	−0·27	−0·34	−0·41	−0·82	−0·37	−0·61
1902 ...	−1·16	−0·64	−0·84	+0·65	−1·27	+0·07	−1·11	−0·26	−1·30	−0·79	−0·42	−0·55	−0·36	−1·00	−0·39	−0·67
1903 ...	−2·81	−1·38	−1·65	+0·20	−2·40	−0·36	−1·91	−0·39	−0·99	−1·53	−0·01	−0·15	−0·27	−0·98	−0·13	−0·76
1904 ...	−1·95	−2·06	−0·97	+0·55	−1·76	−0·19	−1·59	−0·33	−1·16	−1·09	−0·52	+1·02	−1·17	−0·02	−1·03	−0·61
Mean ...	−2·02	−1·38	−0·85	+0·40	−1·54	−0·16	−1·48	−0·39	−1·39	−1·33	−0·24	−0·52	−0·43	−0·96	−0·42	−0·75

TABLE 356.—*Vertical Force Magnetograph—Mean monthly values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Vertical Force at Bombay (Colaba) for each month of the year from 1894 to 1904 derived from table 355.*

Unity = 1γ = ·00001 C. G. S.

Years.	January.								February.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1894 ...	3·94	2·35	1·77	1·96	49 54	134 36	**132 57**	34 24	2·09	1·52	1·09	1·65	39 24	**−10 37**	97 42	30 0
1895 ...	4·25	2·72	3·88	3·15	13 45	83 4	109 50	34 24	3·79	1·90	3·08	2·82	1 51	54 30	99 36	29 41
1896 ...	3·61	1·77	2·64	1·96	3 12	95 13	115 38	35 43	1·78	0·27	1·16	1·38	35 51	155 4	112 24	34 21
1897 ...	5·05	3·33	4·21	3·01	1 20	76 3	104 34	29 59	3·02	2·17	2·95	2·12	4 29	75 41	110 9	33 32
1898 ...	2·67	1·73	2·51	2·10	**−11 55**	72 54	106 54	31 4	2·09	2·05	2·55	1·72	**−11 34**	56 22	101 51	32 19
1899 ...	4·07	4·48	4·67	3·13	**−26 59**	60 51	100 35	28 46	3·20	3·49	3·75	2·36	**−34 5**	58 2	99 13	29 57
1900 ...	3·89	3·20	3·14	2·48	6 11	90 46	113 18	32 3	3·05	2·23	2·62	2·11	**− 0 22**	77 21	109 3	32 51
1901 ...	1·18	1·75	1·51	1·01	60 36	131 2	**136 23**	45 5	2·16	0·91	1·66	1·46	16 34	90 46	112 31	34 7
1902 ...	4·22	4·20	3·61	1·89	24 46	107 55	**128 55**	43 29	2·27	1·30	1·69	1·53	5 52	82 55	110 27	34 16
1903 ...	2·41	2·65	2·18	1·77	10 44	98 52	**121 11**	35 20	2·16	1·61	1·87	1·20	17 19	102 22	**122 46**	39 28
1904 ...	3·45	2·92	3·53	2·92	**− 0 46**	75 29	104 20	28 58	3·55	2·18	2·91	2·29	11 27	76 28	108 49	33 14
Mean ...	3·52	2·83	3·06	2·31	11 53	93 20	115 52	34 29	2·65	1·78	2·30	1·88	7 53	74 27	107½ 41	33 4

	March.								April.							
1894 ...	5·67	3·70	5·14	3·40	9 53	75 17	106 44	33 30	5·59	4·92	5·26	1·75	**362 24**	73 33	104 48	27 45
1895 ...	5·67	4·22	4·94	2·93	**− 8 52**	71 34	103 55	33 13	7·42	6·43	6·27	2·21	**360 40**	73 40	102 30	24 6
1896 ...	3·90	3·07	4·34	2·56	0 10	59 8	98 27	27 21	7·33	6·08	5·94	2·05	357 4	71 44	103 45	25 25
1897 ...	4·15	3·21	4·13	2·63	3 17	80 17	109 41	37 8	7·04	5·37	5·42	2·10	359 46	76 3	106 6	28 22
1898 ...	2·80	2·08	3·47	1·91	16 24	82 0	110 50	38 19	5·70	5·26	5·15	1·70	350 32	62 48	99 15	24 22
1899 ...	3·76	3·47	4·30	2·63	**− 3 7**	76 26	108 52	35 47	5·41	5·00	4·90	1·51	348 47	71 7	105 7	28 46
1900 ...	4·60	4·02	3·91	2·40	**− 6 2**	77 57	108 21	35 40	7·10	5·97	5·28	1·58	354 53	76 8	107 45	32 3
1901 ...	2·44	2·94	3·95	2·42	**−18 28**	68 36	107 5	35 8	5·32	4·97	4·75	1·67	348 35	74 8	106 24	29 6
1902 ...	4·17	3·76	4·21	2·49	**− 1 39**	71 44	103 56	31 6	5·75	4·97	5·14	2·23	**362 8**	75 37	105 2	29 51
1903 ...	3·50	2·75	3·65	2·22	15 59	85 24	113 44	39 22	6·84	6·13	5·67	2·14	352 56	73 13	105 58	30 9
1904 ...	3·84	2·95	3·95	2·41	24 36	81 44	108 52	33 13	6·61	6·15	5·79	1·80	359 15	72 57	104 24	23 7
Mean ...	4·05	3·29	4·18	2·55	2 56	75 28	107 19	34 32	6·37	5·57	5·42	1·89	356 5	72 49	104 39	27 33

	May.								June.							
1894 ...	5·46	6·13	5·86	1·65	**369 54**	71 54	102 29	18 23	6·36	7·12	5·86	1·14	13 12	76 36	106 33	28 12
1895 ...	7·20	7·85	6·92	1·81	356 2	65 39	99 10	19 48	9·36	9·08	7·19	1·78	3 51	74 58	104 3	20 3
1896 ...	7·87	7·35	6·07	1·66	351 27	68 30	101 46	20 49	5·88	5·50	4·48	0·67	3 13	70 51	104 11	20 17
1897 ...	7·81	7·11	5·76	1·45	353 45	71 33	101 33	20 5	6·70	5·97	4·57	0·99	1 57	77 17	106 25	24 56
1898 ...	6·97	6·24	5·57	1·65	358 57	75 1	102 58	21 48	6·68	6·53	5·25	1·14	0 6	77 0	107 4	25 45
1899 ...	6·39	6·53	5·49	1·66	346 23	67 58	100 1	18 8	5·55	4·96	4·30	0·99	3 48	77 37	107 5	28 55
1900 ...	7·37	6·45	5·10	1·46	352 56	75 16	103 48	20 58	5·57	4·59	4·08	1·36	0 53	77 4	103 53	22 37
1901 ...	5·91	5·88	5·12	1·81	357 13	76 9	103 31	21 38	5·95	5·17	4·39	1·14	0 21	77 45	105 51	27 13
1902 ...	5·97	5·89	5·17	1·81	353 35	73 0	102 22	23 20	6·53	6·25	5·30	1·53	3 9	77 53	104 53	25 36
1903 ...	6·24	6·45	5·54	1·51	353 17	73 36	102 43	22 44	8·22	7·69	5·78	1·05	0 17	77 7	105 53	26 26
1904 ...	6·96	7·06	5·83	1·50	359 37	73 3	103 25	21 30	6·04	6·45	5·05	1·00	1 50	76 49	106 32	32 48
Mean ...	6·74	6·63	5·68	1·63	355 44	71 58	102 10	20 50	6·62	6·30	5·11	1·16	2 58	76 27	105 40	25 43

TABLE 356.—*Vertical Force Magnetograph—Mean monthly values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of the Diurnal Inequality of Vertical Force at Bombay (Colaba) for each month of the year from 1894 to 1904 derived from table 355.*

Unity = 1γ = ·00001 C. G. S.

Years.	July.								August.							
	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′					° ′	° ′	° ′	° ′
1894 ...	6·32	6·77	5·54	1·19	12 12	68 51	100 28	15 50	6·92	7·00	5·84	1·55	**372 40**	70 7	101 8	13 6
1895 ...	7·45	6·00	5·01	1·19	19 10	75 10	104 7	16 20	7·04	8·05	6·69	1·99	**363 59**	66 34	99 28	16 20
1896 ...	5·77	6·36	4·96	0·51	4 58	71 23	105 21	24 30	7·43	7·20	5·48	1·66	**360 59**	68 41	100 50	15 57
1897 ...	5·68	5·02	4·71	1·65	15 4	78 25	105 36	25 50	7·51	7·07	5·68	1·67	358 23	70 52	102 36	19 10
1898 ...	5·48	5·41	4·32	0·76	6 11	76 22	106 43	18 49	8·99	7·13	5·19	1·44	**363 49**	75 15	103 6	16 36
1899 ...	4·73	5·79	4·74	1·02	**− 3 23**	68 28	101 45	19 42	6·05	6·71	5·54	1·45	358 6	69 38	101 41	20 41
1900 ...	6·59	6·50	5·27	0·94	3 45	79 6	108 51	29 17	6·05	6·83	5·57	0·98	357 3	70 39	103 5	21 29
1901 ...	4·52	5·30	4·50	0·91	0 58	77 29	107 26	30 15	4·26	6·00	5·15	1·33	348 57	69 0	101 50	23 10
1902 ...	5·79	5·86	4·70	1·31	10 43	81 15	107 51	25 27	6·10	7·21	6·23	2·16	352 51	71 19	101 33	**22 25**
1903 ...	6·00	7·26	5·60	1·15	**− 3 2**	74 0	105 35	23 58	6·11	7·95	6·19	1·46	352 19	69 11	101 14	17 31
1904 ...	6·22	7·27	5·79	1·50	5 43	75 12	105 47	20 38	6·57	7·32	5·83	1·61	**360 13**	69 38	102 45	**22 14**
Mean ...	5·87	6·14	5·01	1·10	6 34	75 4	105 25	22 47	6·64	7·13	5·76	1·57	359 2	70 5	101 45	18 58
	September.								October.							
1894 ...	10·33	9·45	7·77	2·82	355 42	68 45	100 18	22 42	5·98	4·40	5·87	4·03	**366 34**	61 27	97 50	25 19
1895 ...	8·48	9·35	8·03	2·82	354 52	66 59	100 47	25 5	4·96	3·94	5·02	3·17	**372 7**	62 37	96 43	24 37
1896 ...	8·93	8·11	7·30	3·11	358 4	69 31	101 1	26 13	4·53	2·96	4·07	2·68	**369 56**	69 16	101 43	26 49
1897 ...	8·80	8·18	7·22	2·35	357 51	69 11	100 57	25 6	5·53	4·44	4·94	2·52	359 58	66 28	99 42	25 36
1898 ...	9·78	8·99	7·40	3·05	354 17	69 47	101 35	24 23	5·26	4·20	4·89	2·67	357 33	63 47	97 15	22 2
1899 ...	8·06	7·05	6·22	2·48	355 42	71 57	102 20	25 51	5·42	4·32	4·74	2·60	352 36	69 49	101 34	27 25
1900 ...	7·83	8·64	7·85	2·98	351 24	68 40	101 26	26 7	5·29	4·77	5·12	2·94	353 32	68 3	101 4	26 34
1901 ...	7·75	8·36	7·20	2·63	349 29	70 38	102 58	27 11	4·38	3·81	3·99	2·15	354 18	69 23	100 48	25 42
1902 ...	8·80	8·71	7·58	2·85	359 1	74 7	103 44	27 21	5·35	4·52	4·72	2·58	357 56	71 50	101 33	27 5
1903 ...	8·41	9·38	7·55	2·46	344 58	65 45	99 0	24 41	5·15	4·85	5·46	3·01	553 17	67 1	101 5	28 11
1904 ...	8·99	9·14	7·88	3·34	355 12	67 31	99 5	22 44	6·06	4·78	5·12	2·61	**363 59**	67 51	101 11	28 40
Mean ...	8·74	8·67	7·45	2·81	354 14	69 21	101 12	25 13	5·26	4·40	4·90	2·81	360 10	65 23	100 3	26 11
	November.								December.							
1894 ...	2·60	0·71	1·37	1·99	26 2	35 44	93 1	20 57	4·34	2·21	1·76	1·06	37 44	118 47	**128 16**	43 40
1895 ...	3·61	0·09	0·93	1·02	27 48	**−19 44**	107 7	25 16	3·63	1·42	1·16	0·84	22 27	110 24	**120 22**	33 39
1896 ...	3·86	2·27	2·65	2·08	0 6	65 8	100 5	26 58	1·67	0·74	1·51	1·20	11 13	80 25	115 5	37 16
1897 ...	0·91	1·04	0·83	1·12	19 0	12 3	87 38	21 57	1·42	0·18	0·48	0·37	15 0	150 50	**126 49**	31 21
1898 ...	1·86	1·37	1·82	1·55	**− 2 53**	39 52	94 13	25 24	1·55	0·59	1·14	1·38	27 39	104 36	114 33	28 47
1899 ...	2·08	0·23	0·83	1·35	**− 0 18**	72 50	91 41	16 45	2·73	1·72	1·85	1·14	**− 6 18**	84 2	111 12	32 29
1900 ...	2·30	1·10	1·66	1·62	**− 5 41**	46 8	92 16	21 40	0·90	0·39	0·69	0·58	**−29 49**	70 40	113 9	38 32
1901 ...	3·05	1·61	1·86	1·70	**− 0 11**	66 41	98 59	23 22	0·92	0·43	0·92	0·71	8 23	89 47	115 9	33 42
1902 ...	1·32	1·06	1·27	1·14	2 53	45 8	92 57	22 18	1·52	0·69	1·06	0·78	5 17	90 19	117 24	33 57
1903 ...	3·13	1·66	2·43	1·95	0 9	60 32	96 51	21 53	1·82	0·15	1·02	0·77	31 6	107 6	118 52	39 5
1904 ...	2·84	1·12	1·77	1·62	20 34	49 13	96 3	21 56	1·59	1·14	1·17	1·20	17 13	32 30	94 20	26 40
Mean ...	2·51	1·11	1·58	1·56	7 57	43 3	95 32	22 35	2·01	0·88	1·16	0·91	12 43	94 30	115 56	34 28

epochs in the diurnal curve remains remarkably steady and consistent throughout the period examined. The first component attains its maximum at midnight, that is, the greatest solar effects which determine in V the minimum conditions, occur at 12 noon; similarly as the maximum for the second, third and fourth components fall at 5, 7, and 2 hours respectively, the minimum effects all synchronise at 11 A.M.

409. In all the components the winter and summer values of μ do not seem to differ much as no progression is apparently indicated in the seasonal change when the year is considered as divided into summer and winter conditions. But it will be seen that the tendency for low values of μ indicating an early culmination to maximum effects, definitely prevails about the two equinoxes while the reverse effect is observed about July and December. The sudden dislocation in the values of μ which is so conspicuous a feature in the declination co-efficients, is not prominently indicated in the progression here, though it will be seen that the uniform consistency and steadiness observed in the values of μ in all the components from March to October are not quite so nearly pronounced in the winter months, and become much less so as the year passes from minimum spot to maximum spot conditions. The secular effect on the annual variation of μ is more marked in the first and second components than in the third or the fourth, and is obviously more emphasised during the years of maximum spots.

410. Referring lastly to the influence of the 11-year period disturbance, on the mean annual values of μ, the first component appears to be the only one which is at all markedly affected by it. The tendency for the maximum epoch attained on the average at midnight, to shift to a *later* hour, when the frequency of the sun-spots is a maximum and gradually to recede to an *early* culmination about half an hour before midnight as the minimum epoch is reached, is clearly exhibited in this component. On the other hand the other three components do not appreciably at least show any influence of this kind.

CHAPTER VIII.

Diurnal Inequality of Inclination.

411. The diurnal variations of Inclination are not as in other elements derived directly from the registrations of a variation instrument, but have to be computed from the variations of H and V and their absolute values, the derivation of the latter necessitating as we have seen elsewhere the determination of the absolute values of I.

412. The mean values of the elements, that is, the variation ordinates of H and V at each hour of the day added to the absolute values of the respective elements, determine the tangent of the angle of inclination at any hour and thus the equation $\tan I = \frac{V}{H}$ solved for each hour enables the diurnal variations of I to be derived. We have also from the above equation

$$dI = \cos^2 I \frac{dV}{H} - \cos^2 I \tan I \frac{dH}{H} \text{ or}$$

$$\frac{dI}{\sin 1'} = \frac{\cos^2 I}{\sin 1'} \cdot \frac{dV}{H} - \frac{\sin 2I}{2 \sin 1'} \frac{dH}{H}.$$

and by computing the factors involved, the variation of I is derivable directly also from δH and δV.

413. The data for I, on account of the unreliability of the Dip-Circle, to which reference has already been made, is advisedly restricted to results of a short period, and only those for the 11 years, 1894—1904, are made available for examination.

414. In tables 357 to 362 are collected the computed results so derived from which it will be seen that the inequalities appear to follow the vertical force variations so very closely in character and other indications, that no further examination of the phenomenon in detail appears to be desirable or necessary.

415. At Colaba the ordinates of H increase while those of V diminish as the incident rays of the sun become more and more vertical. As I follows V closely, the greatest fall in the value of I occurs, as in V, at about 11 A.M. and this incidence remains practically constant throughout all the months.

416. The seasonal progression of the inequalities is identically the same as in V and the parallelism of the diurnal curve with its seasonal and secular effects is also fairly clearly exhibited in this element as in others ; see figures below.

In plate 59 are charted the inequalities of the average months and the average year, as also of the groups of years for the maximum and minimum spot epochs. In plate 60 are collected the inequalities of each average year and of groups of winter and summer months.

TABLE 357.—*Showing for the period 1894 to 1904 the mean Diurnal Inequality of Inclination for each month of the year and for the whole year.*

Unity = 1 minute of arc.

1894-1904.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H.													
0	+0·4	+0·5	+0·6	+0·6	+0·6	+0·7	+0·6	+0·5	+0·6	+0·5	+0·5	+0·4	+0·5
1	+0·3	+0·4	+0·6	+0·6	+0·6	+0·7	+0·6	+0·5	+0·7	+0·5	+0·4	+0·3	+0·5
2	+0·3	+0·4	+0·5	+0·6	+0·6	+0·6	+0·5	+0·5	+0·6	+0·5	+0·4	+0·2	+0·5
3	+0·3	+0·3	+0·4	+0·5	+0·5	+0·6	+0·6	+0·5	+0·5	+0·4	+0·4	+0·2	+0·4
4	+0·2	+0·3	+0·4	+0·5	+0·6	+0·6	+0·6	+0·6	+0·6	+0·4	+0·3	+0·2	+0·4
5	+0·1	+0·2	+0·4	+0·6	+0·7	+0·9	+0·8	+0·7	+0·7	+0·4	+0·4	+0·1	+0·5
6	+0·1	+0·2	+0·5	**+1·0**	**+1·0**	**+1·1**	**+1·0**	**+1·1**	**+1·2**	**+0·6**	+0·1	0·0	**+0·6**
7	+·01	+0·2	+0·6	+0·7	+0·6	+0·6	+0·6	+0·7	+0·9	+0·5	0·0	−0·1	+0·4
8	+0·2	0·0	−0·1	−0·3	−0·6	−0·3	−0·3	−0·5	−0·4	−0·3	−0·3	−0·1	−0·2
9	−0·3	−0·6	−1·0	−1·5	−1·7	−1·3	−1·4	−1·7	−1·9	−1·4	−0·9	−0·5	−1·2
10	−1·3	−1·2	−1·8	−2·3	−2·4	−2·0	−2·1	−2·3	−2·7	−2·2	**−1·4**	−1·0	−1·9
11	**−1·7**	**−1·5**	**−2·2**	**−2·5**	**−2·4**	**−2·4**	**−2·2**	**−2·3**	**−2·9**	**−2·3**	−1·2	**−1·1**	**−2·1**
12	−1·2	−1·1	−1·8	−1·9	−1·9	−1·9	−1·9	−1·8	−2·2	−1·6	−0·7	−0·6	−1·5
13	−0·6	−0·5	−0·9	−1·1	−1·0	−1·2	−1·2	−1·0	−1·0	−0·5	−0·2	−0·5	−0·8
14	−0·3	−0·1	0·0	−0·2	−0·2	−0·4	−0·4	−0·3	+0·1	+0·1	0·0	−0·3	−0·2
15	0·0	+0·1	+0·4	+0·3	+0·4	+0·3	+0·2	+0·3	+0·6	+0·3	0·0	−0·1	+0·2
16	+0·2	+0·1	+0·3	+0·5	+0·6	+0·6	+0·6	+0·6	+0·6	+0·2	+0·1	+0·1	+0·4
17	+0·1	+0·1	+0·1	+0·4	+0·6	+0·6	+0·6	+0·5	+0·2	+0·1	+0·1	+0·1	+0·3
18	+0·2	+0·2	+0·2	+0·3	+0·4	+0·4	+0·4	+0·2	+0·2	+0·2	+0·4	+0·2	+0·3
19	+0·3	+0·4	+0·4	+0·4	+0·4	+0·4	+0·3	+0·3	+0·4	+0·4	+0·4	+0·2	+0·4
20	**+0·4**	+0·4	+0·5	+0·6	+0·5	+0·5	+0·4	+0·3	+0·5	+0·5	+0·4	+0·3	+0·4
21	+0·4	**+0·5**	+0·6	+0·7	+0·6	+0·6	+0·5	+0·5	+0·6	+0·5	+0·5	**+0·4**	+0·5
22	+0·4	+0·5	+0·6	+0·8	+0·7	+0·6	+0·6	+0·5	+0·6	+0·6	**+0·6**	+0·3	+0·6
23	+0·4	+0·5	**+0·7**	+0·7	+0·6	+0·7	+0·6	+0·6	+0·7	+0·6	+0·6	+0·4	+0·6
Range ...	2·1	2·0	2·9	3·5	3·4	3·5	3·2	3·4	4·1	2·9	2·0	1·5	2·7

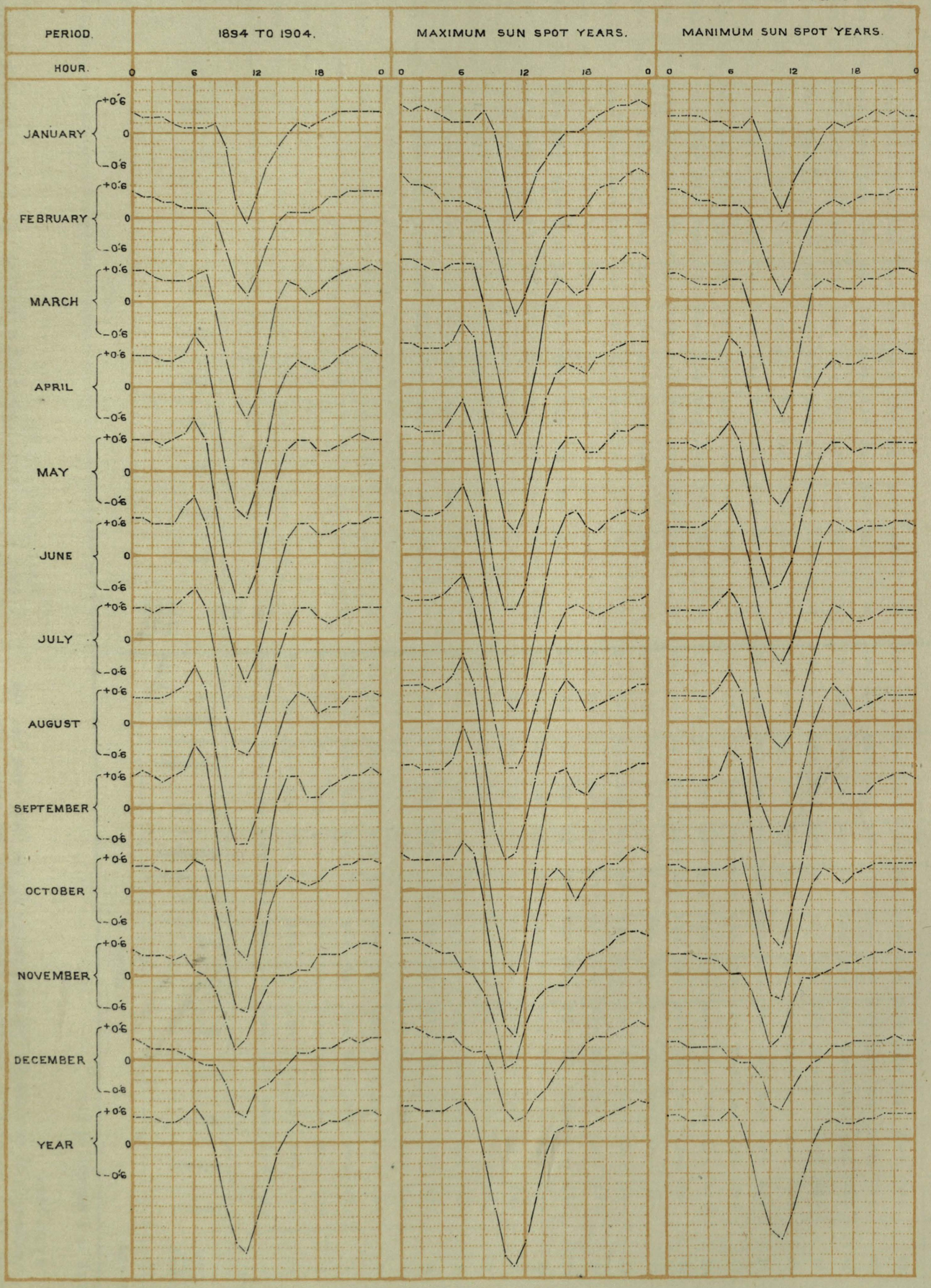
TABLE 358.—*Showing the mean Diurnal Inequality of Inclination for each of the years 1894—1904 and for the whole period of eleven years (1894—1904).*

Bombay Civil Time.	Years.											Mean 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H.													
0	+0·8	+0·7	+0·6	+0·6	**+0·6**	+0·4	+0·5	+0·5	+0·5	+0·5	+0·6	+0·7	+0·6
1	+0·8	+0·7	+0·6	+0·6	+0·5	+0·4	+0·5	+0·4	+0·5	+0·5	+0·6	+0·7	+0·6
2	+0·7	+0·7	+0·5	+0·5	+0·4	+0·4	+0·5	+0·4	+0·5	+0·5	+0·5	+0·6	+0·5
3	+0·6	+0·7	+0·5	+0·4	+0·4	+0·3	+0·5	+0·4	+0·5	+0·4	+0·5	+0·6	+0·5
4	+0·6	+0·6	+0·5	+0·4	+0·4	+0·3	+0·5	+0·4	+0·5	+0·4	+0·5	+0·6	+0·5
5	+0·7	+0·7	+0·5	+0·5	+0·4	+0·4	+0·5	+0·5	+0·5	+0·5	+0·6	+0·6	+0·5
6	**+0·9**	**+0·8**	+0·6	**+0·6**	+0·5	**+0·6**	**+0·6**	**+0·7**	**+0·6**	**+0·6**	**+0·7**	**+0·9**	**+0·7**
7	+0·5	+0·5	+0·4	+0·4	+0·4	+0·4	+0·4	+0·6	+0·5	+0·4	+0·5	+0·5	+0·8
8	−0·3	−0·3	−0·3	−0·3	−0·4	−0·3	−0·2	−0·1	−0·1	−0·2	−0·2	−0·2	−0·2
9	−1·2	−1·4	−1·2	−1·2	−1·2	−1·2	−1·0	−1·0	−0·9	−1·1	−1·2	−1·2	−1·1
10	−2·0	−2·2	−2·0	−1·9	−1·9	−1·8	−1·9	−1·5	−1·7	−1·9	−2·1	−2·2	−1·9
11	**−2·2**	**−2·3**	**−2·1**	**−2·1**	**−1·9**	**−1·9**	**−2·0**	**−1·8**	**−1·9**	**−2·0**	**−2·2**	**−2·5**	**−2·0**
12	−1·8	−1·8	−1·7	−1·6	−1·5	−1·4	−1·5	−1·3	−1·4	−1·5	−1·6	−2·0	−1·6
13	−0·9	−0·8	−0·9	−0·9	−0·7	−0·7	−0·7	−0·6	−0·7	−0·9	−0·8	−1·2	−0·8
14	−0·3	−0·1	−0·2	−0·2	−0·2	−0·1	−0·2	−0·1	−0·1	−0·2	−0·1	−0·4	−0·2
15	+0·1	+0·3	+0·2	+0·2	+0·2	+0·4	+0·2	+0·3	+0·2	+0·3	+0·2	+0·1	+0·2
16	+0·3	+0·4	+0·3	+0·3	+0·3	+0·5	+0·5	+0·4	+0·4	+0·5	+0·4	+0·3	+0·4
17	+0·2	+0·3	+0·3	+0·2	+0·2	+0·3	+0·4	+0·3	+0·3	+0·4	+0·3	+0·3	+0·3
18	+0·3	+0·3	+0·4	+0·3	+0·2	+0·3	+0·3	+0·3	+0·3	+0·3	+0·3	+0·3	+0·3
19	+0·5	+0·5	+0·4	+0·4	+0·3	+0·3	+0·4	+0·3	+0·4	+0·4	+0·4	+0·5	+0·4
20	+0·5	+0·6	+0·5	+0·5	+0·4	+0·4	+0·4	+0·4	+0·4	+0·5	+0·5	+0·5	+0·5
21	+0·6	+0·7	+0·6	+0·5	+0·5	+0·4	+0·5	+0·5	+0·5	+0·5	+0·5	+0·6	+0·5
22	+0·8	+0·8	+0·7	+0·6	+0·6	+0·5	+0·6	+0·5	+0·6	+0·6	+0·6	+0·7	+0·6
23	+0·8	+0·8	**+0·7**	+0·6	+0·5	+0·5	+0·5	+0·5	+0·5	+0·5	+0·6	+0·7	+0·6
Range ...	3·1	3·1	2·8	2·7	2·5	2·5	2·6	2·5	2·5	2·6	2·9	3·4	2·7

COLABA OBSERVATORY

Diurnal Inequality of Inclination.

Plate 59.

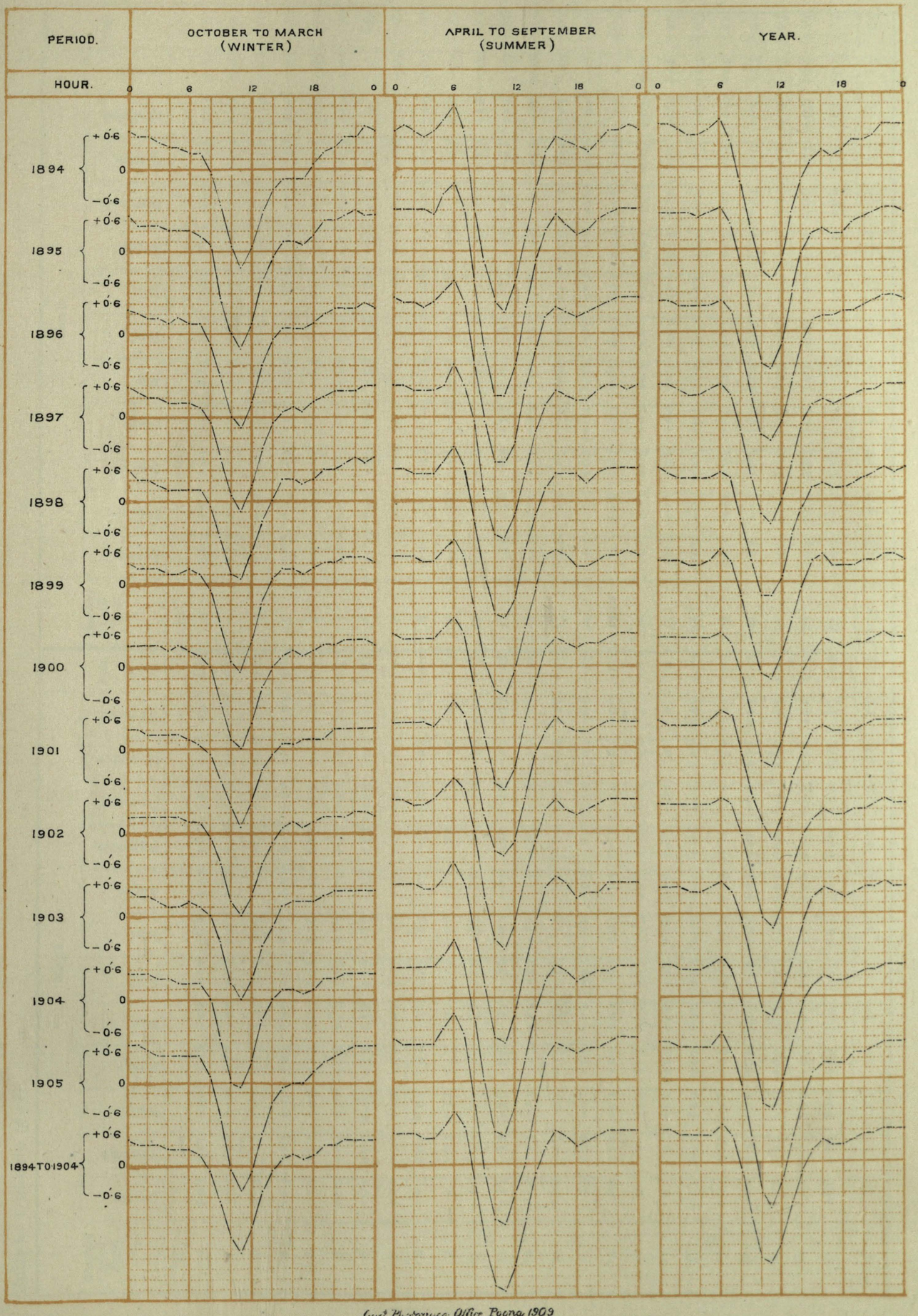


Gov't Photozinco Office, Poona. 1909

COLABA OBSERVATORY

Diurnal Inequality of Inclination.

Plate 60.



Govt. Photozinco. Office Poona 1909

TABLE 359.—*Showing the mean Diurnal Inequality of Inclination for each average month of the maximum sun-spot years 1894, 1895, 1905 and for the average year.*

Unity = 1 minute of arc.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H.													
0	+0·5	+0·8	+0·8	+0·8	+0·8	+0·8	+0·8	+0·7	+0·8	+0·7	+0·7	+0·6	+0·7
1	+0·4	+0·6	+0·8	+0·8	+0·8	+0·8	+0·7	+0·7	+0·8	+0·6	+0·7	+0·6	+0·7
2	+0·5	+0·6	+0·7	+0·7	+0·7	+0·7	+0·7	+0·7	+0·7	+0·6	+0·6	+0·5	+0·6
3	+0·4	+0·5	+0·6	+0·7	+0·7	+0·7	+0·7	+0·6	+0·7	+0·6	+0·5	+0·4	+0·6
4	+0·3	+0·3	+0·6	+0·7	+0·7	+0·8	+0·8	+0·7	+0·7	+0·6	+0·4	+0·4	+0 6
5	+0·2	+0·3	+0·7	+0·8	+1·0	+1·0	+1·0	+0·9	+0·9	+0·6	+0·4	+0·4	+0·7
6	+0·2	+0·3	+0·7	**+1·2**	**+1·3**	**+1·3**	**+1·2**	**+1·3**	**+1·5**	**+0·9**	+0·1	+0·2	**+0·8**
7	+0·2	+0·2	+0·7	+0·9	+0·7	+0·7	+0·6	+0·7	+1·0	+0·7	0	+0·1	+0·5
8	+0·4	+0·1	−0·1	−0·4	−0·6	—0·5	−0·5	−0·7	−0·7	−0·3	−0·4	+0·1	−0·3
9	0	−0·5	−1·1	−1·7	−2·0	−1·8	−1·6	−2·1	−2·2	−1·7	−1·0	−0·3	−1·3
10	−1·0	−1·3	−2·1	−2·6	**−2·7**	−2·8	**−2·5**	**−2·6**	−3·0	−2·6	**−1·8**	−1·0	−2·2
11	**−1·7**	**−1·9**	**−2·6**	**−2·8**	−2·7	**−3·0**	−2·5	−2·5	**−3·2**	**−2·8**	−1·7	**−1·2**	**−2·4**
12	−1·4	−1·5	−2·2	−2·3	−2·2	−2·5	−2·1	−1·9	−2·5	−1·8	−1·0	−1·1	−1·9
13	−0·8	−0·9	−1·2	−1·3	−1·2	−1·5	−1 3	−1·1	−1·1	−0·7	−0·5	−0·8	−1·0
14	−0·5	−0·4	−0·1	−0·3	−0·4	−0·5	−0·6	−0·2	0	+0·2	−0·3	−0·6	−0·3
15	−0·2	−0·1	+0·4	+0·2	+0·3	+0·3	+0·1	+0·5	+0·6	+0·4	−0·2	−0·3	+0·2
16	0	0	+0·3	+0·4	+0·6	+0·7	+0·5	+0·8	+0·7	+0·2	−0·2	0	+0·3
17	0	0	+0·1	+0·3	+0·6	+0·8	+0·6	+0·6	+0·3	−0·2	0	0	+0·3
18	+0·1	+0·2	+0·2	+0·2	+0·3	+0·5	+0·5	+0·2	+0·2	+0·2	+0·3	+0·3	+0·3
19	+0·3	+0·5	+0·6	+0·5	+0·3	+0·4	+0·4	+0·3	+0·5	+0·4	+0·4	+0·4	+0·4
20	+0·4	+0·6	+0·6	+0·6	+0·5	+0·6	+0·5	+0·4	+0·6	+0·5	+0·5	+0·4	+0·5
21	+0·5	+0·6	+0·7	+0·7	+0·7	+0·7	+0·6	+0·5	+0·6	+0·5	+0·7	+0·5	+0·6
22	+0·5	+0·8	**+0·9**	+0·8	+0·7	+0·8	+0·7	+0·6	+0·7	+0·7	**+0·8**	+0·6	+0·7
23	**+0·6**	**+0·9**	+0·9	+0·8	+0·8	+0·7	+0·7	+0·7	+0·8	+0·8	+0·8	**+0·7**	+0·8
Range ...	2·3	2·8	3·5	4·0	4·0	4·3	3·7	3·9	4·7	3·7	2·6	1·9	3·2

TABLE 360.—*Showing the mean Diurnal Inequality of Inclination for each average month of the minimum sun-spot years 1899, 1900, 1901, 1902 and for the average year.*

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H.													
0	+0·3	+0·5	+0·5	+0·6	+0·5	+0·5	+0·5	+0·5	+0·5	+0·5	+0·4	+0·3	+0·5
1	+0·3	+0·5	+0·5	+0·6	+0·5	+0·5	+0 5	+0·5	+0·5	+0·5	+0·4	+0·3	+0·5
2	+0·3	+0·4	+0·4	+0·5	+0·5	+0·5	+0·5	+0·5	+0·5	+0·4	+0·4	+0·2	+0·4
3	+0·3	+0·3	+0·3	+0·5	+0·4	+0·5	+0·5	+0·5	+0·5	+0·4	+0·3	+0·2	+0·4
4	+0·2	+0·3	+0·3	+0·5	+0·5	+0·6	+0·5	+0·5	+0·5	+0·4	+0·3	+0·2	+0·4
5	+0·2	+0·2	+0·3	+0·5	+0·6	+0·8	+0·7	+0·7	+0·6	+0·4	+0·2	+0·2	+0·4
6	+0·1	+0·2	+0·4	**+0·9**	**+0·9**	**+1·0**	**+0·9**	**+1·0**	**+1·1**	+0·5	0	0	**+0·6**
7	+0·1	+0·2	0·4	+0·7	+0·5	+0·5	+0·6	+0·6	+0·9	**+0·6**	0	−0·1	+0·4
8	+0·3	0	−0·2	−0·2	−0·5	−0·2	−0·2	−0·4	−0·3	−0·1	−0·3	−0·1	−0·2
9	−0·2	−0·6	−1·1	−1·3	−1·6	−1·2	−1·2	−1·6	−1·7	−1·2	−0·8	−0·4	−1·1
10	−1·1	−1·1	−1·8	−2·1	**−2·3**	−1·8	−1·9	−2·1	−2·5	−2·0	**−1·4**	−0·9	−1·7
11	**−1·5**	**−1·5**	**−2·2**	**−2·3**	−2·2	**−2·1**	**−2·1**	**−2·1**	**−2·7**	**−2·1**	−1·2	**−1·0**	**−1·9**
12	−1·0	−1·1	−1·7	−1·9	−1·7	−1·7	−1·8	−1·6	−2·0	−1·4	−0·6	−0·6	−1·4
13	−0·6	−0·5	−0·7	−1·0	−0·9	−1·0	−1·1	−0·9	−1·0	−0·4	−0·1	−0·3	−0·7
14	−0·4	0	+0·2	−0·1	−0·2	−0·3	−0·4	−0·1	+0·1	+0·1	−0·1	−0·1	−0·1
15	0	+0·2	+0·4	+0·3	+0·3	+0·3	+0·2	+0·4	+0·6	+0·4	0·0	0	+0·3
16	+0·2	+0·3	+0·3	+0·5	+0·5	+0·6	+0·6	+0·7	+0·6	+0·3	+0·1	+0·2	+0·4
17	+0·1	+0·2	+0·2	+0·4	+0·5	+0·5	+0·5	+0·5	+0·2	+0·1	+0·2	+0·2	+0·3
18	+0·2	+0·3	+0·2	+0·4	+0·3	+0·4	+0·3	+0·2	+0·2	+0·3	+0·2	+0·3	+0·3
19	+0·3	+0·4	+0·4	+0·5	+0·4	+0·5	+0·3	+0·3	+0·2	+0·4	+0·3	+0·3	+0·4
20	**+0·4**	+0·4	+0·4	+0·5	+0·4	+0·5	+0·4	+0·4	+0·4	+0·5	+0·4	+0·3	+0·4
21	+0·3	+0·4	+0·5	+0·6	+0·5	+0·5	+0·5	+0·5	+0·5	+0·5	+0·4	+0·3	+0·5
22	+0·4	**+0·5**	**+0·6**	+0·7	+0·5	+0·6	+0·5	+0·5	+0·6	+0·5	**+0·5**	**+0·4**	+0·5
23	+0·3	+0·5	+0·6	+0·6	+0·5	+0·6	+0·5	+0·5	+0·6	+0·5	+0·4	+0·3	+0·5
Range ...	1·9	2·0	2·8	3·2	3·2	3·1	3·0	3·1	3·8	2·7	1·9	1·4	2·5

TABLE 361.—*Showing the mean Diurnal Inequality of Inclination for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years (1894—1904).*

Unity = 1 minute of arc.

April to September. Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean (1894—1904).
H.													
0	+0·7	+0·8	+0·7	+0·6	+0·6	+0·5	+0·6	+0·5	+0·6	+0·6	+0·6	+0·8	+0·6
1	+0·8	+0·8	+0·6	+0·6	+0·6	+0·5	+0·5	+0·5	+0·6	+0·6	+0·6	+0·7	+0·6
2	+0·7	+0·8	+0·6	+0·5	+0·5	+0·5	+0·5	+0·5	+0·5	+0·6	+0·6	+0·7	+0·6
3	+0·6	+0·8	+0·5	+0·5	+0·5	+0·4	+0·5	+0·5	+0·5	+0·5	+0·6	+0·7	+0·5
4	+0·7	+0·7	+0·6	+0·5	+0·5	+0·4	+0·5	+0·4	+0·6	+0·5	+0·6	+0·7	+0·5
5	+0·9	+1·1	+0·8	+0·6	+0·7	+0·6	+0·7	+0·6	+0·8	+0·7	+0·8	+1·0	+0·7
6	**+1·2**	**+1·3**	**+1·0**	**+1·0**	**+1·0**	**+0·8**	**+0·9**	**+0·9**	**+1·0**	**+1·0**	**+1·1**	**+1·3**	**+1·0**
7	+0·7	+0·8	+0·6	+0·6	+0·6	+0·5	+0·6	+0·6	+0·8	+0·6	+0·7	+0·9	+0·7
8	−0·6	−0·6	−0·6	−0·1	−0·4	−0·5	−0·4	−0·3	0	−0·4	−0·4	−0·4	−0·4
9	−1·8	−1·9	−1·7	−1·5	−1·5	−1·5	−1·4	−1·3	−1·3	−1·6	−1·6	−1·8	−1·6
10	−2·6	−2·8	−2·5	−2·3	−2·2	−2·1	−2·3	−2·0	−2·1	−2·4	−2·6	−2·7	−2·4
11	**−2·8**	**−2·8**	**−2·5**	**−2·4**	**−2·3**	**−2·2**	**−2·4**	**−2·1**	**−2·3**	**−2·5**	**−2·7**	**−2·8**	**−2·5**
12	−2·3	−2·2	−2·1	−1·9	−1·9	−1·7	−2·0	−1·8	−1·8	−1·9	−2·1	−2·2	−2·0
13	−1·3	−1·1	−1·1	−1·1	−1·0	−0·9	−1·1	−1·0	−0·9	−1·0	−1·2	−1·6	−1·1
14	−0·4	−0·2	−0·3	−0·3	−0·3	−0·1	−0·3	−0·1	−0·2	−0·2	−0·3	−0·5	−0·2
15	+0·3	+0·4	+0·3	+0·2	+0·2	+0·5	+0·3	+0·3	+0·4	+0·5	+0·3	+0·4	+0·3
16	+0·6	+0·7	+0·5	+0·5	+0·5	+0·6	+0·5	+0·6	+0·6	+0·7	+0·6	+0·7	+0·6
17	+0·5	+0·5	+0·4	+0·4	+0·5	+0·5	+0·4	+0·4	+0·4	+0·6	+0·5	+0·6	+0·5
18	+0·4	+0·3	+0·3	+0·3	+0·5	+0·3	+0·3	+0·3	+0·3	+0·3	+0·3	+0·5	+0·3
19	+0·3	+0·4	+0·4	+0·3	+0·3	+0·3	+0·4	+0·3	+0·4	+0·4	+0·4	+0·6	+0·4
20	+0·5	+0·6	+0·5	+0·5	+0·5	+0·4	+0·4	+0·4	+0·5	+0·4	+0·5	+0·6	+0·5
21	+0·7	+0·7	+0·6	+0·6	+0·6	+0·5	+0·5	+0·5	+0·6	+0·6	+0·5	+0·7	+0·6
22	+0·7	+0·8	+0·7	+0·6	+0·6	+0·5	+0·6	+0·5	+0·6	+0·6	+0·6	+0·8	+0·6
23	+0·8	+0·8	+0·7	+0·5	+0·6	+0·6	+0·6	+0·5	+0·6	+0·6	+0·6	+0·8	+0·6
Range ...	4·0	4·1	3·5	3·4	3·3	3·0	3·3	3·0	3·3	3·5	3·8	4·1	3·5

TABLE 362.—*Showing the mean Diurnal Inequality of Inclination for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years (1894—1904).*

October to March. Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean (1894—1904).
H.													
0	+0·7	+0·7	+0·5	+0·6	+0·6	+0·4	+0·4	+0·4	+0·3	+0·5	+0·5	+0·7	+0·5
1	+0·6	+0·5	+0·4	+0·5	+0·4	+0·3	+0·4	+0·4	+0·3	+0·4	+0·5	+0·7	+0·4
2	+0·6	+0·5	+0·3	+0·4	+0·4	+0·3	+0·4	+0·3	+0·3	+0·4	+0·5	+0·6	+0·4
3	+0·5	+0·5	+0·3	+0·4	+0·3	+0·3	+0·4	+0·3	+0·3	+0·3	+0·4	+0·5	+0·4
4	+0·4	+0·4	+0·2	+0·3	+0·2	+0·2	+0·3	+0·3	+0·3	+0·2	+0·4	+0·5	+0·3
5	+0·4	+0·4	+0·3	+0·3	+0·2	+0·2	+0·4	+0·3	+0·3	+0·2	+0·3	+0·5	+0·3
6	+0·3	+0·4	+0·2	+0·3	+0·2	+0·3	+0·3	+0·2	+0·2	+0·3	+0·3	+0·5	+0·3
7	+0·3	+0·3	+0·2	+0·2	+0·2	+0·2	+0·2	+0·1	+0·2	+0·2	+0·3	+0·5	+0·2
8	−0·1	+0·1	−0·2	−0·1	−0·1	−0·1	0·0	−0·1	−0·1	0·0	0·0	+0·1	0·1
9	−0·7	−0·9	−0·8	−0·8	−0·7	−0·8	−0·7	−0·6	−0·6	−0·5	−0·8	−0·7	−0·7
10	−1·5	−1·6	−1·6	−1·5	−1·4	−1·5	−1·4	−1·1	−1·3	−1·3	−1·6	−1·7	−1·4
11	**−1·9**	**−1·9**	**−1·8**	**−1·8**	**−1·5**	**−1·7**	**−1·6**	**−1·5**	**−1·6**	**−1·6**	**−1·7**	**−2·1**	**−1·7**
12	−1·5	−1·4	−1·3	−1·3	−1·0	−1·1	−1·1	−1·0	−1·2	−1·2	−1·2	−1·7	−1·2
13	−0·8	−0·6	−0·6	−0·6	−0·4	−0·4	−0·4	−0·4	−0·6	−0·6	−0·4	−1·0	−0·5
14	−0·4	−0·1	−0·1	−0·1	0·0	+0·1	0·0	−0·1	−0·2	−0·2	0·0	−0·4	−0·1
15	−0·2	+0·2	+0·1	+0·1	+0·2	+0·3	+0·2	+0·1	+0·1	+0·2	+0·2	−0·1	+0·1
16	−0·2	+0·2	+0·1	+0·2	+0·2	+0·3	+0·3	+0·1	+0·2	+0·3	+0·2	0·0	+0·2
17	−0·2	+0·1	+0·1	+0·1	+0·1	+0·2	+0·2	+0·2	+0·1	+0·3	+0·1	0·0	+0·1
18	+0·1	+0·3	+0·2	+0·3	+0·2	+0·3	+0·3	+0·2	+0·2	+0·3	+0·2	+0·2	+0·2
19	+0·3	+0·6	+0·4	+0·4	+0·4	+0·4	+0·4	+0·2	+0·3	+0·4	+0·4	+0·4	+0·4
20	+0·4	+0·6	+0·5	+0·5	+0·4	+0·4	+0·4	+0·4	+0·3	+0·5	+0·4	+0·5	+0·4
21	+0·6	+0·7	+0·5	+0·5	+0·5	+0·5	+0·5	+0·4	+0·3	+0·5	+0·5	+0·6	+0·5
22	+0·6	**+0·8**	+0·5	+0·5	**+0·6**	**+0·5**	**+0·5**	**+0·4**	**+0·4**	**+0·5**	**+0·5**	**+0·7**	**+0·5**
23	**+0·8**	+0·7	**+0·6**	**+0·6**	+1·5	+0·5	+0·5	+0·4	+0·4	+0·5	+0·5	+0·7	+0·5
Range ...	2·7	2·7	2·4	2·4	2·1	2·2	2·1	1·9	2·0	2·1	2·2	2·8	2·2

417. The following figures readily enable the phenomenon to be examined in all its different bearings, and though the data extend over only 11 years the average inequalities of which alone are represented here, the progression of the phenomenon fairly clearly shows the same results as those noted in other elements which represent the average condition of 33 years.

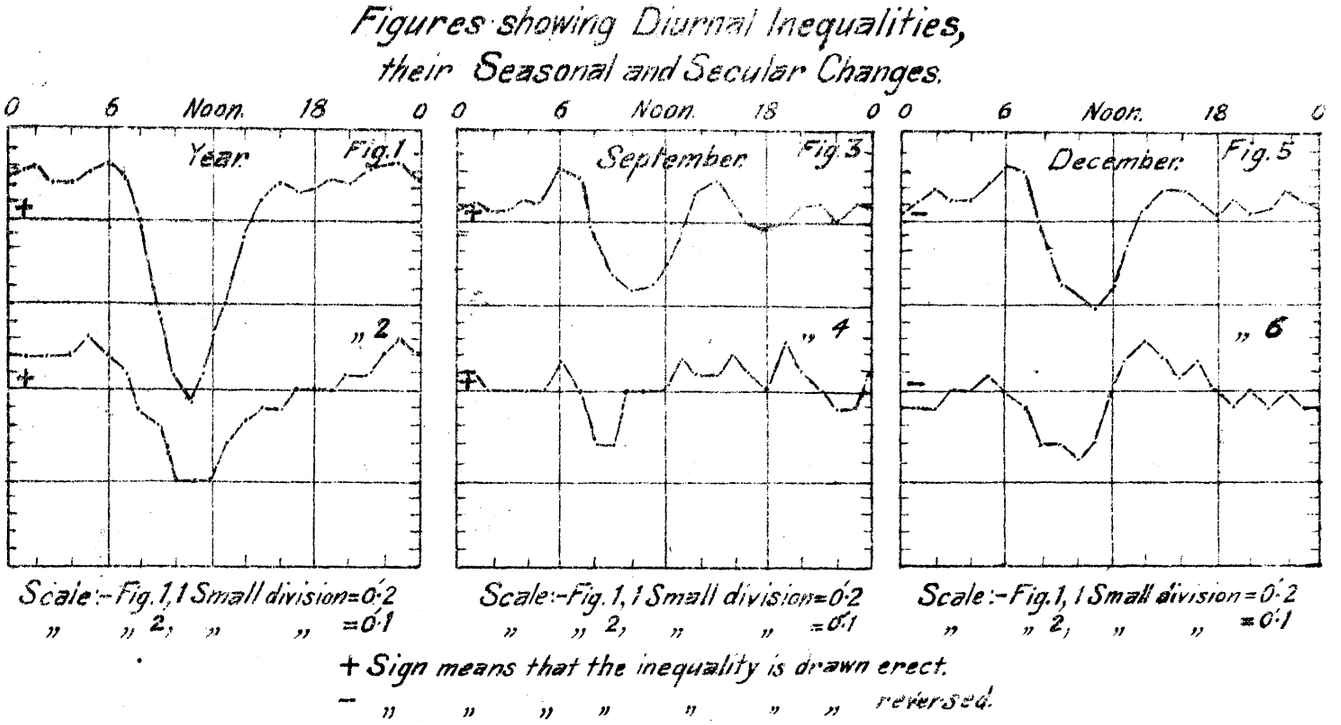


Figure 1 denotes the normal diurnal curve which is the average of 11 years; figure 2 shows the secular effect, that is the diurnal curve at maximum epoch less that at the minimum; figures 3 and 5 show the departures of the diurnal curve for the months of September and December, respectively, denoting the average periodic seasonal change; while figures 4 and 6 show the discontinuous seasonal change due to secular influences. It will be noted that the general run of the curves is fairly parallel.

Harmonic analysis of Diurnal Inequality.

418. In tables 363 and 364 are collected the results of harmonic analysis which, when compared with those of V in tables 350 and 352, show that while in the latter the first three components are almost all equal in magnitude, in I the first component is decidedly the more pronounced; the second and the third are about $\frac{2}{3}$ and $\frac{1}{2}$ in magnitude respectively of the first component.

The epochs of maximum as indicated by the angle μ are more steady in I than in V, and the seasonal fluctuations are also decidedly smaller. The secular changes however in μ appear to be comparatively feeble, as in the eleven years considered the μ of the first component of V varies from 352° to 374°, that is from half an hour before midnight to about an hour after midnight, respectively, for the minimum and maximum years, while that in I varies from 347° to 358° indicating a shift of about 45 minutes only.

In all other respects the results are practically the same as those of V and call for no special remarks.

TABLE 363.—*Inclination—Showing the value of the p, q Coefficients for the first four orders of Harmonic Components of the Diurnal Inequality of Inclination at Bombay (Colaba) for each of the years 1894 to 1905, derived from the inequality of each year.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	−0·97	−0·42	−0·53	−0·27	−0·38	−0·23	−0·15	−0·07
1895 ...	−1·01	−0·36	−0·60	−0·26	−0·44	−0·22	−0·15	−0·12
1896 ...	−0·92	−0·30	−0·52	−0·27	−0·36	−0·22	−0·12	−0·09
1897 ...	−0·89	−0·30	−0·50	−0·26	−0·35	−0·22	−0·14	−0·09
1898 ...	−0·82	−0·25	−0·48	−0·20	−0·36	−0·19	−0·12	−0·08
1899 ...	−0·76	−0·17	−0·52	−0·23	−0·37	−0·22	−0·12	−0·08
1900 ...	−0·82	−0·26	−0·53	−0·27	−0·32	−0·22	−0·11	−0·10
1901 ...	−0·68	−0·23	−0·47	−0·26	−0·35	−0·22	−·012	−0·08
1902 ...	−0·75	−0·27	−0·48	−0·26	−0·32	−0·22	−0·12	−0·12
1903 ...	−0·83	−0·23	−0·52	−0·27	−0·33	−0·24	−0·11	−0·10
1904 ...	−0·87	−0·31	−0·57	−0·27	−0·40	−0·23	−0·17	−0·10
1905 ...	−1·02	−0·43	−0·59	−0·37	−0·38	−0·29	−0·14	−0·12

TABLE 364.—*Inclination—Showing the mean values of p, q Coefficients for the first four orders of Harmonic Components of the Diurnal Inequality of Inclination at Bombay (Colaba) for each month of the years 1894 to 1904, derived by averaging the values of p and q.*

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	−0·60	−0·19	−0·25	−0·23	−0·17	−0·22	−0·08	−0·19
February ...	−0·62	−0·18	−0·26	−0·17	−0·21	−0·16	−0·10	−0·13
March ...	−0·85	−0·29	−0·47	−0·27	−0·39	−0·30	−0·14	−0·20
April ...	−1·02	−0·35	−0·63	−0·37	−0·48	−0·28	−0·15	−0·11
May ...	−1·03	−0·30	−0·74	−0·32	−0·47	−0·25	−0·13	−0·03
June ...	−0·97	−0·40	−0·67	−0·38	−0·38	−0·31	−0·08	−0·03
July ...	−0·94	−0·37	−0·67	−0·37	−0·37	−0·29	−0·07	−0·02
August ...	−0·93	−0·34	−0·72	−0·32	−0·47	−0·26	−0·09	−0·07
September...	−1·07	−0·37	−0·82	−0·33	−0·64	−0·33	−0·24	−0·15
October ...	−0·87	−0·25	−0·55	−0·21	−0·47	−0·19	−0·23	−0·15
November...	−0·64	−0·12	−0·27	−0·05	−0·23	−0·02	−0·12	−0·02
December ...	−0·50	−0·13	−0·17	−0·10	−0·11	−0·09	−0·05	−0·04
Winter ...	−0·67	−0·21	−0·33	−0·17	−0·26	−0·16	−0·11	−0·13
Summer ...	−1·01	−0·33	−0·72	−0·36	−0·47	−0·30	−0·16	−0·08
Year ...	−0·85	−0·27	−0·52	−0·27	−0·36	−0·22	−0·13	−0·08

TABLE 363*a*.—*Showing the mean values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of Diurnal Inequality of Inclination at Bombay (Colaba) for each of the years 1894 to 1904, derived from table 363.*

Unity = 1 minute of arc.

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1894 ...	1·06	0·59	0·44	0·17	358 10	78 15	105 9	26 0
1895 ...	1·07	0·65	0·49	0·19	354 22	76 28	103 36	29 25
1896 ...	0·97	0·59	0·42	0·15	352 49	78 28	105 14	28 58
1897 ...	0·94	0·56	0·41	0·17	353 23	78 29	105 28	27 56
1898 ...	0·86	0·52	0·41	0·14	351 42	76 4	104 1	28 10
1899 ...	0·78	0·57	0·43	0·14	347 22	76 41	105 0	28 10
1900 ...	0·86	0·59	0·39	0·15	352 21	78 15	106 15	30 19
1901 ...	0·72	0·54	0·41	0·14	353 26	79 14	105 28	28 10
1902 ...	0·80	0·55	0·39	0·17	354 33	78 59	106 15	31 0
1903 ...	0·86	0·59	0·41	0·15	350 14	78 28	106 46	30 19
1904 ...	0·92	0·63	0·46	0·20	354 22	77 26	104 43	27 22
1905 ...	1·11	0·70	0·48	0·18	357 37	80 48	107 12	29 54

TABLE 364*a*.—*Showing the mean values of the Amplitude P and of the first maximum μ reckoned from midnight for the first four orders of Harmonic Components of Diurnal Inequality of Inclination at Bombay (Colaba) for each month of the years 1894 to 1904, derived from table 364.*

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·63	0·34	0·28	0·21	352 19	86 4	112 11	36 33
February ...	0·65	0·31	0·26	0·16	350 56	81 21	107 11	32 52
March ...	0·90	0·54	0·49	0·24	353 35	79 42	107 16	33 30
April ...	1·08	0·73	0·56	0·19	353 41	79 58	104 50	28 49
May ...	1·07	0·81	0·53	0·13	350 59	76 27	104 5	23 0
June ...	1·05	0·77	0·49	0·09	357 10	79 32	107 49	24 53
July ...	1·01	0·77	0·47	0·07	356 14	79 13	107 27	23 44
August ...	0·99	0·79	0·54	0·11	354 50	76 44	104 24	29 13
September...	1·13	0·88	0·72	0·28	353 50	75 43	103 51	27 45
October ...	0·91	0·59	0·51	0·27	350 47	75 12	102 5	28 2
November...	0·65	0·27	0·23	0·12	345 22	70 0	96 24	22 7
December ...	0·52	0·20	0·14	0·06	349 19	79 59	107 51	29 25
Winter ...	0·70	0·37	0·31	0·17	352 9	78 23	105 17	32 12
Summer ...	1·06	0·80	0·56	0·18	352 51	78 2	105 36	26 24
Year ...	0·89	0·59	0·42	0·15	352 22	78 28	105 14	27 39

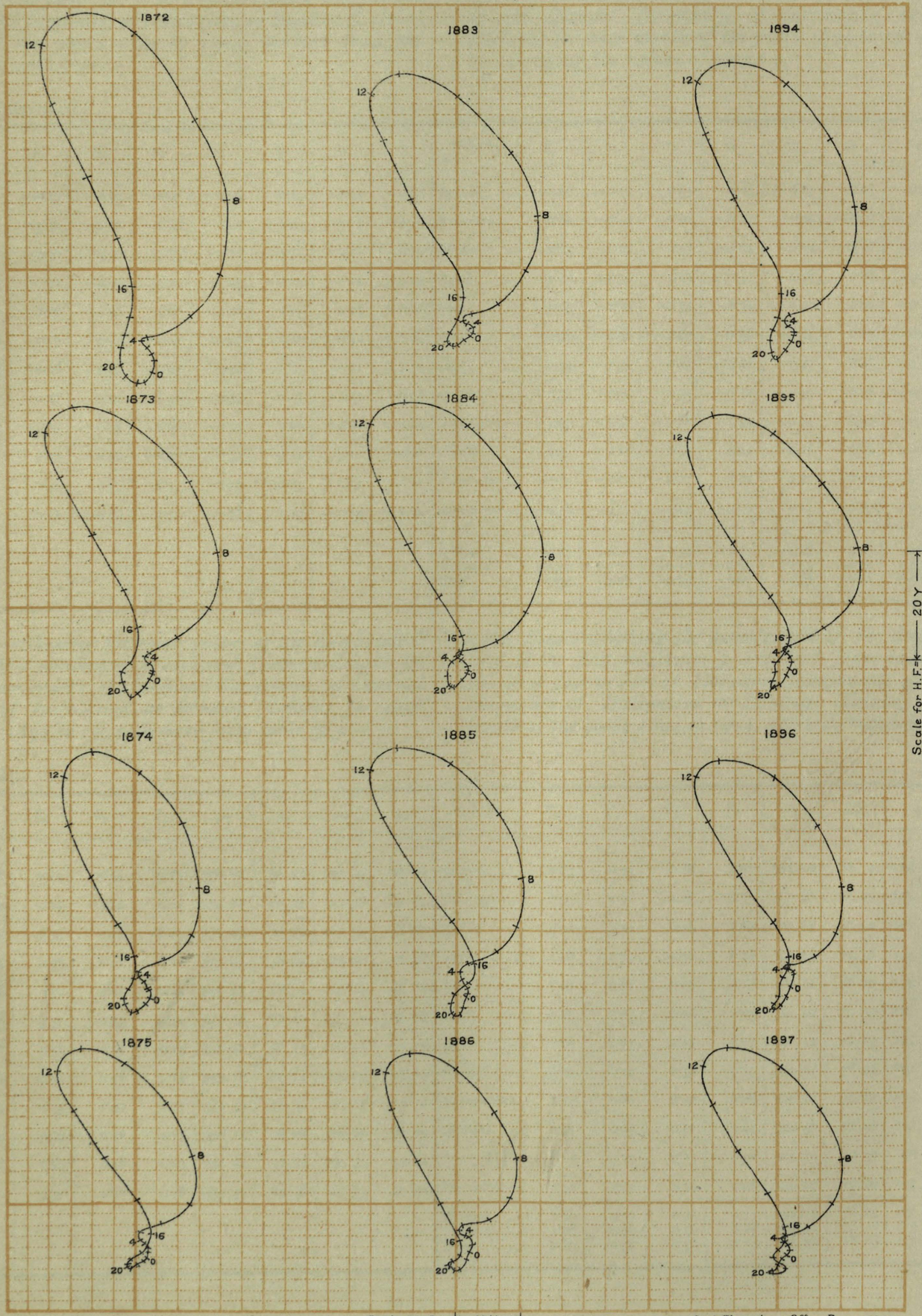
COLABA OBSERVATORY

Vector Diagrams (average year)

Showing the Diurnal Inequality in the Horizontal Plane

(Northerly & Easterly Forces)

Plate 61.



Govt Photozinco: Office, Poona, 1909

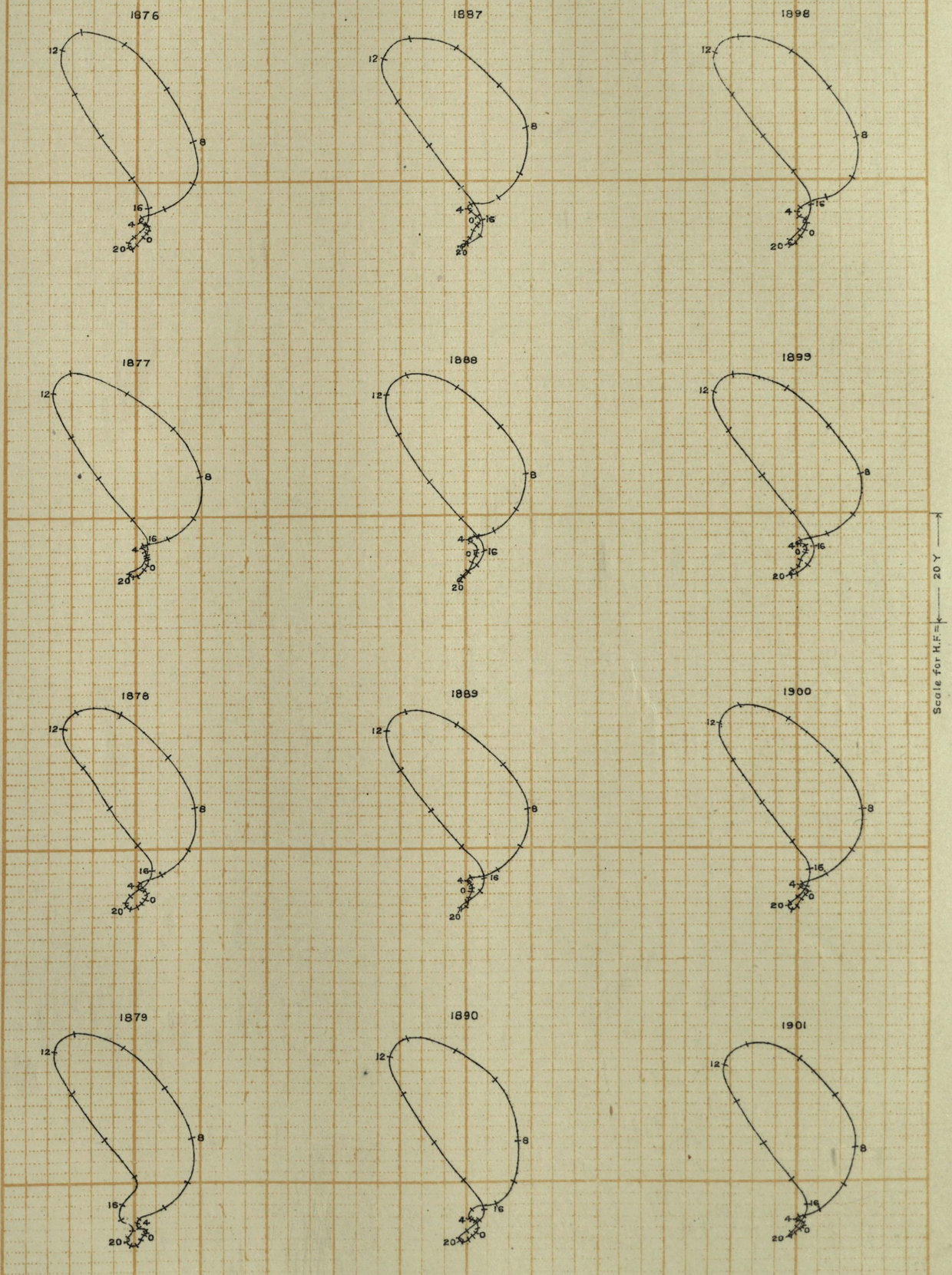
COLABA OBSERVATORY

Vector Diagrams (average year)

Showing the Diurnal Inequality in the Horizontal Plane

(Northerly & Easterly Forces.)

Plate 62.



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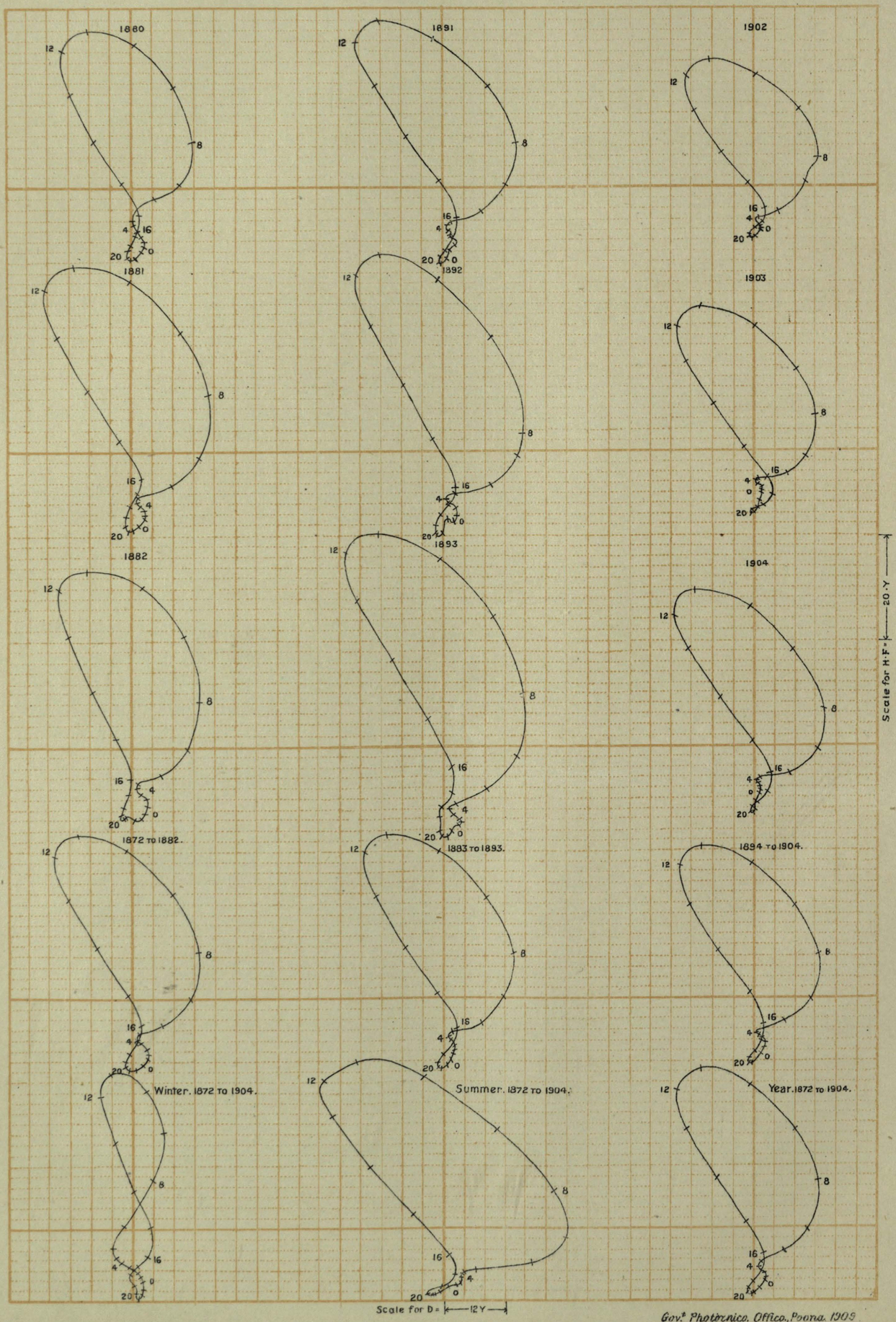
COLABA OBSERVATORY.

Vector Diagrams (Average year.)
Showing the Diurnal Inequality in the Horizontal Plane
(Northerly & Easterly Forces.)

Plate 63.

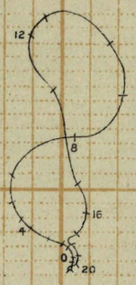
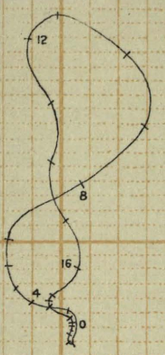
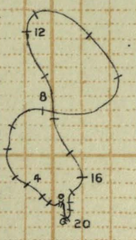
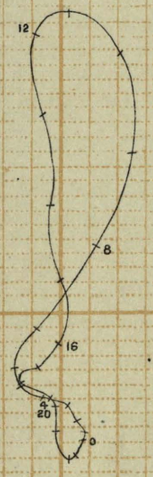
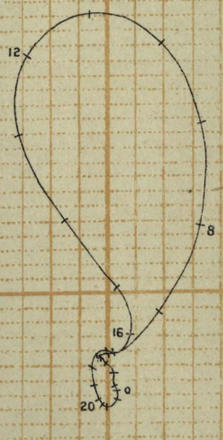
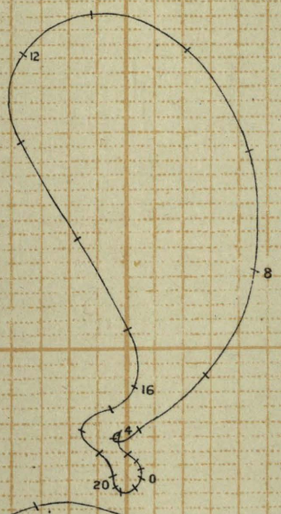
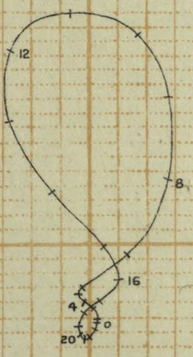
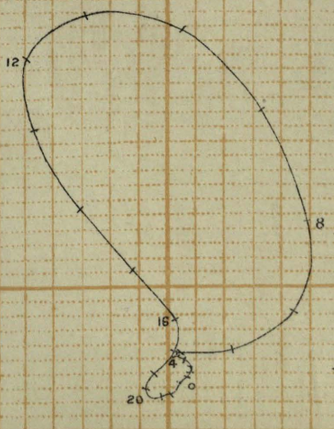
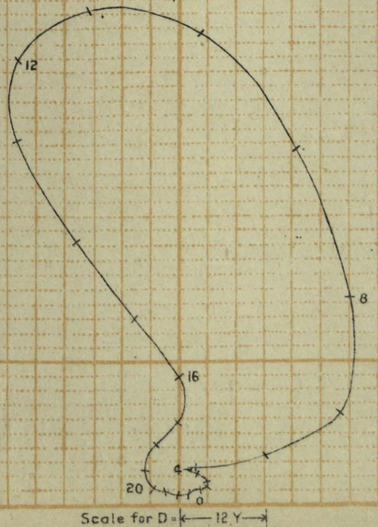
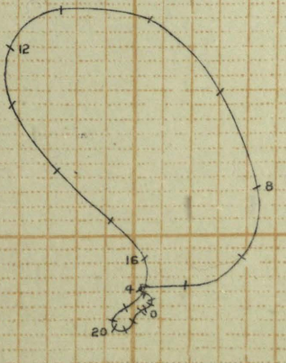


Gov.t Photornico. Office., Poona. 1909

COLABA OBSERVATORY.

Vector Diagrams (Average monthly)
Showing the Diurnal Inequality in the Horizontal Plane.
(Northerly & Easterly Forces.)

Plate 64

	1872 TO 1904	MAXIMUM SUN SPOT YEARS.	MINIMUM SUN SPOT YEARS.
JANUARY.			
FEBRUARY.			
MARCH.			
APRIL.			

Scale for H.F. ⟵ 20 Y ⟶

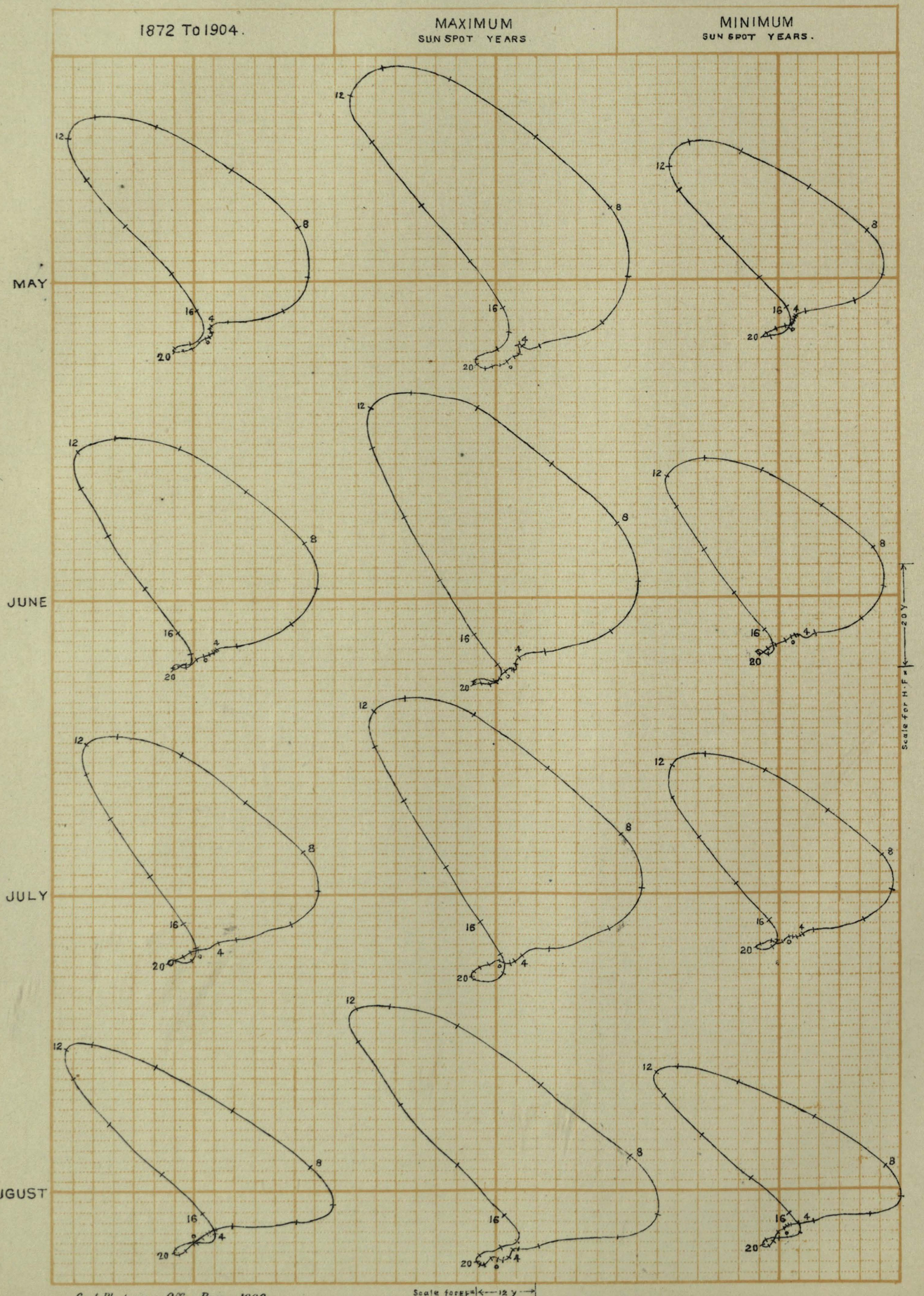
Scale for D ⟵ 12 Y ⟶

Gov^t Photozinco Office. Poona. 1909.

COLABA OBSERVATORY

Vector Diagrams (average monthly)
Showing the Diurnal Inequality in the Horizontal Plane
(Northerly & Easterly Forces)

Plate 65

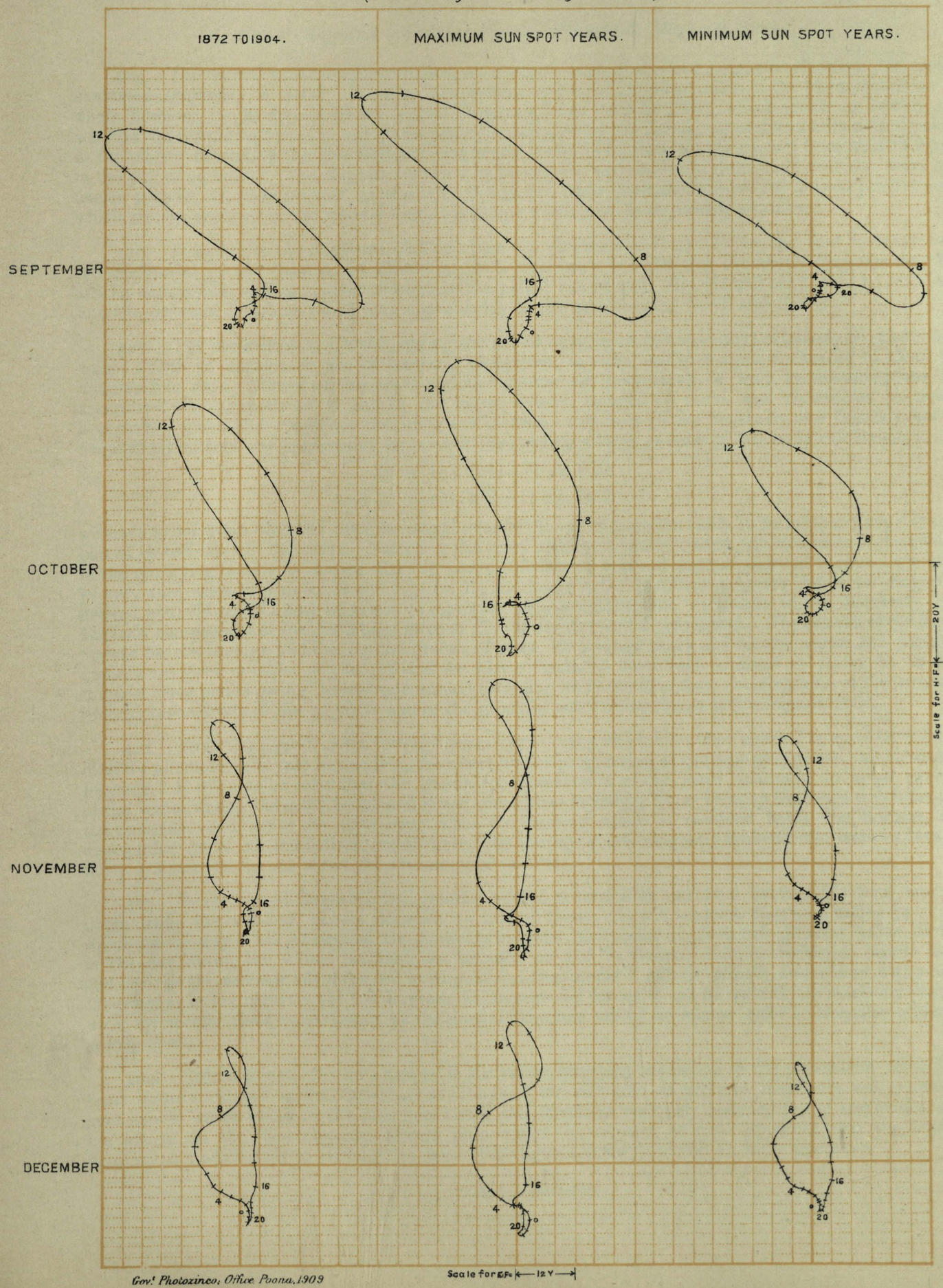


Gov.t Photozinco Office, Poona, 1909.

COLABA OBSERVATORY.

(Vector Diagrams (average monthly)
Showing the Diurnal Inequality in the Horizontal Plane
(Northerly & Easterly Forces)

Plate 66



Govt. Photozinco, Office Poona, 1909

CHAPTER IX.

Vector Diagrams indicating Diurnal Changes in Magnetic Forces.

419. The diurnal variation phenomenon, as it affects each of the four magnetic elements, has been examined separately in detail. A more comprehensive idea of the progression of the phenomenon as a whole, however, can be derived from " Vector Diagrams," first used by Lloyd, which enable us readily to see how the disturbing forces in any given plane as indicated by the radius vector drawn from a fixed point in the plane representing the direction and magnitude of the force, comport themselves from hour to hour in the day of 24 hours. The diagram obtained by joining the extremities of these radii vectores, serve an useful purpose as they present to the eye at a glance some characteristics of the diurnal progression which are not apparent in the several single variations which have been already examined.

420. Referring to the diagrams obtained from the variations of H and D* in the first instance, as the declination is not constant in direction, it is necessary, in order that the vector diagrams may be strictly comparable with each other throughout the period considered, that δH and δD should be resolved into two constant directions which may conveniently be the astronomical N—S and E—W.

421. The declination at Colaba, during the period considered (1872—1905) attained its maximum value, about 57 minutes of arc of easterly elongation, in 1880, and then again decreased to about 10 minutes E in 1904. Hence as this angle and its variation are very small, it may be advantageous to ascertain if the variations of H and D, the latter reduced to units of force, can themselves be made acceptable, under the conditions obtaining at Colaba, as variations of the Northerly and Easterly forces respectively without any appreciably large error thus saving a large amount of laborious calculation.

As
$$\delta N = \cos D\delta H - H \sin D\delta D$$
$$\text{and } \delta E = \sin D\delta H + H \cos D\delta D$$

we have to ascertain what the extreme magnitudes of the corrections are likely to be for the change of one pair of co-ordinates to the other. Selecting the years and hours which involve, the maximum of the effects of the modifying factors, it is seen that the extreme difference between any two pairs of vectors, amounts in very rare cases to $0{\cdot}2\gamma$ for N and $0{\cdot}5\gamma$ for E ; and hence for all practical purposes the vector diagrams derived from δH and δD may be taken to represent fairly accurately the variations of the Northerly and Easterly components of the disturbing force at Colaba for the period considered. The results of the latter derived for the average months, for the groups of years, for average years and for the winter and summer months are given in tables 365 to 378 and the vector diagrams have been charted in plates 61 to 66, the first three plates giving the average annual diagrams while the last three the diagrams of the average months respectively of the 33 years and of the group of years of maximum and minimum spots.

422. From the figures of the average years 1872—1905 which have been charted so as to have those of every alternate 11th year in one line, the effect on the progression of the sun-spot period can be readily followed. It will also be seen that the diurnal phenomenon is in the main restricted to large sweeps of the vector during the solar hours and if the minor ones including those forming the loops which denote the uncertain condition of the night hours when the exciting cause is removed below the horizon, are disregarded as of no immediate significance, the average yearly diagrams approximate more or less to fairly symmetrical figures about the astronominal meridian.

423. In the annual diagrams the greatest vector is invariably indicated between 11 hour and 12 noon, while the smallest occurs between 15 and 16 hours. In the seasonal diagrams plates 64 to 66, which by the way it will be noticed are markedly irregular, the vector acquires the greatest value earlier in the day during the winter months, *viz.* between 10 and 11 hours ; while its incidence occurs later and later as the summer advances, till in August and September it falls practically co-incident with noon, the changes in the character of the diagram due to seasonal forces, it will be noticed, are markedly violent while the secular changes as shown by the annual diagrams are by no means quite so irregular or large in magnitude.

424. Referring now to the changes in the vector diagrams in relation to the parallelism which has been shown to prevail in the individual variations of the elements at times of maximum and minimum spot epochs which would be the case here also if the difference were only confined to the amplitudes and the effects on the two elements always proportional, it becomes at once apparent that the vector diagram as a whole fails to indicate the same (*vide* figures below) and the reason is apparent.

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* Reduced to units of force.

TABLE 365.—*Declination Magnetograph—Showing for the period 1872—1904 the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1872—1904.	Month.												Year.
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+15	+18	+13	+25	+27	+24	+13	+11	+22	+24	+25	+19	+20
1 18	+9	+15	+10	+31	+35	+36	+27	+21	+28	+23	+19	+13	+22
2 18	−1	+9	+5	+29	+38	+43	+36	+29	+29	+18	+10	+2	+21
3 18	−19	−5	−7	+20	+36	+43	+40	+34	+27	+5	−7	−16	+13
4 18	−40	−23	−17	+11	+38	+46	+49	+43	+28	−7	−26	−35	+6
5 18	−60	−41	−21	+14	+67	+84	+86	+78	+46	−12	−42	−54	+12
6 18	**−72**	**−50**	−5	+88	+177	+194	+193	+204	+148	+11	**−63**	−67	+63
7 18	−70	−39	+67	+179	**+237**	**+246**	**+248**	**+278**	**+248**	+82	−51	**−89**	+111
8 18	+16	+22	+127	**+195**	+206	+219	+217	+234	+216	**+106**	−4	−37	**+126**
9 18	**+91**	**+59**	**+130**	+132	+75	+105	+105	+82	+80	+57	+8	+15	+78
10 18	+63	+49	+74	+21	−74	−25	−24	−75	−67	−23	−15	+6	−7
11 18	−24	−11	−28	−117	−188	−152	−148	−199	−212	−119	−59	−21	−106
12 18	−45	−45	−116	**−200**	**−243**	**−227**	−212	**−254**	**−281**	**−145**	−32	−9	**−151**
13 18	−14	−25	**−127**	−192	−209	−219	**−213**	−237	−239	−94	+23	+24	−127
14 18	0	+2	−64	−126	−128	−166	−162	−162	−126	−20	**+42**	**+35**	−73
15 18	+18	+23	+8	−48	−46	−94	−86	−60	−11	+38	+40	+33	−15
16 18	+33	+25	+28	+7	+13	−31	−23	+19	+52	+46	+30	+35	+19
17 18	+13	−1	−1	+10	+25	−3	+5	+43	+34	−3	+7	+20	+12
18 18	+7	−15	−29	−18	−5	−11	−1	+7	−6	−11	+13	+23	−4
19 18	+19	+2	−25	−34	−36	−44	−43	−27	−13	−6	+15	+25	−14
20 18	+17	+3	−17	−29	−34	−41	−46	−33	−12	−3	+14	+20	−13
21 18	+14	+2	−11	−14	−20	−30	−37	−25	−6	0	+12	+17	−8
22 18	+15	+10	−3	+1	−2	−9	−21	−13	+3	+10	+19	+18	+2
23 18	+16	+15	+7	+14	+13	+8	−4	−1	+13	+22	+25	+20	+12
Range ...	163	109	257	395	480	473	461	532	529	251	105	124	277

TABLE 366.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the maximum sun-spot years, 1872, 1873, 1883, 1884, 1892, 1893, 1894, and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+ 19	+ 32	+ 19	+ 29	+ 30	+ 18	+ 8	+ 4	+ 24	+ 29	+32	+26	+ 22
1 18	+ 17	+ 31	+ 18	+ 39	+ 42	+ 32	+ 26	+ 16	+ 30	+ 26	+27	+21	+ 27
2 18	+ 7	+ 24	+ 13	+ 37	+ 45	+ 39	+ 37	+ 29	+ 32	+ 23	+16	+10	+ 26
3 18	- 14	+ 5	- 3	+ 24	+ 42	+ 41	+ 40	+ 35	+ 28	+ 8	- 7	- 9	+ 16
4 18	- 42	- 23	- 16	+ 12	+ 48	+ 52	+ 56	+ 45	+ 27	- 7	-31	-32	+ 7
5 18	- 63	- 47	- 18	+ 21	+ 85	+ 98	+107	+ 91	+ 50	- 14	-53	-56	+ 17
6 18	**- 76**	**- 57**	+ 14	+118	+215	+230	+226	+244	+179	+ 21	**-76**	-69	+ 81
7 18	- 72	- 35	+107	+224	**+272**	**+284**	**+295**	**+326**	**+286**	+105	-57	**-91**	+137
8 18	+ 22	+ 48	**+179**	**+238**	+227	+246	+246	+267	+247	**+131**	+ 9	-22	**+153**
9 18	**+115**	**+102**	+169	+163	+ 79	+107	+104	+ 93	+ 97	+ 83	**+36**	**+51**	+100
10 18	+ 93	+ 81	+ 84	+ 31	- 92	- 38	- 44	- 76	- 68	- 12	+13	+31	0
11 18	- 6	+ 10	- 51	-130	-225	-172	-178	-209	-231	-121	-45	-14	-114
12 18	- 47	- 37	**-149**	**-227**	**-284**	**-245**	**-241**	**-277**	**-313**	**-155**	-27	-12	**-168**
13 18	- 16	- 27	-149	-222	-238	-241	-240	-270	-269	-108	+25	+16	-145
14 18	- 11	- 13	- 70	-150	-147	-185	-182	-192	-143	- 32	+28	+27	- 89
15 18	+ 6	- 3	- 1	- 63	- 54	-109	- 99	- 76	- 19	+ 30	+20	+20	- 29
16 18	+ 19	- 6	+ 11	- 2	+ 15	- 40	- 30	+ 17	+ 50	+ 36	+11	+19	+ 8
17 18	- 9	- 34	- 24	- 1	+ 28	+ 4	+ 15	+ 47	+ 32	- 27	-18	- 5	+ 1
18 18	- 15	- 52	- 62	- 34	+ 2	+ 4	+ 17	+ 14	- 14	- 30	- 1	+ 3	- 14
19 18	+ 16	- 13	- 38	- 52	- 42	- 45	- 40	- 29	- 14	- 8	+17	+16	- 19
20 18	+ 17	- 7	- 22	- 39	- 37	- 44	- 45	- 38	- 12	- 6	+18	+14	- 17
21 18	+ 12	- 8	- 16	- 22	- 20	- 31	- 40	- 32	- 10	- 8	+14	+11	- 12
22 18	+ 14	+ 12	- 8	- 1	- 2	- 11	- 27	- 22	- 1	+ 8	+23	+16	0
23 18	+ 16	+ 19	+ 9	+ 12	+ 12	+ 4	- 12	- 9	+ 11	+ 23	+30	+26	+ 12
Range ...	191	159	328	465	556	529	536	603	599	286	112	142	321

TABLE 367.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the minimum sun-spot years, 1876, 1877, 1878, 1879, 1887, 1888, 1889, 1899, 1900, 1901, 1902 and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+12	+ 9	+ 10	+ 19	+ 27	+ 28	+ 21	+ 14	+ 17	+ 23	+21	+15	+ 18
1 18	+ 6	+ 6	+ 7	+ 22	+ 33	+ 38	+ 31	+ 22	+ 22	+ 21	+17	+ 8	+ 19
2 18	- 4	0	+ 2	+ 23	+ 36	+45	+ 37	+ 28	+ 24	+ 16	+ 8	- 4	+ 18
3 18	-20	-11	- 9	+ 14	+ 33	+ 44	+ 41	+ 33	+ 23	+ 7	- 6	-18	+ 11
4 18	-39	-24	- 17	+ 7	+ 34	+ 43	+ 47	+ 44	+ 25	- 2	-21	-34	+ 5
5 18	-56	-38	- 20	+ 9	+ 56	+ 74	+ 75	+ 75	+ 43	- 6	-34	-48	+ 11
6 18	**-67**	**-42**	- 10	+ 70	+148	+167	+173	+184	+126	+ 6	-52	-59	+ 54
7 18	-66	-35	+ 54	+156	**+207**	**+215**	**+227**	**+251**	**+232**	+ 72	-47	**-77**	+ 99
8 18	+20	+12	+106	**+173**	+183	+194	+207	+215	+203	**+ 95**	-14	-34	**+113**
9 18	**+87**	+33	**+108**	+122	+ 66	+ 91	+103	+ 76	+ 77	+ 46	-12	+ 2	+ 67
10 18	+53	+24	+ 64	+ 24	- 70	- 29	- 20	- 77	- 62	- 30	-32	-16	- 14
11 18	-32	-29	- 32	-104	-171	-146	-146	-197	-199	-118	**-66**	-33	-106
12 18	-43	**-48**	-109	**-180**	**-216**	**-214**	**-208**	**-242**	**-263**	**-140**	-29	-15	**-142**
13 18	-15	-20	**-116**	-173	-185	-197	-206	-222	-223	- 89	+30	+22	-116
14 18	- 3	+17	- 55	-110	-108	-143	-153	-148	-112	- 17	**+51**	+39	- 62
15 18	+18	+46	+ 17	- 36	- 35	- 80	- 81	- 51	- 3	+ 40	+46	+40	- 7
16 18	+40	**+47**	+ 39	+ 16	+ 17	- 25	- 19	+ 26	+ 57	+ 49	+36	**+44**	+ 27
17 18	+23	+19	+ 14	+ 16	+ 24	- 6	+ 2	+ 46	+ 40	+ 10	+17	+34	+ 20
18 18	+16	+ 5	- 11	- 11	- 11	- 19	- 10	+ 4	- 2	- 3	+18	+32	+ 1
19 18	+20	+ 6	- 18	- 28	- 31	- 40	- 41	- 25	- 13	- 8	+14	+28	- 11
20 18	+16	+ 3	- 15	- 28	- 31	- 34	- 41	- 28	- 15	- 3	+12	+22	- 12
21 18	+12	+ 2	- 8	- 15	- 19	- 22	- 31	- 19	- 7	+ 2	+12	+19	- 6
22 18	+12	+ 5	- 2	0	- 1	- 2	- 13	- 9	+ 2	+ 11	+16	+18	+ 3
23 18	+12	+10	+ 5	+ 9	+ 15	+ 15	+ 5	+ 2	+ 10	+ 20	+22	+17	+ 12
Range ...	154	95	224	353	423	429	435	493	495	235	117	121	255

TABLE 368.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each year from 1872 to 1905.*

Unity = ·1γ = ·000001 C. G. S.

Colaba Civil Time.	Years.																																	
	1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
H. m.																																		
0 18	+ 27	+ 26	+ 27	+ 22	+ 21	+ 22	+ 20	+ 21	+ 22	+ 22	+ 24	+ 22	+ 17	+ 17	+ 24	+ 21	+ 20	+ 15	+ 21	+ 18	+ 19	+ 26	+ 19	+ 20	+ 22	+ 21	+ 17	+ 17	+ 16	+ 12	+ 11	+ 12	+ 7	+ 15
1 18	+ 33	+ 33	+ 30	+ 23	+ 23	+ 24	+ 20	+ 22	+ 24	+ 24	+ 27	+ 26	+ 21	+ 21	+ 29	+ 22	+ 20	+ 15	+ 20	+ 16	+ 20	+ 32	+ 23	+ 23	+ 25	+ 24	+ 21	+ 20	+ 18	+ 14	+ 13	+ 15	+ 12	+ 18
2 18	+ 32	+ 35	+ 25	+ 23	+ 23	+ 23	+ 17	+ 19	+ 20	+ 21	+ 24	+ 26	+ 19	+ 20	+ 24	+ 20	+ 20	+ 15	+ 20	+ 16	+ 21	+ 28	+ 23	+ 21	+ 24	+ 22	+ 17	+ 19	+ 16	+ 12	+ 10	+ 13	+ 10	+ 14
3 18	+ 21	+ 26	+ 14	+ 16	+ 17	+ 18	+ 11	+ 12	+ 9	+ 11	+ 12	+ 16	+ 9	+ 13	+ 14	+ 12	+ 12	+ 8	+ 13	+ 8	+ 8	+ 18	+ 12	+ 16	+ 18	+ 13	+ 11	+ 10	+ 9	+ 8	+ 4	+ 5	+ 4	+ 6
4 18	+ 7	+ 14	+ 5	+ 9	+ 9	+ 11	+ 4	+ 6	0	+ 4	+ 3	+ 8	+ 1	+ 7	+ 6	+ 7	+ 7	+ 6	+ 8	+ 4	+ 5	+ 9	+ 7	+ 9	+ 12	+ 8	+ 5	+ 4	+ 4	+ 2	− 2	0	0	0
5 18	+ 20	+ 20	+ 5	+ 9	+ 12	+ 15	+ 9	+ 12	0	+ 10	+ 7	+ 17	+ 7	+ 17	+ 8	+ 12	+ 11	+ 15	+ 13	+ 14	+ 17	+ 20	+ 16	+ 21	+ 17	+ 14	+ 11	+ 11	+ 11	+ 6	− 4	+ 9	+ 11	+ 10
6 18	+ 99	+ 76	+ 54	+ 52	+ 54	+ 57	+ 52	+ 56	+ 42	+ 72	+ 56	+ 74	+ 71	+ 71	+ 59	+ 59	+ 53	+ 58	+ 58	+ 72	+ 90	+ 80	+ 75	+ 83	+ 67	+ 58	+ 58	+ 56	+ 53	+ 45	+ 47	+ 57	+ 69	+ 71
7 18	+157	+134	+103	+100	+105	+107	+ 95	+ 96	+ 92	+129	+104	+127	+132	+113	+ 97	+100	+ 93	+100	+ 89	+120	+142	+141	+125	+136	+108	+104	+103	+104	+100	+ 91	+ 98	+104	+124	+130
8 18	**+168**	**+147**	**+121**	**+106**	**+105**	**+121**	**+109**	**+104**	**+115**	**+148**	**+130**	**+146**	**+162**	**+125**	**+108**	**+110**	**+110**	**+116**	+ 98	**+138**	**+155**	**+155**	**+139**	**+147**	**+118**	**+123**	**+114**	**+118**	**+118**	**+110**	**+124**	**+122**	**+136**	**+153**
9 18	+109	+ 97	+ 90	+ 57	+ 58	+ 68	+ 59	+ 56	+ 81	+ 94	+100	+101	+116	+ 77	+ 69	+ 62	+ 65	+ 67	+ 54	+ 84	+ 87	+ 96	+ 94	+ 82	+ 69	+ 77	+ 63	+ 61	+ 72	+ 73	+ 87	+ 78	+ 77	+107
10 18	0	− 9	+ 13	− 20	− 23	− 22	− 25	− 21	+ 7	− 2	+ 17	− 1	+ 17	− 13	− 1	− 21	− 15	− 17	− 20	− 16	− 11	− 9	+ 13	− 15	− 10	+ 3	− 11	− 14	− 15	+ 8	+ 6	+ 4	− 12	+ 26
11 18	−124	−118	− 82	−104	−103	−121	−108	−112	− 83	−113	− 88	−110	−103	−115	− 88	−114	−105	−110	−108	−124	−125	−127	− 93	−123	−110	− 95	−105	−109	−105	− 88	− 92	− 99	−114	− 95
12 18	**−176**	**−170**	**−127**	**−144**	**−137**	**−154**	**−134**	**−145**	**−133**	**−168**	**−142**	**−161**	**−160**	**−164**	**−133**	**−151**	**−144**	**−145**	**−138**	**−167**	**−170**	**−189**	**−148**	**−171**	**−155**	**−140**	**−146**	**−148**	**−142**	**−130**	**−133**	**−153**	**−155**	**−159**
13 18	−150	−137	−120	−115	−114	−120	−103	−115	−117	−144	−123	−137	−147	−139	−119	−124	−121	−122	−113	−134	−142	−167	−133	−145	−132	−121	−114	−121	−115	−107	−114	−132	−127	−151
14 18	− 91	− 82	− 79	− 59	− 65	− 68	− 48	− 56	− 74	− 86	− 77	− 87	− 96	− 79	− 75	68	− 64	− 64	− 59	− 73	− 80	−105	− 83	− 85	− 72	− 72	− 59	− 62	− 63	− 60	− 64	− 79	− 68	− 99
15 18	− 36	− 26	− 32	0	− 9	− 9	+ 5	+ 1	− 19	− 24	− 27	− 26	− 36	− 11	− 27	− 13	− 5	− 4	− 2	− 13	− 19	− 32	− 28	− 20	− 12	− 19	− 4	− 3	− 9	− 12	− 15	− 19	− 6	− 37
16 18	− 4	+ 2	0	+ 29	+ 24	+ 26	+ 31	+ 34	+ 13	− 17	0	+ 10	+ 11	+ 33	+ 7	+ 28	+ 28	+ 34	+ 34	+ 25	+ 22	+ 14	+ 3	+ 20	+ 18	+ 14	+ 26	+ 29	+ 26	+ 21	+ 20	+ 24	+ 30	+ 6
17 18	− 14	− 8	− 3	+ 13	+ 18	+ 21	+ 13	+ 23	+ 7	+ 9	8	0	+ 9	+ 21	+ 9	+ 24	+ 18	+ 26	+ 24	+ 17	+ 9	+ 11	− 3	+ 9	+ 11	+ 5	+ 18	+ 21	+ 22	+ 16	+ 17	+ 31	+ 23	+ 7
18 18	− 23	− 25	− 10	− 8	− 3	0	− 7	+ 1	− 5	− 6	− 14	− 14	− 11	− 3	− 5	+ 3	+ 2	+ 4	+ 3	+ 2	− 6	− 4	− 15	− 6	0	− 9	+ 4	+ 2	+ 2	+ 1	0	+ 13	+ 6	− 8
19 18	− 27	− 23	− 18	− 15	− 15	− 13	− 17	− 13	− 14	− 16	− 21	− 22	− 16	− 12	− 14	− 6	− 8	− 10	− 13	− 8	− 17	− 9	− 21	− 13	− 11	− 19	− 13	− 9	− 12	− 11	− 11	− 4	− 8	− 10
20 18	− 25	− 18	− 16	− 13	− 15	− 12	− 14	− 14	− 11	− 15	− 17	− 17	− 15	− 10	− 13	− 5	− 8	− 11	− 12	− 8	− 16	− 10	− 16	− 13	− 12	− 17	− 16	− 12	− 14	− 14	− 11	− 7	− 13	− 7
21 18	− 19	− 12	− 9	− 7	− 10	− 5	− 7	− 6	− 4	− 6	− 11	− 12	− 12	− 4	− 3	0	− 5	− 7	− 7	− 6	− 14	− 5	− 13	− 10	− 8	− 11	− 12	− 7	− 8	− 8	− 6	− 2	− 11	− 8
22 18	+ 2	+ 3	+ 2	+ 3	+ 2	+ 6	+ 3	+ 5	+ 6	+ 1	+ 3	0	− 3	+ 4	+ 6	+ 6	+ 4	+ 3	+ 4	+ 5	− 1	+ 3	− 4	+ 1	+ 2	+ 1	0	+ 4	+ 2	− 1	+ 1	+ 3	− 5	− 2
23 18	+ 14	+ 17	+ 18	+ 14	+ 13	+ 16	+ 13	+ 13	+ 16	+ 12	+ 16	+ 12	+ 9	+ 12	+ 19	+ 16	+ 13	+ 8	+ 13	+ 11	+ 5	+ 16	+ 9	+ 13	+ 14	+ 12	+ 11	+ 11	+ 10	+ 8	+ 8	+ 10	+ 4	+ 9
Range ...	344	317	248	250	242	275	243	249	248	316	272	307	322	289	241	261	254	261	236	305	325	344	287	318	273	263	260	266	260	240	257	275	291	312

TABLE 369.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—April to September—for each of the years 1872 to 1882, and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

April to September. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	Mean, 1872 to 1882.
H. m.												
0 18	+ 24	+ 25	+ 27	+ 24	+ 22	+ 27	+ 27	+ 24	+ 26	+ 20	+ 29	+ 25
1 18	+ 39	+ 40	+ 36	+ 32	+ 32	+ 36	+ 34	+ 30	+ 35	+ 30	+ 38	+ 35
2 18	+ 48	+ 49	+ 37	+ 40	+ 38	+ 40	+ 35	+ 32	+ 38	+ 34	+ 40	+ 39
3 18	+ 51	+ 49	+ 34	+ 38	+ 38	+ 41	+ 33	+ 31	+ 37	+ 32	+ 36	+ 38
4 18	+ 50	+ 48	+ 34	+ 38	+ 38	+ 41	+ 31	+ 32	+ 34	+ 34	+ 32	+ 37
8 18	+ 93	+ 77	+ 53	+ 51	+ 61	+ 58	+ 46	+ 55	+ 50	+ 65	+ 52	+ 60
6 18	+240	+193	+158	+142	+149	+148	+130	+147	+139	+187	+155	+163
7 18	**+318**	**+273**	**+233**	**+212**	**+234**	**+225**	**+192**	**+211**	**+210**	**+269**	**+224**	**+236**
8 18	+270	+243	+217	+192	+190	+211	+179	+187	+201	+239	+212	+213
9 18	+109	+115	+119	+ 86	+ 79	+ 94	+ 84	+ 78	+105	+104	+124	+100
10 18	- 55	- 40	- 18	- 32	- 56	- 41	- 35	- 47	- 23	- 45	- 7	- 36
11 18	-213	-175	-145	-142	-163	-178	-140	-168	-147	-184	-138	-163
12 18	**-293**	**-248**	**-215**	**-209**	**-213**	**-241**	**-192**	**-225**	**-216**	**-259**	**-215**	**-230**
13 18	-273	-228	-212	-193	-197	-215	-179	-202	-208	-242	-206	-214
14 18	-187	-158	-154	-133	-126	-140	-116	124	-145	-163	-146	-145
15 18	- 86	- 73	- 73	- 56	- 46	- 55	- 46	- 38	- 63	- 65	- 76	- 62
16 18	- 15	- 19	- 13	- 1	+ 9	+ 7	+ 6	+ 24	- 7	+ 12	- 26	- 2
17 18	+ 10	- 2	+ 2	+ 8	+ 17	+ 18	+ 8	+ 28	+ 8	+ 26	- 10	+ 10
18 18	- 6	- 28	- 10	- 19	- 13	- 10	- 20	- 6	- 10	0	- 16	- 13
19 18	- 45	- 52	- 38	- 37	- 37	- 30	- 39	- 31	- 32	- 36	- 43	- 38
20 18	- 43	- 48	- 37	- 35	- 37	- 27	- 33	- 32	- 29	- 36	- 38	- 36
21 18	- 29	- 34	- 25	- 21	- 25	- 14	- 19	- 18	- 18	- 22	- 25	- 23
22 18	- 11	- 11	- 8	- 4	- 8	+ 1	- 3	- 1	- 3	- 9	- 5	- 6
23 18	+ 4	+ 7	+ 12	+ 11	+ 8	+ 16	+ 14	+ 12	+ 12	+ 5	+ 12	+ 10
Range ...	611	521	448	420	447	466	384	436	426	528	439	466

TABLE 370.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—January to March and October to December—for each of the years 1872 to 1882, and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

October to March. Bombay Civil Time.	Year. 1872.	1873.	1874.	1875.	1876.	1877.	1878.	1879.	1880.	1881.	1882.	Mean, 1872 to 1882.
H. m.												
0 18	+ 30	+ 28	+ 26	+ 20	+ 20	+ 17	+ 12	+ 18	+ 19	+ 23	+ 19	+ 21
1 18	+ 26	+ 25	+ 24	+ 14	+ 15	+ 13	+ 7	+ 13	+ 12	+ 18	+ 16	+ 17
2 18	+ 17	+ 20	+ 14	+ 5	+ 7	+ 7	0	+ 6	+ 3	+ 7	+ 8	+ 9
3 18	- 9	+ 3	- 6	- 5	- 4	- 5	- 11	- 7	- 18	- 10	- 11	- 8
4 18	- 35	- 20	- 24	- 20	- 19	- 19	- 22	- 21	- 35	- 27	- 27	- 24
5 18	- 53	- 37	- 43	- 33	- 36	- 29	- 28	- 30	- 50	- 44	- 39	- 38
6 18	- 42	- 41	**- 49**	- 38	- 40	- 33	- 26	- 35	**- 54**	- 42	- 43	- 40
7 18	- 4	- 4	- 27	- 12	- 24	- 11	- 2	- 19	- 25	- 8	- 16	- 14
8 18	+ 65	+ 52	+ 26	+ 21	+ 21	+ 30	+ 40	+ 21	+ 28	+ 58	+ 49	+ 37
9 18	**+109**	**+ 78**	**+ 62**	+ 28	+ 40	+ 43	+ 34	+ 33	**+ 57**	**+ 84**	**+ 75**	**+ 58**
10 18	+ 55	+ 22	+ 43	- 9	+ 10	- 2	- 15	+ 5	+ 37	+ 41	+ 41	+ 21
11 18	- 35	- 62	- 18	- 65	- 43	- 63	**- 76**	- 57	- 19	- 42	- 38	- 47
12 18	**- 59**	**- 93**	- 40	**- 81**	**- 60**	**- 68**	- 76	**- 65**	- 50	**- 76**	**- 69**	**- 67**
13 18	- 28	- 46	- 28	- 38	- 32	- 25	- 28	- 29	- 27	- 46	- 39	- 33
14 18	+ 5	- 7	- 4	+ 14	- 4	+ 5	+ 21	+ 12	- 3	- 10	- 8	+ 2
15 18	+ 15	+ 22	+ 9	+ 56	+ 29	+ 36	**+ 56**	+ 41	+ 24	+ 18	+ 23	+ 30
16 18	+ 7	+ 22	+ 12	**+ 59**	**+ 40**	**+ 46**	+ 56	**+ 44**	+ 34	+ 22	+ 27	+ 34
17 18	- 37	- 13	- 7	+ 17	+ 19	+ 24	+ 19	+ 18	+ 6	- 7	- 6	+ 3
18 18	- 41	- 22	- 11	+ 4	+ 8	+ 10	+ 6	+ 8	- 1	- 11	- 12	- 6
19 18	- 8	+ 6	+ 1	+ 7	+ 7	+ 4	+ 5	+ 5	+ 5	+ 4	+ 1	+ 3
20 18	- 8	+ 12	+ 4	+ 10	+ 6	+ 3	+ 5	+ 4	+ 8	+ 7	+ 4	+ 5
21 18	- 9	+ 9	+ 7	+ 6	+ 6	+ 4	+ 5	+ 7	+ 10	+ 9	+ 3	+ 5
22 18	+ 16	+ 17	+ 12	+ 10	+ 11	+ 11	+ 9	+ 11	+ 15	+ 11	+ 11	+ 12
23 18	+ 24	+ 27	+ 23	+ 17	+ 17	+ 15	+ 13	+ 15	+ 20	+ 19	+ 20	+ 19
Range ...	168	171	111	140	100	114	132	109	117	160	144	125

TABLE 371.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—April to September—for each of the years 1883 to 1893, and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

April to September	Year.											Mean, 1883 to 1893.
Bombay Civil Time.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	
H. m.												
0 18	+ 18	+ 17	+ 14	+ 25	+ 20	+ 19	+ 19	+ 24	+ 17	+ 13	+ 23	+ 19
1 18	+ 28	+ 26	+ 27	+ 37	+ 28	+ 27	+ 23	+ 29	+ 20	+ 24	+ 35	+ 28
2 18	+ 33	+ 31	+ 33	+ 41	+ 37	+ 36	+ 31	+ 35	+ 27	+ 33	+ 38	+ 34
3 18	+ 31	+ 30	+ 36	+ 41	+ 37	+ 34	+ 29	+ 34	+ 26	+ 26	+ 31	+ 32
4 18	+ 36	+ 37	+ 42	+ 43	+ 45	+ 38	+ 35	+ 40	+ 33	+ 40	+ 34	+ 38
5 18	+ 69	+ 70	+ 76	+ 67	+ 74	+ 61	+ 60	+ 65	+ 68	+ 79	+ 70	+ 69
6 18	+184	+196	+196	+174	+175	+151	+150	+163	+181	+222	+186	+180
7 18	**+260**	**+275**	**+260**	**+237**	**+238**	**+216**	**+213**	**+213**	**+250**	**+289**	**+281**	**+248**
8 18	+229	+241	+226	+207	+203	+201	+194	+174	+221	+243	+249	+217
9 18	+108	+100	+ 94	+ 96	+ 73	+ 94	+ 89	+ 55	+ 91	+ 90	+115	+ 91
10 18	- 42	- 63	- 66	- 33	- 74	- 40	- 38	- 73	- 63	- 62	- 44	- 54
11 18	-172	-210	-198	-154	-196	-161	-158	-179	-199	-205	-195	-184
12 18	**-242**	**-272**	**-265**	**-219**	**-253**	**-222**	**-217**	**-222**	**-258**	**-273**	**-279**	**-247**
13 18	-227	-245	-243	-212	-222	-202	-203	-196	-227	-247	-268	-227
14 18	-159	-154	-155	-148	-137	-130	-130	-117	-144	-154	-189	-147
15 18	- 66	- 52	- 52	- 69	- 46	- 54	- 45	- 27	- 54	- 57	- 80	- 55
16 18	+ 5	+ 21	+ 23	- 10	+ 24	+ 4	+ 17	+ 33	+ 19	+ 18	+ 6	+ 15
17 18	+ 19	+ 37	+ 33	+ 4	+ 33	+ 14	+ 24	+ 32	+ 30	+ 28	+ 36	+ 26
18 18	- 8	+ 6	- 3	- 20	- 5	- 9	- 6	- 5	+ 5	+ 6	+ 16	- 2
19 18	- 39	- 28	- 31	- 42	- 25	- 29	- 30	- 32	- 21	- 35	- 24	- 31
20 18	- 36	- 32	- 27	- 40	- 20	- 28	- 33	- 32	- 18	- 34	- 25	- 30
21 18	- 24	- 25	- 20	- 24	- 12	- 20	- 23	- 21	- 12	- 26	- 16	- 20
22 18	- 9	- 11	- 7	- 9	- 3	- 6	- 6	- 4	0	- 12	- 5	- 7
23 18	+ 4	+ 4	+ 5	+ 9	+ 9	+ 7	+ 6	+ 9	+ 6	- 4	+ 7	+ 6
Range ...	502	547	525	456	491	438	430	435	508	562	560	495

TABLE 372.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—January to March and October to December—for each of the years 1883 to 1893, and for the whole period of eleven years.*

Unity = ·1γ = ·000001 C. G. S.

October to March.	Year.											Mean, 1883 to 1893.
Bombay Civil Time.	1883.	1884.	1885.	1886.	1887.	1888.	1889.	1890.	1891.	1892.	1893.	
H. m.												
0 18	+ 26	+ 17	+ 19	+ 23	+ 22	+ 20	+ 12	+ 18	+ 18	+ 25	+ 30	+ 21
1 18	+ 25	+ 15	+ 16	+ 20	+ 17	+ 14	+ 6	+ 11	+ 12	+ 16	+ 31	+ 17
2 18	+ 19	+ 6	+ 7	+ 7	+ 2	+ 4	- 1	+ 4	+ 5	+ 9	+ 18	+ 7
3 18	+ 2	- 12	- 9	- 12	- 12	- 10	- 12	- 9	- 10	- 9	+ 4	- 8
4 18	- 19	- 34	- 28	- 31	- 31	- 23	- 23	- 23	- 25	- 31	- 15	- 26
5 18	- 34	- **55**	- 43	- 52	- 49	- 40	- 31	- 40	- 39	- 45	- 29	- 42
6 18	- 35	- 53	- 55	- **56**	- **57**	- 45	- 34	- 47	- 37	- 42	- 25	- 44
7 18	- 5	- 11	- 35	- 44	- 38	- 29	- 13	- 35	- 11	- 5	+ 2	- 20
8 18	+ 63	+ 83	+ 23	+ 9	+ 18	+ 19	+ 39	+ 22	+ 55	+ 66	+ 61	+ 42
9 18	+ **93**	+**132**	+ **60**	+ **42**	+ **51**	+ 36	+ 45	+ **52**	+ **76**	+ **85**	+ **77**	+ **68**
10 18	+ 39	+ 97	+ 39	+ 31	+ 31	+ 10	+ 4	+ 32	+ 31	+ 40	+ 27	+ 35
11 18	- 48	+ 3	- 31	- 22	- 33	- 50	- 62	- 37	- 49	- 45	- 59	- 39
12 18	- **80**	- 49	- **62**	- 47	- 50	- **67**	- **72**	- **55**	- **76**	- **67**	- **98**	- **66**
13 18	- 47	- 50	- 35	- 25	- 26	- 41	- 42	- 30	- 41	- 37	- 65	- 40
14 18	- 15	- 39	- 3	- 1	+ 1	+ 1	+ 3	0	- 1	- 5	- 20	- 7
15 18	+ 14	- 20	+ 29	+ 15	+ 20	+ 43	+ 37	+ 22	+ 27	+ 19	+ 16	+ 20
16 18	+ 15	0	+ 43	+ 23	+ 31	+ **51**	+ **52**	+ 35	+ 31	+ 26	+ 23	+ 30
17 18	- 20	- 18	+ 10	+ 13	+ 16	+ 22	+ 27	+ 17	+ 3	- 11	- 12	+ 4
18 18	- 19	- 28	- 4	+ 11	+ 11	+ 14	+ 13	+ 11	- 1	- 18	- 23	- 3
19 18	- 4	- 5	+ 6	+ 14	+ 12	+ 14	+ 9	+ 6	+ 5	+ 2	+ 6	+ 6
20 18	+ 1	+ 2	+ 8	+ 13	+ 10	+ 11	+ 11	+ 8	+ 2	+ 3	+ 6	+ 7
21 18	+ 1	+ 1	+ 11	+ 17	+ 12	+ 10	+ 8	+ 7	+ 1	- 1	+ 6	+ 7
22 18	+ 9	+ 5	+ 15	+ 21	+ 15	+ 15	+ 12	+ 12	+ 10	+ 10	+ 12	+ 12
23 18	+ 19	+ 14	+ 19	+ 28	+ 24	+ 20	+ 11	+ 18	+ 16	+ 15	+ 25	+ 19
Range ...	173	187	122	98	108	118	124	107	152	152	175	134

TABLE 373.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—April to September—for each of the years 1894 to 1904, and for the whole period of eleven years and also for the period of thirty-three years from 1872 to 1904.*

Unity = ·1γ = ·000001 C. G. S.

April to September. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904.	(Mean) 1872 to 1904.
H. m.													
0 18	+ 12	+ 23	+ 21	+ 21	+ 17	+ 20	+ 20	+ 19	+ 14	+ 12	+ 8	+ 17	+ 20
1 18	+ 23	+ 33	+ 33	+ 32	+ 33	+ 28	+ 26	+ 25	+ 18	+ 20	+ 18	+ 26	+ 30
2 18	+ 25	+ 35	+ 37	+ 36	+ 31	+ 32	+ 28	+ 27	+ 19	+ 23	+ 23	+ 29	+ 34
3 18	+ 27	+ 37	+ 38	+ 35	+ 33	+ 30	+ 27	+ 28	+ 19	+ 25	+ 23	+ 29	+ 33
4 18	+ 35	+ 43	+ 40	+ 36	+ 36	+ 32	+ 28	+ 30	+ 19	+ 27	+ 26	+ 32	+ 36
5 18	+ 69	+ 79	+ 68	+ 61	+ 58	+ 56	+ 49	+ 47	+ 40	+ 55	+ 57	+ 58	+ 62
6 18	+194	+208	+170	+156	+160	+145	+138	+128	+128	+160	+172	+160	+167
7 18	**+272**	**+281**	**+238**	**+225**	**+231**	**+212**	**+209**	**+201**	**+209**	**+231**	**+257**	**+233**	**+239**
8 18	+241	+239	+210	+208	+206	+196	+194	+193	+208	+212	+234	+213	+214
9 18	+114	+ 91	+ 93	+104	+ 94	+ 84	+ 93	+ 97	+112	+ 99	+105	+ 99	+ 97
10 18	- 30	- 64	- 32	- 12	- 23	- 29	- 24	- 29	- 19	- 32	- 44	- 31	- 40
11 18	-166	-199	-162	-143	-156	-152	-153	-149	-148	-168	-178	-161	-170
12 18	**-245**	**-271**	**-234**	**-214**	**-231**	**-219**	**-215**	**-215**	**-212**	**-242**	**-245**	**-231**	**-236**
13 18	-238	-245	-218	-202	-210	-202	-194	-197	-197	-223	-226	-214	-218
14 18	-164	-162	-144	-140	-138	-132	-131	-130	-125	-149	-152	-142	-145
15 18	- 74	- 65	- 56	- 66	- 55	- 50	- 51	- 50	- 45	- 55	- 57	- 57	- 58
16 18	- 5	+ 9	+ 2	- 9	+ 2	+ 7	+ 13	+ 10	+ 12	+ 17	+ 16	+ 7	+ 6
17 18	+ 17	+ 23	+ 14	+ 1	+ 16	+ 18	+ 26	+ 19	+ 19	+ 39	+ 33	+ 20	+ 19
18 18	+ 2	- 1	- 7	- 19	- 5	- 7	- 4	- 2	- 7	+ 10	+ 11	- 3	- 6
19 18	- 34	- 33	- 36	- 43	- 32	- 27	- 29	- 22	- 27	- 20	- 22	- 30	- 33
20 18	- 32	- 32	- 38	- 40	- 35	- 29	- 32	- 26	- 26	- 26	- 31	- 32	- 32
21 18	- 27	- 24	- 29	- 28	- 28	- 20	- 22	- 15	- 17	- 15	- 23	- 23	- 22
22 18	- 14	- 10	- 12	- 10	- 11	- 3	- 5	- 3	- 4	- 4	- 12	- 8	- 7
23 18	- 1	+ 7	+ 4	+ 7	+ 5	+ 9	+ 9	+ 9	+ 6	+ 4	- 1	+ 5	+ 7
Range ...	517	552	472	439	462	431	424	416	421	473	502	464	475

TABLE 374.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for the half-year—January to March and October to December—for each of the years 1894 to 1904 and for the whole period of eleven years and also for the period of thirty-three years from 1872 to 1904.*

Unity = ·1γ = ·000001 C. G. S.

October to March. Bombay Civil Time.	Year. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	(Mean) 1894 to 1904.	(Mean) 1872 to 1904.
H. m.													
0 18	+ 26	+ 18	+ 22	+ 21	+ 16	+ 15	+ 13	+ 6	+ 8	+ 11	+ 7	+ 15	+ 19
1 18	+ 24	+ 12	+ 17	+ 17	+ 10	+ 12	+ 11	+ 4	+ 7	+ 9	+ 5	+ 12	+ 15
2 18	+ 20	+ 8	+ 12	+ 9	+ 2	+ 5	+ 3	- 3	+ 1	+ 2	- 2	+ 5	+ 7
3 18	- 2	- 5	- 3	- 8	- 11	- 10	- 9	- 11	- 10	- 15	- 14	- 9	- 8
4 18	- 21	- 24	- 16	- 20	- 27	- 24	- 19	- 26	- 24	- 28	- 25	- 23	- 24
5 18	- 38	- 37	- 34	- 32	- 36	- 35	- 27	- 35	- 31	- 37	- 35	- 34	- 38
6 18	- 43	- 42	- 36	- 40	- 43	- 33	- 32	- 38	- 34	- 45	- 34	- 38	- 41
7 18	- 22	- 9	- 23	- 17	- 25	- 4	- 8	- 20	- 12	- 22	- 10	- 16	- 17
8 18	+ 37	+ 55	+ 26	+ 37	+ 21	+ 39	+ 42	+ 27	+ 39	+ 33	+ 38	+ 36	+ 38
9 18	**+ 74**	**+ 73**	**+ 45**	**+ 50**	+ 31	+ 38	**+ 52**	**+ 49**	**+ 62**	**+ 58**	**+ 49**	**+ 53**	**+ 60**
10 18	+ 57	+ 34	+ 11	+ 18	+ 1	0	- 5	+ 45	+ 31	+ 40	+ 20	+ 23	+ 26
11 18	- 20	- 47	- 57	- 47	- 54	- 66	- 56	- 26	- 36	- 30	- 49	- 44	- 44
12 18	**- 51**	**- 71**	**- 77**	**- 66**	**- 60**	**- 78**	**- 69**	**- 45**	**- 54**	**- 64**	**- 65**	**- 64**	**- 65**
13 18	+ 28	- 44	- 47	- 39	- 17	- 40	- 35	- 16	- 31	- 42	- 27	- 33	- 35
14 18	- 1	- 7	- 1	- 4	+ 20	+ 7	+ 5	+ 10	- 2	- 10	+ 15	+ 3	- 1
15 18	+ 17	+ 25	+ 31	+ 28	+ 47	+ 43	+ 33	+ 26	+ 16	+ 16	+ 46	+ 30	+ 27
16 18	+ 10	+ 31	+ 33	+ 37	**+ 51**	**+ 51**	+ 39	+ 31	+ 27	+ 32	+ 44	+ 35	+ 33
17 18	- 23	- 4	+ 7	+ 9	+ 20	+ 23	+ 18	+ 13	+ 15	+ 23	+ 13	+ 10	+ 6
18 18	- 33	- 12	+ 8	+ 1	+ 12	+ 12	+ 9	+ 5	+ 8	+ 16	+ 1	+ 2	- 2
19 18	- 7	+ 7	+ 13	+ 6	+ 6	+ 9	+ 5	+ 1	+ 5	+ 11	+ 7	+ 6	+ 5
20 18	0	+ 6	+ 14	+ 6	+ 2	+ 5	+ 5	- 2	+ 4	+ 11	+ 5	+ 5	+ 6
21 18	0	+ 4	+ 13	+ 7	+ 5	+ 7	+ 6	0	+ 4	+ 11	+ 1	+ 5	+ 6
22 18	+ 6	+ 12	+ 17	+ 11	+ 11	+ 10	+ 9	0	+ 6	+ 10	+ 3	+ 9	+ 11
23 18	+ 19	+ 20	+ 23	+ 17	+ 15	+ 13	+ 12	+ 6	+ 10	+ 15	+ 9	+ 14	+ 18
Range ...	125	144	122	116	111	129	121	94	116	122	114	117	125

TABLE 375.—*Declination Magnetograph—Showing for the period 1872—1882 the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S

1872-1882. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+ 20	+ 23	+ 14	+ 26	+ 31	+ 28	+ 19	+ 19	+ 28	+ 24	+ 27	+ 20	+ 23
1 18	+ 14	+ 18	+ 10	+ 35	+ 39	+ 41	+ 34	+ 29	+ 31	+ 24	+ 22	+ 14	+ 26
2 18	+ 2	+ 10	+ 4	+ 32	+ 43	+ 48	+ 42	+ 36	+ 35	+ 21	+ 11	+ 3	+ 24
3 18	- 19	- 6	- 7	+ 22	+ 41	+ 47	+ 46	+ 41	+ 33	+ 7	- 8	- 14	+ 15
4 18	- 40	- 24	- 17	+ 12	+ 41	+ 47	+ 51	+ 45	+ 30	- 5	- 28	- 33	+ 7
5 18	- 60	- 43	- 24	+ 13	+ 66	+ 80	+ 83	+ 76	+ 43	- 7	- 45	- 52	+ 11
6 18	- **75**	- **51**	- 9	+ 82	+175	+186	+191	+198	+143	+ 21	- 65	- 64	+ 61
7 18	- 74	- 34	+ 67	+173	**+233**	**+243**	**+241**	**+275**	**+254**	+ 92	- 48	- **86**	+111
8 18	+ 4	+ 28	+128	**+189**	+204	+219	+212	+237	+217	**+103**	+ 2	- 40	**+125**
9 18	+ **81**	+ **66**	**+134**	+131	+ 78	+108	+104	+ 93	+ 84	+ 47	+ 15	+ 9	+ 79
10 18	+ 64	+ 48	+ 79	+ 25	- 70	- 20	- 23	- 64	- 66	- 39	- 19	- 8	- 8
11 18	- 14	- 10	- 25	-108	-184	-146	-143	-190	-207	-128	- **65**	- 40	-105
12 18	- 41	- 42	-116	**-189**	**-243**	**-220**	-200	**-249**	**-275**	**-146**	- 38	- 19	**-148**
13 18	- 12	- 23	**-123**	-184	-211	-212	**-203**	-237	-238	- 87	+ 20	+ 26	-124
14 18	- 2	+ 3	- 61	-122	-133	-161	-155	-171	-127	- 12	+ 39	+ 45	- 71
15 18	+ 15	+ 19	+ 11	- 49	- 50	- 95	- 84	- 75	- 17	+ 46	+ **43**	+ **46**	- 16
16 18	+ 30	+ 21	+ 28	+ 2	+ 12	- 39	- 29	+ 1	+ 40	+ 45	+ 33	+ 43	+ 16
17 18	+ 12	- 8	- 5	+ 5	+ 23	- 11	- 5	+ 27	+ 23	- 11	+ 8	+ 22	+ 7
18 18	+ 7	- 23	- 37	- 25	- 9	- 17	- 11	0	- 13	- 16	+ 14	+ 23	- 9
19 18	+ 21	- 2	- 30	- 38	- 41	- 50	- 52	- 32	- 18	- 8	+ 15	+ 24	- 18
20 18	+ 17	0	- 18	- 32	- 36	- 46	- 53	- 36	- 12	- 3	+ 14	+ 20	- 15
21 18	+ 15	- 1	- 12	- 16	- 18	- 32	- 41	- 25	- 4	- 1	+ 14	+ 16	- 9
22 18	+ 18	+ 12	- 4	+ 2	+ 1	- 10	- 22	- 9	+ 5	+ 10	+ 21	+ 17	+ 3
23 18	+ 19	+ 17	+ 8	+ 14	+ 17	+ 10	- 1	+ 4	+ 18	+ 22	+ 28	+ 22	+ 15
Range ...	156	117	257	378	476	463	444	524	529	249	108	132	273

TABLE 376.—*Declination Magnetograph—Showing for the period 1883—1893 the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

1883-1893. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+ 16	+ 19	+ 15	+ 26	+ 27	+ 22	+ 12	+ 8	+ 19	+ 27	+ 27	+ 21	+ 20
1 18	+ 8	+ 18	+ 15	+ 30	+ 38	+ 33	+ 27	+ 14	+ 24	+ 24	+ 20	+ 15	+ 22
2 18	- 4	+ 11	+ 9	+ 32	+ 41	+ 43	+ 36	+ 26	+ 27	+ 16	+ 11	+ 2	+ 21
3 18	- 23	- 1	- 4	+ 22	+ 39	+ 42	+ 39	+ 30	+ 23	+ 4	- 8	- 17	+ 12
4 18	- 43	- 20	- 15	+ 15	+ 44	+ 51	+ 50	+ 42	+ 27	- 10	- 29	- 39	+ 6
5 18	- 63	- 40	- 18	+ 20	+ 79	+ 92	+ 91	+ 83	+ 49	- 19	- 47	- 62	+ 14
6 18	- **75**	- **48**	0	+101	+191	+208	+200	+220	+158	+ 3	- **70**	- 76	+ 68
7 18	- 70	- 41	+ 71	+193	**+239**	**+255**	**+262**	**+292**	**+250**	+ 77	- 63	- **96**	+114
8 18	+ 26	+ 22	**+131**	**+202**	+195	+222	+226	+238	+220	**+112**	- 9	- 31	**+133**
9 18	**+106**	+ **62**	+129	+132	+ 57	+ 96	+106	+ 76	+ 83	+ 72	+ 8	+ **32**	+ 80
10 18	+ 75	+ 55	+ 73	+ 7	-100	42	- 34	- 88	- 69	- 9	- 10	+ 24	- 10
11 18	- 25	- 3	- 33	-136	-212	-166	-159	-216	-217	-111	- 55	- 8	-112
12 18	- 51	- 42	-122	**-218**	**-254**	**-237**	-223	**-270**	**-283**	**-149**	- 31	0	**-157**
13 18	- 21	- 26	**-136**	-204	-210	-227	**-225**	-250	-244	-105	+ 24	+ 24	-133
14 18	- 4	- 4	- 71	-130	-119	-167	-171	-168	-129	- 31	+ **39**	+ 27	- 77
15 18	+ 16	+ 16	+ 3	- 46	- 35	- 91	- 90	- 56	- 11	+ 30	+ 36	+ 19	- 17
16 18	+ 35	+ 18	+ 26	+ 15	+ 24	- 23	- 21	+ 33	+ 59	+ 46	+ 31	+ 25	+ 22
17 18	+ 12	- 5	- 1	+ 13	+ 31	+ 5	+ 12	+ 58	+ 39	- 1	+ 7	+ 14	+ 15
18 18	+ 5	- 17	- 30	- 19	- 2	- 5	+ 5	+ 14	- 7	- 11	+ 15	+ 20	- 3
19 18	+ 20	0	- 23	- 34	- 35	- 42	- 40	- 22	- 11	- 5	+ 19	+ 25	- 12
20 18	+ 18	+ 2	- 15	- 27	- 32	- 38	- 43	- 27	- 12	- 1	+ 18	+ 21	- 11
21 18	+ 13	+ 2	- 10	- 13	- 19	- 27	- 35	- 21	- 7	+ 2	+ 15	+ 18	- 7
22 18	+ 14	+ 7	- 1	+ 3	- 2	- 9	- 20	- 13	+ 1	+ 13	+ 21	+ 20	+ 3
23 18	+ 16	+ 15	+ 9	+ 15	+ 13	+ 6	- 5	- 3	+ 9	+ 24	+ 27	+ 22	+ 12
Range ...	181	110	267	420	493	492	487	562	533	261	109	128	290

TABLE 377.—*Declination Magnetograph—Showing for the period 1894–1904 the mean Diurnal Inequality of Declination for each month of the year and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

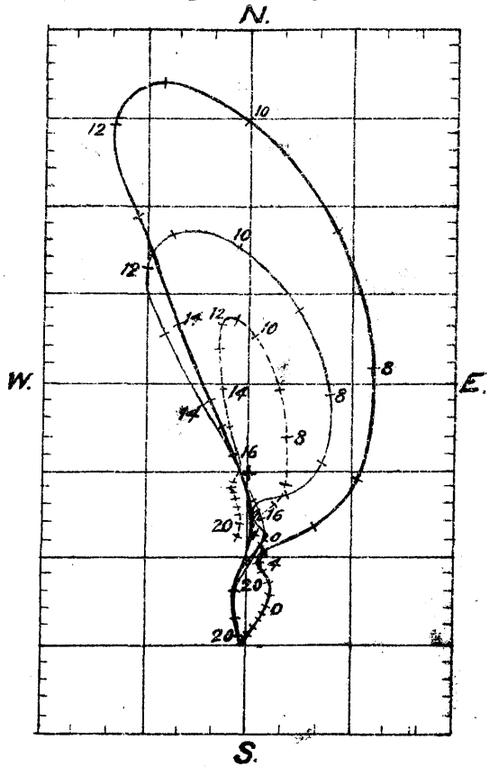
1894·1904.	Month.												
Bombay Civil Time	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+ 11	+ 13	+ 9	+ 22	+ 22	+ 23	+ 8	+ 7	+ 19	+ 21	+ 21	+ 15	+ 16
1 18	+ 6	+ 11	+ 6	+ 27	+ 30	+ 34	+ 20	+ 19	+ 28	+ 21	+ 16	+ 10	+ 19
2 18	− 2	+ 6	+ 2	+ 25	+ 31	+ 37	+ 29	+ 26	+ 26	+ 18	+ 8	0	+ 17
3 18	− 16	− 9	− 10	+ 15	+ 29	+ 39	+ 36	+ 31	+ 25	+ 4	− 6	− 16	+ 10
4 18	− 37	− 25	− 18	+ 7	+ 30	+ 42	+ 46	+ 42	+ 27	− 5	− 22	− 32	+ 5
5 18	− 55	− 40	− 20	+ 9	+ 56	+ 80	+ 82	+ 77	+ 46	− 10	− 33	− 47	+ 12
6 18	**− 66**	− 50	− 7	+ 79	+166	+187	+188	+194	+144	+ 8	− 53	− 61	+ 61
7 18	− 63	− 41	+ 63	+172	**+237**	**+241**	**+241**	**+269**	**+241**	+ 77	− 43	**− 85**	+109
8 18	+ 20	+ 16	+122	**+192**	+217	+218	+213	+227	+211	**+102**	− 4	− 39	**+125**
9 18	**+ 86**	**+ 48**	**+126**	+134	+ 91	+112	+106	+ 76	+ 74	+ 51	+ 1	+ 4	+ 77
10 18	+ 50	+ 44	+ 79	+ 31	− 52	− 13	− 15	− 72	− 64	− 22	− 16	+ 3	− 4
11 18	− 33	− 20	− 27	−107	−170	−143	−143	−192	−214	−117	**− 56**	− 16	−103
12 18	− 45	**− 50**	−112	**−192**	**−233**	**−223**	**−212**	**−243**	**−285**	**−140**	− 28	− 7	**−147**
13 18	− 9	− 28	**−121**	−187	−207	−217	−211	−225	−236	− 90	+ 26	+ 22	−124
14 18	+ 5	+ 8	− 62	−127	−133	−168	−160	−147	−120	− 16	**+ 48**	+ 34	− 70
15 18	+ 22	+ 34	+ 9	− 51	− 54	− 97	− 83	− 50	− 5	+ 38	+ 41	+ 35	− 13
16 18	+ 35	+ 36	+ 29	+ 5	+ 4	− 30	− 18	+ 23	+ 56	+ 46	+ 27	**+ 38**	+ 21
17 18	+ 14	+ 10	+ 4	+ 13	+ 20	− 3	+ 9	+ 43	+ 42	+ 2	+ 6	+ 26	+ 15
18 18	+ 10	− 4	− 21	− 11	− 3	− 12	+ 2	+ 6	+ 1	− 6	+ 10	+ 27	0
19 18	+ 18	+ 8	− 22	− 30	− 32	− 40	− 38	− 28	− 10	− 6	+ 10	+ 26	− 12
20 18	+ 16	+ 6	− 17	− 26	− 34	− 39	− 42	− 35	− 12	− 4	+ 9	+ 20	− 13
21 18	+ 14	+ 5	− 10	− 14	− 23	− 30	− 35	− 29	− 6	− 1	+ 7	+ 16	− 9
22 18	+ 12	+ 8	− 6	0	− 5	− 8	− 20	− 17	+ 2	+ 8	+ 13	+ 16	0
23 18	+ 12	+ 14	+ 4	+ 12	+ 11	+ 8	− 5	− 4	+ 11	+ 20	+ 19	+ 16	+ 10
Range ...	152	98	247	384	476	464	453	512	526	242	104	123	272

TABLE 378.—*Declination Magnetograph—Showing the mean Diurnal Inequality of Declination for each average month of the intermediate sun-spot years, 1874, 1875, 1880, 1881, 1882, 1885, 1886, 1890, 1891, 1895, 1896, 1897, 1898, 1903, 1904, and for the whole year.*

Unity = ·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 18	+ 16	+ 18	+ 12	+ 27	+ 25	+ 24	+ 10	+ 13	+ 25	+ 23	+ 25	+ 19	+ 20
1 18	+ 8	+ 15	+ 9	+ 33	+ 34	+ 37	+ 24	+ 23	+ 31	+ 23	+ 18	+ 13	+ 22
2 18	− 3	+ 9	+ 4	+ 30	+ 37	+ 43	+ 33	+ 30	+ 32	+ 17	+ 9	+ 1	+ 20
3 18	− 21	− 6	− 8	+ 21	+ 36	+ 42	+ 40	+ 34	+ 30	+ 2	− 9	− 17	+ 12
4 18	− 40	− 22	− 17	+ 14	+ 36	+ 46	+ 47	+ 42	+ 31	− 9	− 28	− 37	+ 5
5 18	− 61	− 41	− 22	+ 15	+ 67	+ 84	+ 83	+ 76	+ 46	− 15	− 43	− 57	+ 11
6 18	**− 74**	**− 51**	− 11	+ 86	+181	+196	+192	+201	+151	+ 9	**− 65**	− 72	+ 62
7 18	− 71	− 43	+ 57	+176	**+242**	**+252**	**+241**	**+277**	**+243**	+ 78	− 52	**− 97**	+109
8 18	+ 12	+ 17	+119	**+190**	+212	+225	+211	+232	+210	**+102**	− 3	− 46	**+123**
9 18	**+ 82**	**+ 57**	**+128**	+126	+ 81	+115	+107	+ 81	+ 75	+ 52	+ 9	+ 9	+ 77
10 18	+ 57	+ 53	+ 84	+ 15	− 69	− 16	− 17	− 72	− 69	− 23	− 16	+ 11	− 5
11 18	− 27	− 8	− 16	−120	−184	−147	−136	−196	−214	−118	− 59	− 16	−103
12 18	− 46	− 46	−107	**−201**	**−244**	**−228**	−201	**−252**	**−280**	**−145**	− 37	− 3	**−149**
13 18	− 13	− 29	**−124**	−191	−214	−224	**−205**	−233	−238	− 91	+ 18	+ 29	−126
14 18	+ 6	− 1	− 68	−127	−135	−172	−159	−158	−127	− 16	+ 41	+ **37**	− 73
15 18	+ 23	+ 19	+ 6	− 51	− 51	− 98	− 83	− 60	− 14	+ 40	**+ 45**	+ 35	− 16
16 18	+ 35	+ 23	+ 27	+ 6	+ 10	− 31	− 22	+ 15	+ 49	+ 48	+ 35	+ 37	+ 19
17 18	+ 15	0	− 1	+ 11	+ 24	− 4	+ 4	+ 39	+ 32	− 1	+ 10	+ 22	+ 13
18 18	+ 11	− 12	− 28	− 16	− 3	− 13	− 3	+ 5	− 6	− 8	+ 16	+ 26	− 3
19 18	+ 20	+ 6	− 24	− 30	− 37	− 46	− 46	− 28	− 12	− 4	+ 15	+ 27	− 13
20 18	+ 18	+ 7	− 16	− 24	− 35	− 45	− 50	− 34	− 10	0	+ 13	+ 21	− 13
21 18	+ 16	+ 7	− 9	− 11	− 21	− 34	− 40	− 26	− 3	+ 2	+ 12	+ 17	− 7
22 18	+ 17	+ 11	− 2	+ 4	− 3	− 13	− 23	− 12	+ 5	+ 11	+ 18	+ 18	+ 3
23 18	+ 18	+ 18	+ 8	+ 17	+ 13	+ 5	− 7	0	+ 16	+ 23	+ 25	+ 20	+ 13
Range ...	156	108	252	391	486	480	446	529	523	247	110	134	272

Variation of the Northerly & Easterly Forces.
(Average of 55 years)



Thick curve :– Maximum Sun-spot years.
Thin curve :– Minimum " "
Dotted curve :– Maximum minus minimum.

425. The hourly vectors from 8 to 10 seem to sweep fairly symmetrically, but taking up for examination the radius vector at 12 noon, which hour is nearest to the time of the incidence of the greatest activity of the disturbing force, we find that its inclination on an average of 33 years is 29° W. of N. If the years of maximum spots are considered, the angle is reduced to 26° W. of N. while in the mean minimum epoch it increases to 33° W. of N. Obviously hence either the forces which control the 11-year secular effects do not for some reasons affect the two elements equally proportionately at all times, or that the exciting cause itself is somehow modified in direction to the extent indicated oscillating about the mean position of 29° W. of N. When the seasonal changes are similarly considered it appears that the vector approches in the winter months to within 14° W. of N. while in the summer months it recedes to 39° W. of N. If now instead of the single ordinate at 12 noon the summed range of the variation is taken to denote the *average disturbance* ordinate of the day for each element and combining the two to represent a resultant disturbance vector, *both* in magnitude and direction (a process for obvious reasons open to objection but adopted for convenience for want of a better method of demonstration) the results appear to be practically the same. The average ratio of the activity of the two components is represented by the angle 26° W. of N.

This result, it will be seen, is fairly accordant with that of the 12 noon ordinate and presumably indicates that the disturbance effect which is due to solar action towards the North and West respectively in the case of H and D variations is in the proportion indicated. Similarly the ratios for the maximum and minimum epochs are indicated by 23° and 28° respectively. The ratios for the winter and summer months are indicated by 17° and 34°, while those for the months of February and September by 13° and 39°. Hence it will be easily seen why under such circumstances the annual vector diagrams, though fairly symmetrical, fail to exhibit the parallelism noted severally in the variations of H and D. If the source from which the dirturbing forces emanate, is assumed to be constant the inference is forced upon us that the effects are somehow subsequently so modified locally as to influence δH more than δD, in the secular effects, and δD more than δH in the seasonal effects.

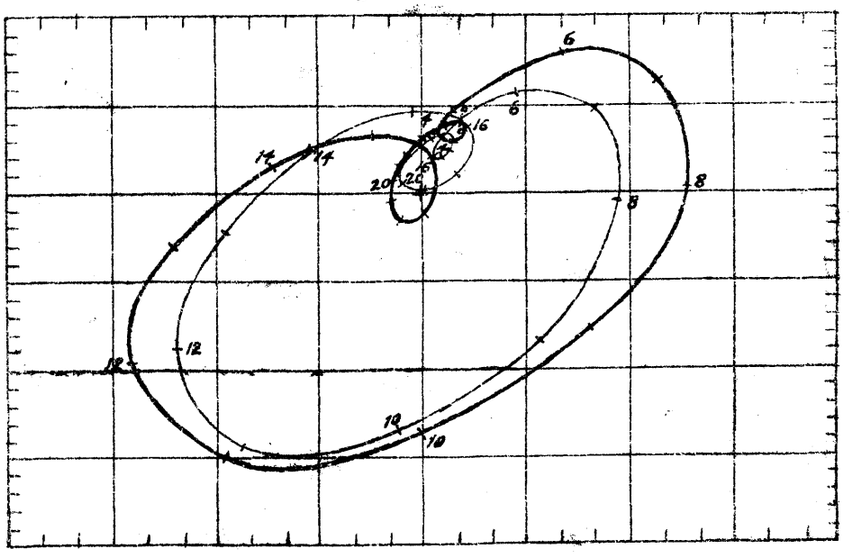
426. In table 379 are collected such average ratios for each month which indicate the relative activity of H and D in their diurnal progression as measured by the *average* daily ordinate—the summed range of the variation of each element. These will be further examined in detail later on.

427. Vector diagrams similarly derived from δV and δD are given in plates 67 to 71. These indicate the disturbing forces in the (E. W.) vertical plane. The first two plates show the average yearly, while plates 69 to 71 the average monthly diagrams.

It will be seen that these figures appear in contrast with those in the horizontal plane to be much more regular and symmetrical. The greatest vector whether it indicates the yearly, summer, or winter conditions occurs between 11 hour and 12 noon, it being incident somewhat earlier during the winter months and later—concurrent almost with 12 noon—during the summer months. The vector almost always disappears at 18 hour.

428. It appears that in this vertical plane the effects of the disturbing forces of the 11-year period are incident not quite so disproportionately on the variations of the two elements, as will be seen from the diagrams derived from δV and δE. The irregular sweeps of the vector observed in the δH and δD diagrams are not nearly so marked in the diagrams in the vertical plane as shown below. The difference curve is not drawn as it is very small.

Variation of Easterly & Vertical Forces.
(Average of 33 years.)



Thick curve :- Maximum Sun-spot years.
Thin curve :- Minimum " "

The noon vector indicates an inclination downwards and westwards from the horizontal plane, of about 31° in the average of 33 years, which in the mean maximum and minimum years only fluctuates from 30° to 32°. The seasonal effect as shown by the ratios for the summer and winter months, indicates a change from 29° to 39°. The mean ordinate of the day as measured by the summed range figures gives for the average, mean maximum epoch, mean minimum epoch, the summer and winter months the inclination angles respectively of 40°, 39°, 40°, 37° and 42°.

429. In table 380 are collected the summed-range ratios $\frac{\Sigma\delta V}{\Sigma\delta D}$ for each month, and a glance at column 15 of the table, giving the annual means, shows that while in a similar series given in table 379, column 15, the 11-year period is very prominently exhibited, here it is nearly suppressed. And knowing as we do that both the elements D and V are influenced by the 11-year period, it is obvious that its suppression in the ratios indicates nearly equal incidence of this perturbation effect, and the small and irregular residual fluctuations which remain, are due perhaps to the effects of other sub-periods which may affect the two variations disproportionately.

430. The vector diagrams as first used by Rucker combining δI and δD—the latter modified by the co-efficient cos I which practically represents a curve drawn on a plane perpendicular to the mean position of the magnet during the day,—are given in plate 72.

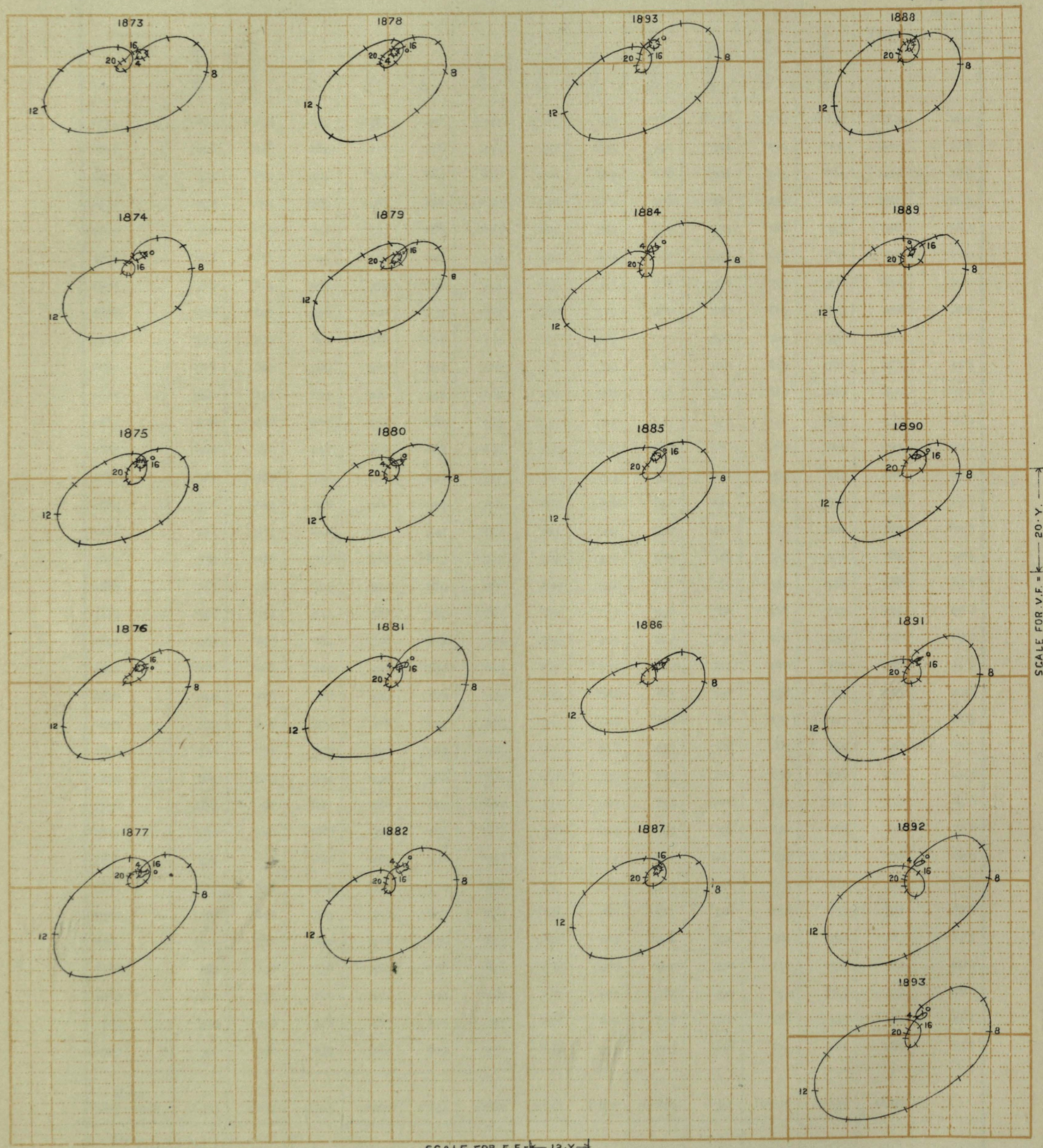
TABLE 379.—*Ratios of the activities of the Easterly and Northerly Components or of the summed ranges of the ordinates of their diurnal variations.*

Years.	Months.												Year.	Mean $\tan^{-1}\frac{\Sigma\delta E}{\Sigma\delta N}$
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
														°
1871 ...	0·222	0·176	0·243	0·380	0·418	0·547	0·557	0·628	0·580	0·316	0·200	0·239	0·375	20·4
1872 ...	·296	·248	·284	·411	·506	·573	·521	·635	·592	·334	·210	·200	·401	21·8
1873 ...	·355	·165	·304	·447	·682	·697	·704	·677	·618	·304	·245	·264	·455	24·5
1874 ...	·292	·255	·283	·422	·561	·620	·626	·664	·773	·387	·251	·281	·451	24·3
1875 ...	·378	2·63	·241	·331	·689	·667	·675	·763	·975	·374	·268	·355	·498	26·5
1876 ...	·246	·211	·249	·388	·646	·799	·699	·812	1·062	·451	·248	·312	·510	27·0
1877 ...	·319	·214	·308	·495	·702	·794	·871	·951	·971	·325	·355	·360	·555	29·0
1878 ...	·526	·242	·306	·462	·639	·669	·738	·717	·827	·426	·209	·503	·522	27·6
1879 ...	·523	·202	·241	·358	·670	·744	·713	·918	·777	·340	·309	·370	·514	27·2
1880 ...	·315	·209	·329	·427	·622	·665	·711	·759	·646	·278	·219	·382	·463	24·8
1881 ...	·340	·232	·273	·422	·591	·603	·529	·688	·749	·352	·225	·270	·439	23·7
1882 ...	·278	·296	·267	·452	·580	·655	·542	·743	·537	·320	·244	·265	·432	23·4
1883 ...	·332	·251	·246	·402	·685	·632	·608	·596	·682	·286	1·63	·262	·429	23·2
1884 ...	·301	·361	·273	·428	·496	·572	·710	·795	·792	·298	·234	·353	·468	25·1
1885 ...	·371	·149	·258	·382	·634	·606	604	·876	·842	·241	·251	·336	·462	24·8
1886 ...	·354	·307	·218	·507	·794	·843	·847	·999	·930	·432	·379	·509	·593	30·7
1887 ...	·553	·226	·317	·587	·813	·740	·784	·906	·980	·356	·355	·396	·584	30·3
1888 ...	·371	·230	·325	·591	·689	·781	·870	·954	·870	·379	·350	·408	·568	29·6
1889 ...	·398	·252	·344	·587	·789	·625	·691	·777	·938	·380	·328	·427	·545	28·6
1890 ...	·465	·248	·264	·508	·658	·765	·709	·923	·827	·310	·271	·330	·523	27·6
1891 ...	·421	·208	·345	·463	·656	·603	·540	·775	·787	·341	·187	·230	·463	24·8
1892 ...	·290	·176	·330	·509	·573	·539	·657	·680	·665	·307	·158	·308	·433	23·4
1893 ...	·333	·218	·339	·378	·497	·514	·514	·626	·690	·293	·157	·245	·400	21·8
1894 ...	·310	·191	·306	·410	·563	·521	·510	·678	·637	·328	·184	·249	·407	22·1
1895 ...	·367	·215	·324	·496	·586	·715	·663	·767	·645	·300	·158	·236	·456	24·5
1896 ...	·323	·196	·251	·480	·607	·637	·610	·903	·695	·227	·235	·344	·459	24·6
1897 ...	·280	·250	·286	·526	·737	·817	·726	·844	·699	·329	·244	·278	·501	26·6
1898 ...	·434	·216	·266	·485	·742	·755	·716	1·014	1·012	·347	·291	·352	·552	28·9
1899 ...	·627	·397	·329	·478	·778	·688	·691	·785	·792	·396	·213	·364	·545	28·6
1900 ...	·397	·221	·329	·506	·677	·684	·599	·787	·920	·416	·296	·435	·522	27·6
1901 ...	·401	·261	·290	·418	·630	·812	·698	·822	1·004	·354	·206	·356	·521	27·5
1902 ...	·564	·192	·330	·480	·568	·801	·838	·966	·900	·390	·244	·372	·554	29·0
1903 ...	·421	·257	·280	·451	·604	·789	·724	·872	1·085	·330	·273	·319	·534	28·1
1904 ...	·518	·250	·318	·485	·575	·597	·658	·802	·827	·320	·172	·345	·489	26·1
1905 ...	·390	·388	·259	·462	·619	·582	·652	·757	·903	·438	·175	·181	·484	25·8
Mean 1872—1905 .	0·385	0·237	0·293	0·460	0·644	0·682	0·676	0·802	0·810	0·341	0·246	0·334	0·492	...
Mean $\tan^{-1}\frac{\Sigma\delta E}{\Sigma\delta N}$.	° 21·1	° 13·3	° 16·3	° 24·7	° 32·8	° 34·3	° 34·1	° 38·7	° 39·0	° 18·8	° 13·8	° 18·5	° 26·2	26·2

COLABA OBSERVATORY.

Vector Diagrams (Average year.)
Showing the Diurnal Inequality in the Vertical Plane (E:W.)
(Vertical & Easterly Forces.)

Plate 67.

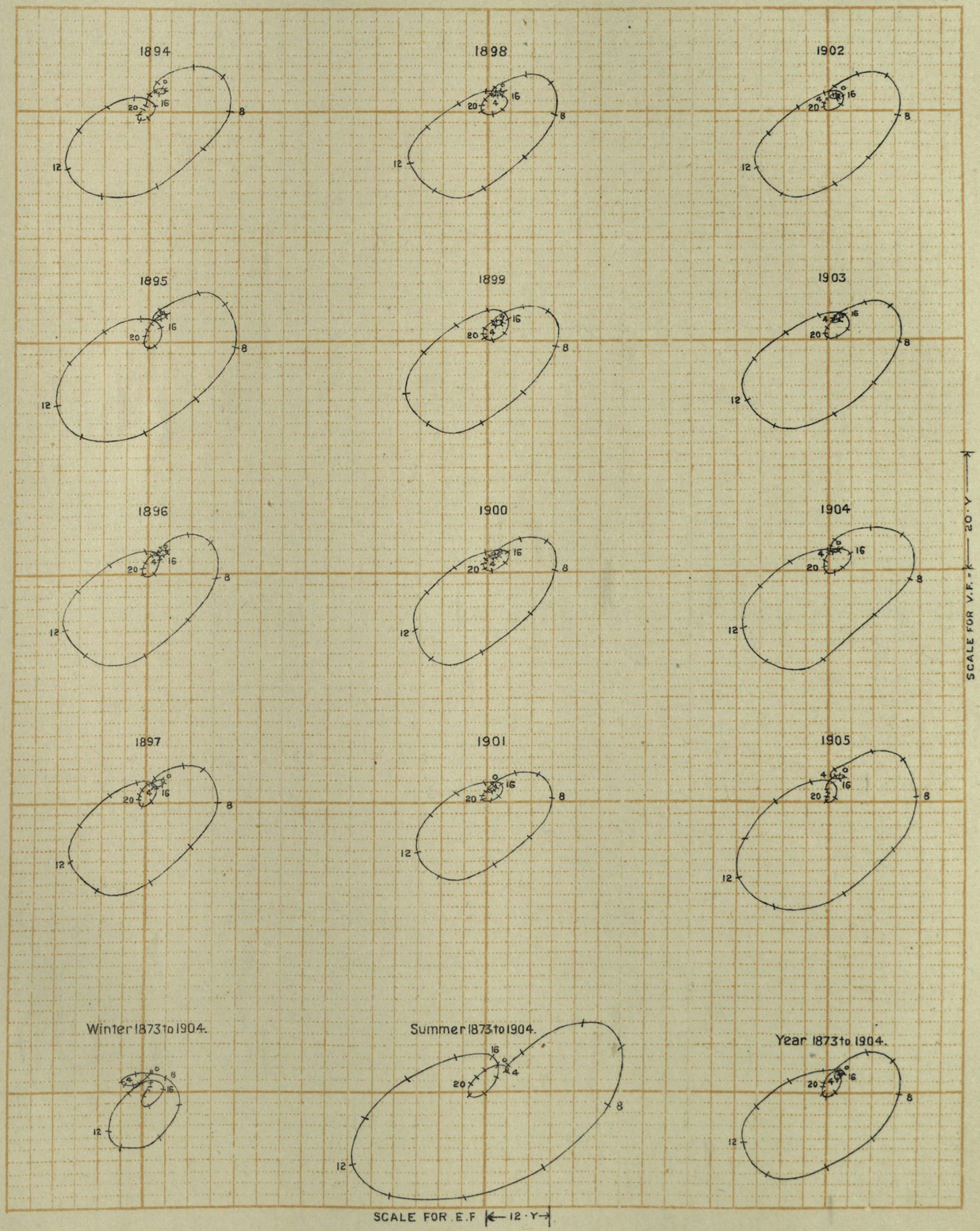


Govt. Photozinco: Office, Poona, 1910.

COLABA OBSERVATORY.

Vector Diagrams (average year.)
Showing the Diurnal Inequality in the Vertical Plane (E-W.)
(Vertical & Easterly Forces.)

Plate 68.



Govt. Photozinco. Office, Poona, 1910

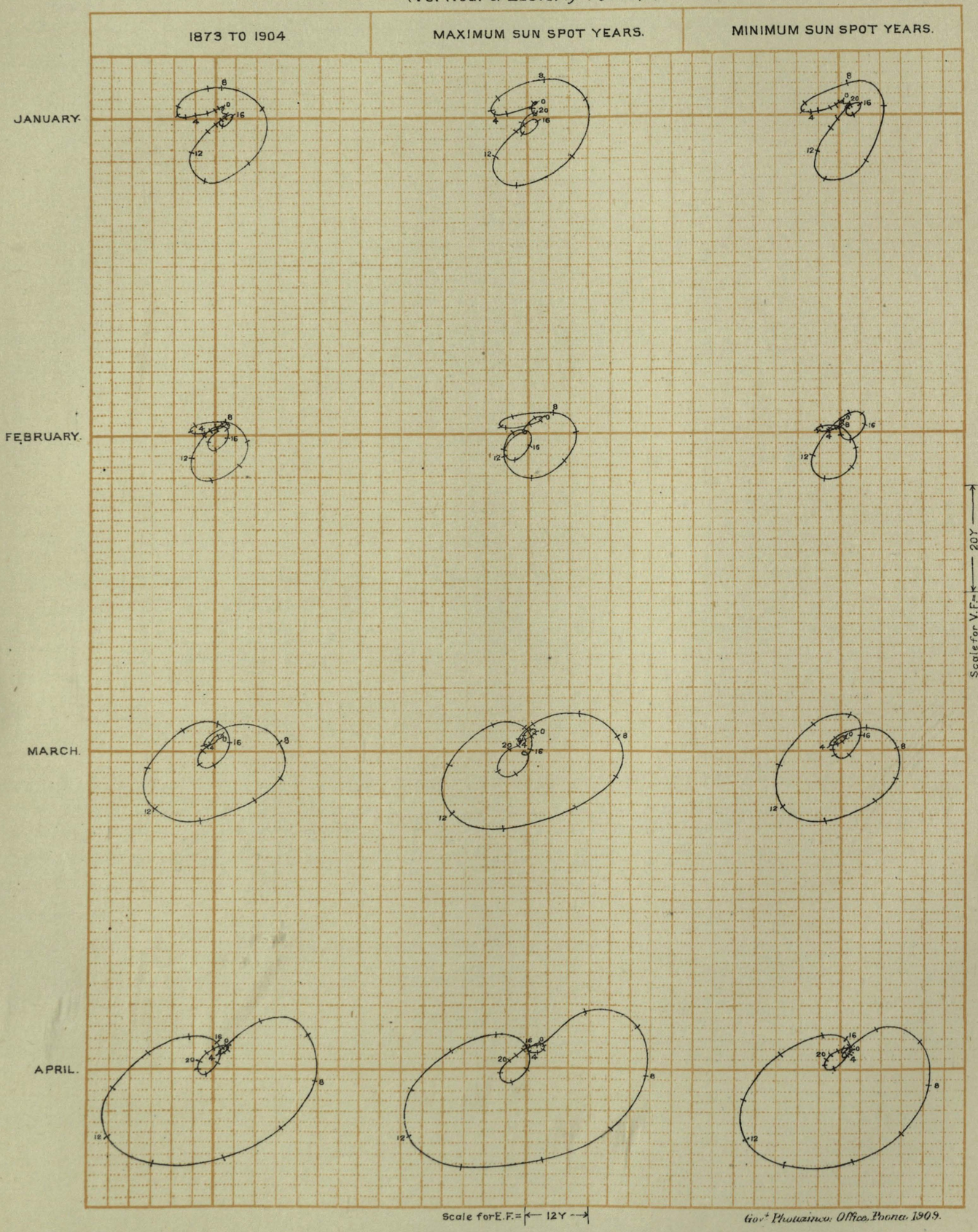
COLABA OBSERVATORY

Vector Diagrams (average month.)

Showing the Diurnal Inequality in the Vertical Plane (E-W.)

(Vertical & Easterly Force)

Plate 69.



Govt. Photozinco. Office, Poona. 1909.

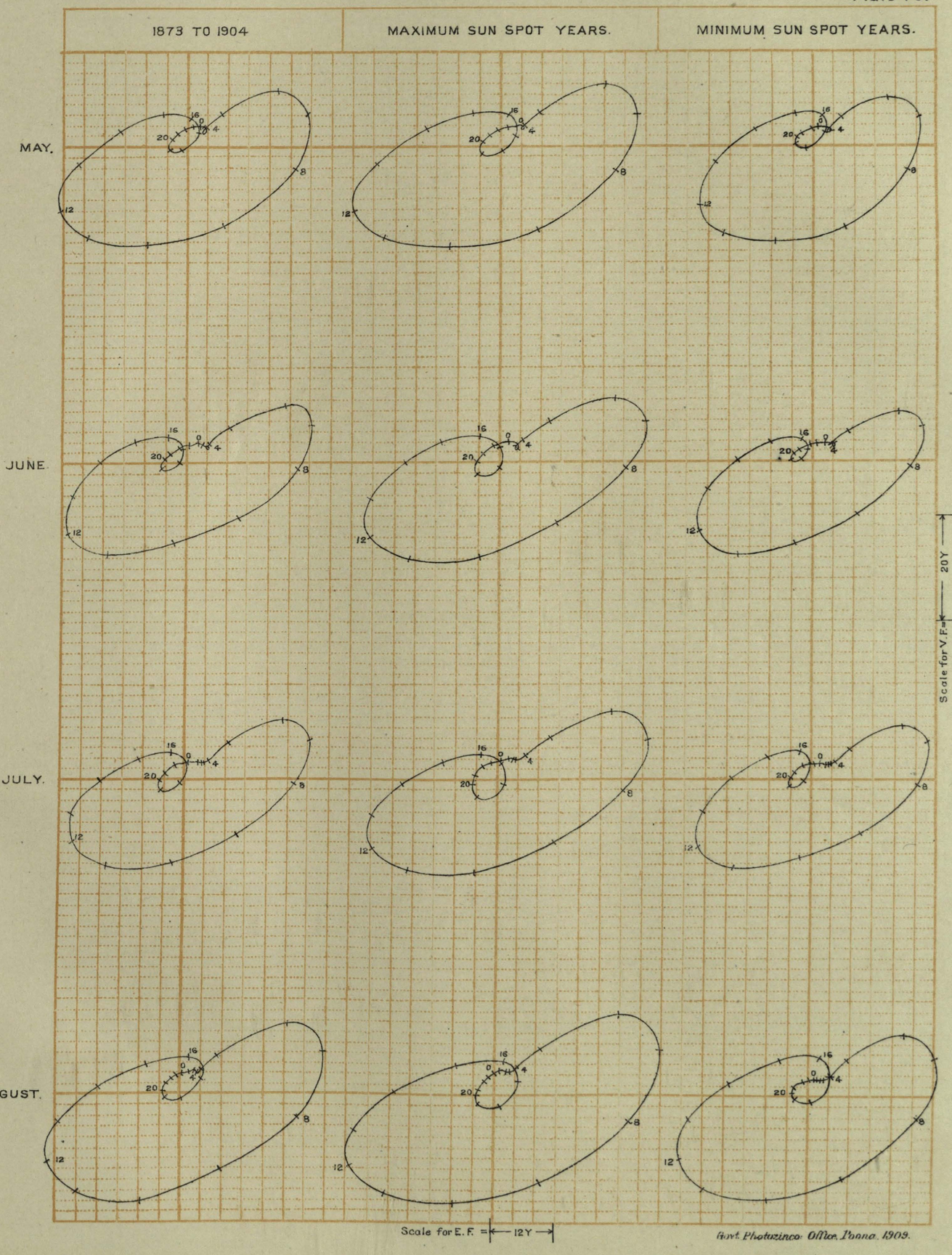
COLABA OBSERVATORY

Vector Diagrams (average month)

Showing the Diurnal Inequality in the Vertical Plane.

(Vertical & Easterly Force)

Plate 70.



Govt. Photozinco. Office, Poona. 1909.

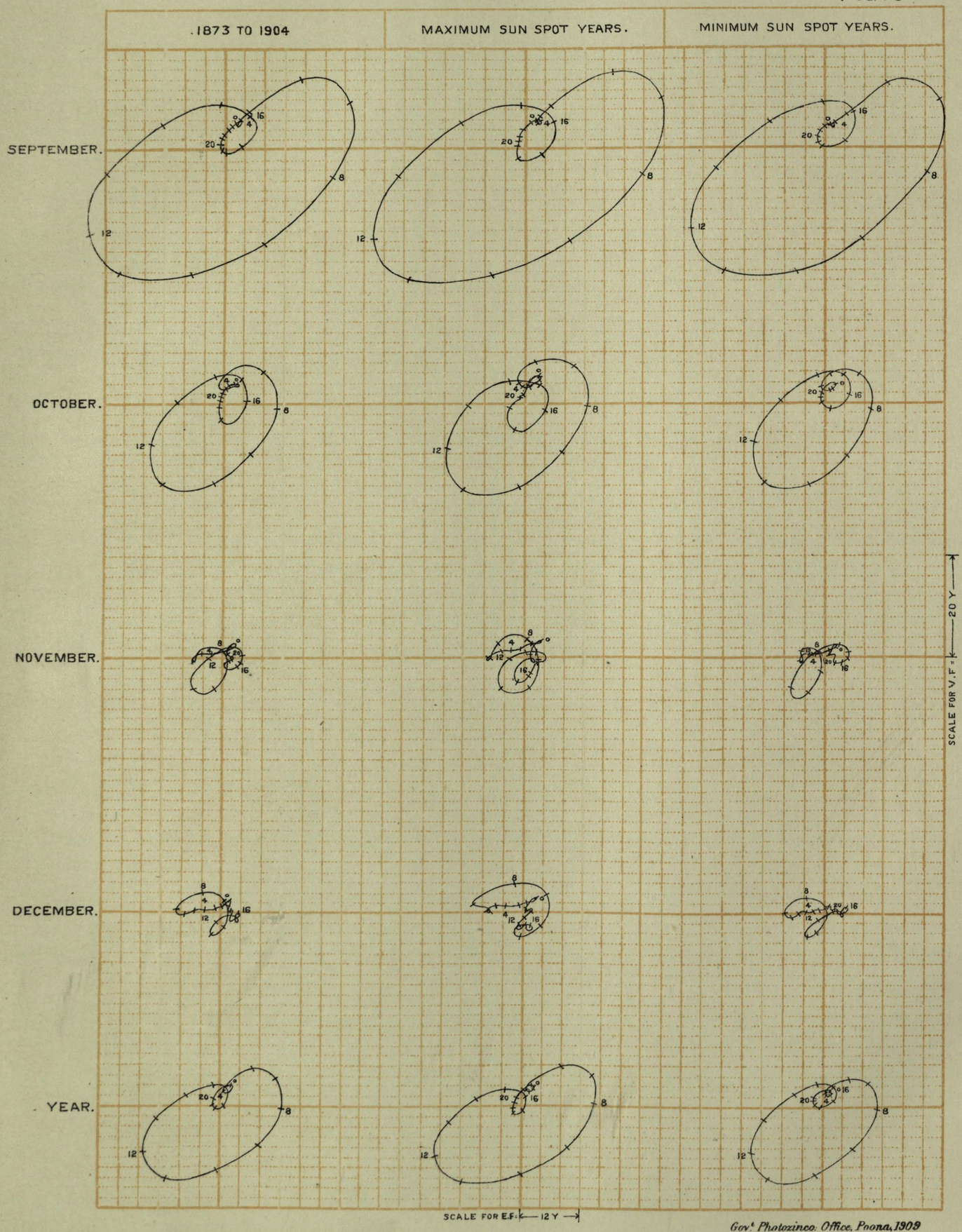
COLABA OBSERVATORY

Vector Diagrams (average month)

Showing the Diurnal Inequality in the Vertical Plane (E-W.)

(Vertical & Easterly Forces.)

Plate 71



Gov^t Photozinco. Office, Poona, 1909

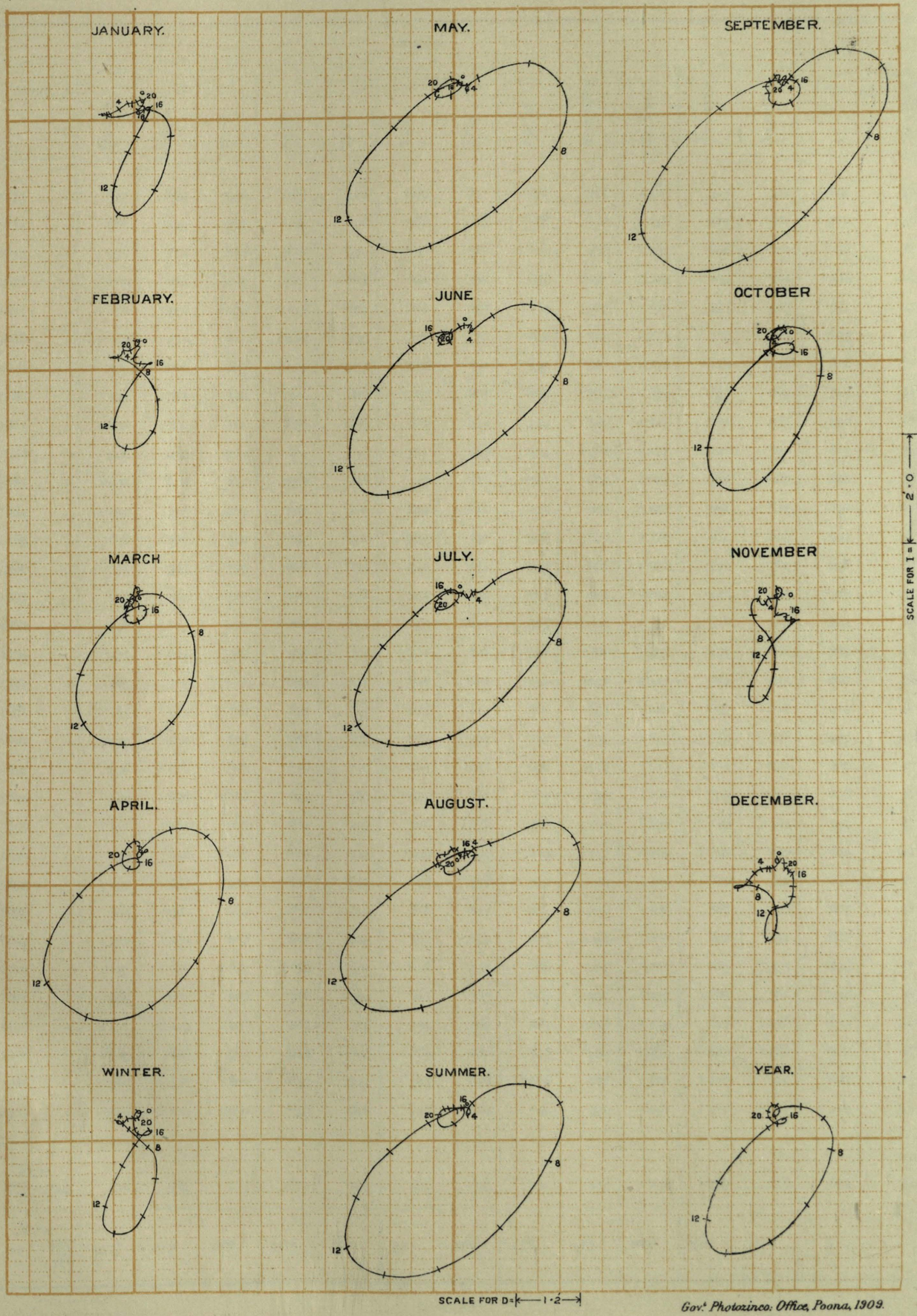
COLABA OBSERVATORY

Vector Diagrams.

Dip & Declination (average month & year.)

(1894 to 1904.)

Plate 72.



Gov.t Photozinco. Office, Poona, 1909.

TABLE 380.—*Ratios of the activities of the Vertical and Easterly Components or of the summed ranges of the ordinates of their diurnal variations.*

Years.	Months.												Year.	Mean $\tan^{-1}\frac{\Sigma\delta V}{\Sigma\delta E}$
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1873 ...	·637	·893	·658	·489	·582	·577	·771	·557	·876	1·109	·543	·585	·690	34·4
1874 ...	·683	·495	·783	·689	·746	·562	·693	·688	·913	1·178	·627	·371	·702	35·1
1875 ...	1·036	·772	·810	·871	·649	·591	·582	·635	·989	1·133	·692	·310	·756	37·1
1876 ...	1·100	1·000	·964	·823	·745	·642	·581	·836	1·031	1·443	1·109	·585	·905	42·1
1877 ...	1·059	1·542	1·173	1·116	·839	·662	·556	·744	·965	1·226	·423	·985	·941	43·3
1878 ...	1·156	1·057	1·011	1·062	·755	·627	·736	·800	1·125	1·221	·759	·426	·895	41·8
1879 ...	·933	1·000	·867	1·019	·717	·653	·631	·697	·983	1·250	·622	·348	·810	39·0
1880 ...	·333	·925	·550	·701	·688	·525	·621	·825	1·067	1·283	·797	·289	·717	35·6
1881 ...	·831	·861	·861	·868	·726	·639	·639	·744	·946	1·225	·642	·493	·790	38·3
1882 ...	·929	·963	·909	·884	·739	·591	·753	·733	1·006	1·067	·576	·591	·812	39·1
1883 ...	1·037	·634	·841	·935	·768	·576	·613	·711	·923	1·045	·969	·985	·836	39·9
1884 ...	1·133	·795	·969	·899	·711	·632	·650	·775	·925	1·215	·909	·857	·872	41·1
1885 ...	·678	1·490	·959	·844	·690	·521	·547	·628	·879	1·128	·564	·693	·802	38·7
1886 ...	·791	·523	·779	·818	·654	·441	·531	·673	·861	1·000	·339	·364	·648	32·9
1887 ...	·753	·685	·927	·916	·758	·755	·664	·697	·990	1·090	·455	·429	·760	37·2
1888 ...	·648	1·189	·915	1·068	·794	·673	·650	·823	1·060	1·151	·568	·329	·822	39·4
1889 ...	·775	·929	1·195	·983	·792	·581	·610	·650	·988	1·393	·474	·698	·839	40·0
1890 ...	·729	·754	1·125	·820	·734	·600	·617	·754	1·032	1·345	·585	·535	·802	38·7
1891 ...	1·165	1·085	1·118	·979	·719	·675	·611	·689	·884	1·250	·823	1·032	·919	42·6
1892 ...	1·133	1·354	·898	·732	·633	·628	·594	·759	·934	1·295	1·352	·568	·907	42·2
1893 ...	·978	1·078	·768	·710	·710	·623	·617	·698	·912	1·214	1·135	·637	·840	40·0
1894 ...	·929	·696	1·008	·693	·582	·632	·652	·689	1·024	1·154	·779	1·200	·836	39·9
1895 ...	1·111	1·067	·976	·759	·720	·708	·633	·718	1·010	1·239	1·196	1·103	·937	43·1
1896 ...	·893	·698	1·033	·855	·757	·592	·694	·749	1·011	1·257	1·127	·459	·844	40·2
1897 ...	1·295	·957	·949	·836	·801	·635	·576	·773	1·022	1·420	·643	·338	·854	40·5
1898 ...	·705	·982	·833	·827	·710	·616	·617	·874	1·030	1·358	587	·545	·807	38·9
1899 ...	1·032	1·040	·967	·811	·704	·583	·639	·723	1·044	1·410	·840	·781	·881	41·4
1900 ...	1·123	1·196	1·079	1·053	·902	·626	·750	·688	·906	1·217	·723	·253	·876	41·2
1901 ...	·500	·672	·843	·911	·794	·641	·583	·605	·926	1·257	1·385	·381	·791	38·3
1902 ...	1·171	1·049	1·033	·967	·908	·749	·667	·685	1·038	1·174	·607	·446	·874	41·2
1903 ...	·899	846	·904	·959	·805	·785	·683	·743	·920	1·086	·984	·486	·842	40·1
1904 ...	·963	1·236	·806	·853	·844	·595	·650	·676	·980	1·512	1·146	·494	·896	41·9
1905 ...	·950	1·119	1·030	·957	·898	·749	·686	·749	·996	1·194	1·187	1·727	1·020	45·6
Mean 1873—1905.	·912	·957	·925	·870	·745	·627	·639	·721	·976	1·228	·793	·616	·834	39·8
Mean $\tan^{-1}\frac{\Sigma\delta V}{\Sigma\delta E}$	43·4	43·7	42·8	41·0	36·7	32·1	32·6	35·8	44·3	50·8	38·4	31·6	...	...

During the summer, the movements perpendicular to the meridian—those due to δD—are usually larger than those in the meridian due to δI, but during the winter months the greater suppression of the declination ordinates is responsible for the contraction of the range of the former and the consequent rotation of the whole diagram. If the greater movements connote greater activity in the disturbing force it will be seen that $\frac{\Sigma\delta D}{\Sigma\delta I}$ as given by the summed range of the elements which may be taken as a measure of the average *relative* activity in the two elements, is indicated by an inclination of 30° for the average year and 40° and 22° for the summer and winter months respectively.

CHAPTER X.

Disturbances, Horizontal Force.

430. Besides the regular periodic changes in the magnetic elements, already examined, there often occur other irregular movements, usually small but on occasions violently large, in the magnetic traces of each day. Small irregular movements are more or less present on most days in the year, but they are more prevalent during the years of maximum-spot than in the minimum-spot epoch; and these are interspersed with days on which the traces show more or less quiescent conditions denoted by smooth sweeps of the characteristic diurnal wave. The violent changes or magnetic storms which punctuate the traces here and there, occur occasionally, and though apparently irregular, their frequency and incidence appear, as will be seen later, to be controlled by some periodic action.

431. The effects of the disturbances on the hourly ordinates of each magnetic element, as indicated by the departures of the average diurnal inequality of each month from the normal or undisturbed diurnal wave of the month, will be discussed in due course. These departures denote the periodic part of the disturbances characteristic of the average day of the month. As, however, the magnetic phenomenon is principally a day-to-day phenomenon, the change from one day to the next, which varies so materially in character and intensity, can scarcely be so effectively or easily studied from the average conditions of the month as from the aperiodic day-to-day changes. It may be advantageous hence to examine in the first instance at any rate, the character of the day as derived from the intensity of its disturbed condition noted in the traces of each day. As the declination and vertical force elements at Colaba are invariably feebly perturbed even by the most violent of storms, the character of the day is ascertained from the H traces. The day is classed either as (1) a quiet day, or a day of (2) small, (3) moderate, (4) great, or (5) very great disturbance according to the degree of disturbance; the letters used for distinguishing each class being C, S, M, G, and VG respectively. For representing intermediate conditions of activity of the smaller period movements, sub-divisions Ca, Sa, and Ma have been introduced.

To those familiar with such work of classification the great difficulty of correctly assigning a day to its proper division, is well known. Considerable judgment has to be exercised in several details, for there are movements and movements, and their intensities have to be estimated from other factors besides merely that of range, as their periods vary from one minute and less to over several hours. In table 381* is given the character of each day thus derived for the period, 1883—1905; and though all possible care has been taken in the classification which has been revised twice, it is by no means pretended that here and there a day may not be found which may more correctly belong to either a class above or below the one to which it has been assigned in the list. In any case as a list of the kind even at best can hardly prove of much practical utility, involving as it also does a large personal equation, some additional data are clearly essential in order to make the classification more mathematically definite. The daily range, or preferably the summed range, figures of the diurnal inequality of each day would probably serve as the most appropriate data for this purpose; but as this is not possible on account of the heavy labour involved in their derivation, such of the ready available data as appear to best suit the requirements, have been utilised for the purpose.

432. It is noted, as will be seen later (*vide* Chapter XI), that quiet days are almost always associated with days of high daily means, the disturbed conditions with days of comparatively low daily means, while the stormy days have invariably the lowest value of the daily means recorded in the month. As the daily means of the uncorrected tabulated values of the magnetograph ordinates were ready available, they were made use of, and the difference of the values of two consecutive days' means† which were duly converted into force, was secured without much labour. The series furnishes the *crude* changes in the mean value of the absolute force from one day to the next, *uncorrected* for either temperature or instrumental errors. As however these errors‡ are small for one day they may be neglected for the purposes of this chapter, and the figures so collected are given as a measure of the disturbance factor

* The results in the table have been derived independently of those published before. It is obvious that in order that the classification may be comparable throughout from year to year, it is necessary to have the whole work taken in hand and completed at one time so that the weights given to the different factors in the classification may all be alike and remain unchanged. The classification as published in the volumes from year to year suffer slightly on this account and the results in the above table and those published before may not at some places therefore be found to accord closely.

† It may have suited the purpose better to take the departures of each day's mean from the mean value of the month, but this would have involved large instrumental corrections and was not therefore attempted though the data from 1890 to 1905 have been prepared and discussed in Chapter XIII.

‡ Correct daily means have been derived for the period 1894—1905 and the figures in the table for this period hence appear fully corrected for these errors.

TABLE 381.—*Showing the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1872. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 4	− 7	+ 3	0	− 30	− 3	− 24	+ 9	+ 3	+ 2	− 6	− 2
2	− 5	+ 15	− 89	− 9	+ 7	− 11	− 8	+ 5	− 1	− 26	− 17	− 4
3	− 3	0	+ 49	− 4	+ 12	− 58	− 9	− 31	− 85	+ 4	− 8	− 14
4	+ 7	− 226	− 17	− 38	− 22	− 17	− 9	− 58	+ 33	+ 9	+ 13	+ 11
5	− 5	+ 131	+ 21	+ 19	+ 1	+ 11	+ 7	+ 39	+ 5	− 3	+ 6	− 8
6	+ 7	+ 50	+ 64	− 9	0	+ 3	+ 7	+ 10	+ 3	− 20	− 4	− 5
7	− 52	+ 28	− 21	+ 3	− 11	− 11	− 24	+ 9	+ 2	+ 16	− 12	− 13
8	+ 19	+ 4	− 3	− 14	− 9	+ 11	− 116	− 19	+ 6	+ 7	+ 21	+ 4
9	− 6	+ 1	− 1	+ 2	− 24	− 10	+ 52	− 90	− 47	− 1	− 4	− 41
10	+ 3	+ 9	+ 5	− 40	− 30	− 54	+ 29	+ 64	+ 35	+ 6	− 3	+ 15
11	+ 21	− 7	0	− 59	+ 12	+ 31	− 5	+ 16	− 12	+ 9	− 46	+ 13
12	− 41	− 9	− 7	+ 36	+ 9	+ 4	− 2	+ 2	− 1	− 1	+ 26	+ 8
13	− 9	0	+ 16	+ 13	0	+ 3	+ 3	+ 6	+ 12	− 40	− 27	− 2
14	− 6	− 3	− 7	0	+ 2	− 18	0	− 57	+ 9	− 14	+ 34	− 18
15	0	− 17	− 6	− 51	− 18	0	− 1	− 92	+ 11	− 159	− 32	− 20
16	− 16	− 22	− 15	− 4	− 4	− 5	− 10	+ 80	− 11	+ 71	+ 12	+ 12
17	+ 10	0	− 5	+ 12	+ 2	+ 1	− 17	+ 13	− 30	− 73	+ 10	+ 6
18	− 16	+ 7	+ 2	− 4	− 16	+ 1	+ 33	+ 5	− 49	+ 8	− 6	− 7
19	0	− 14	− 14	− 9	+ 11	− 2	− 77	+ 16	+ 32	+ 108	+ 9	+ 10
20	− 10	− 59	− 17	− 1	− 7	+ 1	+ 45	− 20	+ 7	+ 29	− 2	+ 7
21	+ 6	†2	− 5	+ 17	+ 2	− 10	− 60	+ 11	+ 3	+ 5	+ 3	− 31
22	+ 1	†2	− 5	+ 7	+ 4	− 42	+ 30	+ 7	0	− 3	0	− 17
23	− 5	†2	− 15	− 12	− 30	− 15	+ 9	− 3	+ 8	+ 5	+ 10	+ 9
24	+ 4	†2	+ 9	− 4	+ 10	+ 24	0	+ 7	− 11	− 4	− 74	+ 6
25	− 35	− 19	− 14	0	− 32	− 19	− 2	− 60	+ 1	+ 3	+ 20	− 3
26	+ 4	+ 6	0	− 4	− 17	+ 3	+ 9	+ 3	+ 3	+ 3	− 8	− 1
27	− 8	− 14	+ 15	+ 6	− 16	+ 4	− 8	+ 10	0	+ 8	+ 10	+ 4
28	*	...	− 15	+ 9	+ 9	+ 5	− 32	+ 19	− 6	− 32	+ 5	+ 6
29	*	+ 10	− 17	− 28	− 7	0	− 3	+ 1	− 52	− 24	− 1	− 5
30	+ 9		+ 25	+ 9	0	0	+ 10	− 6	+ 15	− 6	+ 2	− 1
31	− 23		+ 11		− 10		− 11	− 9		+ 12		− 14
‡ Average instrumental change per day.	5·0γ	4·9γ	4·7γ	4·5γ	4·4γ	4·2γ	4·1γ	4·0γ	3·8γ	3·7γ	3·6γ	3·5γ

Unity = 1γ = ·00001 C. G. S.

1873. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 13	− 14	− 9	15	− 1	− 13	+ 4	+ 11	− 6	†	− 29	+ 4
2	+ 4	− 5	− 26	− 60	− 5	− 13	+ 3	+ 9	+ 11	+ 11	+ 9	+ 3
3	− 6	+ 20	+ 14	+ 6	+ 12	+ 3	+ 2	− 8	− 14	− 4	+ 3	0
4	− 2	+ 1	+ 7	+ 21	− 4	− 8	− 14	+ 1	− 15	− 5	+ 5	+ 3
5	− 16	− 9	− 3	+ 18	− 6	+ 3	+ 10	+ 4	0	− 9	+ 2	− 9
6	− 24	− 6	+ 6	− 17	+ 6	− 4	− 7	− 14	+ 20	+ 14	+ 7	+ 14
7	− 21	− 2	+ 8	− 2	− 18	− 8	− 1	− 18	− 8	− 5	− 10	− 16
8	− 23	+ 2	− 8	+ 11	− 9	0	+ 4	+ 8	− 4	− 5	− 6	− 22
9	+ 23	− 46	− 152	+ 4	+ 5	+ 2	+ 2	+ 3	− 9	− 10	− 2	− 5
10	+ 35	+ 27	+ 64	− 20	− 3	− 2	− 31	− 3	0	− 6	+ 5	− 3
11	+ 11	+ 2	+ 20	+ 10	− 3	+ 6	+ 14	− 5	+ 6	+ 2	+ 2	+ 9
12	− 26	+ 2	+ 21	0	+ 10	− 24	+ 2	0	− 2	− 12	− 23	− 8
13	+ 15	+ 12	+ 12	− 21	− 4	+ 7	− 19	− 7	+ 2	+ 8	− 17	− 5
14	− 9	− 12	+ 3	+ 6	− 21	0	+ 11	+ 8	− 20	+ 2	− 6	+ 3
15	+ 13	+ 7	− 15	+ 5	− 4	− 25	− 12	+ 1	0	− 4	+ 13	− 33
16	+ 6	+ 9	+ 1	− 3	− 37	+ 1	− 6	+ 4	+ 3	− 22	− 5	+ 20
17	0	− 9	− 19	+ 12	+ 16	+ 5	− 7	− 25	− 1	+ 14	+ 13	+ 11
18	− 5	− 2	+ 12	− 49	− 1	+ 3	− 2	0	+ 9	− 18	+ 10	0
19	− 70	− 15	+ 9	− 34	+ 2	− 37	+ 6	0	− 15	− 1	+ 9	+ 3
20	+ 41	− 11	+ 3	+ 11	− 4	+ 15	+ 10	+ 2	− 23	+ 10	− 23	+ 10
21	+ 2	− 15	− 12	+ 8	− 4	− 5	− 16	+ 9	+ 6	− 17	+ 3	− 20
22	+ 8	− 2	− 36	+ 10	0	− 2	0	+ 6	+ 6	+ 9	− 19	+ 7
23	+ 5	− 8	− 2	− 3	− 5	+ 10	− 17	− 17	− 12	+ 5	+ 8	− 13
24	− 15	− 1	+ 4	+ 3	− 23	− 9	+ 8	− 21	0	+ 5	0	+ 1
25	− 32	+ 3	+ 1	+ 12	+ 18	− 23	+ 6	+ 10	+ 5	+ 3	− 23	+ 9
26	+ 15	+ 5	− 3	− 28	+ 10	− 7	+ 1	− 10	+ 12	+ 5	+ 5	− 3
27	− 4	+ 1	+ 5	− 1	− 21	− 36	− 11	− 20	+ 3	+ 2	− 6	− 7
28	+ 9	+ 11	− 7	+ 3	− 6	+ 26	+ 2	+ 16	+ 1	− 21	+ 15	+ 6
29	− 3		+ 9	− 1	− 9	+ 8	+ 12	+ 5	+ 2	+ 5	+ 13	− 18
30	+ 9		+ 10	− 6	+ 4	− 12	− 13	+ 11	− 14	+ 5	− 18	+ 3
31	− 4		+ 12		+ 5		− 31	− 18	− 21	− 5		+ 16
										+ 10		
Average instrumental change per day.	3·4γ	3·3γ	3·2γ	3·0γ	2·9γ	2·9γ	2·8γ	2·7γ	2·6γ	2·5γ	2·4γ	2·3γ

* No differences are available owing to loss of curve due to stoppage of clock.

† No differences are available owing to re-adjustment of the instrument on these days.

‡ The instrumental correction is positive for the differences given in the table throughout.

TABLE 381.—*Showing the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1874. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	−15	− 18	− 2	−27	+ 8	+10	+ 6	−39	− 9	+ 10	+ 8	+ 2
2	−12	+ 14	+ 2	−37	− 1	+ 2	− 4	+23	− 6	+ 13	−16	+ 4
3	+ 8	− 9	− 7	+27	+ 9	−18	−15	+ 6	−10	− 3	− 1	− 7
4	− 3	−103	+ 3	+ 7	−20	−17	+ 3	+ 3	+ 8	−138	− 4	+ 3
5	−22	+ 24	−10	− 2	+ 2	+19	+10	+ 1	+ 5	+ 59	− 3	+ 2
6	+ 4	+ 27	+ 5	+ 7	+19	+15	− 2	−12	− 8	+ 25	−30	+10
7	+ 5	+ 24	−38	−20	+ 2	−33	−17	+ 3	−14	+ 2	+ 4	+ 2
8	+ 4	+ 14	−83	−35	0	−26	− 1	− 4	−10	+ 11	+11	− 3
9	0	+ 7	+70	+21	+ 5	+12	− 1	+ 3	+ 8	− 1	+11	+ 4
10	+ 1	− 12	+17	+21	−11	+ 7	−13	+ 7	−37	+ 4	+ 2	−11
11	+14	− 2	+12	+ 8	− 8	+ 2	−22	− 2	+ 1	+ 6	−14	+ 2
12	−11	+ 8	+ 2	+16	− 5	+ 6	+ 9	−14	+12	+ 34	− 5	+ 1
13	− 2	− 4	−34	−50	− 1	− 5	−27	−18	+ 3	− 49	+ 2	+ 3
14	− 1	+ 13	+19	+15	− 6	− 2	0	+ 8	+15	+ 1	+ 1	− 1
15	− 2	− 7	+11	+ 2	+ 5	− 8	+18	− 3	− 1	+ 9	+ 8	−11
16	−29	+ 6	− 6	+ 6	− 4	0	− 2	+ 3	+ 3	− 3	+ 1	−13
17	− 1	0	+ 6	+ 1	+18	+ 1	0	+ 5	−11	− 6	+ 2	+ 7
18	−29	− 19	− 1	+ 6	−10	−10	+12	0	− 3	+ 10	− 8	+ 5
19	+17	+ 11	−12	+ 1	−12	− 1	− 5	− 4	+ 5	+ 1	+ 7	− 8
20	+ 9	− 12	0	+11	− 1	− 1	0	− 2	+ 3	+ 1	−14	+ 7
21	+13	+ 7	+ 3	+ 4	0	+ 4	− 9	+ 9	+ 8	+ 4	−15	+ 4
22	− 4	− 2	+ 8	−12	− 1	+ 1	+14	+ 3	− 9	+ 3	+11	−24
23	+ 8	+ 2	+ 2	+ 3	− 2	− 2	−10	− 3	− 9	− 11	− 8	+ 1
24	− 9	+ 9	+ 1	− 5	− 1	+ 4	− 3	−13	+ 1	+ 7	−14	− 1
25	− 5	+ 1	+12	−21	+ 6	− 6	−14	− 2	+ 1	+ 6	+14	+ 6
26	+ 5	− 10	−19	+ 7	−31	−12	+ 4	+ 5	+ 1	− 20	+ 6	0
27	−13	0	+ 6	0	− 8	+ 5	+ 2	− 6	+ 3	− 10	− 2	+ 3
28	−43	+ 1	+ 2	−10	− 2	− 6	+12	+ 3	+10	+ 6	+ 6	+ 2
29	+31		− 9	−36	+11	+ 1	−14	− 3	−50	0	− 4	− 1
30	+11		− 7	+14	+ 3	+ 4	+ 8	+11	+ 5	+ 7	−21	− 5
31	+ 7		+ 2		− 4		−13	− 6		+ 3		+ 7
Average instrumental change per day.	2·2γ	2·1γ	2·0γ	1·9γ	1·8γ	1·7γ	1·6γ	1·5γ	1·5γ	1·5γ	1·5γ	1·5γ

Unity = 1γ = ·00001 C. G. S.

1875. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	−10	− 5	+ 6	+ 2	+ 6	+ 2	− 6	+ 6	0	+ 6	− 2	+ 3
2	− 8	− 6	+14	+ 3	− 8	− 9	+ 3	+ 3	+ 2	− 9	−25	0
3	+ 3	+ 3	− 14	+ 3	+11	− 5	+ 9	+ 1	−34	− 1	− 1	+ 6
4	+ 3	+11	+17	+ 1	−14	− 8	− 8	− 7	+ 1	+ 6	+ 6	0
5	+ 3	− 3	+ 6	− 8	−25	0	− 4	+10	+10	−34	+ 7	+ 2
6	+ 4	− 1	+ 3	+ 3	− 5	+ 2	− 1	− 5	0	+10	+ 6	− 3
7	−12	− 5	−16	−74	− 2	− 8	− 5	0	+ 1	+ 3	0	−13
8	−10	− 1	+ 5	+24	+ 7	+ 1	− 3	− 1	0	+ 5	+ 5	+ 4
9	+ 7	+ 8	+12	+12	+ 6	− 3	+ 3	− 5	−27	0	−12	0
10	+ 6	− 20	+11	+13	−22	− 6	+ 2	+ 3	+ 9	− 1	−15	− 2
11	+ 4	− 9	−12	+ 4	+12	+ 4	−25	0	0	− 2	+ 7	− 2
12	+ 4	− 3	−10	− 3	− 4	− 3	+ 7	−30	− 2	− 1	+ 3	+ 5
13	−11	0	− 1	− 1	+10	+13	+10	+ 5	+ 6	− 2	−12	0
14	− 2	− 5	0	− 6	+ 1	− 6	−30	+ 4	− 6	+ 3	+ 5	− 10
15	− 1	+12	+ 8	+ 7	− 1	− 3	− 1	− 2	+ 3	− 8	+ 4	+ 3
16	− 7	+ 3	0	−11	+ 2	−16	+ 5	− 2	−52	+13	0	− 1
17	− 2	+ 5	− 3	− 1	− 5	+15	− 4	+ 2	+31	− 6	+ 2	− 3
18	− 8	− 3	+ 2	+ 9	+ 5	−27	− 1	− 1	0	+ 3	+ 2	−13
19	− 3	+ 1	−39	+ 6	− 9	+ 5	+ 3	− 5	+13	+ 3	− 2	+ 7
20	+16	+ 3	+22	+ 2	0	− 1	+ 2	+ 6	+ 8	+ 3	− 4	− 3
21	+ 5	−13	−11	− 1	+10	0	+ 6	− 8	−11	− 1	− 9	0
22	−11	+ 2	+ 9	− 3	− 6	− 1	−11	+10	− 1	− 6	−17	0
23	− 2	+ 2	+17	+ 2	−25	− 3	+ 6	− 8	+ 3	0	+ 6	+ 3
24	+10	+ 2	− 1	− 9	+ 1	+ 3	0	− 6	− 4	0	+ 5	+ 3
25	−10	−13	− 3	− 2	+ 5	+ 2	+ 5	+ 4	+ 6	−14	− 1	−11
26	− 7	−19	+ 4	0	− 2	+ 4	0	+ 1	*	−10	+ 9	− 6
27	− 1	−91	+ 8	−21	+ 4	+ 6	−17	− 8	*	0	− 5	+ 2
28	− 4	+51	− 6	+ 3	− 2	− 4	−13	− 4	+ 2	+ 4	+ 7	+ 6
29	+ 4		−19	+ 3	+ 1	− 6	+ 8	0	− 3	− 3	− 6	− 3
30	+11		+ 2	0	− 4	−17	+ 5	+ 3	−17	− 2	−20	+ 7
31	−10		+ 2		− 3		−17	− 4		+ 6		0
Average instrumental change per day.	1·5γ	1·5γ	1·5γ	1·5γ	1·5γ	1·5γ	1·4γ	1·4γ	1·4γ	1·4γ	1·4γ	1·4γ

* No difference is available as the curve for the 26th September is lost owing to defect in the photographic paper.

TABLE 381.—*Showing the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1876. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 6	− 7	+ 4	+12	− 4	+ 3	− 1	− 3	+ 6	+ 2	0	−10
2 ...	− 9	+ 5	− 3	+ 6	− 3	− 6	+ 3	− 3	+ 4	+ 5	+ 6	− 3
3 ...	+ 8	+ 9	+ 3	− 4	+ 9	+ 4	− 1	− 7	− 6	−12	− 6	+ 1
4 ...	− 8	+ 4	−14	− 5	0	− 8	+ 8	− 3	− 3	− 5	+ 4	+ 5
5 ...	− 4	−41	− 2	0	+ 3	−14	− 4	− 3	− 1	+ 6	− 3	+ 1
6 ...	− 1	+12	+ 6	0	−19	+ 4	− 8	+ 3	+ 6	−14	− 1	− 2
7 ...	+ 5	+ 3	− 5	− 2	+ 2	+ 2	− 6	− 1	+ 3	− 5	+ 3	− 3
8 ...	+ 1	− 1	− 1	+12	+ 1	+ 3	− 1	+ 4	− 7	+ 9	− 4	− 3
9 ...	− 8	+ 5	+ 4	− 8	+ 3	+ 3	+ 3	− 2	−13	+ 5	0	+ 6
10 ...	+ 5	+ 1	− 2	+ 6	− 5	− 5	− 1	− 9	+ 2	+ 5	−18	−51
11 ...	+ 1	− 6	+ 1	− 7	+ 1	−11	+ 3	+ 6	+ 3	−20	0	+12
12 ...	+ 1	+ 1	−10	+ 3	+ 6	− 2	+ 4	− 3	+ 4	+13	+ 7	+ 6
13 ...	+ 8	+ 6	−11	− 6	−10	+ 5	+ 1	0	−17	+ 4	−18	+ 2
14 ...	−30	− 6	+ 4	+ 4	− 6	0	− 2	− 9	− 3	− 4	+ 6	+ 3
15 ...	− 3	− 3	+ 9	− 3	− 3	− 1	− 9	0	0	+ 3	+10	+ 2
16 ...	+ 5	− 3	− 6	− 5	+ 6	+ 1	+ 4	− 3	+ 4	−13	−11	+ 8
17 ...	+ 3	+ 9	+ 5	− 9	−15	−16	−16	+ 2	+ 4	− 3	+ 4	−14
18 ...	+ 5	+ 1	0	+ 6	+ 5	+ 4	− 3	+ 4	0	+ 2	−15	− 3
19 ...	− 4	−51	+ 7	+ 2	0	+10	+ 5	− 2	+ 3	+ 5	+15	0
20 ...	− 1	− 2	− 3	−10	+ 3	+ 1	− 6	− 1	− 13	− 3	− 5	+ 5
21 ...	0	+27	− 3	+ 1	0	−15	+ 5	− 1	+ 9	− 8	+ 1	+ 3
22 ...	− 4	0	+ 4	+ 8	− 3	− 4	+ 5	0	− 7	0	+ 3	−10
23 ...	−13	+ 4	−10	− 6	+ 1	+ 2	0	+ 9	−23	−10	− 4	− 1
24 ...	0	+13	+ 6	− 8	+ 4	0	− 6	−15	+ 8	−12	+ 9	0
25 ...	+ 3	− 6	−46	+ 3	−27	+ 5	+ 3	− 3	+10	+ 7	+ 3	0
26 ...	+ 5	−15	− 3	+ 2	− 1	+ 2	+ 2	+ 4	− 9	0	−18	0
27 ...	+ 5	+ 8	+26	+ 5	+ 5	− 1	−11	− 9	−21	0	−10	− 2
28 ...	− 4	+ 3	0	−15	+ 3	−27	− 6	− 1	+10	+ 1	+ 5	+ 6
29 ...	+ 1	+ 2	−16	0	+ 3	+ 9	0	+ 7	+ 7	+ 1	+ 3	− 3
30 ...	0		+ 6	0	+ 3	− 8	− 5	−23	+ 3	+ 2	+12	+ 1
31 ...	− 9		− 8		− 5		+ 6	+ 4		− 6		+ 1
Average instrumental change per day.	1·4γ	1·4γ	1·4γ	1·4γ	1·3γ	1·3γ	1·3γ	1·3γ	1·3γ	1·3γ	1·3γ	1·3γ

Unity = 1γ = ·00001 C. G. S.

1877. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 4	+ 3	−14	0	+ 4	− 6	− 4	−14	0	−23	0	− 1
2 ...	− 6	− 6	−21	+ 6	− 7	+ 3	+ 5	+ 6	− 6	+ 6	− 1	+13
3 ...	+ 5	−14	+13	0	−34	+ 2	− 7	− 1	0	+ 3	−48	−14
4 ...	− 4	+ 1	+ 2	− 3	+ 9	+ 1	+ 4	+ 2	+ 2	− 2	+10	−24
5 ...	+ 6	− 5	+ 5	+ 7	+ 5	+ 4	− 7	− 7	− 2	+ 6	+12	+ 7
6 ...	−23	...	+ 1	−11	+ 7	+ 9	+ 1	− 5	0	− 1	0	+ 1
7 ...	−23	+12	− 3	+ 5	+ 3	− 17	− 3	+11	+ 2	+ 2	− 5	0
8 ...	+14	+42	+ 3	−19	− 9	− 11	−21	0	+ 2	− 1	− 8	+ 1
9 ...	+ 2	+ 7	+ 7	0	+13	+11	+10	0	− 7	0	+ 8	+ 7
10 ...	− 2	0	−45	+ 2	+ 3	+ 3	− 8	− 4	+ 1	+ 1	−13	+ 7
11 ...	+ 6	−19	+14	+ 8	−37	+ 2	+ 8	+ 4	+ 1	− 2	+12	− 3
12 ...	+ 2	0	+ 7	− 2	+ 3	0	+ 8	− 5	− 6	−45	+ 5	−27
13 ...	+ 7	+ 1	+ 1	+ 4	+ 8	− 9	− 2	− 5	− 2	+12	+ 5	+ 7
14 ...	− 3	− 2	+ 1	− 1	+ 1	−14	+ 1	− 2	+ 6	+13	− 1	+ 4
15 ...	−14	− 1	+ 4	−25	+ 9	+ 4	+ 2	− 2	− 5	− 3	− 2	+ 7
16 ...	0	−21	+10	+ 4	+ 2	+ 8	− 5	+10	− 8	+ 7	− 4	− 4
17 ...	+ 6	+11	− 1	+ 6	− 2	+ 7	− 3	−17	+ 4	+ 1	+ 5	− 3
18 ...	− 1	− 6	− 3	+ 2	− 3	− 7	+ 3	−15	− 1	0	+ 1	− 5
19 ...	+ 6	− 9	− 3	+ 7	+ 5	+11	− 7	+ 2	−56	− 3	− 10	+ 4
20 ...	+ 1	− 7	+ 4	0	+ 6	− 6	+ 6	0	+32	+ 5	−33	0
21 ...	−12	− 3	−12	− 1	−23	− 4	−12	− 1	0	− 9	+14	+ 4
22 ...	+ 1	+ 3	+ 1	− 5	+ 1	+ 6	−21	+ 2	+ 5	+ 2	+12	− 4
23 ...	− 7	+ 9	− 4	−21	− 4	− 9	+ 7	+ 4	− 2	+ 7	+ 4	+ 1
24 ...	+10	+ 4	−13	+ 8	+ 5	+ 5	− 2	0	+ 1	− 8	−26	− 4
25 ...	+ 2	− 4	+ 7	− 2	− 5	−19	+ 2	− 3	+ 6	−19	+15	+ 1
26 ...	−13	− 2	− 2	0	+ 2	0	+ 3	+ 1	− 1	+15	+ 2	0
27 ...	− 8	+ 1	+ 5	+ 2	+ 2	+ 2	− 2	+ 4	− 2	+ 8	0	− 1
28 ...	+ 6	+ 6	+ 7	+ 2	− 3	− 3	+ 6	− 9	0	− 6	+ 6	− 5
29 ...	0		− 5	+ 6	− 4	− 58	− 7	−18	− 7	− 2	− 2	− 2
30 ...	+ 5		− 7	− 5	+23	− 7	+ 9	+12	+ 6	+ 1	− 2	+ 2
31 ...	+ 6		− 2		+11	+10	− 7	+ 3		+ 2		0
Average instrumental change per day.	1·2γ	1·2γ	1·2γ	1·2γ	1·2γ	1·2γ	1·2γ	1·1γ	1·1γ	1·1γ	1·1γ	1·1γ

TABLE 381.—*Showing the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1878. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 6	− 2	− 1	+ 3	+ 1	− 7	− 2	− 2	− 2	+ 5	0	−52
2 ...	0	− 3	+ 2	−12	− 8	+ 3	+ 1	+10	+ 5	+ 6	− 7	+27
3 ...	+10	+ 3	+ 7	*	+ 1	−71	+ 1	+ 2	− 1	+ 2	+ 8	+ 5
4 ...	+ 5	− 2	− 1	*	+ 1	+10	− 2	− 9	− 7	−14	− 5	+ 5
5 ...	−14	0	− 6	*	− 5	+19	− 2	0	+ 9	+ 3	+16	+ 4
6 ...	− 4	− 8	− 1	− 1	+ 2	+ 7	+ 7	− 5	+ 2	0	−30	− 3
7 ...	+ 6	− 7	+ 6	+ 7	+ 3	+14	−20	− 2	− 4	−10	+ 3	+ 5
8 ...	− 2	− 3	− 5	0	− 5	−47	+ 4	− 9	− 7	+12	− 1	0
9 ...	− 2	+ 7	+ 9	+ 4	+ 1	+ 1	− 2	+ 7	+12	+ 3	+ 1	+ 5
10 ...	+ 2	− 2	−11	− 7	− 2	− 9	0	+ 5	− 2	+ 1	+ 3	− 4
11 ...	−12	+ 5	−10	− 1	+ 1	− 3	− 1	− 2	+ 5	−11	− 1	+ 4
12 ...	+ 2	− 3	+ 3	− 4	− 1	0	− 4	− 6	0	0	− 1	−19
13 ...	+ 5	+ 3	0	+12	− 3	+ 8	− 1	+ 1	− 9	+ 8	+ 3	− 5
14 ...	+ 1	+ 1	− 6	− 1	−26	+ 1	− 1	+ 6	−10	− 3	−24	+ 5
15 ...	− 9	−10	− 1	+ 5	−15	+ 3	+ 1	0	+ 9	− 4	0	+10
16 ...	+ 7	+ 5	0	−28	+10	− 2	+ 4	− 1	+ 7	+ 3	− 2	− 6
17 ...	− 7	+ 6	+ 3	+ 1	+ 9	+ 3	−11	− 3	− 4	+ 8	+ 3	+ 1
18 ...	+ 5	− 6	0	− 1	− 1	+ 1	0	+ 6	+ 2	−23	+ 6	− 2
19 ...	− 5	0	+ 4	− 3	+ 2	− 2	− 1	− 1	− 5	− 8	+ 3	0
20 ...	0	− 6	+ 2	+ 7	+ 8	+ 6	− 5	− 7	0	+ 5	− 3	− 5
21 ...	0	+ 7	−10	− 3	− 2	0	+11	− 7	0	0	+ 1	+ 2
22 ...	− 2	0	+ 4	+ 2	− 3	− 3	− 7	+ 8	+ 4	+10	− 7	+10
23 ...	+ 1	0	+ 2	+ 1	− 1	+ 2	+ 2	+ 1	−23	−14	+ 4	− 5
24 ...	−55	− 2	− 5	+ 2	− 5	− 1	− 1	− 5	+ 4	+ 7	+ 1	−10
25 ...	+21	− 2	+ 2	− 6	+ 1	+ 2	− 3	−10	+ 7	+ 3	+ 2	− 3
26 ...	+ 5	0	− 7	− 2	+ 2	0	+ 5	+ 7	−22	+ 3	0	+ 5
27 ...	+11	− 4	− 3	0	− 4	+ 5	− 8	−14	+12	− 6	+ 2	+ 3
28 ...	+ 2	− 3	0	− 9	0	+15	− 3	+ 4	+ 1	+ 3	− 3	− 4
29 ...	+ 6		0	+ 6	0	+ 2	− 5	+ 7	−20	+ 2	0	+ 3
30 ...	+ 4		− 3	+ 5	+ 3	+ 1	+ 9	− 4	+ 7	+ 6	− 8	− 6
31 ...	− 6		+ 5		+ 3		− 5	−15		− 4		−17
Average instrumental change per day.	1·0γ	1·0γ	1·0γ	1·0γ	1·0γ	1·0γ	0·9γ	0·9γ	0·9γ	0·9γ	0·9γ	0·9γ

Unity = 1γ = ·00001 C. G. S.

1879. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	+ 1	+11	+ 5	− 6	+ 2	−12	+11	−28	+ 5	+ 2	− 8
2 ...	+ 9	+ 8	+13	+ 3	+ 6	0	+ 7	−18	+ 6	− 3	− 5	− 1
3 ...	+ 8	+ 5	−20	− 6	− 3	+ 7	+ 1	0	+ 8	− 5	+ 5	+ 5
4 ...	− 1	−12	+ 9	+ 3	− 4	− 1	0	− 4	+ 4	−16	+ 2	− 2
5 ...	0	− 3	−10	− 5	+ 3	+ 7	−12	− 5	+ 2	+10	− 1	− 3
6 ...	+10	− 1	0	+ 8	− 2	+ 8	− 4	− 1	− 5	− 8	− 3	+ 1
7 ...	− 7	+ 7	− 7	− 8	+ 4	− 7	+ 1	+ 5	− 4	0	+ 8	− 4
8 ...	− 2	− 4	+ 6	+ 2	0	− 6	+ 2	+ 8	− 6	− 3	− 3	−27
9 ...	+ 5	+ 4	− 9	+12	−13	−17	+ 2	+ 1	+12	+ 3	− 4	+11
10 ...	− 3	− 5	+ 8	−14	+ 3	+ 2	+ 4	−18	−26	+11	+ 2	+ 4
11 ...	− 5	+ 4	+10	− 6	+ 5	+ 5	− 3	+ 3	+11	− 7	−11	−21
12 ...	+ 9	− 1	+ 4	+10	+ 1	+ 8	0	+ 3	− 21	− 2	− 4	+16
13 ...	− 7	0	−13	−15	−16	− 2	+ 6	+ 3	+16	+ 4	+ 3	+ 1
14 ...	0	− 9	−10	+ 3	− 3	+ 5	+ 1	0	+ 1	− 8	− 5	− 2
15 ...	+ 2	†	+ 8	− 2	− 1	− 3	−12	− 5	+ 4	+15	− 3	+ 3
16 ...	− 7	†	− 4	+ 3	+ 6	− 3	+ 4	+ 2	− 1	− 8	+ 4	+12
17 ...	− 1	+ 3	+ 2	+ 3	+ 1	+13	+ 3	+ 3	+ 6	− 1	+ 5	− 7
18 ...	+ 3	−13	0	+ 3	− 3	−55	+ 1	+ 1	− 1	− 2	+ 7	− 7
19 ...	− 3	+ 5	+ 3	−10	+ 9	+18	−12	− 1	+ 2	+ 2	−12	+ 6
20 ...	− 9	0	− 7	−19	− 9	+ 4	+ 1	− 1	−13	− 7	− 1	+ 2
21 ...	− 3	− 3	− 1	+ 7	− 1	+ 9	+ 3	+ 1	+10	+10	+ 2	+ 4
22 ...	+ 8	+ 9	0	+ 8	+ 3	+ 1	+ 3	− 1	0	− 8	− 1	−11
23 ...	0	+ 3	− 7	+ 4	+ 2	+ 6	− 2	− 3	− 4	− 3	+ 4	− 8
24 ...	− 4	− 8	− 1	+ 3	−39	− 2	+ 4	+ 1	+ 4	+ 5	+ 3	+13
25 ...	− 1	− 8	+ 3	+ 2	+21	+ 1	−12	− 7	− 1	+ 4	− 2	− 3
26 ...	+ 5	+ 4	0	− 5	+ 6	− 3	− 5	0	−10	− 5	− 4	− 7
27 ...	− 1	+ 8	+ 4	− 1	+ 3	−21	+ 3	+11	+ 6	+ 5	0	+ 5
28 ...	− 2	−17	− 2	− 1	+ 5	+ 8	+ 5	− 7	− 8	− 2	+ 3	0
29 ...	− 1		−14	− 3	+ 2	+ 2	− 5	− 9	0	+ 5	− 2	− 1
30 ...	− 1		+ 9	+ 6	−16	+ 9	− 1	+ 3	+ 5	+ 2	+ 3	+ 2
31 ...	0		− 2		− 3		0	+ 1		−13		+ 5
Average instrumental change per day.	0·9γ	0·8γ	0·8γ	0·8γ	0·8γ	0·8γ	0·8γ	0·8γ	0·8γ	0·7γ	0·7γ	0·7γ

* No differences are available as the curve on 3rd and 4th is lost owing to defect in the photographic paper.

† No differences are available as February 15th is rejected owing to heating experiments on the magnetograph.

TABLE 381.—*Showing the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1880. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 6	− 2	− 6	0	− 5	+ 3	+ 5	−23	−37	+17	+38	− 9
2	+ 4	+ 4	− 7	−31	−26	+ 2	−12	+ 5	+19	− 1	+15	+ 8
3	+ 6	− 2	− 2	+ 7	+11	+ 8	− 6	− 7	+14	0	−58	− 6
4	−11	− 4	+ 5	+15	+ 4	0	+ 6	+ 8	+ 1	+ 2	+29	+11
5	3	+ 6	− 6	−15	+ 5	− 5	+ 3	−22	0	0	+19	−12
6	+ 3	−11	+ 3	+ 5	+14	− 1	−10	+14	+ 8	+ 7	+ 3	+11
7	− 5	+ 1	−14	+ 3	+ 2	− 7	+10	− 2	− 2	− 5	+ 4	− 4
8	−10	+ 2	+15	+ 6	− 4	− 3	+ 2	+13	− 1	− 4	+ 5	+ 4
9	+ 4	+ 3	0	+ 3	+ 5	+ 9	− 2	− 9	+15	+ 2	+ 7	+ 2
10	+ 1	+ 5	0	− 1	+ 1	+ 3	+ 6	+11	0	− 4	−15	+ 3
11	+ 5	− 1	− 2	+ 3	0	+ 7	− 7	−19	− 5	9	+ 5	−27
12	+ 1	− 6	− 5	− 3	+ 3	− 5	+ 8	−67	− 5	+ 9	0	+27
13	0	+ 2	−14	− 3	− 1	+ 3	−14	+ 8	− 3	− 4	+ 4	−22
14	+ 2	*	− 8	− 7	− 3	+ 4	−20	+12	+ 3	+ 4	+ 5	+ 9
15	+ 2	*	+12	− 3	−16	− 5	+ 7	+19	−79	− 4	0	0
16	− 1	+ 1	+ 8	+ 2	+11	−11	0	− 9	+34	− 3	0	+ 8
17	−16	− 9	−38	− 6	+ 4	− 3	+ 6	+21	+ 7	+ 1	+10	+ 5
18	− 5	+ 7	− 7	+ 4	− 4	0	+ 5	+16	+ 9	0	− 2	+ 8
19	+ 6	+ 8	+24	−25	− 3	+ 4	− 7	−70	+ 6	+ 3	− 2	−33
20	+ 5	− 9	+ 1	+14	− 1	+ 4	− 8	+34	+ 5	+ 2	−48	+ 2
21	− 4	+ 1	+ 4	0	+ 1	− 3	+13	+13	+ 4	− 1	+ 8	+ 8
22	−10	− 4	− 3	− 6	− 8	+11	−20	+ 9	−11	−13	+ 8	+12
23	−12	− 5	+ 3	+ 6	+ 9	−37	+13	− 5	+ 1	− 2	+ 8	− 9
24	+ 5	+ 8	+ 3	+12	+ 2	+ 9	+12	+ 9	+ 7	− 7	− 1	+ 3
25	+11	+ 6	+ 3	−13	+ 8	+ 2	− 5	+ 8	+ 8	− 2	+13	+ 8
26	*	− 4	− 1	+ 3	−20	+11	− 2	−14	+ 1	−11	+ 1	0
27	*	− 1	− 2	+13	−14	0	− 3	−19	−27	0	−12	− 6
28	*	+ 1	0	−24	+ 1	+ 4	+ 3	+16	−14	−17	− 3	+ 4
29	− 6	+ 1	+ 1	− 1	+ 6	+ 1	− 2	− 8	0	+28	+ 9	−11
30	*		+ 4	− 3	0	+ 1	− 5	+19	+ 8	+19	−14	+ 6
31	*		+ 7		0		+ 7	+ 1		−69		+ 1
Average instrumental change per day.	0·7γ	0·7γ	0·7γ	0·7γ	0·7γ	0·6γ	0·6γ	0·6γ	0·6γ	0·6γ	0·6γ	0·6γ

* January 26th, 27th and 30th are rejected as heating experiments were going on in the magnetograph room.

Unity = 1γ = ·00001 C. G. S.

1881. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 1	+34	+ 9	+ 8	0	+ 1	− 3	+ 2	− 8	− 6	+17	+ 9
2	+ 1	+27	− 2	+10	− 4	+ 8	−26	+ 2	+ 6	+ 6	−10	− 3
3	+ 1	+19	−28	0	+ 3	− 4	−29	+ 3	0	+ 8	− 2	+ 9
4	− 5	− 7	+13	0	+ 8	−31	+26	− 4	− 3	− 5	0	+ 6
5	− 3	+ 3	+13	+ 9	+ 3	− 1	+ 8	− 7	− 11	−10	+ 9	+ 6
6	− 3	− 3	+ 3	− 1	+ 1	−27	+ 4	− 1	+ 7	− 4	0	−12
7	+ 1	+ 4	− 5	−13	−13	+27	+17	−21	+ 1	··20	+ 2	+ 9
8	†	+ 8	+ 1	+ 5	− 1	− 2	−14	+ 6	+ 1	+10	− 4	−35
9	†	+ 6	+10	+10	−23	+ 2	0	+10	− 32	+ 1	−75	− 7
10	†	+ 3	+13	+ 7	+14	+16	+ 2	+ 7	+ 4	+12	+52	+15
11	− 6	− 8	0	+ 2	+ 4	− 7	− 1	+10	+ 10	+ 6	+ 5	+19
12	+ 8	+ 6	−15	− 3	− 5	+10	−20	−17	− 18	− 4	+11	− 6
13	− 2	+ 6	−12	−16	+ 6	− 6	0	− 5	−113	+ 2	+15	+ 3
14	+ 4	+ 3	+ 7	− 4	0	+ 4	+ 8	− 2	+ 78	− 1	+ 6	− 5
15	− 6	−24	+11	+ 3	+ 5	+ 1	+24	+ 7	+ 13	+ 8	··15	+ 1
16	0	− 14	+ 4	− 5	− 7	0	−14	− 4	+ 6	+12	− 2	− 5
17	+ 1	+20	+ 4	+11	+ 3	+ 6	+ 9	− 2	+ 3	−40	− 5	+ 7
18	+ 3	+12	−10	+ 5	− 3	− 6	− 6	+ 8	+ 17	+ 4	+ 6	− 1
19	+ 8	+ 4	−18	−23	− 1	+ 4	+ 7	+ 6	+ 9	− 4	− 1	− 1
20	+ 9	− 6	+ 8	+ 4	+ 9	+ 2	− 1	−19	− 6	+11	+ 3	− 2
21	− 8	− 6	+ 7	−24	+ 3	− 9	− 4	− 7	− 6	+ 4	+ 8	+ 2
22	− 33	+11	+ 4	+14	− 6	+ 6	+ 5	+10	+ 7	+ 7	+ 3	+11
23	+ 14	− 3	− 3	+ 8	+ 2	0	+ 3	+ 3	+ 10	+ 1	− 23	−30
24	− 9	†	+ 4	+11	− 1	0	−11	− 1	+ 3	− 4	−25	− 6
25	+ 5	†	+ 1	−11	+ 4	−11	0	+ 8	− 12	− 7	+32	+10
26	− 5	†	0	0	−14	− 2	+ 4	−14	+ 2	+ 7	+ 3	+ 4
27	+ 6	−49	+11	+ 1	+ 4	+12	+ 1	+ 5	+ 4	− 22	−22	+ 9
28	+ 6	+33	−12	−23	+ 2	− 2	− 8	− 1	+ 6	+13	+10	− 4
29	+ 5		− 2	+ 7	− 4	+ 6	+ 4	+ 1	− 12	+10	−11	− 4
30	0		+ 2	+13	+ 4	−10	− 7	− 2	+ 4	+ 3	+ 2	+ 2
31	−114		−33		− 4		+ 3	+ 5		−37		+ 1
Average instrumental change per day.	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ

† January 8th and 9th and February 24th and 25th are rejected as heating experiments were then going on in the magnetograph room.

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1882. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 5 − 5	+ 6	− 11	+ 7	− 2	− 9	− 7	+18	+ 6	+ 3		− 12
2	+ 1 −29	+ 7	− 1	− 10	+ 7	+10	+34	− 3	−138	+ 14		+ 6
3	− 1 +29	− 9	− 1	+ 6	+ 3	+ 2	+14	−16	+ 52	− 13		+ 7
4	+ 1 + 4	−12	− 20	− 3	+ 5	+ 5	−42	+ 6	+ 19	+ 4		− 10
5	− 6 − 6	0	+ 7	+12	+ 5	−12	0	−15	+ 13	+ 3		+ 6
6	− 4 −34	+ 4	+ 2	+ 4	− 7	+17	+19	− 3	− 70	− 8		+ 4
7	+10 +14	+ 2	+ 8	+ 8	− 1	−12	− 6	+12	+ 63	− 6		0
8	0 + 1	−14	0	+ 4	+ 1	+11	+16	+ 8	+ 14	− 2		+ 6
9	− 7 − 3	− 20	− 6	+ 5	− 6	−35	+ 6	− 1	+ 11	− 10		− 8
10	+ 6 − 2	+17	+ 3	0	+ 9	+27	−27	+ 1	− 3	+ 23		+ 6
11	− 7 + 9	+ 9	+ 10	− 6	+ 4	+ 5	+21	+ 5	+ 1	+ 12		− 1
12	− 7 + 3	+ 8	− 7	−14	+ 2	− 4	−13	−13	+ 7	− 71		− 7
13	− 3 − 5	− 6	+ 5	− 1	−15	− 3	+14	+ 7	+ 6	− 51		+ 6
14	+ 5 +12	− 9	− 34	−46	+ 8	+ 6	+ 1	0	− 6	+ 59		+ 8
15	−11 0	+11	+ 8	+13	−22	+ 6	+ 5	− 2	− 11	+ 26		+ 4
16	+10 + 5	− 6	− 1	+19	−15	+ 5	+ 4	+ 5	+ 1	+ 11		−44
17	− 1 + 6	+17	−222	− 7	+16	−34	+ 1	− 1	+ 6	−128		+15
18	+ 9 −14	+ 6	+157	+20	+ 8	+13	0	+ 6	+ 7	− 20		− 2
19	−12 + 6	−15	+ 21	+ 5	+ 4	+ 4	− 4	+ 1	+ 6	+ 58		− 7
20	−31 −33	−19	− 43	− 4	− 6	− 7	+ 5	− 9	+ 11	−151		−12
21	+14 + 6	− 1	+ 39	+ 1	−12	+ 8	− 2	− 5		0		+150		−19
22	+12 +12	+ 5	+ 17	−12	+ 7	+ 5	−13	+ 4	− 29	+ 21		+24
23	+ 6 + 8	0	+ 2	+11	+ 3	− 4	+13	− 2	0	+ 17		+10
24	− 8 0	+ 6	0	−10	−53	− 4	+10	+11	− 6	+ 15		+ 3
25	+ 4 0	+ 2	+ 7	+ 4	+10	+ 2	− 8	−46	− 26	− 13		+ 4
26	+ 5 + 5	+ 2	+ 9	−12	+13	+ 2	0	+19	+ 24	+ 6		+15
27	− 1 + 2	−12	− 1	+ 3	+ 3	0	− 9	+ 2	+ 7	+ 9		− 7
28	+ 3 − 6	+ 1	+ 7	− 4	+ 5	+12	+ 2	+12	− 19	+ 4		−11
29	+ 2	+ 6	− 23	− 4	− 2	+ 2	− 5	0	+ 12	+ 12		+ 3
30	− 7	+ 2	− 1	+ 3	+18	− 6	+ 5	+ 1	+ 7	− 1		+ 2
31	+ 7	+ 5		+ 8		−61	− 3		+ 4			− 1
Average instrumental change per day	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ

1883. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	Ca + 2	Sa − 8	Sa + 7	C 0	C − 9	Ca + 3	S − 9	S +23	Ca − 1	C + 6	S − 9	Ca −12
2	Ca − 2	Sa −13	Sa + 2	C + 1	Ca − 9	Sa −30	Ca + 7	Ca +17	Ca − 3	C + 4	M −36	S − 8
3	Ca + 6	Sa + 4	Ca +15	G −75	C + 7	Ca +17	Ca +11	C +11	Ca + 5	C − 3	Sa − 8	C +15
4	C + 6	S + 5	Ca + 9	S +32	C + 8	C +11	C + 8	C + 7	Ca − 6	Ca + 1	Sa +18	C +14
5	Ca 0	Ca + 2	Ca − 1	S +23	C 0	C +11	Ca − 9	S + 5	Ca − 23	M −39	S +12	C + 4
6	Sa − 8	Ca 0	S +17	Ca + 3	C + 5	S −11	Ca +13	S −23	Ca − 9	S − 1	Ca + 5	C + 3
7	Sa − 6	C + 4	S −16	C +14	C − 2	C + 5	Ca +14	Ca + 6	Ca + 23	Ca +13	C − 1	C − 6
8	S + 4	C + 5	Ca − 9	Ca − 1	C + 2	Ca 0	S −15	C + 1	Ca + 10	Ca +10	C + 5	Ca 0
9	Ca + 7	C + 6	S + 4	Ca + 5	C − 3	Ca − 4	S + 7	C +14	Ca + 11	C + 9	C + 5	S −28
10	Ca + 2	Ca + 4	C + 6	C + 5	C + 4	Ca + 6	S −16	Ca + 9	Ca − 2	C + 1	Ca − 1	Ca +21
11	C − 3	C + 4	C +12	C − 3	C + 7	Ca + 2	S − 1	Ca −10	C − 1	Ca − 1	Ca + 5	S + 2
12	Ca + 2	Ca + 6	Ca + 7	C + 4	C 0	Ca + 1	Ca −13	C + 4	Ca − 4	Ca − 3	Ca −14	Ca −13
13	C + 2	C + 6	Sa − 51	C − 3	C − 8	C − 4	Ca +12	C + 3	S − 16	Ca − 5	Ca − 2	Ca 0
14	Ca − 3	Ca −17	Ca +20	C + 1	Ca − 7	C + 3	S − 6	Ca − 6	Ca + 2	Ca 0	C −13	Ca − 2
15	Ca − 1	Ca − 3	C + 7	C + 3	Ca + 5	C + 8	S + 9	Ca + 5	S + 9	S −14	Ca +16	C +12
16	Ca 0	C 0	C + 6	Ca + 2	Ca − 8	Ca − 1	Ca − 3	C − 2	Ma −147	Sa −11	C + 7	C + 6
17	S − 8	Ca −14	C + 4	Ca − 6	Ca + 7	Ca −13	Ca + 7	C + 3	S + 32	Sa −10	C − 1	Ca − 8
18	S 0	Ca +15	C + 3	Ca −19	Ca − 9	S −16	S − 1	Sa −31	S + 55	Sa +11	Ca + 6	Ca −13
19	C + 5	Ca + 6	C + 6	Ca −22	Ca −14	Ca + 8	Ca − 7	S +12	S + 7	S +21	Ca − 1	Ca +11
20	Ca −14	S − 4	Ca +12	S + 1	Sa + 6	Ca + 6	C + 3	C + 1	C + 6	S − 9	Sa −57	Ca +12
21	Ca + 3	Ca − 7	Sa −32	C +16	Sa −38	Ca + 1	C +11	C +10	C + 6	C + 7	S +18	Ca + 1
22	Ca +19	S −33	Sa −22	C + 2	S +21	S + 1	Ca + 9	Ca − 2	C + 9	Ca −10	G −79	Ca − 1
23	C − 2	S + 4	S +15	C +13	Ca + 6	Ca −19	C +10	Ca −11	Ca + 9	C +17	S +42	Ca + 2
24	S + 2	Sa − 4	C +10	M − 8	C + 4	Ca +13	Ca −23	Ca − 1	Ca − 13	C + 1	Ca +35	Ca − 2
25	Sa −15	Sa −33	C 0	Sa −48	C + 6	Ca + 6	C − 1	C + 4	Ca − 9	C +11	Ca +16	Ca −12
26	Sa −16	Ca +36	M −11	Ca +27	Ca − 8	Ca + 5	S + 3	C + 9	Ca + 13	Ca − 7	C +10	C − 1
27	S +13	Sa − 1	M −34	Ca 0	Ca + 5	S −30	C −11	Ca + 3	Ca + 8	C 0	S −19	Ca + 9
28	Ca + 4	Sa −18	Sa +20	C + 4	C − 5	Ca +14	C + 6	S − 1	S − 6	C + 2	Ca + 1	Ca −17
29	Ca 0		S + 5	C + 8	C + 3	Ca + 5	S − 2	Ca + 4	Ca 0	C + 5	C +10	C + 4
30	C + 6		Ca +15	C + 4	C + 2	Sa −24	Sa −60	Ca + 1	Ca + 6	C 0	C + 2	C + 9
31	Ca − 5		Ca + 2		C − 7		S − 2	C − 5		Ca + 2		C + 5
Average instrumental change per day	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ	0·5γ
Total number of days. C	6	6	9	15	18	6	7	13	4	13	9	11
Ca	16	11	9	9	10	18	12	12	19	10	11	17
S	5	4	5	3	1	4	11	5	6	4	5	3
Sa	4	7	6	1	2	2	1	1	0	3	3	0
M	0	0	2	1	0	0	0	0	0	1	1	0
Ma	0	0	0	0	0	0	0	0	1	0	0	0
G	0	0	0	1	0	0	0	0	0	0	1	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1884	Month.											
Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 8	Ca − 2	Sa +23	Ca + 8	Sa −38	Ca −40	Ca −11	C + 3	Ca − 4	Sa −14	S + 2	Ca + 8
2 ...	Ca − 1	Ca −33	Sa + 2	Ca +18	C +15	Sa −17	Sa + 4	C − 6	Ca + 9	M −80	M −56	C + 1
3 ...	C + 4	Ca + 8	Sa + 3	Ca − 3	C + 8	Ca +27	M −70	C + 3	Ca −15	Ca +36	Sa −45	C − 1
4 ...	Ca − 1	S + 9	Ca +18	Ca + 1	C + 6	Ca +10	S +19	C + 3	C + 1	Ca +17	S +63	C + 4
5 ...	Ca −17	Ca − 4	Ca +12	Ca + 3	C − 2	C + 5	S +14	C − 3	C + 9	Ca + 9	C + 6	C − 1
6 ...	C + 6	Ca − 4	Ca +18	Ca 0	Ca + 5	Ca − 4	Ca + 4	Ca +13	Ca − 1	Ca + 1	Ca +15	C + 4
7 ...	Ca +14	Ca + 5	S −17	Ca + 4	Ca − 5	C − 3	Ca +10	Ca + 2	Ca − 2	S −19	Ca + 5	Ca + 2
8 ...	Ca −17	Ca − 4	Ca −11	C −10	C − 4	C + 4	S − 1	S −26	Ca − 8	C +19	Ca + 1	Ca −25
9 ...	Ca − 2	Ca − 0	Ca − 4	C + 6	C + 3	C + 1	Ca +12	Sa − 5	Ca +14	Ca + 9	Ca −15	Ca +10
10 ...	Ca +10	Ca +11	Ca + 9	S − 1	Sa − 3	C 0	C 0	S + 8	S −26	Ca −12	Ca + 9	Ca +12
11 ...	Ca −17	C + 6	C + 7	S −35	Ca −15	Ca + 4	Ca + 7	Ca + 4	Ca − 5	Ca + 5	Ca − 9	S −21
12 ...	Ca −17	C + 3	C + 4	Ca +13	Ca − 3	Ca − 4	C − 9	Ca +11	C +13	C + 8	Ca +12	Ca +12
13 ...	Ca +20	C − 4	C + 4	Ca + 9	Ca + 7	Ca −12	Ca + 6	Ca − 7	S −18	Ca + 2	Ca +13	C + 4
14 ...	C +10	C + 2	Ca 0	Ca + 3	Ca + 3	Ca − 4	Ca −31	Ca 0	S −15	Sa −31	Ca − 3	Sa −14
15 ...	C −16	C + 9	Ca + 1	Ca −22	Ca −16	C +14	Ca +15	Ca − 5	Ca +19	S − 5	C + 1	Sa −32
16 ...	C + 5	Ca − 9	Ca − 6	Ca + 6	C +14	C + 8	Ca + 2	C + 3	Ca +21	Ca +20	Ca + 8	S +16
17 ...	Ca +12	Ca − 2	C − 7	Ca − 5	C + 5	C +10	C + 6	C 0	Sa −16	S − 6	S −11	Ca +15
18 ...	Ca + 8	Ca −12	C + 2	S −15	C − 5	S + 2	C + 8	Ca 0	S −43	Ca +18	S −14	C + 6
19 ...	Ca −17	Ca + 1	Ca 0	S +14	Ca − 4	Ca −39	S + 3	Ca 0	Sa +29	Sa − 3	Ca + 4	Ca +13
20 ...	Ca + 7	C + 9	S −20	Ca − 2	C − 1	C +13	Ca −24	Ca +11	S +12	Ca +11	Ca + 3	S −23
21 ...	Ca − 6	Ca + 3	Ca − 2	Ca + 6	C +11	Ca +10	C +12	S −31	C + 2	Ca −15	C + 4	Ca − 1
22 ...	C + 3	Ca + 2	Ca + 4	Ca +11	S − 8	S − 4	C +10	S 0	C − 1	C + 8	Ca + 7	S − 2
23 ...	Ca − 2	S −13	Ca − 2	C − 5	Ca −16	M −43	Ca 0	Ca + 8	C + 9	C + 4	S −11	S − 4
24 ...	C + 3	S −22	Ca − 1	Sa −20	Ca +10	Ca +13	Ca +10	Ca + 4	C + 1	Ca + 1	S −10	Ca +10
25 ...	Ca + 9	S + 8	Ca + 8	C −28	C +12	C +14	Ca −33	Ca + 3	Ca +13	Ca −29	Ca − 1	Ca − 2
26 ...	S −31	Ca + 6	Ca + 8	S +24	Ca − 1	C + 3	Ca + 9	Ca + 9	Ca −11	S + 8	C + 8	C + 9
27 ...	Ca +13	Ca + 3	S + 1	Ca + 8	Ca + 3	Ca + 9	C − 2	C −10	C + 9	C +17	Ca + 2	Ca + 5
28 ...	C + 2	C + 1	S −12	Ca +11	C − 8	Ca + 5	C + 9	C + 9	C − 5	Ca + 4	S −44	S − 9
29 ...	C + 7	S −11	S −43	C + 5	C + 3	Ca + 3	S 0	C − 1	Ca + 9	Sa −26	Ca +28	Ca 0
30 ...	C + 2		Ca +23	Ca +11	C + 1	Ca + 1	Ca + 2	C 9	S + 5	C + 9	Ca + 8	C − 1
31 ...	C + 6		Ca + 7		Ca + 3		Ca − 3	C + 1		C +11		Ca + 7
Average instrumental change per day ...	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ
Total number of days. C ...	12	7	5	5	15	11	8	12	9	7	4	9
Ca ...	18	17	18	19	13	15	16	14	13	15	17	14
S ...	1	5	5	5	1	2	5	4	6	4	7	6
Sa ...	0	0	3	1	2	1	1	1	2	4	1	2
M ...	0	0	0	0	0	1	1	0	0	1	1	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1885.	Month.											
Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca + 1	C 0	S − 3	S −14	C + 7	C + 5	S −20	Sa −45	Ca − 1	Ca + 4	Ca − 4	S − 2
2 ...	Sa −37	C + 6	Ca − 2	Ca +13	Ca − 6	C 0	C + 4	S +13	C 0	Ca + 2	C +14	Ca −20
3 ...	C +12	C + 1	Ca + 2	S −13	C +11	C +12	C +16	Ca +11	Ca + 3	C − 2	C + 8	Ca +13
4 ...	C +10	S 0	C + 4	Ca +11	C − 4	Ca −19	S +10	Ca − 3	S −15	C +13	C + 3	C + 2
5 ...	C + 9	Sa −15	C + 9	C + 5	C −14	C +11	Ca − 7	C + 8	S + 5	Ca + 7	C − 1	Ca +10
6 ...	Ca + 4	Ca + 5	Ca + 9	Ca 0	Ca − 6	C + 7	Ca −21	Ca + 5	S + 9	Ca − 2	C − 5	S −31
7 ...	Ca − 6	C +11	Ca − 6	Ca −10	Ca + 2	C + 7	C + 5	S −19	Ca +11	Ca −14	S − 9	Sa − 5
8 ...	S −12	Ca −10	C 0	S −26	Ca − 4	C − 7	Ca − 2	Ca 0	Ca −15	Ca + 6	Ca −16	S − 2
9 ...	S + 9	Ca + 7	C + 3	Ca +20	Ca +13	Ca +18	Ca +14	C +11	Ca + 6	Ca −11	Ca +11	Ca + 9
10 ...	Ca − 3	Sa −17	C + 8	Ca +10	Sa +12	Ca −12	C − 4	C − 3	Ca + 6	C +12	S −27	C + 6
11 ...	Ca + 7	S +18	Ca 2	Ca − 2	Sa −69	C − 7	Ca + 1	Ca +11	Ca + 4	Ca − 3	Sa −10	C + 6
12 ...	Ca − 1	S −23	Ca −30	Ca − 1	Ca +21	C − 1	C − 3	Ca − 6	C − 8	Ca −11	Ca +16	C + 5
13 ...	C + 1	Ca + 7	S + 3	Ca −17	Sa − 4	C + 1	C − 8	C + 5	Ca + 9	S − 4	Ca +15	Ca + 6
14 ...	C + 3	C + 8	Ca + 8	Ca +18	Ca −19	C + 6	C + 7	C + 7	Ca 0	Ca − 7	C + 8	C − 4
15 ...	C + 2	C +12	Ma −85	S −18	Ca +26	C − 9	Ca + 5	Ca − 7	Sa −33	S − 4	C + 8	C − 3
16 ...	Ca + 2	C 0	S +22	Ca + 7	Ca + 7	C − 8	Ca + 6	S −12	S −21	S + 5	C + 2	C + 1
17 ...	Ca − 6	S − 3	Ca +35	Ca + 6	Ca + 5	C − 2	S + 7	C +11	S +21	Ca +24	C − 1	Ca 0
18 ...	Ca − 4	S − 1	C +15	Ca + 6	Ca + 3	Ca + 6	S −32	C + 5	Ca + 3	Ca − 11	Sa −30	Ca − 6
19 ...	Ca − 1	C + 3	C +11	S − 7	C + 4	Ca 0	Ca + 4	C 0	Ca + 3	Ca + 5	Ca − 1	Ca 0
20 ...	C + 9	Ca +11	S −11	Ca + 4	Ca + 3	S −12	C + 6	Ca −15	C + 6	Ca − 3	Ca +14	C − 1
21 ...	Ca + 1	S −23	Ca − 6	Ca − 4	C − 7	Ca +17	C − 3	Ca −11	Ca +11	C + 7	C + 7	Ca + 1
22 ...	Sa −33	Ca − 7	C + 2	C +11	C + 8	Ca −16	C + 2	Ca + 5	S −12	S −19	Ca − 1	Ca + 1
23 ...	Ca 0	C +15	Ca +14	C + 8	Ca + 7	Ca − 1	C + 3	C + 7	Sa −11	S − 9	C + 1	C + 4
24 ...	Ca + 6	C + 6	C − 3	Ca −17	Ca −17	S +10	Ca + 7	C + 2	Ca +12	Ca +12	C − 1	C + 3
25 ...	C 0	C − 1	C + 6	C 0	Sa − 2	M −65	Ca −29	C + 6	Ca −10	C − 8	Ca − 4	C + 3
26 ...	C +18	Ca + 8	C + 3	Ca + 2	Sa −57	Ca +21	C +10	Ca −16	Ca + 8	C + 7	Ca + 4	Ca − 2
27 ...	Ca − 1	Sa −37	C 0	S −20	S +12	C +26	Ca + 7	S +18	S −22	Ca − 3	Ca + 2	C − 1
28 ...	Ca − 7	M +15	Ca + 1	Sa −10	S + 2	Ca +18	Ca − 8	S −38	Ca +16	Ca +14	Ca + 2	S − 9
29 ...	Ca + 7		C 0	Ca +22	Ca +17	C + 7	Ca + 7	S + 3	Ca + 8	Ca − 7	C +11	Ca − 4
30 ...	Sa −45		Ca − 4	C + 5	Ca − 3	C + 3	C − 7	Ca + 5	Ca − 4	Ca − 8	C + 1	S +13
31 ...	Ca +36		Ca − 4		Ca +10		Ca +17	Ca + 5		S 0		Ca + 5
Average instrumental change per day ...	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ
Total number of days. C ...	9	11	13	5	7	17	13	11	3	6	14	12
Ca ...	17	7	13	18	17	10	14	13	18	19	12	13
S ...	2	6	4	6	2	2	4	6	7	6	2	5
Sa ...	3	3	0	1	5	0	0	1	2	0	2	1
M ...	0	1	0	0	0	1	0	0	0	0	0	0
Ma ...	0	0	1	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1886. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	Ca 4	Ca + 5	Ca 0	Ca +20	S − 6	C − 6	S + 7	Ca + 3	Ca + 1	Ca − 3	C + 6	S + 2
2	S − 9	S − 1	Ca + 3	C +26	S −14	C + 1	Ca + 6	C 0	Ca − 5	Ca + 2	Sa −16	S − 3
3	S − 6	S + 4	Sa −16	C +18	Ca + 3	Ca + 4	Ca + 6	C + 8	Ca + 6	C − 3	Sa −24	S + 5
4	S −12	Ca 0	Ca − 2	Ca +14	Ca + 1	S − 2	Ca + 4	C 0	Ca + 7	C + 1	S − 4	S 0
5	Ca + 7	S −12	Ca +10	Ca − 9	Ca + 7	S −14	Ca + 8	C + 4	Ca −11	Ca + 5	S + 1	S 0
6	C + 6	Ca + 7	Ca − 2	C + 1	Ca +12	Ca + 2	C + 2	Ca − 6	C − 2	S −37	S + 5	Ca + 1
7	Ca + 5	Ca + 3	S −18	Ca − 6	Ca + 5	Ca + 1	C + 4	S − 5	Ca − 5	S − 8	Ca + 8	Ca + 3
8	S + 1	S − 5	C + 8	C + 8	Sa −18	S − 2	C + 2	C − 6	Ca − 4	Sa −24	Ca + 6	Ca − 7
9	Ma −76	Ca +16	Ca + 5	C + 3	Sa −68	Ca − 1	Ca + 4	C + 4	S −13	S +16	Ca + 1	Ca +11
10	Ca +13	Sa −21	Ca − 3	C + 2	S +38	Ca +11	Ca − 4	C + 6	S −32	S + 8	C + 2	C + 4
11	Ca +26	Sa − 8	Ca + 1	S −10	S − 1	Ca + 7	Ca − 2	S −12	S + 3	Ca + 8	Ca 0	Ca − 4
12	C + 8	C +10	Ca + 5	S −28	S + 5	S −24	Ca − 1	Sa −36	S + 3	Ca + 2	S −14	C − 1
13	Ca + 6	C + 9	Ca + 1	S + 3	Ca + 7	Ca + 2	C − 1	Ca +19	S + 8	Ca + 6	S + 3	S − 2
14	S + 3	Ca + 6	Ca + 7	Sa −19	S − 2	Ca 0	S − 6	S −12	S + 5	Ca − 1	Ca +22	Ca + 4
15	S −15	Ca − 1	Ca −13	S + 3	Ca 0	Ca + 4	Ca − 5	S +11	C +11	Ca + 6	S − 4	Ca − 4
16	Ca +14	Sa −17	S −25	S +13	Ca +12	Ca +15	Ca − 2	S + 2	Ca + 5	C + 5	Ca + 5	Ca − 3
17	C +10	S + 2	S + 5	S +15	S −17	S − 9	Ca +11	S + 2	Ca − 6	S − 4	Ca − 4	S − 1
18	C − 4	S + 2	S − 5	S − 6	S − 7	Ca − 1	Ca + 7	S + 2	C + 7	S + 5	Ca 0	Ca + 4
19	S −25	S − 5	S + 4	S + 6	Ca +21	Ca − 4	Sa −22	S + 1	C + 5	S −10	Ca +10	Ca − 8
20	S + 7	Ca + 2	S − 1	S − 3	Ca + 9	C +10	S 0	Ca + 8	Ca + 7	Ca +27	S −15	C + 6
21	S + 9	S − 9	S + 6	Ca + 1	S −14	Ca − 6	S − 7	C 0	S −10	Ca −13	Ca + 1	Ca − 4
22	S − 8	S − 1	S −12	Ca + 8	Ca + 6	S −20	Ca + 5	C + 8	Ca − 7	Ca − 5	C + 7	S + 4
23	C + 9	Ca +11	Sa − 2	Ca + 7	Ca + 9	Ca + 8	Ca − 2	S + 3	Ca +13	C + 7	S −10	S − 8
24	Ca + 4	Ca +13	Ca +17	Ca + 5	Ca − 8	S + 1	Ca + 6	S −27	C 0	C +11	S −11	C + 6
25	C +13	Ca + 3	Ca − 2	S −26	C + 9	Ca + 1	C + 3	Ca +16	C + 2	C − 3	Ca + 9	Ca + 5
26	C − 2	Ca + 2	Ca + 8	Ca +16	S − 2	Ca − 2	C +10	Ca − 4	C + 4	Ca − 5	C + 3	S − 8
27	C − 4	Ca −10	Ca − 6	Ca + 5	S + 2	Ca + 8	S −40	Ca + 4	C + 1	S −11	C + 1	S − 4
28	Ca +11	Ca + 9	Ca + 5	Ca − 4	Ca —11	Ca + 2	S −17	C + 1	C + 3	S − 5	C + 2	S − 1
29	S −21		S − 2	Ca + 1	Ca + 3	S −12	Ca +31	C + 3	Ca − 3	S − 4	S − 2	S −14
30	Sa −17		G −78	Ca + 1	C + 9	S −21	Ca + 3	C + 7	S − 9	Ca + 7	Sa −17	Ca + 8
31	Ca +10		M − 3		C + 1		Ca + 9	Ca + 4		C + 7		C + 6
Average instrumental change per day	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ	0·4γ
Total number of days. C	8	2	1	6	3	3	6	12	9	7	6	5
Ca	10	14	17	13	15	18	18	8	13	13	11	13
S	11	9	9	10	11	9	6	10	8	10	10	13
Sa	1	3	2	1	2	0	1	1	0	1	3	0
M	0	0	1	0	0	0	0	0	0	0	0	0
Ma	1	0	0	0	0	0	0	0	0	0	0	0
G	0	0	1	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1887. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 4	S − 7	Ca − 9	Ca − 3	Ca + 5	Ca − 5	C − 9	Sa −26	S − 9	Ca + 7	C + 4	Ca + 2
2 ...	Ca + 6	Ca + 3	C + 5	Ca −17	S −10	C + 1	C + 1	S −34	S + 8	C + 3	Ca + 4	C + 7
3 ...	Ca − 5	Ca + 5	C + 8	S −11	Ca − 6	C + 3	C + 2	S + 4	Ca − 5	C +10	Ca − 3	C + 2
4 ...	Ca −11	S + 3	C 0	S +10	Ca + 6	Ca + 9	Ca +14	S +12	C +11	C + 6	Ca − 3	C + 1
5 ...	C + 9	S − 7	S −13	S −20	Ca + 4	Sa −48	Ca +10	S 0	C + 3	Ca − 1	C + 2	Ca + 2
6 ...	C +11	C + 2	S −13	S 0	Ca + 5	Ca +36	Ca −42	S +10	C − 1	C − 5	C + 5	Ca − 7
7 ...	S 0	Ca 0	S + 7	S − 4	Ca − 2	Ca + 3	Sa −22	Ca + 1	C + 8	Ca − 1	C 0	S − 5
8 ...	Ca + 3	Ca +11	S − 8	S +10	C + 2	Ca + 7	S +14	Ca − 3	C + 3	C − 1	Ca − 2	C + 2
9 ...	C − 4	S −18	S − 7	S + 1	C + 5	Ca −11	C + 2	C + 9	Ca + 5	C + 5	Ca − 8	C + 3
10 ...	C +12	Ca + 1	S +13	Ca + 4	C + 2	S − 7	Ca +14	C + 7	S −14	Ca + 4	S −21	C + 2
11 ...	C −12	Ca + 1	Ca + 2	S −12	Ca + 1	Ca + 8	Ca − 8	C + 3	S + 2	C − 5	Ca +18	C + 4
12 ...	Ca + 1	S −16	C + 5	Ca +11	Ca + 4	C + 5	C − 9	C + 2	Ca − 1	Ca −11	C + 5	C + 4
13 ...	Ca + 8	S − 3	Ca + 5	C + 3	Ca −19	C −15	C + 3	C + 2	C + 2	Ca − 5	C + 5	Ca −26
14 ...	S −13	S + 3	C − 5	Ca + 9	Ca + 2	C + 4	C + 9	Ca −11	Ca +12	Ca − 1	C − 1	C + 6
15 ...	S −15	Ca + 2	S − 2	S −14	Ca + 2	C + 7	Ca +18	S − 8	Ca −18	Ca + 5	C + 1	C + 9
16 ...	S + 5	Ca + 4	Ca − 7	Ca +12	C + 1	C − 1	Ca −10	Ca + 1	Ca − 7	C + 6	C +10	S −34
17 ...	S − 4	Ca + 4	Ca + 7	S −13	C 0	Ca + 5	C + 3	Ca + 9	Ca + 1	Ca + 4	Ca − 6	S + 7
18 ...	S 0	Ca + 8	C + 4	C + 4	Ca − 1	Ca +13	Ca + 2	C − 2	C + 4	C 0	C − 9	S +12
19 ...	Ca + 3	S − 2	Ca + 8	Ca +10	C − 4	S −15	Ca − 9	C + 5	C + 4	C 0	S − 3	Ca − 3
20 ...	Ca − 3	S −10	S −14	Ca − 4	C + 5	Ca + 1	Ca + 2	C + 9	C + 7	C + 5	S −10	Ca + 3
21 ...	Ca + 7	S − 6	S − 8	Ca 0	C +11	Ca − 6	C + 2	C − 3	Ca 0	Ca + 8	Sa −29	S −14
22 ...	S +10	S +11	Ca + 2	S − 3	C −10	Ca − 7	C + 2	C −11	Ca −17	M −31	S +12	S −12
23 ...	S −16	S − 3	Ca + 4	Ca − 7	Ca + 5	Ca − 1	C + 1	C + 1	Ca + 8	Sa + 4	Ca + 6	C +27
24 ...	S + 3	S + 4	Ca −10	Ca − 2	Ca −40	C + 7	C − 5	C + 4	Ca − 8	Ca + 5	Ca + 7	C + 9
25 ...	S − 2	Ca + 7	C +11	S − 9	Ca + 5	C + 2	C + 3	Ca + 1	Sa − 6	Ca + 3	C + 4	S + 1
26 ...	S 0	Ca + 1	Ca 0	Ca +18	S +21	C + 5	C + 3	C + 4	Sa −49	Sa −25	C + 4	S −18
27 ...	Ca + 3	Ca − 7	Ca − 2	C +13	S + 1	C − 6	Ca + 3	C 0	Sa +23	S + 9	Ca +12	S + 8
28 ...	C + 3	Ca + 9	Ca − 2	S −23	Ca −14	C +11	C + 7	S −19	S + 3	C + 9	Ca 0	Ca − 1
29 ...	Ca − 4		C + 7	Ca −17	C +14	Ca + 3	C + 1	S −21	S +14	C +12	S −18	Ca + 2
30 ...	Ca + 2		C + 5	C + 9	Ca − 3	Ca − 2	C −	S + 3	S − 2	S −13	S + 4	Ca + 2
31 ...	Ca + 4		C + 5		Ca + 4		C + 3	Ca + 6		Ca + 7		Ca + 2
Average instrumental change per day ...	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C ...	7	1	10	4	10	12	18	14	9	13	12	12
Ca ...	13	14	12	13	18	15	11	7	11	13	11	10
S ...	11	13	9	13	3	2	1	9	7	2	6	9
Sa ...	0	0	0	0	0	1	1	1	3	2	1	0
M ...	0	0	0	0	0	0	0	0	0	1	0	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1888. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca − 1	C + 2	C − 8	C + 8	Ca −25	C − 4	S −17	C − 1	Ca + 2	C + 7	Ca − 5	C + 7
2 ...	C + 7	C + 1	C + 5	Ca + 3	Ca + 8	Ca + 8	Ca + 6	Ca +12	C + 2	C + 6	Ca + 2	Ca − 6
3 ...	C − 1	Ca 0	C + 5	Ca −20	Ca 0	S −29	Ca − 2	S −29	C + 1	C + 5	C +10	Ca − 2
4 ...	C + 6	Ca − 1	C − 5	S − 1	C + 4	Ca −10	Ca + 6	Ca −10	C + 1	C + 9	Ca − 6	Ca − 2
5 ...	Ca 0	Ca − 3	C + 4	S − 4	C + 4	Ca +18	C + 2	Ca +16	C + 6	S −22	Ca − 2	Ca + 1
6 ...	Ca −19	C + 7	C + 6	Ca + 5	Ca +15	Ca + 4	C + 7	C + 6	C + 3	Ca − 8	Ca − 2	Ca − 5
7 ...	S +15	Ca + 5	Ca + 2	Ca +10	S −40	C 0	Ca + 6	C − 1	Ca +10	C + 5	Ca −10	Ca + 7
8 ...	Sa −73	Ca + 8	Ca −26	Ca − 1	S + 3	C + 1	Ca −21	C − 3	Ca −17	C + 7	Ca + 3	S −32
9 ...	Ca +54	S −19	S + 5	C + 1	S + 6	C + 4	Ca + 3	C + 4	Ca − 1	C + 1	Ca +10	S +25
10 ...	C +10	S + 1	Ca − 6	Ca +12	S − 2	Ca + 9	C + 4	Ca + 8	C + 3	Ca + 1	Ca +11	C + 3
11 ...	C − 4	S − 6	C + 7	Sa −49	Ca + 2	C + 2	C + 7	Ca − 3	Ca + 4	Ca − 5	S − 8	C + 3
12 ...	Ca +14	Ca + 1	C + 4	S − 1	Ca 0	C − 9	C − 3	Ca −19	Ca −10	Ca −13	C 0	Ca + 7
13 ...	Sa −48	C + 7	Ca + 1	S + 6	C 0	C + 8	C + 3	Ca +10	S −17	Ca + 1	C + 7	Ca − 5
14 ...	S +18	C + 3	Ca + 2	S + 6	C + 9	C − 2	C + 1	C + 8	Ca + 5	C + 4	C + 1	Ca − 3
15 ...	Ca + 4	C + 4	S −12	Ca + 4	C +11	Ca + 4	Ca + 7	Ca +10	Ca − 5	C + 5	Ca + 4	S −11
16 ...	Ca + 8	Ca −13	S −27	C +11	Ca − 9	C − 7	Ca −10	S −42	Ca + 4	C − 2	S −23	Ca + 5
17 ...	Ca − 5	Ca 0	S − 3	Ca + 7	C + 5	C 0	Ca −14	S + 6	Ca + 9	Ca + 5	S +19	Ca + 6
18 ...	C − 2	Ca − 2	S + 8	C − 6	Ca + 2	Ca + 7	Ca +12	Ca − 4	Ca −10	Ca + 6	S +11	Ca + 2
19 ...	C + 7	Ca − 5	Ca +10	Ca +12	Ca − 9	Ca − 2	C − 1	Ca +14	Ca + 6	S − 9	Ca + 8	C + 1
20 ...	C + 9	Ca + 1	C − 1	Ca − 6	Sa −11	C − 4	Ca + 3	Ca − 6	Ca 0	S −24	Ca + 5	C + 4
21 ...	Ca − 7	S − 4	Ca + 8	C + 1	Sa −45	C + 3	Ca −16	C + 6	Ca + 1	S + 4	C − 1	C − 6
22 ...	Ca − 8	Ca + 6	C + 1	C + 2	Ca +36	S − 4	Ca − 3	C − 1	C + 4	Ca +12	C − 1	C + 2
23 ...	Sa −28	C + 1	C + 2	C + 3	S + 4	Ca −14	Ca − 3	C + 3	C + 4	Ca − 2	C + 7	S +11
24 ...	S + 7	Ca + 2	Ca + 6	Ca − 3	Ca − 6	Ca + 6	Ca + 6	C + 4	C +10	C − 5	C + 7	S −27
25 ...	Ca +12	Ca − 1	C + 7	C −11	C +12	Ca + 2	C +11	C + 7	Ca −14	Ca − 3	Ca 0	Ca + 6
26 ...	Ca 0	C 0	C − 2	C + 2	S + 6	C − 7	C + 4	Ca − 3	Ca −10	C + 9	Ca − 4	Ca + 1
27 ...	Ca + 8	C + 5	Ca + 5	C + 6	Ca − 9	C +14	C + 1	C − 5	Ca − 1	C − 1	S + 1	Ca 0
28 ...	Ca − 2	Ca + 2	S −14	Ca + 4	Ca + 4	C − 3	S − 1	C + 9	Ca + 5	C + 5	Ca − 8	C + 6
29 ...	C + 4	Ca + 3	Ca − 2	Ca + 3	Ca + 5	C − 2	Ca −11	C 0	Ca − 8	C + 1	Ca + 3	Ca +10
30 ...	C + 5		C + 2	S − 7	C − 7	S + 5	C + 6	Ca + 6	C + 4	S +12	Ca 0	Ca 0
31 ...	C − 4		C − 9		C + 7		C + 3	Ca −26		S −21		Ca − 3
Average instrumental change per day ...	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C ...	11	9	15	10	9	16	13	14	10	15	8	8
Ca ...	14	16	10	13	14	11	16	14	19	10	17	18
S ...	3	4	6	6	6	3	2	3	1	6	5	5
Sa ...	3	0	0	1	2	0	0	0	0	0	0	0
M ...	0	0	0	0	0	0	0	0	0	0	0	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1889. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca −6	C +1	S −23	Ca +1	C −1	Ca +4	S −6	Ca +1	C +10	Ca +2	M −51	Ca +6
2 ...	Ca −7	C 0	Ca +10	Ca 0	C +5	C −1	Ca +1	Ca +2	Ca −2	Ca 0	S +19	Ca +2
3 ...	C +15	Ca 0	Ca +6	Ca +2	Ca +9	C +3	Ca −2	C +3	C +4	Ca −9	S +4	Ca +5
4 ...	C −1	Ca −4	Ca +10	Ca −6	Ca −17	C +3	C −1	C +3	C −9	C 0	Ca +5	C +3
5 ...	C 0	C +7	Ca +7	C +7	Ca −9	C +4	Ca +6	C +2	C −6	S −10	Ca −5	Ca +8
6 ...	Ca 0	C 0	S −29	C +2	Ca +2	Ca −1	Ca −4	C +7	Ca +4	S −14	C +16	S −1
7 ...	Ca −4	Ca −6	Ca 0	S −2	Ca −5	C −2	C −5	Ca +2	Ca −11	S +6	C +2	S −7
8 ...	Ca +1	Ca −9	Ca +3	S −27	C +11	Ca +11	C +7	Ca −8	Ca −6	Ca +2	C +7	Ca +1
9 ...	Ca +1	C +4	C +8	Ca +2	C +11	S −23	C +1	Ca −2	S −36	Ca 0	S +6	Ca +2
10 ...	S 0	C +3	C −1	C +5	C −9	Ca +8	C −3	Ca +9	S +11	Ca +5	Ca −6	C 0
11 ...	Ca −11	C +4	C +6	Ca +2	C +1	C +2	Ca +2	Ca −19	S +1	C +4	Ca +5	C +5
12 ...	Ca +5	C +3	Ca +5	Ca +5	Ca +7	C +2	C −3	Ca +8	Ca +12	C +7	C 0	C +5
13 ...	Ca −3	Ca +4	Ca −18	Ca −3	Ca −14	Ca +7	C +6	S −15	Ca +6	Ca +4	C −2	Ca −7
14 ...	C +4	Ca −15	Ca −3	Ca +9	Ca 0	Sa −64	C −3	C +6	C 0	Ca −7	C +4	C −12
15 ...	Ca +2	Ca −2	Ca +4	C +3	C +6	C +34	C 0	Ca −1	C +12	Ca −1	Ca −3	C +3
16 ...	Ca +3	Ca −3	C +5	C +6	C +5	C +8	C +5	Ca +3	Ca +4	C −4	Ca −13	C +10
17 ...	C +2	S −1	S −6	Ca −3	C +5	C +7	M −35	C +6	Ca −7	C +3	S −10	Ca −11
18 ...	C +1	Ca −4	Ca −8	Ca −2	Ca −1	C +4	Ca +7	C −2	Ca −3	S −10	Ca −2	C +11
19 ...	C +1	Ca +5	C +11	C −10	Ca −21	C −1	Ca +7	C +6	Ca −2	Ca −9	C +10	Ca +1
20 ...	Sa −26	Ca −9	Ca −2	C −1	C +10	Ca +10	Ca −3	S −26	C +4	S −8	C +6	Ca −6
21 ...	S 0	C +9	C +1	Ca 0	Ca −2	Ca −16	C −2	Ca +9	Ca +5	Ca +3	Ca +3	Ca +1
22 ...	Ca +4	Ca −4	Ca −4	Ca +6	Ca −21	Ca −3	C +6	Ca +7	Sa −32	Ca +4	C −5	Ca −8
23 ...	Ca +7	Ca +3	C +6	Ca −9	C +9	C +4	Ca +9	Ca +1	S −2	Ca +5	C 0	Ca +3
24 ...	C −1	Ca +6	C +2	C +5	Ca +5	C +3	Ca −3	C +8	S +6	C +5	Ca +6	Ca +4
25 ...	Ca +6	Ca +3	C −4	S −6	C +9	C +1	Ca 0	S −2	Ca +8	C +3	Ca −12	Ca +4
26 ...	C −1	Ca +3	Ca +3	C −12	Sa −18	C +4	C −2	S −21	Ca +8	Ca +16	S −18	Ca 0
27 ...	C +7	Ca −10	Ca 0	Ca +13	C +3	C +7	C −1	S +4	Ca −2	C −7	S −6	S −15
28 ...	Ca −5	Ca −1	S −24	Ca −6	C +4	Ca −6	Ca +10	Ca +3	C +4	Ca −3	S +7	Ca +3
29 ...	Ca +5		Ca +13	Ca +3	C +1	C −8	Ca −6	Ca −3	Ca +7	C −1	Ca −2	Ca −8
30 ...	Ca −5		Ca +7	C −1	Ca +3	C +5	Ca −1	Ca +6	Ca +2	C +1	Ca +3	Ca −7
31 ...	C +1		Ca +6		Ca −8		Ca −12	Ca		Ca +1		C +10
Average instrumental change per day ...	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0.3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C ...	11	9	9	10	15	19	14	9	8	10	10	9
Ca ...	17	18	18	17	15	9	15	17	16	16	12	19
S ...	2	1	4	3	0	1	1	5	5	5	7	3
Sa ...	1	0	0	0	1	1	0	0	1	0	0	0
M ...	0	0	0	0	0	0	1	0	0	0	1	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1890. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	C + 3	Ca + 3	Ca + 3	S −21	C − 4	Ca + 1	C − 6	Ca − 4	Ca + 7	Ca +12	Ca −13	Ca − 3
2	Ca +10	C − 3	C − 6	Ca + 1	C − 2	Ca −24	C + 3	C −12	Ca − 6	Ca −10	C − 7	C + 3
3	S −22	S −10	C − 1	C + 6	Ca 0	C + 2	C + 1	C +13	Ca −12	Ca + 4	C +14	Ca + 1
4	Ca + 9	C 0	C − 3	C + 2	Ca −12	Ca + 9	C + 1	C − 3	Ca + 6	C + 1	Ca + 9	C − 3
5	Ca + 3	Ca + 5	Ca + 3	Ca + 1	S −19	Ca + 3	Ca + 3	C − 1	Ca − 1	S −10	C − 9	Ca −10
6	S − 4	Ca + 1	Ca − 1	Ca − 7	Ca +14	Ca +12	Ca + 1	Ca + 1	Ca 0	C −16	C +11	C + 6
7	C − 2	C + 3	Ca + 3	Ca − 5	C + 1	C − 5	Ca − 4	Ca − 5	C − 9	Ca +12	S −16	C + 1
8	C + 8	Ca − 2	C − 4	C − 4	C + 5	Ca + 4	Ca −10	Ca + 1	C + 5	S −15	S −40	Ca − 3
9	C + 3	C − 1	Ca − 7	C + 6	Ca + 7	Ca − 3	C + 5	Ca − 5	C + 4	Ca − 1	S +20	C 0
10	Ca + 3	C + 7	Ca + 8	C 0	Ca − 3	Ca − 5	Ca + 5	C − 2	Ca − 2	Sa − 3	Ca + 7	C + 8
11	Ca − 7	Ca − 2	Ca − 6	C + 1	Ca − 1	Ca + 7	Ca − 7	C + 2	S −26	S + 9	Ca +10	C 0
12	C + 5	Ca −20	Ca − 3	C + 6	Ca + 3	C − 9	C − 4	C + 6	S − 6	S − 4	C + 2	Ca + 9
13	Ca + 7	Ca + 9	Ca − 7	C − 6	Ca + 1	C + 5	C 0	C 0	Ca +10	Ca + 3	S − 4	Ca − 6
14	C −12	Ca + 1	Ca + 6	C − 3	Ca − 4	C + 5	C + 3	S − 4	Ca + 4	Ca + 5	S 0	Ca + 5
15	Ca − 4	Ca − 8	Ca + 2	C + 1	C − 6	C − 9	C − 5	S −17	S + 1	S − 5	S − 1	Ca 0
16	C + 3	C + 4	S −20	C + 1	Ca +10	Ca + 4	Ca +15	S − 1	S − 2	Ca + 3	Ca + 7	C − 3
17	Ca − 3	Ca + 5	Ca + 9	C − 1	Ca − 5	Ca 0	S −21	Ca − 3	Ca + 1	S +11	Ca − 5	C − 3
18	S − 2	Ca − 9	S − 7	Ca + 9	C − 1	C + 1	Ca − 1	Ca 0	Ca +11	Sa −28	Ca + 1	C + 1
19	C − 1	S − 2	Ca + 8	Ca − 6	C − 1	C + 4	S − 0	Ca + 6	Ca + 7	S + 4	C + 2	C + 6
20	S + 1	Ca + 1	Ca + 5	C − 7	Ca + 4	Ca + 7	Ca − 1	Ca − 9	Ca − 6	Ca +13	Ca + 4	Ca + 2
21	S + 5	Ca + 8	Ca + 2	Ca − 4	C −11	Ca −15	Ca + 2	Ca + 6	Ca − 6	C + 3	Ca − 7	Ca − 9
22	Ca + 2	Ca + 3	Ca − 4	Ca − 1	C + 1	Ca − 7	Ca + 4	Ca + 3	C − 2	C − 1	Ca + 8	S − 4
23	Ca + 1	C + 4	C − 1	Ca − 1	Ca +14	C + 1	Ca 0	Ca + 2	C + 4	C + 2	Ca − 1	Ca − 6
24	Ca + 4	C − 3	C + 8	C + 2	C − 4	C + 6	C − 4	C − 1	Ca + 5	S −21	C − 6	C + 5
25	Ca − 1	C + 2	C + 2	C + 5	Ca − 5	C − 3	C + 3	C + 1	S −22	C +21	C + 6	Ca − 3
26	Ca + 1	Ca + 8	Ca + 3	C + 2	C − 6	C + 3	C 0	C − 6	C +25	Ca − 3	Ca − 9	C + 3
27	C + 2	Ca −16	C − 7	Ca + 9	C + 2	C + 2	C + 5	C + 9	C + 1	S −12	Ca + 1	Ca + 2
28	C − 2	C + 9	C − 1	Ca − 2	C + 7	Ca − 4	C + 1	C 0	Ca − 1	C +12	C + 2	Ca + 3
29	Ca − 3		C + 1	Ca + 1	C + 1	Ca +11	C + 8	Ca + 7	Ca −13	Ca + 7	Ca +10	C − 2
30	C + 1		C + 3	Ca − 9	C − 3	Ca − 1	C + 3	C + 7	C + 8	Ca + 3	Ca −12	Ca − 8
31	C + 3		Ca +10		C + 1		Ca − 2	C − 7		Ca − 1		C 0
Average instrumental change per day	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C	12	10	11	16	16	13	16	15	8	7	9	15
Ca	14	16	18	13	14	17	13	13	17	13	15	15
S	5	2	2	1	1	0	2	3	5	9	6	1
Sa	0	0	0	0	0	0	0	0	0	2	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0
Ma	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0		0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1891. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 5	Ca −15	S +10	S − 3	C + 1	C + 4	Ca + 1	Ca + 7	S − 2	S +10	C + 6	C − 3
2 ...	C − 2	C +10	M −31	S + 8	C + 6	C + 3	C − 7	S −14	Ca − 4	S −12	C + 2	Ca +14
3 ...	C + 5	C + 9	M − 1	Ca + 7	C −22	C − 4	Ca −14	S −25	S +15	S +10	C − 3	C − 2
4 ...	C + 5	C + 2	Sa − 7	Ca + 5	S + 4	Ca − 8	Ca − 8	S +12	Ca −17	Ca + 6	C − 1	Ca − 6
5 ...	Ca + 3	Ca − 4	Sa + 8	C + 3	C +11	S +13	Ca +15	C + 3	C +17	C + 4	C − 7	Ca +18
6 ...	Ca − 7	C −14	S + 6	C + 6	Sa −19	Ca −15	S −11	C + 4	C + 5	C + 6	C +15	Ca − 2
7 ...	C + 1	C + 8	Ca + 4	S − 8	Ca + 2	C + 6	S − 1	C + 4	C + 1	Ca − 6	C − 6	M −54
8 ...	C + 2	C + 7	C + 5	Sa −33	Ca − 2	Ca + 5	C + 4	C − 2	C + 2	S + 2	C + 6	Sa +41
9 ...	C + 1	S − 9	Ca + 7	S +10	Ca + 7	C − 1	C +11	Ca − 1	Sa −33	S − 8	Ca +10	Sa −23
10 ...	C − 3	Ca −12	C − 5	S + 6	C − 8	C + 2	C −10	Ca − 5	Sa −22	S −13	Ca − 9	S +11
11 ...	Ca + 1	S + 6	C + 7	S + 7	Ca + 9	C 0	C + 5	Ca −10	Sa + 3	S +23	Ca − 1	S + 3
12 ...	Ca − 3	S −20	Ca −15	S − 9	Ca + 5	C − 1	C + 6	Ca + 5	S +18	Sa − 1	C + 3	Ca + 8
13 ...	C 0	S + 4	S −12	S − 7	Sa −21	C + 6	C +14	Ca + 8	Ca +19	Ca − 7	Ca − 3	S + 3
14 ...	Ca − 9	S − 9	Ca + 9	Ca + 8	M −52	Ma −17	S −10	Ca 0	Ca + 8	C + 7	S − 4	S − 3
15 ...	C +12	S −14	S + 6	Ca + 2	Ma −24	Ca −10	C − 9	Ca − 9	S −13	C 0	S −10	Ca + 5
16 ...	Sa −18	Ca +32	S −11	Ca + 2	Sa +32	C − 3	Ca + 3	Ca − 4	C +11	C + 4	S + 4	C + 5
17 ...	Ca − 9	S 0	S + 7	Ma −43	Ca +18	Ca +14	Sa −45	C 0	S −12	C + 4	S −10	C + 2
18 ...	Ca + 2	C + 1	S − 1	S +29	Ca +13	Ca + 8	C +29	Ca +17	C +13	S + 3	Ca + 9	C +12
19 ...	S − 9	C + 2	Ca 0	C +18	Ca + 3	Ca − 8	C + 9	Ca − 1	C +11	S −18	S +14	S −16
20 ...	C +10	C + 1	C + 5	Sa + 5	Ca + 6	Ca − 7	Ca + 1	Ca −12	C + 5	S − 5	Sa −57	S − 5
21 ...	C + 4	C + 5	C + 9	Ca − 2	Ca + 1	Ca + 4	C + 3	Ca − 3	Ca − 7	C + 6	Sa + 7	S −13
22 ...	C + 2	C + 1	C + 6	S − 1	C + 1	C + 1	C +10	Ca +10	C + 3	Ca + 8	S +18	S − 9
23 ...	Ca +10	C − 3	S − 8	Ca + 3	Ca + 2	Ca + 9	C + 3	C 0	S −29	S − 9	Ca + 8	Ca +16
24 ...	Ca − 9	Ca + 4	S −13	S + 1	Ca − 1	S − 2	Sa −27	C + 1	Ca +15	Sa −27	Ca + 3	Ca + 8
25 ...	C + 5	Ca + 3	S + 3	Ca − 6	C + 1	Ca − 3	Ca + 1	C +11	Ca +20	S + 7	Ca + 2	C + 1
26 ...	C + 8	S −11	Ca + 4	C + 9	C +11	Ca − 9	C +17	C −11	Ca −31	S 0	Ca −15	C + 2
27 ...	C − 1	C 0	Ca 0	C + 1	S +12	S + 6	C + 3	C + 2	S +14	S + 7	Ca + 3	C − 6
28 ...	Ca − 2	C − 2	C + 2	C + 6	Sa −24	C + 7	C + 6	S + 6	Sa −37	S − 3	Ca + 6	C + 2
29 ...	Ca 0		C + 2	Ca −12	S + 7	C + 2	C 0	S −66	S + 9	S − 6	C + 7	S + 6
30 ...	C + 8		Ca − 8	C + 3	S − 4	C + 3	Ca + 4	S +27	S + 6	S +11	C + 4	M −22
31 ...	C − 6		S −24		C + 2		C − 4	S + 7		S + 3		Ca +14
Average instrumental change per day ...	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C ...	18	14	8	7	9	14	18	10	9	7	11	9
Ca ...	11	6	8	9	12	12	8	14	8	4	11	9
S ...	1	8	11	11	4	3	3	7	9	18	6	9
Sa ...	1	0	2	2	4	0	2	0	4	2	2	2
M ...	0	0	2	0	1	0	0	0	0	0	0	2
Ma ...	0	0	0	1	1	1	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1892. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca − 7	Ca + 12	Sa − 52	S − 2	M − 68	Ca + 14	Ca + 13	C + 7	C − 16	C − 2	Ca + 3	Ca − 17
2 ...	C + 12	S − 21	S + 23	S + 3	Sa + 29	Sa + 10	Ca + 1	C + 8	Ca + 7	S + 3	Ca − 1	C + 11
3 ...	C + 2	S + 4	S + 10	Ca + 2	S + 15	Sa − 72	Ca + 13	S − 13	Ca + 2	Ca + 3	S + 7	C + 5
4 ...	Sa − 7	S + 1	S − 3	C − 1	S + 25	S + 42	C − 3	Sa − 39	Ca + 6	S − 9	Ma − 27	M − 25
5 ...	M − 37	S − 3	C + 16	C + 9	Sa + 5	Ca + 13	C + 7	Ca + 29	Ca + 11	S − 1	S − 55	Sa − 79
6 ...	S − 26	S + 1	G − 55	Ca − 2	S − 3	Ca + 12	C + 2	Ca + 12	Ca − 4	Ca − 3	S + 31	S + 31
7 ...	Ca + 20	S + 3	Sa − 0	S − 19	Sa + 4	Ca + 5	C + 4	S + 4	Ca − 5	C + 15	C + 25	Ca + 32
8 ...	Ca + 5	S − 6	S + 40	S + 20	Sa − 29	C + 5	C + 4	S − 37	Ca − 7	Ca − 1	C + 8	S + 5
9 ...	C + 18	Ca − 1	S + 4	S − 19	S + 31	C − 2	Ca − 14	Ca + 28	C + 6	C + 12	Ca − 2	Ca + 10
10 ...	C + 5	Ca + 15	Ca + 13	S − 5	Ca − 4	C − 2	Ca − 8	Ca + 13	Ca + 9	S − 13	C 0	C + 10
11 ...	Ca − 4	Ca − 4	Sa − 18	Ca + 6	Ca + 12	C + 9	Ca + 8	Ca + 7	S − 4	S − 34	C + 19	Ca + 6
12 ...	Ca − 4	Ca + 3	M − 71	Ca + 4	Ca + 8	C + 2	M − 23	G − 73	S + 1	Sa − 10	C − 2	S − 11
13 ...	Ca + 10	VG − 167	Ca + 36	Ca + 4	Ca + 6	C + 2	Sa − 59	Ca − 4	S − 4	S − 7	C + 2	S − 11
14 ...	C + 7	Sa + 36	S + 35	Ca − 1	C − 6	C + 3	Sa + 12	C + 40	S − 1	S + 10	S − 17	S + 7
15 ...	Ca + 4	Sa + 59	S + 18	C + 1	C + 6	C + 6	Ca + 47	C + 15	Ca − 3	Sa + 2	S − 1	Ca + 11
16 ...	Sa − 18	S + 30	Ca − 5	C + 5	S + 2	Ca − 24	M − 10	C + 4	S − 30	S + 17	Ca + 13	Ca − 3
17 ...	Sa − 6	Ca + 19	Ca + 14	C + 1	Sa − 56	Ca + 3	Sa − 38	C + 2	Ca + 17	Sa + 7	Sa − 29	Ca − 10
18 ...	S 0	Ca + 2	Ca − 3	C + 1	Ma − 55	C − 6	S + 26	C + 6	C + 4	M − 29	S 0	Ca + 12
19 ...	S + 13	Ca − 2	Ca + 10	C + 2	Sa + 23	C + 8	Ca + 11	C + 9	Ca + 9	Sa + 7	Ca + 9	Ca − 22
20 ...	Ca − 2	S + 4	Ca + 1	C + 1	S + 51	Ca + 12	S + 8	Ca 0	Ca + 9	S + 17	C + 13	C + 20
21 ...	Ca + 11	S − 22	C − 9	C + 1	S + 6	Ca − 14	S − 2	C − 12	M − 15	S + 1	Ca − 2	S + 2
22 ...	C − 4	Ca + 21	C + 10	C + 2	Sa + 5	Ca − 1	S − 17	Ca + 6	Sa − 30	S − 5	S − 5	Ca + 2
23 ...	Ca + 7	Ca + 7	C + 3	S − 6	C − 2	Ca + 4	C + 25	Ca + 6	Ca + 14	Ca + 5	Ca + 13	S − 21
24 ...	C − 9	S − 14	S − 4	Sa − 51	S + 12	S 0	Ca + 5	S − 25	Ca + 5	S − 2	S − 14	S + 7
25 ...	Ca + 1	Ca + 2	Sa − 34	Sa − 3	C − 2	S − 11	S − 4	S + 1	C + 10	C + 6	Ca 0	Ca + 8
26 ...	C + 2	Sa − 10	Sa 0	M − 73	C + 9	C + 8	Sa − 26	S + 7	Ca + 7	C + 8	Ca + 7	Ca − 2
27 ...	C + 3	Sa − 11	S + 10	S + 67	C − 4	Ma − 103	S + 22	Ca + 6	Ca + 3	Ca − 7	Ca + 7	Ca + 1
28 ...	S 0	Ca + 21	Sa − 11	S + 11	S − 4	Sa + 50	Ca + 12	C 0	S − 21	Ca + 14	Ca − 5	C − 2
29 ...	Ma − 55	S + 13	S + 8	Sa − 25	Ca 0	S + 18	S − 8	Ca + 1	Ca − 5	C − 4	Ca + 1	S − 13
30 ...	S + 34		S + 8	Ca + 25	Ca − 3	Ca 0	Ca + 12	C + 7	S + 11	Ca 0	Ca + 6	S + 11
31 ...	Ca + 8		S + 3		Ca − 22		Ca − 7	Ca − 3		Ca + 7		S + 6
Average intrumental change per day ...	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ	0·3γ
Total number of days. C ...	9	0	4	10	6	11	6	11	4	6	7	5
Ca ...	12	12	7	7	7	11	12	12	17	8	13	13
S ...	5	12	12	9	9	4	7	6	7	12	8	11
Sa ...	3	4	6	3	7	3	4	1	1	4	1	1
M ...	1	0	1	1	1	0	2	0	1	1	0	1
Ma ...	1	0	0	0	1	1	0	0	0	0	1	0
G ...	0	0	1	0	0	0	0	1	0	0	0	0
VG ...	0	1	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1893. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	S − 9	Ca + 5	Ca − 3	C +14	C + 2	C + 7	Ca +13	C + 6	Ca − 5	S +30	Sa −38	Ca + 5
2	C + 3	S + 5	C −10	Ca + 1	C + 7	Ca + 1	Ca + 4	Ca − 6	Ca −11	Sa −16	Sa −37	C + 6
3	Ca + 7	S −33	Ca − 8	C −17	C + 5	Ca 0	C + 7	Ca +15	C + 8	S −15	Sa +37	C + 4
4	Ca − 5	Sa − 9	Ca − 1	C + 1	C − 3	Ca −35	C + 7	C − 4	C + 5	Ca +21	Ca +20	Ca + 7
5	Sa + 4	S −25	C +10	Ca + 5	Ca 0	Ca 0	C + 9	Ca −10	S −12	Sa −12	Ca + 9	Sa −35
6	Ca −18	S +18	C − 1	Ca + 4	C + 1	S − 1	C − 1	Sa −34	Ca −17	S + 5	Ca + 3	S +14
7	C +14	S +12	C + 4	C − 5	S −13	C − 2	C − 1	Ca −71	S +28	S 0	Ca +10	C + 9
8	S + 3	Ca +11	Ca − 7	S − 7	Ca − 9	C +12	C + 2	Sa +60	S −39	Ca +13	Ca + 4	Ca + 4
9	S −22	C + 6	Ca − 1	C + 9	S −23	S + 4	C + 4	Ca +16	S − 4	Ca − 3	S − 4	Ca − 7
10	Ca +15	C − 4	C + 7	C − 2	Ca + 3	Ca −16	C − 5	Ca +25	S +20	Sa −41	S 0	Ca + 7
11	Ca − 4	Ca +12	C − 8	Ca 0	Ca + 6	Ca −14	Ca + 6	S +13	S + 2	S +35	Ca + 6	C − 1
12	Ca + 9	C + 5	Ca + 6	S −31	C + 3	C +17	C − 1	Sa −12	C +11	Ca + 6	Ca + 4	C + 1
13	Ca + 1	Ca +15	Ca − 8	S +15	C + 4	C +20	C 0	S −19	Ca + 7	S − 2	Ca − 6	C + 2
14	C + 6	S −12	S −20	C − 2	C +13	S + 2	Sa −26	Ca + 2	S − 2	S + 6	C + 1	C − 1
15	C + 7	S −46	S −18	S − 2	C − 6	S −25	Sa − 1	Ca − 2	Ca − 7	S − 7	C + 2	C + 2
16	C − 3	S − 4	S +17	Ca − 5	C − 2	Ca + 7	S −48	C +16	Ca +10	Ca + 7	C + 1	Ca − 4
17	Ca +16	Sa +11	Ca +12	Ca +10	Ca +19	C +14	Ca +30	Ca + 3	S −10	Ca + 1	Ca −14	C + 3
18	Ca − 6	S + 5	C + 3	C 0	S − 6	Sa + 2	Ca +10	Ma −85	Ca + 1	Ca 0	C + 2	C +11
19	S −29	Ca + 6	C + 7	Ca − 3	C − 5	S −31	Ca + 9	S +27	S + 4	C +10	C +11	C − 2
20	Ca +15	Ca − 2	C + 2	Ca +18	C + 6	S + 1	C + 7	S +24	Ca − 8	C 0	C − 1	C + 1
21	Sa −11	C + 7	C + 3	C − 2	C + 4	Ca +10	S − 7	C + 7	C + 1	C 0	C − 1	C + 2
22	S −12	C + 1	C − 2	C − 4	C + 3	C +11	S − 2	Ca + 7	C +11	C + 7	S +10	C + 8
23	Ca +12	C + 2	C + 2	C +10	C − 3	C +10	Ca + 1	Ca − 6	C + 1	Ca + 6	C −10	Ca − 8
24	C + 4	C + 5	Ca + 5	Ca −10	Ca + 6	C 0	Ca − 1	C +11	C − 1	S − 6	Ca + 4	Sa −41
25	C 0	Ca +15	M −16	C − 7	Ca −21	C 0	Ca + 1	C + 1	Ca + 3	Sa −61	Ca − 3	S − 7
26	C − 5	C − 7	M −51	M −21	Ca + 2	Ca + 7	C + 7	C − 8	M −56	S +26	Ca −11	Ca +24
27	C + 6	C − 4	S + 2	S −21	C + 7	Ca − 2	Ca + 2	C +10	S +18	Sa +21	Sa −17	S −19
28	Ca + 9	C +11	S +31	S +17	C + 3	S − 9	S − 5	C + 2	Ca +21	S −18	S + 3	S 0
30	Sa −12		S − 2	Ca +16	C 0	S −46	Ca + 7	C + 1	S + 7	S − 7	S −13	S +16
29	Ca + 4		Ca +17	C + 3	S + 8	S + 8	C − 1	Ca + 6	M −35	Ca +12	S +19	S − 4
31	C + 8		C + 5		Ca − 4		C + 3	Ca 0		Ca + 1		Ca +4
Average instrumental change per day	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C	10	10	13	13	18	10	14	10	7	4	8	14
Ca	13	7	10	10	9	10	11	13	10	10	12	9
S	5	9	6	6	4	9	4	4	11	12	6	6
Sa	3	2	0	0	0	1	2	3	0	5	4	2
M	0	0	2	1	0	0	0	0	2	0	0	0
Ma	0	0	0	0	0	0	0	1	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 5	Ca +15	Sa +20	S +68	S −13	S +34	S + 2	C + 15	Ca + 9	Ca +30	Ca + 4	C − 3
2 ...	S + 2	Sa −15	S +29	Ca +28	S +25	Ca −10	Sa − 25	C + 4	C − 3	S + 4	Ca + 5	C + 4
3 ...	Ma −35	S − 7	Ca + 9	C + 6	Ca + 9	S − 9	C − 10	Ca + 6	C + 6	C + 5	S + 3	C + 1
4 ...	M − 6	Ca +18	Ca − 4	C + 5	S −11	Ca − 2	Ca + 16	Ca + 4	C − 2	Ca +12	Ca + 5	C + 3
5 ...	Sa +18	Ca + 7	C +18	Ca − 4	C +10	C +12	Ca − 2	Ca − 8	Ca − 6	Sa −34	Ca +11	S − 4
6 ...	Sa + 8	S −16	S + 8	Sa −13	C + 3	C + 7	C + 15	Ca − 4	Ca + 7	Ca +22	Ca − 7	S −13
7 ...	Ca + 2	Ca 0	Ca + 1	S + 5	S +15	C + 7	Ca + 12	C + 4	Ca −14	Ca − 3	S − 7	Ca + 2
8 ...	C + 6	C +11	Ca + 2	Ca + 5	Ca − 18	Ca 0	Ca − 28	Ca + 9	C + 3	Ca + 8	Sa −27	S 0
9 ...	C +14	C −10	Ca −15	C +12	C + 3	Sa −33	S − 1	Ca − 10	Ca + 9	Ca − 9	C +17	C − 2
10 ...	Ca −17	C + 4	Ca + 7	Ca + 1	Ca +10	Ma −54	C + 16	Ca + 10	Sa − 8	C + 5	C + 3	C + 7
11 ...	Sa +11	Ca +11	C +13	C + 8	Ca − 3	Sa +40	C + 3	Ca − 8	S − 3	Ca + 4	C − 1	C +14
12 ...	Sa −16	S 0	C + 7	S −13	Ca 0	Ca +18	C − 2	C − 2	S 0	C + 5	Ca + 3	Ca −13
13 ...	S + 7	Ca − 2	C +13	Sa −31	S − 6	Ca + 7	Ca − 7	Sa 0	Ca +13	Ca + 1	G −97	Sa −11
14 ...	Ca + 1	Ca + 9	C −19	Ca +21	Sa −28	Ca + 3	Ca + 9	S − 27	G −68	Ca −18	Sa +15	Ca + 3
15 ...	C +12	Ca −12	Ca −11	C +13	S − 6	Ca + 6	Sa + 3	S + 2	S −10	Ca + 4	Ca +41	Sa −23
16 ...	C + 7	Ca −16	Ca − 1	C + 3	Ca +10	Ca − 1	Ca − 2	Ca + 12	Ca +43	Sa −33	S − 6	S + 4
17 ...	C + 2	S +21	Ca + 1	Ma −44	Ca + 5	S − 4	Sa − 22	C + 9	C +13	S +10	Sa +15	Ca +24
18 ...	C − 3	Ca + 4	S − 1	S −17	C + 6	Ca − 2	Sa − 9	C + 4	S + 3	Sa +10	Ma −16	C + 4
19 ...	Ca + 8	Sa −19	Ca + 6	S +30	C + 4	S + 2	Sa − 6	Sa − 11	Sa −35	S 0	S + 6	Ca 0
20 ...	C − 1	S + 7	C + 9	Ca + 9	Ca − 7	S + 4	VG −135	VG −243	Sa − 7	Ca +10	Ca +22	Ca + 9
21 ...	Ca − 6	Ma −79	Sa −23	S − 4	Ca 0	Sa −25	Sa + 58	M +161	Sa +21	Ca + 1	C +16	S −13
22 ...	S −10	Sa +36	Sa −23	C 0	S + 3	S − 7	S + 48	S + 40	Sa −11	Ca + 7	C + 2	Ca − 1
23 ...	Ca + 2	Ma −52	S +19	C +10	Ca + 1	Ca +17	Ca + 17	Ca + 14	S +18	C − 2	Sa −33	Ca + 6
24 ...	C − 4	Sa +13	Ca +15	Ca + 1	C + 6	Ca +18	Ca + 6	Sa − 8	Ca + 3	C + 2	Sa − 4	Ca − 2
25 ...	Sa +13	G −59	S − 2	Ca + 4	C − 3	Ca 0	Ca − 10	S + 13	S + 2	S − 1	S +20	C + 5
26 ...	Sa −24	Sa +73	Ca 0	Ca + 2	C + 8	C + 5	C + 3	Sa − 14	Ca + 7	Ca −17	Ca + 7	C + 8
27 ...	C +10	S +44	C + 5	C + 7	Ca +13	C 0	C + 14	C + 20	Ca + 1	S + 7	Ca + 5	Ca + 6
28 ...	Ca + 2	G −60	C + 8	S + 7	Sa −31	Ca −10	Sa + 1	Ca + 1	S + 7	Ca + 9	Ca −10	C − 2
29 ...	Ca − 2		C + 5	S +11	Ca + 2	Ca + 2	Ca + 3	C + 3	C +10	Ca + 3	Ca − 1	C − 6
30 ...	Ca − 2		Ma −75	Sa −27	Ca + 1	Ca + 4	Ca + 4	C + 3	Sa −23	S − 2	Ca +10	C + 2
31 ...	Ca − 2		Sa −34		Ca −27		C + 5	C + 3		S − 6		C 0
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	10	3	9	9	8	5	8	10	5	5	5	14
Ca ...	10	10	12	9	14	15	12	11	11	16	13	10
S ...	3	6	5	8	7	6	3	4	7	7	5	5
Sa ...	6	5	4	3	2	3	7	4	6	3	4	2
M ...	1	0	0	0	0	0	0	1	0	0	0	0
Ma ...	1	2	1	1	0	1	0	0	0	0	1	0
G ...	0	2	0	0	0	0	0	0	1	0	1	0
VG ...	0	0	0	0	0	0	1	1	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. C. S.

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	Sa −27	Ca −17	Ca +26	Sa + 3	Ca + 8	Ca − 8	Sa −11	C + 3	C + 9	Sa +48	Ca +10	C +10
2	Ca −23	Ca −23	Ca −10	Ca + 6	S − 6	Sa −14	Ca + 4	C − 2	C +12	C +14	S − 9	Ca + 4
3	Ca +14	C +27	Sa − 2	Ca − 1	Ca − 2	S − 6	C + 6	C + 2	Ca + 7	C + 3	Ca +12	Ca + 3
4	Ca + 7	Ca +22	Ca + 4	Ca + 8	C + 9	S + 3	Ca + 7	C + 2	Sa −70	S −11	Ca − 4	C + 1
5	Ca +18	Ca −11	S + 1	S −18	Ca − 8	Ca +10	Ca + 6	Ca + 6	S + 2	S + 6	Ca + 1	C + 5
6	Sa −26	Sa −25	S − 4	Ca + 5	Ca + 4	Ca + 2	S −46	C −14	C + 4	Ca + 7	C +12	Ca +10
7	S +19	Sa +12	Ca + 9	Ca + 5	Ca −20	C − 8	C +39	C + 3	C +10	Ca + 8	C + 7	M −11
8	Ca 0	Sa − 7	Sa − 9	Ca +12	Ca + 5	C +20	C − 3	C + 4	C + 6	Ca − 6	S −15	Sa −36
9	Sa −10	M − 9	Sa −16	Ca −14	Ca + 5	Ca −10	Ca +10	Ca −23	C + 6	Ca + 5	M −36	S +16
10	S − 1	S − 3	Ca +16	Ca + 4	M −11	C +11	Ca − 2	Sa −42	C − 2	Ca +14	Sa − 8	S + 2
11	S + 4	Ca +19	Ca + 8	Ma −50	Ca + 5	Ca −11	S +13	Ca +16	C + 8	Ca + 8	Sa +18	Ca − 3
12	Ca + 6	Ca +10	Ca +10	Sa +16	Ca +14	C + 8	Sa −20	C + 6	C − 1	S −28	S + 9	Ca + 7
13	Ca 0	Ca − 2	Ma −43	S +19	C −12	C + 8	Ca −19	C +18	C +13	Sa −33	S − 2	Ca + 7
14	C + 3	Sa −10	Sa −18	Ca 0	Ca − 7	C − 1	S − 1	C + 1	Ca + 3	S +23	C +10	Ca + 3
15	Ca + 6	M −15	Ca +25	Ca + 2	C + 8	Ca +22	Ca + 8	C + 1	Sa −32	Sa + 7	S + 1	Ca − 6
16	Ca −14	Sa −12	S + 5	Sa − 9	C +12	Ca − 4	Ca + 6	C + 1	Ca + 3	Sa + 7	Ca + 3	C + 3
17	Sa −15	S +15	Sa − 5	Ca + 5	C −11	Ca −28	Ca − 2	Ca +14	Ca +10	Sa −27	Ca +11	C − 4
18	S +13	Ca + 8	S +7	C − 1	Ca − 3	C + 5	C + 4	Ca −26	Ca + 5	Ca +24	C − 1	Ca + 7
19	Sa −14	Ca + 4	Ca + 1	Ca + 9	C +17	C + 6	C + 2	C +15	S − 7	C + 7	C + 4	Ca 0
20	S + 4	Sa 0	Ca − 3	C − 6	C 0	C + 1	Ca 0	Ca +20	Sa − 5	Ca + 6	C + 7	C +10
21	Ca + 2	C + 7	Ca + 4	C +10	Ca 0	C +15	C + 1	C − 6	C + 9	Ca 0	C − 4	Sa − 5
22	Ca + 6	C + 7	S + 5	C +15	Ca − 2	Ca −13	C + 3	C + 4	Ca 0	Ca + 4	C + 8	Ca −19
23	Ca + 9	Ca + 6	Ca − 3	Sa − 9	C + 6	Ca − 8	C 0	Ca + 6	Ca + 6	Ca + 1	Sa −42	S 0
24	Ca − 6	Ma −45	Ca +18	Ca − 9	C + 5	C − 3	C + 4	C −14	C − 1	C + 2	Sa −18	Sa −16
25	C +10	Ca +19	S − 2	S + 9	C − 5	C +10	Ca +16	C 0	Ca − 9	C + 5	S +28	Ca +10
26	C +11	C +26	Sa −15	Ca −11	C + 4	C +10	S −19	C − 2	C + 6	S 0	Ca +10	C + 9
27	C − 3	Ca +11	Ca − 2	Ca 0	C + 6	Ca + 9	S − 8	C + 6	C + 5	Sa −54	S + 1	C + 4
28	C + 4	Ca −33	Ca +16	C + 7	S − 9	S − 7	Ca 0	C + 2	C + 1	S + 2	S −11	C + 4
29	C −23		Ca + 8	C + 4	Sa −22	Ca −15	Ca − 2	Ca − 4	S + 6	Sa + 2	S + 3	C + 5
30	C +12		Sa −13	C +11	S − 3	Ca −11	Ca + 6	Ca +10	Sa −71	Ca + 8	Ca + 6	C − 1
31	C + 4		S − 4		Ca − 1		Ca +15	C − 6		Ca + 6		C + 5
Average instrumental change per day	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C	8	4	0	7	12	13	9	21	15	5	8	12
Ca	13	13	16	15	14	13	15	9	8	13	8	12
S	5	3	7	3	3	3	5	0	3	6	9	3
Sa	5	5	7	4	1	1	2	1	4	7	4	3
M	0	2	0	0	1	0	0	0	0	0	1	1
Ma	0	1	1	1	0	0	0	0	0	0	0	0
V	0	0	0	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	C + 5	Sa −31	Ca +18	C + 7	Ca + 5	C + 4	C −18	S − 1	C − 9	Sa + 6	C +15	Ca − 4
2	S − 6	S − 6	Ca +16	C − 2	G −92	C +10	C + 3	Sa −24	Ca + 5	Ca − 7	C + 4	C + 2
3	Sa −28	S + 9	Ca − 2	Ca − 4	Ma −23	C + 2	S + 1	Sa + 7	Sa + 4	Ca − 2	C − 1	Sa −17
4	Sa − 1	Sa −12	Ma −39	Ca − 8	Ca +68	C − 7	Sa −12	Ca + 6	C − 6	C + 6	Ca −10	M −43
5	Sa + 1	S + 2	Ca + 8	Ca −10	Ca +27	Ca − 4	Sa + 1	C +12	Ca 0	C + 5	Sa + 3	S +20
6	Sa + 3	Ca +14	S +19	C +10	Ca +11	C 0	S + 2	Sa + 4	S − 2	C + 2	Ma −42	S + 9
7	Sa − 3	C + 8	Sa −10	C +16	C −14	C + 4	Ca + 6	Sa −27	C + 5	C + 5	M −11	Ca + 3
8	Ca + 9	S − 8	C +10	Ca + 5	C +13	Sa + 9	C −10	S +13	Ca +10	S −10	Sa + 5	C + 7
9	Sa −16	Ca + 6	Ca +11	Ca −13	C + 8	Sa −22	C + 7	Ca + 1	C + 4	Sa −14	Sa +15	C 0
10	S + 5	Ca + 4	C + 7	Ca +14	C − 3	Ca + 1	C +12	Ca − 3	C − 5	Sa + 2	S + 6	Ca + 7
11	Ca + 9	Ca − 2	Ca +10	Ca + 1	Ca + 7	C + 7	Sa −19	Ca + 6	Ca + 1	Sa −11	C +10	Ca 0
12	Ca + 5	Ca + 2	Sa −39	C + 4	Sa − 8	C + 3	S −23	Ca + 1	S −10	M −42	C + 8	C +13
13	S − 5	Sa +11	S +17	C 0	Ca + 5	C + 9	Ca +20	C + 4	Ca − 8	Sa +29	C − 6	M −21
14	Sa + 5	Sa −22	S − 4	Ca + 5	Ca + 2	S − 7	Ca + 5	C + 8	Ca +14	Ca +12	C − 1	S − 6
15	Ca + 6	S + 7	S + 8	C − 9	Ca − 4	Ca −13	Ca + 1	C − 6	Ca − 1	S + 4	Ca + 1	S + 6
16	Ca + 8	Ca + 8	C + 6	C +10	Ca + 7	Sa − 6	Ca − 1	C + 3	Ca −16	S − 8	Ca +15	Ca + 5
17	Sa −22	Ca − 5	C + 3	S −10	Sa −17	S − 1	C + 4	Sa +11	Sa 0	C + 8	Ca + 7	C +10
18	Ca + 8	Ca + 7	C +10	Ca − 9	Sa −33	Ca + 3	C + 7	C −24	Ma −81	C + 7	Ca −26	C + 7
19	Sa −13	Ca − 2	C + 1	Ca +11	S + 5	C + 7	C 0	Ca +11	Ca +50	Ca − 4	C + 9	C 0
20	S − 1	C + 3	S −16	Ca + 9	Sa +11	C + 3	Ca + 4	Sa − 5	Sa −21	Ca +10	Ca +14	C + 4
21	Ca +12	Ca + 1	C +14	Sa −24	S + 5	C − 1	Ca − 1	S −56	S +24	C 0	Ca − 8	C + 1
22	Ca + 1	C − 2	Ca +10	Sa −25	S 0	C + 4	C − 1	S +31	S +20	C + 6	C + 3	C + 7
23	Ca + 6	Ca + 4	C − 4	Sa − 2	S + 2	C + 5	Sa +12	Ca + 1	Ca − 5	C − 5	C + 5	C −21
24	C − 2	C +14	C + 8	Sa + 7	Ca + 2	C + 6	Sa −22	Ca +11	Ca − 4	Ca + 8	C + 1	C + 8
25	Ca − 2	Ca − 4	Ca −25	S + 3	Ca 0	C + 1	Sa −13	Ca − 1	C +17	C + 4	C + 7	C + 4
26	C + 5	Ca − 4	Sa −30	Ca + 5	C +10	Ca 0	Ca + 7	Ca + 7	C + 9	C + 3	C + 4	Ca + 4
27	C − 2	S −31	Sa + 6	Ca +10	C − 4	C −15	S + 1	C 0	C − 5	C − 4	C − 8	Ca − 7
28	C +15	M − 5	S 0	Ca + 2	C +18	C + 2	C + 5	C + 5	Ca +17	C + 6	C − 4	Ca − 4
29	Ca +19	Sa + 1	S +14	C − 2	C + 6	S +18	C +10	Sa + 7	Ca − 6	C + 6	C − 3	Ca + 4
30	Sa −46		C +11	C +12	C −10	Ca − 9	C − 9	Ca − 7	Ca + 1	S −18	C + 6	Ca − 1
31	S + 4		Sa −10		C − 4		C +10	C + 2		C − 5		C 0
Average instrumental change per day	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C	5	4	10	10	10	19	13	9	8	15	17	14
Ca	11	13	8	14	11	6	8	11	14	6	7	10
S	5	6	7	2	4	3	4	4	4	4	1	4
Sa	10	5	5	4	4	2	6	7	3	5	3	1
M	0	1	0	0	0	6	0	0	0	1	1	2
Ma	0	0	1	0	1	0	0	0	1	0	1	0
V	0	0	0	0	1	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1897.	Month.											
Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Sa − 5	Ca − 1	S +13	S −19	C +14	Ca +17	C +12	Sa +15	C + 3	S − 8	Sa 0	Ca − 8
2 ...	Ma −113	C + 6	Ca − 5	S − 9	Sa − 8	S + 5	C + 4	Ca +14	C + 3	S −13	Ca − 7	C + 2
3 ...	Sa + 56	Sa −19	S −11	Ca +34	S + 2	S −28	C − 9	C +10	Ca + 3	Ca + 7	C + 8	C + 9
4 ...	C + 24	Sa −11	Sa −22	Ca −11	Ca + 1	Ca +10	C − 1	C 0	S − 7	Ca + 4	Ca + 9	Ca − 3
5 ...	C + 11	C +12	Ca + 4	Ca − 4	Ca + 7	Ca +11	C +12	C + 5	S −14	C 0	Ca − 4	Ca − 4
6 ...	C + 6	Ca +10	S +15	S − 5	S − 9	C + 5	C − 4	C + 5	Ca + 8	C − 4	C − 9	C + 1
7 ...	C + 13	C −18	Ca +10	S + 2	C + 5	C − 1	Ca − 7	C + 7	C + 6	C + 1	C + 9	C + 3
8 ...	C − 7	C + 9	S −24	Ca + 9	Ca + 4	C + 3	C − 2	Ca − 2	C + 2	C + 5	C − 2	C + 5
9 ...	C + 9	C + 8	S +10	S + 2	C + 6	C + 6	C + 8	Ca − 6	C −10	Ca +10	C − 6	Ca + 3
10 ...	Ca 0	Ca − 1	S +11	S −18	Ca + 4	C + 3	Ca + 7	C − 5	S +10	Ca −20	C + 9	S −23
11 ...	Sa − 23	C + 4	Ca − 3	Ca +19	Ca −13	S − 6	C −16	C + 2	Sa −26	C − 7	C + 1	Ma −55
12 ...	S + 2	Ca 0	Ca + 7	C + 5	C +10	Ca + 8	C + 2	C − 1	S + 6	Ca + 2	C + 1	S +19
13 ...	Ca − 3	C − 1	Ca −10	Ca −12	S +11	Ca + 4	C − 3	C − 5	S +16	C + 8	C + 3	C +18
14 ...	Ca + 14	Sa − 7	Ca +11	Ca −11	Sa −34	C − 9	S + 7	C − 7	S −17	C + 5	S −17	C +10
15 ...	Ca − 12	C + 3	C + 3	C +15	Ca 0	S + 1	Ca −10	Ca +11	Ca +11	S + 2	Ca + 1	Sa + 4
16 ...	C + 12	C + 7	C + 6	Ca − 3	C + 8	S −18	C − 1	C − 3	Ca + 3	Ca − 2	C + 5	Ca + 5
17 ...	Ca − 3	C − 1	C + 1	Ca − 5	Sa −32	S −26	C + 1	C − 2	C +10	S − 2	Sa −27	Sa − 1
18 ...	C + 12	C + 5	C − 3	Ca + 2	Ca +30	Ca +15	C + 5	C − 7	C + 3	Ca −23	S +15	Ca − 4
19 ...	C + 1	C + 3	Ca + 2	Sa +12	S − 6	Ca + 4	Ca + 4	Ca + 7	C − 1	Ca +15	C + 4	C +11
20 ...	C 0	C + 7	C + 1	Ma −65	Ca 0	Ca + 5	C − 4	S −11	C − 9	C + 7	S − 3	Ma −59
21 ...	C + 4	C −16	C + 2	Ca +32	Sa −23	Ca + 5	Ca − 3	C + 9	Ca + 1	C +10	Ca + 7	Sa +20
22 ...	C + 5	C + 3	Ca − 2	Ca +25	S +14	Ca − 4	Ca −17	C + 8	C − 1	Ca + 3	C − 3	S +11
23 ...	C − 2	Ca − 7	Ca −14	Sa −26	S + 3	C + 3	Ca +11	C + 1	Ca −10	Ca − 7	Ca +13	Ca +13
24 ...	C − 9	S + 9	S +10	Sa + 3	C + 1	C + 3	Ca + 5	C − 5	C − 4	Ca + 3	Sa − 7	Ca − 2
25 ...	C − 6	Sa +10	C − 1	S + 5	C + 4	C + 5	C + 3	Ca 0	C + 9	C − 2	S − 3	C − 1
26 ...	C + 7	S −28	C + 8	S + 2	C + 5	Ca + 4	C + 3	C − 6	C + 3	Ca − 1	Ca + 2	C + 8
27 ...	C 0	Sa −16	Ca 0	Ca + 5	C + 7	Ca − 5	C − 5	Ca + 5	C + 2	S + 3	Ca + 2	C + 5
28 ...	Sa + 6	Sa +23	Ca − 1	Ca + 6	C + 8	C 0	C + 1	C + 3	C +11	S −10	C 0	C +11
29 ...	Sa − 10		S −18	C + 3	S + 1	C − 1	C + 5	C + 7	C − 4	S − 8	Ca + 5	S −37
30 ...	S − 2		S 0	Ca 0	Sa −34	C + 4	S − 4	Ca − 3	C − 3	Ca − 1	C + 4	S +14
31 ...	S 0		C + 1		Ca +13		Sa −59	Ca + 3		C +11		Sa − 9
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	17	15	9	3	10	12	20	20	17	11	14	12
Ca ...	5	5	12	15	9	12	8	9	6	13	9	8
S ...	4	2	9	8	7	6	2	1	6	7	4	5
Sa ...	4	6	1	3	5	0	1	1	1	0	3	4
M ...	0	0	0	0	0	0	0	0	0	0	0	0
Ma ...	1	0	0	1	0	0	0	0	0	0	0	2
V ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca + 2	C + 7	Ca + 3	C −16	Ca − 8	Ca + 4	C 0	C +10	Ca −11	Ca + 5	Ca +20	C +20
2 ...	Ca +11	C 0	Sa −44	C + 4	C − 4	Ca − 2	C + 5	S −12	Sa − 6	C + 7	Ca + 2	C + 2
3 ...	C + 1	C − 6	C +22	Ca + 5	S +16	C + 7	Ca + 2	Ca −14	Sa −25	C + 6	Ca − 5	Ca − 7
4 ...	C + 4	Ca +11	C +11	S −22	S −32	C + 3	C + 2	C +13	Ca +16	C + 5	C − 5	C + 1
5 ...	C + 4	S − 9	Ca − 3	Ca + 6	S +12	C + 5	C − 9	Ca + 1	Ca 0	C + 1	C + 7	Sa +15
6 ...	C 0	Ca −13	S −11	Ca − 4	Ca + 9	Ca + 8	Ca − 1	Ca − 2	C + 8	Ca +12	C + 4	Ca + 3
7 ...	C + 3	C +10	Ca +13	Sa − 3	C − 1	Sa −16	C − 2	C + 5	C +19	Ca −19	C − 4	Sa −23
8 ...	C + 3	C + 6	C + 1	S +20	C + 2	Ca − 1	Ca 0	Ca + 2	Sa 0	C + 1	Ca + 7	Ca +11
9 ...	C − 1	C 0	C + 5	Ca + 7	Ca + 4	C + 7	C + 3	Ca + 5	G −99	C + 2	C −18	Ca − 9
10 ...	S −11	Ca +11	Ca − 1	C + 4	C + 6	Ca + 4	C + 8	C + 1	M −35	C − 7	C + 9	C + 3
11 ...	S −14	M −37	Sa −28	C + 2	S 0	Ca − 6	C + 2	Ca + 3	Ca +47	C +10	C + 1	Ca + 6
12 ...	Ca +14	S − 5	S +10	S −43	S −12	C + 1	C − 2	C − 5	Ca +25	C + 2	Ca + 9	Ca +10
13 ...	Ca 0	S +12	Ca + 6	Ca +30	Ca + 7	C + 2	C − 2	C −13	Ca +14	C − 3	C − 2	Ca 0
14 ...	C +10	S −15	Sa + 5	S − 1	Ca + 7	C + 4	C − 1	C +12	S −14	Ca − 3	C 0	S −35
15 ...	Sa − 2	S + 6	Ma −78	S +12	S −11	S − 1	C 0	C + 8	Ca +21	Ca +10	Ca + 3	S +10
16 ...	Sa −15	S + 2	Sa − 5	Ca + 2	Ca + 4	C − 2	C + 4	Sa −19	Ca +17	Ca − 7	Ca + 5	S − 9
17 ...	Sa − 2	S + 4	S +42	Ca + 1	C + 4	C + 5	C − 2	S −18	Ca − 4	C + 3	S −21	Ca + 2
18 ...	Sa + 2	Ca + 5	Sa +13	S + 4	Ca + 8	Ca + 6	C + 6	S +12	Ca − 6	C 0	S − 6	Ca +14
19 ...	S + 1	Ca + 9	S − 2	C + 5	C + 2	Ca − 3	S +10	Ca + 5	Ca + 4	Ca +11	C +14	S − 2
20 ...	Sa + 5	S + 3	S + 3	C − 3	C − 3	C 0	Ca −31	Ca 0	C + 7	Sa −26	Ca + 6	Ca − 3
21 ...	Ca − 3	S −11	Ca + 7	C + 6	C − 1	C + 1	S +10	Ca − 2	C − 3	S + 2	Sa −17	Ca + 6
22 ...	C + 4	Ca − 2	C + 4	C + 3	C +11	Ca +12	S − 4	S + 1	Ca +12	Sa − 8	Sa −27	Ca − 4
23 ...	C + 5	C +11	Ca + 2	Ca − 3	C − 6	Ca −23	Ca − 3	Ca + 3	S −11	Ca + 7	Ca +18	C + 4
24 ...	Ca + 7	C − 2	Ca + 1	C + 7	C − 1	Ca + 7	S − 2	C + 3	Ca − 9	Ca + 8	Ca + 13	C + 4
25 ...	Ca + 1	C + 2	C − 3	C − 9	C + 4	Ca + 4	S − 3	C + 1	Ca + 3	Sa −21	C 0	C + 2
26 ...	S − 6	C + 8	Ca +12	C + 3	C + 4	S −22	Ca + 6	S + 6	C +11	S + 3	Ca − 4	C + 5
27 ...	Ca 0	C 0	Ca + 2	Ca + 9	Ca − 3	Ca − 2	S + 9	Ca − 8	C + 2	Ca + 7	S 0	Ca + 2
28 ...	Ca − 8	C 0	Ca + 1	C − 9	C −17	Ca +16	Ca − 7	Ca −13	Ca −28	S − 4	C +11	Ca −11
29 ...	Ca + 6		C − 6	C + 5	S + 2	Ca − 7	C + 3	Ca +10	Sa − 3	Sa −23	Ca − 2	C + 5
30 ...	Ca + 9		Ca − 3	Ca − 1	Sa −21	C − 2	Ca +11	C + 1	Ca +15	Sa +14	Ca + 4	C − 1
31 ...	C − 1		Ca +12		Ca + 8		C − 5	Ca +12		Ca + 8		C − 2
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	11	12	7	13	14	12	17	11	6	12	12	11
Ca ...	11	6	13	10	9	15	8	14	16	11	13	14
S ...	4	9	5	6	7	2	6	5	2	3	3	4
Sa ...	5	0	5	1	1	1	0	1	4	5	2	2
M ...	0	1	0	0	1	0	0	0	1	0	0	0
Ma ...	0	0	1	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	1	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 2	Ca −10	C − 7	Ca + 5	Sa + 5	Ca −13	Ca +14	C + 5	Ca + 4	C + 2	C + 6	Ca + 5
2 ...	Ca − 2	C − 2	C +10	Ca + 2	S −13	Ca − 1	S + 6	Ca + 2	Ca − 2	C + 2	C + 4	Ca − 7
3 ...	Ca −10	C + 3	Ca − 4	Ca + 2	Sa +20	Ca − 1	Sa −10	Sa − 9	Ca + 2	C 0	Ca 0	Ca + 5
4 ...	Ca − 5	C + 5	C + 4	Ca − 7	Ca −27	Ca + 5	Sa + 9	Ca −14	Ca 0	Ca + 5	Ca −18	C + 2
5 ...	C − 1	C + 5	C + 3	Ca − 2	Sa −10	C + 2	Ca + 8	Ca + 9	C 0	Ca + 3	Ca + 5	C + 2
6 ...	Ca + 8	Ca + 7	Ca + 5	Ca + 8	C +25	C + 6	Ca + 7	Ca + 1	C − 2	Ca −12	C + 2	C + 7
7 ...	C + 4	Ca + 4	Ca −14	Ca − 6	Ca + 9	C + 2	Ca + 5	Ca − 8	C + 3	Ca + 3	C + 7	Ca −13
8 ...	C + 5	Ca − 9	Ca +10	Ca + 3	Ca + 6	C + 5	Ca − 5	Ca + 2	Ca + 6	C + 4	C + 1	Ca − 9
9 ...	Ca + 2	C − 8	S + 1	Ca − 3	C 0	C + 2	C + 4	Ca + 5	Ca − 2	C + 3	C 0	C + 5
10 ...	C 0	C +12	Sa − 9	Ca − 2	Ca + 6	C − 3	Ca + 6	C − 8	Ca − 8	C + 2	C + 6	C + 8
11 ...	C − 1	Ca + 5	Sa − 4	Ca − 3	S − 2	Ca − 7	Ca − 8	C + 5	C + 9	C − 1	Ca − 7	C + 8
12 ...	Ca − 6	Ma −97	Ca + 3	Ca + 2	C − 8	Ca + 1	Ca − 1	C + 7	Ca − 1	C + 5	Ca − 1	C − 5
13 ...	C + 2	Ca +51	S − 7	C + 4	C +11	Ca −11	C − 3	Ca − 9	Ca − 6	C + 1	C − 6	C − 4
14 ...	Ca + 8	Sa + 7	Ca + 9	C + 4	Ca + 4	C + 6	C + 8	C + 5	Ca +12	C − 2	C + 7	C + 6
15 ...	Ca − 9	Ca + 6	Ca 0	C + 4	Sa −17	C 0	C + 7	C + 4	S −13	S −24	C − 2	C + 3
16 ...	S − 5	Ca + 4	Ca + 4	C − 4	Ca −18	C + 6	C + 1	C − 3	Ca 0	C + 6	C + 4	Ca + 8
17 ...	S + 2	Ca + 6	C + 3	Ca − 4	Ca + 7	C + 1	C + 2	C − 3	Ca − 2	Ca − 1	Ca + 5	C −11
18 ...	Sa − 5	C + 6	C 0	Sa −38	C + 9	Ca 0	C − 3	C + 4	Ca − 9	Ca + 2	Ca +10	Sa + 3
19 ...	Ca + 4	Ca + 5	C + 1	Sa + 6	C + 3	C + 3	C + 1	C +10	Ca + 9	C +10	Sa − 8	Sa −16
20 ...	Ca − 5	Ca − 6	Ca + 4	Ca + 6	Ca − 7	C − 6	C + 1	Sa −25	C + 4	C + 1	C − 7	Ca + 3
21 ...	Ca + 3	Ca − 9	Ca −10	C + 7	C +13	C + 4	C + 2	S − 3	Ca − 1	C + 9	C − 1	Ca − 1
22 ...	Ca + 6	Ca + 8	Sa −38	C + 2	C − 3	C + 7	C − 4	Ca + 6	Ca +11	Ca − 9	Sa −11	C 0
23 ...	S −19	Sa − 5	Sa −17	Ca + 8	Ca +12	Ca − 5	C + 1	C + 1	Ca − 2	Sa −13	S 0	C + 2
24 ...	C +13	Ca −11	Ca +18	Ca + 3	C + 2	C − 5	Ca + 3	C + 5	Ca + 4	Ca − 1	Ca + 2	C + 5
25 ...	C + 1	Ca 0	C +13	Ca − 9	C − 3	C + 1	Ca −12	C 0	Ca + 5	Ca + 4	C + 2	Ca + 1
26 ...	C − 1	Ca + 7	C + 2	C + 9	S − 3	Ca + 8	Ca + 1	C + 2	Sa −28	Ca + 1	C + 4	Sa − 1
27 ...	C + 7	Ca +13	C +10	C + 5	C − 1	S −15	C − 1	Ca + 3	S − 4	Ca 0	C + 1	Ca − 6
28 ...	Sa −12	Ca − 6	Ca + 5	C − 2	C + 2	Sa − 6	C +10	Ca +14	Ca + 8	C + 3	C + 3	Ca − 1
29 ...	S −20		C + 8	Ca + 5	C + 2	Sa −15	C 0	S 0	Ca − 5	C + 7	C − 3	Ca − 2
30 ...	Ca +14		C + 4	Ca −14	Ca + 6	S −25	C − 5	Sa −22	Ca + 9	C + 6	Ca 0	Ca + 4
31 ...	C + 3		C + 2		Sa −12		C + 7	S − 4		C − 5		Ca − 1
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	12	7	13	9	13	16	17	14	5	18	18	14
Ca ...	13	18	12	19	10	10	11	11	22	11	9	14
S ...	4	0	2	0	3	2	1	3	2	1	1	0
Sa ...	2	2	4	2	5	2	2	3	1	1	2	3
M ...	0	0	0	0	0	0	0	0	0	0	0	0
Ma ...	0	1	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1900.	Month.											
Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C 0	C 0	Ca +12	C + 4	Ca − 54	C +16	C + 5	Ca 0	C + 7	C + 3	Sa +11	Ca − 9
2 ...	Ca + 4	C 0	Ca − 4	C − 1	Ca + 26	C − 3	C − 8	C + 2	C + 2	C − 2	Ca − 1	Ca −10
3 ...	C + 2	C − 2	Ca 0	C + 6	Ca + 6	C − 6	C + 7	C + 6	Ca − 5	C + 8	C − 2	C + 1
4 ...	Ca + 6	Sa − 6	C + 2	Ca − 1	Ca + 7	C + 5	C + 5	C − 2	Ca + 6	Ca − 3	C +10	C + 2
5 ...	Sa −36	Ca −16	C + 7	Ca −13	Ma −107	C + 7	Ca + 3	C − 7	Ca − 7	C −14	C + 4	C − 1
6 ...	Ca +12	C +11	Ca + 5	Ca + 7	Ca + 47	C + 2	C + 3	C + 5	C + 4	C +12	C − 4	C + 6
7 ...	C + 2	C + 8	C − 9	C − 2	Ca + 16	C 0	Ca − 5	Ca + 3	C − 2	C − 2	C + 1	Ca − 4
8 ...	C + 6	Ca +11	Sa −19	C − 5	Ca + 17	C + 1	C − 1	Ca −19	C + 4	Ca − 1	C − 1	C − 4
9 ...	C +11	Ca −12	S −28	Ca +10	C + 6	C − 2	C + 4	C + 6	C + 2	C − 4	C 0	Ca + 8
10 ...	Ca − 5	Ca − 3	C +20	Ca −16	C + 6	C − 3	C − 6	C + 7	C − 8	Ca + 8	C + 3	C −18
11 ...	Ca + 2	Ca − 3	C +11	C + 5	Ca + 1	C + 3	C + 4	Ca + 9	C 0	C + 1	C − 2	C + 9
12 ...	Ca −10	C + 7	Ca + 4	C + 1	Ca + 6	C + 2	C + 1	Ca + 1	C + 6	C + 4	Ca − 1	C + 3
13 ...	Ca − 1	C + 5	Ma −94	C − 2	C − 12	C + 3	C − 6	Ca − 7	C + 5	C + 1	C − 4	C + 1
14 ...	S 0	Ca − 1	Ca +60	C + 7	C − 4	C 0	C + 5	C − 7	C − 8	C − 3	Ca 0	C + 5
15 ...	S −11	Ca −13	C +18	C +10	C + 15	C − 1	C + 3	C +14	Ca + 1	C 0	Ca + 2	C − 1
16 ...	Ca + 6	C + 2	C + 5	C − 2	C − 1	C − 3	C − 6	C − 5	C − 7	C + 1	C + 1	C − 2
17 ...	Ca + 2	C + 9	C + 9	Ca 0	C + 3	C + 4	Ca + 3	C + 2	C + 5	C + 1	C 0	C 0
18 ...	Ca + 5	C + 4	Ca + 7	C −11	Ca + 7	C + 2	C − 6	C − 8	C − 2	C − 1	Ca 5	C + 4
19 ...	Sa − 8	C + 8	C 0	C + 4	C − 12	C 0	Ca + 1	Ca + 5	C + 4	C + 3	C + 3	C − 3
20 ...	Sa −10	Ca + 3	C + 5	C + 4	C + 8	C − 3	Ca − 7	Ca − 1	C + 2	Ca − 2	C + 6	C − 1
21 ...	S − 7	Ca −18	C + 1	C − 2	C − 1	C + 1	C + 7	C − 5	C 0	Ca − 8	C 0	Ca + 4
22 ...	Ca +25	C + 7	Ca − 2	C + 2	C − 3	C + 2	C 0	C + 6	Ca − 5	C + 2	Ca − 2	C 0
23 ...	Ca 0	Ca +10	Ca − 5	Ca − 3	C + 6	C − 5	C +10	C − 4	C − 4	Ca + 5	Ca + 5	C − 1
24 ...	Ca + 4	Ca −16	C + 2	Ca − 9	C − 1	C − 2	Ca −10	Ca + 5	Ca + 4	Ca + 4	C − 9	C + 5
25 ...	Ca − 1	Ca + 3	C + 6	C +11	C − 1	C + 2	C − 6	Ca − 6	C + 1	Sa −44	C − 4	C −15
26 ...	Sa −12	C + 2	C − 4	C + 5	C − 3	C − 1	C − 1	C + 1	C + 6	Ca +20	C 0	Ca + 7
27 ...	Ca − 1	Ca + 3	C + 1	C − 4	C + 5	Ca +10	C + 3	Ca + 2	Ca − 2	Ca − 3	C + 2	S − 8
28 ...	Ca +10	C − 3	Ca +12	C 0	C + 5	Ca −17	Ca + 1	C − 8	Ca −21	C + 3	Ca +11	Ca − 6
29 ...	C + 2		Ca − 7	C + 8	C − 4	Ca + 2	C 0	C + 2	C +11	C + 4	Ca − 8	Ca + 1
30 ...	C + 5		Ca − 9	Ca − 7	C − 11	C − 6	C − 1	C + 5	C − 1	Ca − 5	C + 3	C + 3
31 ...	C −11		Ca + 1		C 0		Ca + 4	C + 5		C + 5		C − 1
Avarage instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	8	14	15	21	20	27	23	20	22	20	20	22
Ca ...	16	13	13	9	10	3	8	11	8	10	9	8
S ...	3	0	1	0	0	0	0	0	0	0	0	1
Sa ...	4	1	1	0	0	0	0	0	0	1	1	0
M ...	0	0	0	0	0	0	0	0	0	0	0	0
Ma ...	0	0	1	0	1	9	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1901.	Month.											
Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	S +21	C − 5	C + 1	S +10	C + 1	Ca + 3	C − 9	C + 2	C − 7	C − 9	C +14	Sa + 4
2 ...	Ca −11	Sa −17	C + 6	Ca − 9	C − 1	C − 8	C + 4	C + 4	C + 2	C + 3	C + 2	Sa −33
3 ...	C 0	C + 7	Ca − 4	C + 7	C − 4	C + 5	C + 7	Ca − 5	C − 1	C − 1	S + 1	C + 7
4 ...	S +13	C + 4	C − 2	C 0	C − 1	C + 2	Ca − 2	Ca −11	C − 4	C + 5	Ca −31	C + 4
5 ...	Sa −13	C + 3	C + 2	C + 3	C + 4	C + 1	C − 6	C − 2	C + 3	C − 6	Ca +20	Ca − 8
6 ...	Ca − 2	C − 1	C + 1	C + 9	C + 5	C + 7	Ca + 1	C +12	C + 2	C + 5	Ca − 3	C + 7
7 ...	Ca + 5	C + 1	C − 5	Ca −12	C − 2	Ca −10	C − 2	Ca +11	C − 2	Ca + 2	Ca + 3	C + 5
8 ...	C + 1	C + 1	C + 3	C − 4	C + 3	C + 1	C + 7	C −20	C + 1	S −11	Ca − 2	Ca + 6
9 ...	Ca + 4	C + 1	C − 3	C + 2	C − 4	C − 3	C + 4	C + 9	C + 9	S −13	Ca − 1	S − 5
10 ...	C − 7	C − 2	C + 8	Ca + 7	Sa −12	C 0	C − 7	C − 1	Sa −22	Ca + 7	C + 5	C − 4
11 ...	Ca 0	C + 7	C − 4	C − 1	Ca − 8	C + 1	S + 8	C − 2	Ca − 7	C + 2	S − 2	C + 5
12 ...	C − 2	S −12	Ca 0	C − 1	Ca + 3	C + 5	Ca −29	C + 4	Ca + 1	C + 4	C 0	C + 1
13 ...	C + 6	Ca + 1	Ca −12	Ca + 1	C + 3	S + 5	C +14	C + 3	C + 8	Ca + 1	C + 2	C 0
14 ...	Ca + 5	C + 3	C + 9	Ca − 8	C + 2	Ca −16	C + 5	Sa −21	C + 1	C 0	C + 3	C + 1
15 ...	Ca − 1	C + 5	C +10	Ca + 2	C 0	Ca − 9	Ca + 2	S − 6	C + 8	C + 2	C − 1	C − 3
16 ...	C − 2	C + 6	C + 1	C − 3	C + 4	C + 5	Ca − 7	Ca + 4	Ca + 8	Ca − 3	Ca − 1	C + 6
17 ...	C + 3	C 0	C − 8	C 0	C + 6	C + 6	S − 8	C + 6	Ca −15	C + 2	C − 3	C − 3
18 ...	C − 1	C − 2	S − 4	C + 8	C 0	C + 3	Ca + 9	C + 1	C + 2	C 0	C + 4	C + 2
19 ...	C + 4	S −18	C − 4	C + 1	C −11	Ca + 6	Ca + 3	C + 5	C + 5	C + 6	S −10	C − 2
20 ...	Ca − 1	S 0	Ca + 3	C 0	C 0	S + 2	Ca 0	Ca + 3	C − 2	C − 1	C + 1	C − 5
21 ...	Ca − 8	C + 2	C + 4	C + 1	C + 3	S − 3	C 0	C − 5	C + 1	C − 6	C + 4	C + 2
22 ...	Sa − 1	Sa 0	C 0	S − 3	C + 7	C − 2	C − 4	C 0	C + 4	C + 1	C + 1	C + 2
23 ...	Sa −13	S +10	S + 4	C −13	S + 5	C + 1	C + 8	C + 2	Ca + 1	C + 1	C + 5	C + 1
24 ...	Ca + 2	C − 8	M − 48	C + 1	S −11	C − 2	C + 4	C + 6	C − 5	C + 5	C − 1	Ca + 4
25 ...	C + 6	C − 2	Ca +12	C +14	Ca + 2	C 0	C − 2	C + 3	C − 2	S −10	Ca + 5	C − 6
26 ...	C + 1	C + 8	C +14	C 0	Ca + 1	C − 1	C 0	C − 8	C + 5	C − 7	C − 5	C + 2
27 ...	Ca + 6	C + 5	C + 8	S 0	C − 4	C +10	C − 4	C − 8	C − 6	Ca +13	C 0	Ca + 2
28 ...	C − 1	C − 2	C + 3	C −10	C + 2	C + 5	C + 1	C + 6	C − 1	Ca − 2	C − 2	Sa −34
29 ...	C + 2		S + 1	C + 2	C 0	C − 4	C − 1	C + 7	C + 2	C − 1	C − 3	Ca +11
30 ...	C − 9		C − 6	C + 8	C + 2	C −14	C + 3	C − 6	C + 1	C + 1	C + 4	Ca + 3
31 ...	C + 6		C + 6		Sa + 6		Ca + 3	Ca + 5		C + 5		C + 3
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	15	21	22	21	23	22	20	23	24	22	19	21
Ca ...	11	1	5	6	4	5	9	6	5	6	8	6
S ...	2	4	3	3	2	3	2	1	0	3	3	1
Sa ...	3	2	0	0	2	0	0	1	1	0	0	3
M ...	0	0	1	0	0	0	0	0	0	0	0	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	9	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	C − 9	C + 9	Ca − 3	Ca − 7	C − 9	Ca + 5	C + 7	C − 3	Ca − 7	C 0	C +42	C − 5
2	C + 4	C − 2	C − 6	C + 1	C − 6	C + 4	C + 3	C + 4	Ca −11	C +11	C + 8	C 0
3	Ca − 4	C − 6	C + 4	Ca − 5	C + 8	C 0	Ca + 5	C + 3	Ca + 4	C − 2	C +10	C + 5
4	Ca + 2	C + 3	C + 2	C 0	C − 2	C + 3	C − 9	C − 7	Ca − 3	C − 1	C + 3	C − 5
5	C + 3	C − 1	C + 4	C + 3	C + 1	C + 1	C + 5	C + 3	C + 7	C + 2	C + 3	C + 6
6	C + 2	Ca + 6	Ca − 8	C − 1	C 0	C − 6	C + 3	C + 2	C + 3	C + 3	S + 2	C − 5
7	C 0	Sa −18	Ca + 5	C + 6	C − 2	C + 6	C + 1	C − 3	C − 1	C + 2	Ca − 4	C + 5
8	Ca − 3	S − 3	Ca −12	Ca + 9	S + 3	C − 3	S − 3	C 0	C − 1	C − 3	C + 3	C − 1
9	C 0	Ca + 7	C + 4	Ca −11	Sa −23	C + 6	Ca 0	S + 2	C + 3	C − 3	C + 4	S + 1
10	C − 2	C + 4	C + 3	S − 1	C + 9	Ca + 4	C + 1	Ca + 1	C − 7	C + 3	C − 2	C − 5
11	C − 2	C + 6	S +10	Ma −56	C + 5	Ca − 3	Ca + 3	C −12	C − 4	S − 8	C + 5	Ca + 8
12	C + 9	Ca − 2	Ca −14	C +32	C + 6	Ca − 8	S −14	C + 4	S 0	Ca 0	C 0	Ca − 3
13	C − 1	C + 2	C + 4	Ca +11	Ca + 8	C + 1	C + 6	C 0	C + 2	Ca + 4	Ca − 4	Ca − 4
14	C + 3	Ca − 3	C 0	C − 1	C −10	C − 4	Ca + 8	C + 4	C + 8	C 0	S + 4	C + 1
15	Sa −16	Ca + 2	Ca + 8	C +10	C + 3	S + 6	Ca + 1	C + 1	Ca − 2	C 0	Ca − 4	C + 2
16	S −16	Ca − 6	C −11	C + 3	C + 3	C − 5	C − 9	S + 4	Ca − 3	C + 4	C + 1	C − 1
17	Ca + 8	C + 3	Ca + 2	C − 3	C +10	Ca + 5	C + 6	Ca − 3	Ca + 2	Ca + 2	C + 3	C − 1
18	C + 4	C + 6	C + 1	C − 2	Ca −11	C 0	C + 6	C − 7	S + 5	Ca + 1	Ca 0	C + 6
19	C + 7	C − 4	C + 6	Ca + 2	C 0	C 0	C −12	C + 8	S − 8	C − 7	C − 3	Ca − 1
20	C + 3	S − 3	C + 3	Sa − 4	C − 3	C − 1	C + 7	S + 1	S − 6	Ca + 9	C + 1	C − 5
21	C + 2	Ca − 8	C − 4	S − 5	C + 2	Ca + 4	C 0	Sa −15	Ca − 1	C − 5	Ca − 4	C + 4
22	C + 1	C + 9	C − 3	Ca + 5	C − 1	Ca −15	C + 1	S −16	S + 6	C + 1	Ca − 4	Ca − 3
23	C 0	C + 1	C + 5	C + 4	C + 8	C + 8	Ca 0	Ca +12	C − 7	S + 1	S − 8	S −18
24	S − 3	Ca + 4	Sa −16	C − 2	C + 2	Ca + 5	S −16	C + 7	C + 8	S − 7	S −34	Ca + 4
25	C + 4	Ca − 8	S + 2	C + 4	C − 6	C − 2	S − 5	S + 8	C + 1	C −15	S +14	C + 7
26	S − 1	C − 1	C + 1	C + 5	C − 8	Ca − 1	Ca + 3	C − 6	C 0	Ca + 8	S +10	Ca − 1
27	C + 1	C + 5	C + 3	C − 3	C + 7	C − 2	C + 4	C + 6	C + 2	S − 1	Ca +16	Ca + 3
28	C + 5	Ca + 5	C + 4	C + 5	C + 4	Ca + 4	C + 3	C + 1	C 0	Ca + 4	C − 1	C − 2
29	C − 2		C + 1	C + 1	Ca − 5	Ca −10	C + 2	C + 1	Ca + 4	S + 6	C + 3	C + 1
30	C + 2		C − 2	Ca − 4	C − 9	C − 4	C − 5	C 0	Ca − 6	S −13	C − 2	C + 5
31	C 0		C + 6		C + 5		C + 6	Ca − 3		S −47		C + 3
Average instrumental change per day	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C	23	15	21	18	26	18	20	21	15	17	17	21
Ca	4	10	7	8	3	11	7	4	10	7	7	8
S	3	2	2	2	1	1	4	5	5	7	6	2
Sa	1	1	1	1	1	0	0	1	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0
Ma	0	0	0	1	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	C + 5	C +10	Ca −10	C − 2	C − 9	S + 4	Ca + 8	C − 7	S + 7	Ca +17	Sa +190	S −15
2 ...	Ca + 3	C + 3	C −11	Ca − 3	C + 4	S − 3	C + 1	Ca + 8	Ca − 3	S −13	S + 31	S −24
3 ...	Ca − 2	C − 4	C + 1	C 0	C + 5	Ca + 4	C + 4	C + 1	C + 4	Ca +10	S + 14	C + 8
4 ...	S 0	Ca + 5	Ca +10	Ca +10	Ca − 6	Ca + 4	C + 3	S + 1	S − 1	S + 7	S + 13	S + 7
5 ...	S −12	C − 2	Ca −12	Sa −12	S −10	C + 3	S + 3	C −14	S −10	S − 4	S + 10	S − 5
6 ...	C 0	C − 2	Ca + 7	M −79	S − 7	C + 2	Ca −13	C + 7	Ca + 5	S 0	S + 3	Ca + 5
7 ...	C + 2	C + 3	Ca −11	S +38	Ca + 6	C + 3	C −13	C + 8	S + 3	S − 3	S + 9	S − 2
8 ...	C + 8	S −20	Ca − 3	S +28	C + 6	Ca 0	Ca +24	Ca − 5	S − 4	S − 8	S − 5	S + 2
9 ...	Ca − 2	C + 4	C + 1	S − 9	Ca 0	Ca + 3	C − 1	Ca − 5	Ca 0	C +14	S + 9	Ca + 5
10 ...	Ca − 3	C + 9	C + 7	Ca + 4	C + 3	C − 3	S +10	Ca + 8	S + 6	Ca + 7	S − 19	Ca + 4
11 ...	C − 4	Ca − 8	C + 4	Ca + 8	C + 1	C + 4	Ca − 3	S −12	Ca − 5	S − 4	S + 4	C − 3
12 ...	C + 2	S +13	S + 1	C + 3	C + 1	C − 2	C + 8	S − 3	S − 7	M −40	S + 7	C + 8
13 ...	Ca + 5	C − 1	S − 6	C + 3	C + 4	C +11	S +12	S + 4	Ca 0	S −16	S + 1	Ma −76
14 ...	C + 1	C − 1	Ca 0	C + 4	C − 8	Ca − 1	Ca − 2	S 0	Ca + 2	S + 7	C + 4	S +15
15 ...	C − 5	Ca + 1	C + 4	Ca − 9	C + 3	C −15	C − 9	C − 1	Ca + 3	S +22	C + 4	S +22
16 ...	C 0	Ca − 2	C + 1	C +13	S + 7	S +11	Ca + 4	C + 2	C 0	Ca + 6	Ca − 7	Ca +13
17 ...	C − 2	C − 3	C + 1	Ca − 2	Ca − 8	Ca − 8	C + 1	C − 1	C +12	Ca + 3	S − 5	Ca + 6
18 ...	Ca + 5	C + 3	C + 7	S − 7	C + 2	Ca − 5	S + 4	C + 1	C − 2	Ca + 1	Sa + 3	C +14
19 ...	Ca − 5	C + 7	C − 4	S + 4	C − 3	Ca + 5	S −13	C + 6	Sa −34	Ca 0	Ca − 8	C + 7
20 ...	C 0	Ca 0	C − 1	C + 3	C + 8	C 0	C + 7	C − 6	Sa + 5	C +10	S + 9	S −21
21 ...	C − 2	Ca − 6	C 0	C + 1	Ca 0	Ca − 1	C + 1	S − 9	S + 7	C + 2	S + 6	S + 2
22 ...	C + 5	C −17	Ca + 2	C + 3	Ca − 2	Ca − 9	C 0	Sa −28	Ca + 2	S −11	S − 11	C + 6
23 ...	Ca − 4	C +12	C − 2	C 0	S −20	Ca + 1	C − 3	S +15	S −10	Ca + 2	S + 2	C + 2
24 ...	Ca + 4	C + 3	C + 1	C + 1	Ca +12	C − 4	C +11	Ca + 8	S − 2	Ca − 1	C + 7	C + 7
25 ...	C + 1	C − 6	C + 2	Ca + 8	S − 3	C + 7	S − 2	S + 6	Ca +11	S +10	C + 5	Ca +10
26 ...	S + 2	C +10	C − 4	S − 6	C − 1	C + 4	Sa −21	Sa −30	C + 5	S −33	Ca + 6	Ca + 4
27 ...	C −15	C + 1	C + 1	Ca −10	C + 3	C + 7	S + 4	S +18	S +13	Ca +18	Ca + 6	Ca −10
28 ...	C + 9	C + 5	C + 4	C + 7	C − 6	S − 2	S + 1	C + 5	S + 2	C + 5	S + 6	Ca + 1
29 ...	C + 3		Ca −10	C 0	C + 2	S −19	C − 2	C +10	S −25	S +11	C − 17	S +10
30 ...	Ca − 4		S + 6	C + 2	C + 3	S − 1	C 0	S − 4	Ca +11	S + 4	Ca + 7	Sa −41
31 ...	C − 2		Ca − 4		C + 5		Ca + 1	C + 1		VG −295		S −17
Average instrumental change per day ...	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ	0·2γ
Total number of days. C ...	18	20	18	14	19	13	15	14	5	4	5	8
Ca ...	10	6	10	8	7	11	7	5	10	10	5	9
S ...	3	2	3	6	5	6	8	10	13	15	19	12
Sa ...	0	0	0	1	0	0	1	2	2	0	1	1
M ...	0	0	0	1	0	0	0	0	0	1	0	0
Ma ...	0	0	0	0	0	0	0	0	0	0	0	1
G ...	0	0	0	0	0	0	0	0	0	0	0	0
VG ...	0	0	0	0	0	0	0	0	0	1	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	S −7	S −21	C −15	M −69	Ca −3	Ca −5	Ca +3	Ca +10	C +8	C −13	C +14	Ca −6
2	S +14	S −6	Ca +5	S +16	Ca +10	C +1	Ca −11	Ca −8	C +1	Ca −1	S +2	Ca +14
3	S −1	C +11	S −1	S +13	C 0	C +4	C −4	Sa −14	C +1	C +1	S +11	S −17
4	Ca −1	S +7	S −19	S +8	C +7	Ca +11	C +4	S −21	Ca +4	C +3	Sa −38	S +3
5	S 0	S −8	Ca 0	C +6	C +7	C +1	C −5	C +25	Ca +3	C −8	S +9	S −6
6	S +5	S −3	C +10	Ca +1	C −2	Sa +2	Sa −1	Ca +10	Ca −8	Ca +5	Ca +8	Ca +9
7	Ca +8	S +4	C 0	Ca −12	C +1	Ca −24	Ca −24	C +3	Ca +3	S −30	C +8	C 0
8	Ca +7	S −2	C +2	C +3	Ca +2	C +12	C +12	C −1	S −2	S +4	C +3	C +8
9	S 0	S −5	Ca +1	S +12	C +7	Ca +8	Ca +2	Ca +6	Ca −5	S +6	C +2	S −7
10	S −15	Ca +2	C +6	Ca 0	C −2	Ca +3	C −7	Ca −2	Ca 0	Ca +13	C +3	Ca −1
11	Ca −6	Ca +5	S +5	S −3	C −7	C −9	C +14	C 0	Ca −3	C +7	C +3	C +6
12	Ca +4	C +3	S −12	Ca +6	Sa −20	C 0	C +3	C +3	Ca +7	C −4	C +2	C +3
13	C +7	S +3	C +10	Ca −4	Sa −55	C +9	Ca +5	C −7	C −1	S −4	C +1	C +4
14	C +3	Ca 0	C 0	C +7	S +38	Ca +3	S −5	C +1	Ca +5	S −2	C +1	S −2
15	S +7	Ca +4	C +2	Ca +2	Ca +18	Sa −40	Ca −7	Ca +7	Ca +8	C +3	S 0	S −13
16	S −40	S −7	C +2	C −2	Ca +13	S −32	Ca +6	C −14	S −8	C +5	S −37	S −3
17	C +27	S +4	C +1	S +5	Ca −2	S +35	Ca +1	Ca +2	C −5	C +4	S +9	Ca +7
18	C +10	C −2	C +1	Sa −25	Ca +2	Ca +6	C +4	C −2	C +2	C +6	S −3	Ca −1
19	C +3	C +4	C +2	Sa −34	Ca −12	C +7	C +7	C +1	C +1	C −1	C +14	S +4
20	C +2	C −1	Ca −11	Ca +42	C +4	Ca +1	Ca +2	C +16	C +9	Ca +2	C +8	Ca −3
21	Ca −5	C +5	Ca +1	C +10	C +5	C −2	C −4	Ca −9	C 0	S −43	C +8	C −12
22	S −12	C −1	C +9	C −1	C +5	C +12	Ca +2	Ca −12	Ca 0	S +10	Ca −6	C +12
23	C +9	Ca +3	C +1	C +5	Ca 0	C +8	C −5	C 0	C −12	C +10	C 0	C +8
24	Ca +4	Ca +3	C −4	C −3	Ca −18	C −3	C +1	C +6	S −1	C +9	Ca +5	C −1
25	Ca +7	Ca +3	Ca +7	Ca 0	C +10	C −1	C +2	C +3	S −46	S +13	Sa −36	Ca +11
26	C +2	C −6	Ca −23	C −18	C +9	Ca +10	Ca 0	C +7	Ca +23	Ca −8	S +11	Ca −18
27	Ca +4	C +3	Ca +6	C +14	S −2	S −24	Ca −15	C +3	C +12	S −5	Ca +8	C +4
28	Sa −32	C −1	C +7	C +4	S −35	C +1	Ca +5	C +1	C +4	Ca −5	C +9	Ca −2
29	S −4	C −5	Ca 0	Ca +2	S +22	C +7	C +4	Ca −4	Ca +15	Ca +6	Ca +12	Ca 0
30	S +9		Ca +3	Ca −10	Ca +1	C +12	Ca −4	S −27	C −3	C −6	Ca −3	C −3
31	S +7		S +1		C +6		C +3	C +9		Ca −6		C +7
Average instrumental change per day	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ
Total number of days. C	8	11	16	11	14	16	15	18	13	14	14	12
Ca	9	7	10	10	11	9	14	10	13	8	6	11
S	13	11	5	6	4	3	1	2	4	9	8	8
Sa	1	0	0	2	2	2	1	1	0	0	2	0
M	0	0	0	1	0	0	0	0	0	0	0	0
Ma	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0
VG	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 381.—*Showing the magnetic character of each day and the difference of the daily mean of H from that of the preceding day.*

Unity = 1γ = ·00001 C. G. S.

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	Ca − 7	S +11	Ca − 6	Ma −69	Ca −12	C + 7	Ca − 7	S +17	Ca + 6	S −14	C +20	C +11
2 ...	C − 2	S −12	Ma −67	Sa − 8	Ca + 7	C + 2	C 0	M −80	Ca + 2	C +12	Ca + 8	S + 2
3 ...	Ca + 3	Ma −64	S +17	S +23	C + 1	Ca + 3	C + 3	S +23	Ma −36	C + 6	Ca − 5	S − 2
4 ...	S −11	Sa +24	Ca +15	S + 2	C + 5	Ca + 3	C + 9	S +10	Sa +23	Ca + 1	S −27	M −31
5 ...	Sa −11	Sa +13	Sa +19	S − 4	C − 4	Ca −26	S − 7	Ca +13	S − 3	Ca + 2	Ca − 4	S +13
6 ...	Ca −12	S +14	S +14	S + 8	C + 8	S +14	S −24	Ca + 1	C + 8	Sa −36	S +17	Ca + 4
7 ...	Ca +17	Ca − 2	Sa −38	Ca 0	C − 1	C 0	S + 4	S −21	C + 8	S +22	Ca + 4	C + 7
8 ...	C + 6	Ca + 7	S +15	C + 2	Ca − 1	Ca +12	S − 1	Ca + 9	S + 9	Ca + 1	Ca + 4	C − 2
9 ...	Ca +10	C + 3	Ca + 8	C + 7	C + 1	S − 3	S + 4	Ca +18	S + 7	Ca + 6	C + 4	Ca +14
10 ...	S − 4	S + 4	C +11	C 0	C + 1	Sa −38	C + 3	C + 8	S −13	C + 3	C − 4	C − 2
11 ...	Ca −18	C + 9	C + 3	C + 6	C + 2	S +14	C + 5	Ca − 4	Ca − 3	Ca + 1	C + 6	S + 4
12 ...	S +11	Ca − 6	C − 5	S + 2	Ca + 9	C + 4	Ca + 2	Ca +14	Ca + 6	C + 3	G −81	Sa − 9
13 ...	C + 3	Ca − 9	Ca − 2	C − 5	Ca −10	C +14	S 0	S −14	C + 1	S − 5	M +32	S −37
14 ...	S − 9	S − 4	Ca + 1	Ca + 4	C 0	C + 2	Ca − 2	Ca −14	C + 4	S + 1	Sa +11	Ca +22
15 ...	C − 4	S + 8	S − 4	Ca − 8	C + 1	Ca − 6	C + 8	C + 5	C + 1	Ca + 9	G −38	Ca + 7
16 ...	Ca + 7	S 0	S − 7	C + 5	C + 7	C + 5	C + 6	S + 1	C − 1	C + 3	M −32	C + 8
17 ...	S − 7	Ca − 1	Ca +14	C + 2	Ca − 6	C + 3	Ca − 1	Ca + 9	S + 8	S − 6	Sa +54	C − 8
18 ...	S +13	Ca 0	Ca +13	C + 3	Ca + 4	C + 2	C − 5	C + 5	M −19	Ca + 1	S +12	C + 3
19 ...	S − 6	C + 5	Ca − 3	Ca + 6	Ca −14	C + 5	Ca + 1	C + 1	Sa −49	C + 7	Ca +11	Ca 0
20 ...	S + 7	C +12	Ca 0	Ca − 5	Ca 0	Ca + 1	C − 3	Ca − 3	S +32	Ca + 5	C + 5	S −25
21 ...	Ca + 4	S −11	Ca 0	S − 6	C + 5	Ca −10	C − 3	C − 1	C + 7	C −12	Ca −12	C +18
22 ...	S −19	S + 1	Ca +13	C + 2	Ca +13	S −14	C − 6	Ca + 5	S + 9	C + 2	Ca + 8	C + 8
23 ...	Ca +18	S −18	Ca − 5	C + 4	Ca + 1	Sa −18	S +18	Ca − 5	C + 2	C + 3	Ca − 7	C + 1
24 ...	S + 4	Ca +25	Ca − 9	C + 7	C −12	S +17	S −38	C − 7	C + 5	Ca + 1	Ca + 9	C + 6
25 ...	S −10	S − 4	C + 5	Ca + 2	C − 3	C + 7	C +13	Ca − 1	S 0	Ca − 8	Ca +12	C − 2
26 ...	Ca + 1	S − 5	C + 2	Ca −12	Ca + 4	C + 6	C + 9	S +15	S −22	Ca − 6	C −14	C − 3
27 ...	Ca + 6	Ca − 9	S − 5	Ca 0	S −10	C + 2	C − 2	Ca − 4	S −11	S +16	Ca + 1	C + 6
28 ...	Ca 0	C +21	Ca + 8	S + 6	Ca + 1	C + 7	C + 2	Ca − 9	Ca +21	Sa −27	C + 4	Ca − 3
29 ...	S − 7		S +12	S −10	S − 3	C − 1	C − 4	S −10	C + 6	C + 4	C + 5	Ca − 8
30 ...	Ca − 1		S − 9	S + 6	Ca + 6	Ca 0	C + 4	S − 7	S − 5	C +11	Ca + 8	C − 2
31 ...	S + 4		S + 6		Ca + 2		C + 8	S + 7		C + 3		C − 2
Average instrumental change per day ...	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ	0·1γ
Total number of days. C ...	4	5	5	11	14	15	18	6	10	12	8	16
Ca ...	13	8	14	8	15	8	5	14	5	11	13	7
S ...	13	12	9	9	2	5	8	10	11	6	3	6
Sa ...	1	2	2	1	0	2	0	0	2	2	2	1
M ...	0	0	0	0	0	0	0	1	1	0	2	1
Ma ...	0	1	1	1	0	0	0	0	1	0	0	0
G ...	0	0	0	0	0	0	0	0	0	0	2	0
VG ...	0	0	0	0	0	0	0	0	0	0	0	0

as affecting the absolute force of any particular day, from the condition of the preceding twenty-four hours. The data are collected in the same table 381 along with the distinctive letters which characterise the disturbance of the day as determined by the inspection of the traces in regard to the range of movement of the hourly ordinates.

433. In any phenomenon there may or may not exist a relation between the range of hourly movements and the mean absolute value of the day, and for this and other reasons the consideration of these two factors together may not perhaps be held as altogether free from objection. This relation has been examined for a period of twelve years (*vide* Chapter XIII) and it will be seen that some kind of relation for the average results does appear to exist, though it is by no means simple or easily determinable from day to day. In any case the two factors have been considered here as independent of each other and a fairly comprehensive and continuous history of the progression of the disturbances is derived from the data, each factor furnishing its own characteristic information.

434. A study of table 381 shows at a glance several features which are notably prominent. The incidence of a large disturbance between Ma and VG as judged by the inspection of the traces, is invariably accompanied by a more or less heavy fall in the daily mean presumably indicating a sudden demagnetisation of the earth. In not a single case has this been markedly noted the other way in a heavy disturbance. The equilibrium in the magnetic conditions which thus seems to be initially disturbed appears to be restored by forces, whatever they be, represented by a nearly large positive figure or smaller positive figures of the daily mean differences, according as the recuperative operation is either quickly or more tardily performed. On some occasions, though not often, as for example March 30th, 1894, May 13th, 1891, the disturbances are heavy and continuous and affect the daily means of the next two or three days. After a disturbance has ceased, or weakened sufficiently to allow of the forces of restitution to become effective, the usual average condition of feeble disturbance or occasionally that of quiet days is established. The effects of an average single large disturbance do not seem to extend much beyond 48 hours, though a disturbance may follow another before the effects of the previous one is completely compensated, in which case the hourly ordinates betray the effects for several days together (*vide* figures 19th February to 28th February 1894, table 381). It may be convenient to hold that two successive large negative figures presumably indicate a single continuous disturbance, while a positive figure occurring between two negative ones indicates, that the recuperative forces becoming effective in the interval so far, the two disturbances may be held as separate perturbations.

TABLE 382.—*Showing the departure of the highest and the lowest daily mean of H from the corresponding monthly mean value.*

Unity = $1\gamma = \cdot 00001$ C. G. S.

Years.	Month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Positive.											
1894 ...	+22	+37	+37	+31	+24	+20	+39	+34	+24	+16	+38	+18
1895 ...	20	31	21	20	20	26	24	19	40	28	27	20
1896 ...	38	27	32	22	28	15	20	24	24	25	23	23
1897 ...	21	19	15	19	28	20	17	15	12	15	12	29
1898 ...	12	21	28	20	19	22	20	15	38	21	16	16
1899 ...	13	23	15	14	18	14	12	16	17	12	18	17
1900 ...	18	15	21	10	19	11	9	8	9	12	8	10
1901 ...	9	11	13	12	10	13	10	16	12	8	9	19
1902 ...	8	8	8	17	10	10	10	8	7	11	11	7
1903 ...	9	9	7	19	10	16	12	15	14	29	30	28
1904 ...	17	15	13	16	22	18	16	13	13	15	16	16
1905 ...	11	18	30	18	13	13	15	29	22	15	33	15
	Negative.											
1894 ...	−39	−119	−84	−46	−32	−67	−142	−230	−56	−32	−78	−32
1895 ...	27	27	39	42	16	28	35	52	55	32	37	26
1896 ...	19	23	37	29	96	17	30	50	82	57	45	49
1897 ...	100	25	30	49	30	32	58	25	21	13	26	49
1898 ...	16	24	69	46	30	15	13	22	97	33	35	20
1899 ...	27	74	50	32	36	49	29	15	15	14	13	13
1900 ...	23	21	94	13	91	13	9	15	17	33	8	12
1901 ...	13	13	40	11	14	17	19	17	17	16	7	27
1902 ...	24	13	10	50	21	12	15	25	9	57	41	16
1903 ...	12	16	12	75	13	14	12	33	21	271	74	61
1904 ...	29	17	20	42	63	55	25	35	47	27	26	13
1905 ...	22	58	61	38	15	30	24	50	46	30	79	31

It will also be observed that a large positive figure showing a sudden rise in the daily mean which connotes certain conditions whatever they be, never precedes but always follows negative figures. On examining in connection with this question the departures of the (absolute) daily means from the mean of the month, it is seen that the largest positive figure (*vide* table 382) never exceeds 40γ, while a fall of over 200γ is by no means a rare occurrence in the larger disturbances at Colaba which in extreme cases reaches even to 270γ and more. From the two tables referred to, it becomes apparent that the mean value of absolute force for the month is certainly not the most probable value and the divergence between the mean and the *median* is very large especially during the maximum spot epoch. This question will be more fully dealt with in Chapter XIII. Recognising hence that the lowering action on the daily mean is one of the principal features associated with disturbances, we can well call to mind the fact noted previously that in the 11-year perturbations disclosed in the absolute values of force referred to in Chapter I, paragraph 295, a precisely similar influence is seen to affect the daily mean and the range of the average diurnal inequality. During the maximum spot epoch when the disturbances are frequent the mean absolute value of force for the year stands lower by a certain amount and the regular diurnal oscillation simultaneously becomes larger; while during the minimum epoch the reverse effects appear to prevail, the absolute values of force stand higher, the disturbances are reduced in frequency and intensity and the diurnal oscillation is contracted. And even in the march of the phenomenon from month to month a similar effect is notable. It will be seen from paragraph 436 that disturbances are clearly most frequent and intense during the equinoxes and least so during the solstices. We have seen (*vide* paragraph 305, Chapter I) that in the annual march of absolute force also, the mean monthly values of force stand lower during the equinoctial months and higher in the solstitial; and that the diurnal range is also correspondingly affected, though the pulse is not quite so pronounced in September and July as in March and December* (*vide* paragraph 355).

The disturbance phenomenon hence as presented by the daily mean data in table 381, which however have been more fully discussed and analysed in Chapters XIII and XIV, when examined together with the magnetic character of each day appears presumably to indicate that (1) a rise in the daily mean is accompanied by some distinct stiffening effect on the diurnal oscillations and (2) there is a near upper limit which the daily mean always attempts to approach but is as assiduously prevented from reaching owing to effects of disturbances the incidence of which lowers the daily mean through a very large lower limit.

435. Conceding then that the movements in the larger disturbances at least, are not purely or principally of an oscillatory character and symmetrically distributed on both sides of the mean, but are distinctly characterised by the lowering action on the hourly or daily mean (*vide* Chapter XI), advantage is taken of this inference and a list of disturbances, in which the daily mean is lowered by 50γ and more, is prepared, such being accepted as typical generally of the proper disturbance phenomenon and suitable for the derivation of the disturbance variation. The limiting value of 50γ is advisedly adopted. It is something definite as a glance at table 381 will show. There is no uncertainty about the effects of the disturbances so selected, the traces of all of which exhibit more or less the same definite conditions of incidence and progress which a lower limit than 50γ may not always ensure. From the analysis of the data made later however, it appears that perhaps 30γ is a better approximation to the correct limit (*vide* Chapter XIV, paragraph 552). And though some disturbances which by the inspection of the traces have been judged as fairly large, such as that of the 16th July 1892, are excluded as the fall of force during that day does not reach the limit of 50γ and others, estimated as small, such as that of the 24th April 1892, included, the limit divides the disturbances broadly into two classes large and small, correct enough for our requirements and almost all of the former class, which are discussed in paragraph 444, are included in table 383. It will be seen that the list contains some 134 disturbances and includes almost all those classed as Ma to VG and nearly, though not all, that are denominated as M.

436. In table 384† are collected the dates of the larger disturbances referred to above. It will be seen from column 14 of the table that the frequency of the disturbances in any year varies with its position in the sun-spot period, and has a decided tendency to influence the absolute values of force with which they appear to vary inversely fairly uniformly (*vide* Chapter XIV). In their seasonal growth the numbers in the last row but one show that a tendency for these disturbances to grow more frequent during the equinoxes than during the solstitial months is definitely indicated. In the last row are given the intensity figures derived by giving weight to each disturbance by the magnitude of its lowering action on the daily

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* The probable result of seasonal variation.

† *See* also similar table in Chapter XIV.

TABLE 383.—*List of principal magnetic disturbances affecting the mean value of force of the day by a fall of 50γ and more.*

Month and year.	Commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range. Unity = 1γ.	Fall in the daily mean. Unity = 1γ.	Date of fall.	Month and year.	Commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range. Unity = 1γ.	Fall in the daily mean. Unity = 1γ.	Date of fall.
1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
1872 January ...	6 22·9	25	6 23	7 19	107	52	7	1877 September ...	18 20	32	18 20	19 16	113	56	19
„ February ...	4 19·3	24	4 20	4 22	1,023	226	4	1878 January ...	24 5·3	22	24 6	24 15	118	55	24
„ „ ...	20 5·6	26	20 8	20 18	192	59	20	„ June ...	3 12·4	19	3 12	3 18	156	71	3
„ March ...	2 0·0	24	2 8	2 17	195	89	2	„ December ...	1 6	22	1 6	1 17	127	52	1
„ April ...	10 18·9	30	10 19	11 1	238	59	11	1879 June ...	17 15	27	17 15	18 14	108	55	18
„ „ ...	15 8	48	15 10	15 20	195	51	15	1880 August ...	12 16·4	20	12 17	12 17	256	67	12
„ June ...	3 14	18	3 14	3 23	169	58	3	„ „ ...	19 8·5	21	19 12	19 16	199	70	19
„ „ ...	9 21	29	10 1	10 18	120	54	10	„ September ...	15 4	28	15 6	15 18	156	79	15
„ July ...	7 21·8	29	7 22	8 4	221	116	8	„ October ...	31 5	19	31 9	31 18	193	69	31
„ „ ...	19 9·1	9	19 9	19 13	156	77	19	„ November ...	3 3	27	3 5	3 16	150	58	3
„ „ ...	20 15·1	34	20 15	21 17	122	60	21	1881 January ...	31 9	24	31 12	31 23	329	114	31
„ August ...	3 12·4	40	3 12	4 18	253	58	4	„ September ...	12 18	32	13 10	13 13	262	113	13
„ „ ...	9 0·0	22	9 0	9 12	183	90	9	„ November ...	9 11	27	9 11	9 17	255	75	9
„ „ ...	14 23·0	31	14 23	15 15	195	57 & 92	14 & 15	1882 April ...	17 4·5	22	17 4	17 12	477	222	17
„ „ ...	25 2	34	25 11	26 0	184	60	25	„ June ...	24 17	11	24 18	25 1	218	53	24
„ September ...	2 17·1	36	2 17	3 20	222	85	3	„ July ...	30 22	30	31 11	1 0	137	61	31
„ „ ...	29 14·8	18	29 15	29 20	114	52	29	„ October ...	2 14·5	16	2 15	2 23	365	138	2
„ October ...	15 3·2	44	15 4	15 15	430	159	15	„ „ ...	5 12	38	5 14	6 18	177	70	6
„ „ ...	17 1	52	17 12	17 18	265	73	17	„ November ...	12 4·2	27	12 11	12 18	258	71	12
„ November ...	24 5·5	15	24 6	24 16	156	74	24	„ „ ...	13 7	53	13 9	13 18	213	51	13
1873 January ...	19 1	29	19 12	19 18	205	70	19	„ „ ...	17 15·2	45	17 20	18 16	445	128	17
„ March ...	9 12·7	19	9 13	9 15	288	152	9	„ „ ...	19 17	33	20 7	20 18	446	151	20
„ April ...	1 20	34	1 20	2 21	143	60	2	1883 March ...	13 9	11	13 9	13 18	160	51	13
1874 February ...	4 12·4	16	4 12	4 23	294	103	4	„ April ...	3 13·9	16	3 14	3 21	383	75	3
„ March ...	7 24	26	8 0	8 16	144	83	8	„ July ...	30 4·6	29	30 5	30 18	139	60	30
„ April ...	13 1·5	31	13 9	13 22	147	50	13	„ September ...	16 7·6	37	16 8	16 16	307	147	16
„ September ...	29 11·5	21	29 11	29 21	222	50	29	„ November ...	20 1	24	20 12	20 21	156	57	20
„ October ...	3 18·7	39	3 19	4 15	299	138	4	„ „ ...	22 6·3	36	22 10	22 18	331	79	22
1875 February ...	26 16	32	27 11	27 18	381	91	27	1884 July ...	3 0·1	35	3 0	3 21	190	70	3
„ April ...	7 6	34	7 11	7 18	205	74	7	„ October ...	2 2·7	33	2 3	2 8	183	80	2
„ September ...	16 2	20	16 3	16 14	109	52	16	„ November ...	1 16	72	2 9	3 17	225	56	2
1876 February ...	19 8·6	41	19 9	20 13	149	51	19	1885 March ...	15 8	27	15 10	15 21	242	85	15
„ December ...	10 5·6	25	10 9	10 17	141	51	10	„ May ...	11 7	20	11 10	11 21	181	69	11
1877 May ...	28 23·3	29	29 4	29 16	125	58	29	„ „ ...	25 18·5	23	25 19	26 12	211	57	26

The times of commencement of 'X' Disturbances are given in tenth of an hour, all others are given to the nearest full hour.

TABLE 383.—*List of principal magnetic disturbances affecting the mean value of force of the day by a fall of 50γ and more.*

Month and year.	Commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range. Unity = 1γ.	Fall in the daily mean. Unity = 1γ.	Date of fall.
1	2	3	4	5	6	7	8
1885 June ...	25 3·3	23	25 9	25 20	227	65	25
1886 January ...	9 13·0	25	9 13	10 0	305	76	9
„ March ...	30 13·2	21	30 13	30 23	312	78	30
„ May ...	9 0	26	9 1	9 16	139	68	9
1888 January ...	7 21	25	7 21	8 17	178	73	8
1889 June ...	14 10	12	14 10	14 18	157	64	14
„ November ...	1 10	20	1 11	1 21	195	51	1
1891 May ...	13 13·2	92	13 13	15 19	299	52	14
„ August ...	29 4	24	29 4	29 19	140	66	29
„ November ...	20 3	23	20 5	20 16	151	57	20
„ December ...	7 4	28	8 6	7 19	174	54	7
1892 January ...	28 23·1	33	29 12	29 16	255	55	29
„ February ...	13 9·9	37	13 10	14 1	612	167	13
„ March ...	1 2	27	1 2	1 20	116	52	1
„ „ ...	6 14·6	38	6 15	7 1	242	55	6
„ „ ...	12 3·4	31	12 4	13 3	239	71	12
„ April ...	24 2	34	24 3	25 2	96	51	...
„ „ ...	25 20	40	26 10	26 19	232	73	24
„ May ...	1 9	20	1 10	1 20	173	68	1
„ „ ...	17 2·8	25	17 10	18 0	170	56	17
„ „ ...	18 13·2	24	18 13	18 21	348	55	18
„ June ...	2 19	28	3 4	3 15	186	72	3
„ „ ...	27 9·9	20	27 12	27 19	388	103	27
„ July ...	12 22·7	23	12 23	13 3	290	59	13
„ August ...	12 17·4	19	12 23	13 1	403	73	12
„ November ...	4 7·3	35	4 10	5 16	213	55	5
„ December ...	5 1·2	29	5 1	5 7	183	79	5
1893 March ...	26 12·7	21	26 13	27 1	202	51	26
„ August ...	6 8·7	43	6 9	7 18	197	71	7
„ „ ...	18 7	20	18 12	18 22	286	85	18
„ September ...	26 6	31	26 12	26 17	184	56	26
„ October ...	25 12	10	25 12	25 20	144	61	25
1894 February ...	21 1·2	28	21 1	21 17	197	79	21
„ „ ...	23 3·3	33	23 4	24 7	179	52	23
1894 February ...	25 12·6	17	25 13	25 20	384	59	25
„ „ ...	28 20·1	31	28 21	1 1	370	60	28
„ March ...	30 11	41	30 11	31 6	279	75	30
„ June ...	10 1	38	10 4	10 20	127	54	10
„ July ...	20 10·8	25	20 13	20 18	525	135	20
„ August ...	10 7·8	26	20 8	20 16	607	243	20
„ September ...	14 6·0	32	14 12	15 9	250	68	14
„ November ...	13 18·9	...	13 19	13 21	265	97	13
1895 April ...	11 10	16	11 11	11 16	186	50	11
„ September ...	4 5	21	4 12	4 20	150	70	4
„ „ ...	29 19	29	29 19	30 16	133	71	30
„ October ...	26 18	30	27 10	27 21	155	54	27
1896 May ...	2 13	39	2 13	2 22	268	92	2
„ August ...	20 21	27	21 6	21 20	116	56	21
„ September ...	17 23·2	26	18 10	18 16	206	81	18
1897 January ...	1 15	54	1 15	2 20	263	113	2
„ April ...	19 18	34	20 10	20 20	261	65	20
„ July ...	31 6	20	31 6	31 13	103	59	31
„ December ...	11 6	24	11 10	11 17	191	55	11
„ „ ...	20 13	15	20 13	20 21	273	59	20
1898 March ...	15 6	41	15 12	15 23	230	78	15
„ September ...	9 16·8	33	9 17	10 3	340	99	9
1899 February ...	12 2	26	12 3	12 17	250	97	12
1900 March ...	12 20	33	13 9	13 18	205	94	13
„ May ...	1 2	21	1 4	1 17	61	54	1
„ „ ...	5 8·0	18	5 8	5 19	279	107	5
1902 April ...	11 3	19	11 4	11 16	151	56	11
1903 April ...	6 4·3	21	6 6	6 19	230	79	6
„ October ...	31 10·8	41	31 12	31 20	819	295	31
„ December ...	13 17	13	13 17	13 24	189	76	13
1904 April ...	1 4	22	1 11	1 16	180	69	1
„ May ...	12 10	42	12 12	13 20	220	55	13

The times of commencement of 'X' Disturbances are given in tenth of an hour, all others are given to the nearest full hour.

TABLE 384.—*Showing dates of storms indicating a decrease in the daily mean by 50γ and more from the value of the preceding day.*

Year.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total number of disturbances during the year.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1872 ...	7	4, 20	2	15, 11	...	3, 10	8, 19, 21	4, 9, 14, 15, 25	3, 29	15, 17	24	...	20
1873 ...	19	...	9	2	...	...	...	...	...	...	...	...	3
1874 ...	...	4	8	13	...	...	...	...	29	4	...	...	5
1875 ...	...	27	...	7	...	...	...	...	16	...	...	...	3
1876 ...	...	19	...	...	...	...	...	...	...	...	...	10	2
1877 ...	...	...	...	...	29	...	...	...	19	...	...	...	2
1878 ...	24	...	...	...	...	3	...	...	...	...	...	1	3
1879 ...	...	...	...	...	...	18	...	...	...	...	...	...	1
1880 ...	...	...	...	...	...	...	...	19, 12	15	31	3	...	5
1881 ...	31	...	...	...	...	...	...	...	13	...	9	...	3
1882 ...	...	...	...	17	...	24	31	...	...	2, 6	12, 13, 17, 20	...	9
1883 ...	...	...	13	3	...	...	30	...	16	...	20, 22	...	6
1884 ...	...	...	...	...	...	...	3	...	...	2	2	...	3
1885 ...	...	...	15	...	11, 26	25	...	...	...	...	...	...	4
1886 ...	9	...	30	...	9	...	...	...	...	...	...	...	3
1887 ...	...	...	...	...	...	...	...	...	...	...	...	...	0
1888 ...	8	...	...	...	...	...	...	...	...	...	...	...	1
1889 ...	...	...	...	...	...	14	...	...	...	...	1	...	2
1890 ...	...	...	...	...	...	...	...	...	...	...	...	...	0
1891 ...	...	...	...	...	14	...	...	29	...	...	20	7	4
1892 ...	29	13	1, 6, 12	24, 26	1, 17, 18	3, 27	13	12	...	...	5	5	16
1893 ...	...	...	26	...	...	...	...	7, 18	26	25	...	...	5
1894 ...	...	21, 23, 25, 28	30	...	...	10	20	20	14	...	13	...	10
1895 ...	...	...	...	11	...	...	...	...	4, 30	27	...	...	4
1896 ...	...	...	...	...	2	...	...	21	18	...	...	...	3
1897 ...	2	...	...	20	...	...	31	...	...	...	...	11, 20	5
1898 ...	...	...	15	...	...	...	...	...	9	...	...	...	2
1899 ...	...	12	...	...	...	...	...	...	...	...	...	...	1
1900 ...	...	...	13	...	1, 5	...	...	...	...	...	...	...	3
1901 ...	...	...	...	...	...	...	...	...	...	...	...	...	0
1902 ...	...	...	...	11	...	...	...	...	...	...	...	...	1
1903 ...	...	...	...	6	...	...	...	...	...	31	...	13	3
1904 ...	...	...	...	1	13	...	...	...	...	...	...	...	2
1905 ...	...	3	2	1	...	...	...	2	...	...	12	...	5
1872—1904 Total Number ...	8	11	13	14	12	10	9	12	14	10	14	7	134
1872—1904 Total Intensity ...	608	1,044	1,014	1,034	791	649	697	1,088	1,079	1,137	1,060	426	

Intensity of storms in the month is measured by the total amount of decrease in the value of the daily mean of each disturbance day from that of the preceding day.

mean. This shows the prevalence of the semi-annual period much more emphatically. The results given above are of course derived from the larger disturbances only. But even when we take *all* days into consideration and examine the disturbed condition of every day of the month, as given by the sums without regard to signs, of the differences of the daily means from one day to the next, derived from table 381, and collected separately in table 385, which practically measure the variability of the daily mean of H, we find from its annual variation (average of 33 years) indicated in the last row of the table that during the solstices, June to August and December to Febuary, the variability is 8·1γ which is increased to 9·0γ during the equinoxes, March to May and September to November, the average result of the year being placed at 8·6γ. The above figures leave little room for doubt that the disturbances tend to become more frequent and intense about the equinoxes, and weaker and less frequent during the solstices. A similar effect is also noted later in the difference annual variation of absolute force that is quiet day less all day results. (See Chapter XI, paragraph 468.)

437. To complete the data as fully as possible, in regard to disturbances, table 386, which was drawn up originally for a different purpose, is also supplemented. Here the disturbances were selected in the usual way by a simple inspection of the traces* from the year 1882 to 1905. Such of the disturbances as have lasted for five hours and more, and indicated an abnormal movement in range greater than 70γ, have all been listed. Hence practically every disturbance which is of any note, is included in the table. In this as well as the former table full details, *viz.*, the time of commencement of the storm, the time of attainment of the maximum and minimum values in the daily curve, the duration of the disturbance, the range of movement and the corresponding fall in the daily mean, have been given.

438. The accurate determination of the time of the exact commencement of a disturbance is obviously out of question in the case of each and every storm. Only in cases of those marked as X disturbances which, it is well known, commence with a sudden sharp jerky movement, is it possible to have reliable data in this direction. On the other hand the times of the attainment of the maximum and minimum turning points in the traces of a stormy day, specially the latter which shows a drop to the lowest value in force indicating the greatest effect of the storm, are nearly always definite in most cases and give useful information.

X Disturbances.

439. Taking up then for examination in the first instance the group of disturbances known as X storms we have in the 33 years under consideration 113 such disturbances of varying degree of magnitude, and in the table below is shown the distribution over the twenty-four hours of the day of the commencing epoch of these storms.

	Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total.
Frequency of commencement of X Storms.	1872—1882	2	2	0	2	3	2	2	0	2	2	0	2	3	2	1	3	0	1	0	3	1	1	1	3	38
	1883—1893	3	1	0	4	0	2	3	3	1	2	3	2	1	7	2	1	0	2	1	2	2	2	1	2	47
	1894—1904	1	2	0	2	1	0	2	0	4	0	0	4	3	2	0	0	1	2	0	1	1	0	0	2	28
	1872—1904	6	5	0	8	4	4	7	3	7	4	3	8	7	11	3	4	1	5	1	6	4	3	2	7	113

It will be seen that while the disturbances seem to be fairly distributed over all the hours of the day a feeble tendency for them to crowd more about the noon hours at Colaba may be suspected. If so, it appears that 13 hours determines the climax in the energy at least of the predisposing causes of the storms, whatever they be, and the sudden drop in the number of the disturbances thereafter during the succeeding small hours of the noon may be regarded as the reaction after the climax. The evidence however is too slender for any generalisation here, for it will be seen that when the result of each individual 11-year period is considered, the first and the third groups give no decided indication whatever of this character of incidence, but it is the middle group 1883—1893 alone which is responsible for bringing out the relation to the position of the sun. This result hence may be regarded as fortuitous. It will be seen later that this distribution of the incidence of the storms indicating a relation to the position of the sun, is not indicated by the larger 134 disturbances collected in table 383, while it is markedly shown when *all* disturbances, great and small as shown in table 386, are considered together.

* The scale co-efficient of the magnetograph from 1872 to 1882 was about 400γ for an inch of ordinate. In July 1882 the instrument was re-adjusted and made sensitive, the scale co-efficient being made equal to about 100γ. Under the former condition of the instrument, the inspection method was rougher and much less certain for the determination of the character or degree of the disturbance, hence the list is restricted to the later period 1882—1905.

TABLE 385.—*Consecutive differences of daily means of Horizontal Force summed without regard to signs for each month of the period 1872 to 1904, their annual means and annual inequality and the mean variability for each year and the average months.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Year.	Mean variability of daily means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1872 ...	335	799	493	423	364	377	652	777	493	711	431	317	514	16·9
1873 ...	469	259	513	400	276	317	284	274	248	249	309	284	323	10·6
1874 ...	338	366	411	432	216	240	270	224	269	463	253	160	303	10·0
1875 ...	199	300	283	237	218	183	220	154	254	165	205	121	212	7·0
1876 ...	160	254	228	158	159	176	138	144	209	185	204	167	182	6·0
1877 ...	205	199	227	165	308	200	193	169	173	215	266	163	207	6·8
1878 ...	217	100	119	140	129	248	129	166	202	187	148	235	168	5·5
1879 ...	117	154	197	180	199	235	131	137	225	182	114	202	173	5·7
1880 ...	154	114	208	237	192	166	229	510	334	250	346	279	252	8·3
1881 ...	274	329	265	251	161	223	269	200	412	289	379	244	275	9·0
1882 ...	206	259	239	673	266	272	333	309	234	588	921	270	380	12·5
1883 ...	166	262	380	353	225	278	309	244	451	234	454	253	301	9·9
1884 ...	293	206	279	307	238	326	346	189	349	457	418	274	307	10·1
1885 ...	293	270	311	307	382	334	282	313	293	244	237	178	287	9·4
1886 ...	365	194	275	287	327	201	237	224	198	259	213	140	243	8·0
1887 ...	183	158	198	273	214	254	236	231	255	211	217	237	222	7·3
1888 ...	390	113	205	215	306	192	200	282	177	220	179	209	224	7·4
1889 ...	135	123	235	159	232	256	159	195	226	154	238	169	190	6·2
1890 ...	137	149	154	130	158	172	128	144	213	255	244	118	167	5·5
1891 ...	162	208	236	263	331	181	291	287	402	236	253	335	265	8·7
1892 ...	341	514	537	372	507	461	451	424	276	261	324	413	407	13·4
1893 ...	279	298	296	262	197	314	228	509	367	395	301	259	309	10·2
1894 ...	258	620	403	409	287	343	494	672	365	284	419	195	396	13·0
1895 ...	314	405	312	278	230	287	283	279	329	376	311	226	302	9·9
1896 ...	273	235	386	249	424	183	247	305	360	259	258	245	285	9·4
1897 ...	377	245	229	369	317	219	235	175	216	204	186	378	262	8·6
1898 ...	155	207	359	277	240	183	155	220	475	245	244	231	249	8·2
1899 ...	185	317	229	179	266	172	155	198	171	147	133	154	192	6·3
1900 ...	217	186	369	162	401	114	132	165	142	177	105	143	193	6·3
1901 ...	157	133	196	140	117	140	164	188	138	135	139	181	152	5·0
1902 ...	119	137	157	206	179	126	154	147	122	173	202	121	154	5·1
1903 ...	117	161	138	279	158	146	189	234	201	584	428	372	251	8·3
1904 ...	262	132	167	337	325	293	172	234	200	243	274	195	236	7·8
1905 ...	242	302	336	224	154	246	202	341	327	237	459	270	278	9·1
Annual inequality, 1872—1904 ...	−22	−5	+20	+16	−1	−23	−15	+10	+12	+20	+23	−34	260	8·6
Mean variability of daily means ...	7·7	9·1	9·0	9·2	8·4	7·9	7·9	8·7	9·1	9·0	9·4	7·3	8·6	...

TABLE 386.—*List of principal magnetic disturbances at Colaba, Bombay, for the period 1882 to 1905.*

[The disturbances are determined from the Horizontal Force traces.]

Reference number.	Time of commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range unity = 1γ.
			d. h.	d. h.	
1	1882, January, 19 16 ...	16	...	...	111
2	„ February, 1 18 ...	30	...	...	111
3	„ „ 20 19·9 ...	6	20 20	21 1	136
4	„ April, 13 22 ...	26	...	...	132
5	„ „ 17 4·5 ...	22	17 4	17 12	477
6	„ „ 19 8 ...	15	...	...	128
7	„ „ 20 8·4 ...	24	20 13	20 17	264
8	„ May, 14 10 ...	11	...	...	153
9	„ „ 15 0·8 ...	5	15 1	15 4	89
10	„ June, 15 8 ...	14	...	...	124
11	„ „ 24 17 ...	11	...	...	218
12	„ July, 16 12 ...	36	...	...	111
13	„ „ 30 22 ...	30	...	...	137
14	„ August, 4 10·7 ...	37	4 11	4 23	156
15	„ „ 12 14 ...	16	...	...	132
16	„ September, 5 10 ...	20	...	...	121
17	„ „ 12 3 ...	13	...	...	93
18	„ „ 25 8 ...	18	...	...	107
19	„ October, 2 14·5 ...	16	2 15	2 23	365
20	„ „ 5 12 ...	38	...	...	177
21	„ „ 25 5 ...	20	...	...	126
22	„ „ 28 2 ...	48	...	...	96
23	„ November, 2 7 ...	37	...	...	122
24	„ „ 12 4·2 ...	27	12 11	12 18	258
25	„ „ 13 7 ...	77	...	...	213
26	„ „ 16 13·1 ...	26	16 13	16 21	...
27	„ „ 17 15·2 ...	45	17 20	18 16	445
28	„ „ 19 17 ...	33	...	...	446
29	„ „ 21 20 ...	10	...	...	104
30	„ „ 25 21·3 ...	9	25 21	25 24	108
31	„ December 16 4·5 ...	40	16 12	16 17	156
32	„ „ 20 12 ...	38	...	...	123
33	1883, January, 25 14 ...	14	...	...	73
34	„ February, 1 21 ...	33	...	...	102
35	„ „ 24 18·6 ...	23	24 19	25 16	135
36	„ „ 27 19 ...	31	...	...	103
37	„ March, 13 9 ...	11	...	...	160
38	„ „ 21 8 ...	40	...	...	160
39	„ „ 26 11 ...	62	...	...	168
40	„ April, 3 13·9 ...	34	3 14	3 21	383
41	„ „ 24 20 ...	28	...	...	138
42	„ May, 20 22 ...	39	...	...	127
43	„ June, 2 7 ...	21	...	...	127
44	„ „ 27 4 ...	21	...	...	146
45	„ „ 30 10 ...	34	...	...	162
46	„ July, 8 11 ...	98	...	...	107
47	„ „ 30 4·6 ...	29	30 5	30 18	139
48	„ August, 1 0 ...	36	...	...	90
49	„ „ 18 11·3 ...	22	18 11	18 21	139
50	„ September, 16 7·6 ...	37	16 8	16 16	307
51	„ „ 18 20·4 ...	24	19 12	19 18	88
52	„ „ 28 8 ...	12	...	...	123
53	„ October, 5 2 ...	38	...	...	203
54	„ „ 15 6 ...	28	...	...	130
55	„ „ 16 21·0 ...	18	17 4	17 10	72
56	„ „ 18 7 ...	19	...	...	118
57	„ November, 1 20 ...	51	...	...	110
58	„ „ 20 1 ...	24	...	...	156
59	„ „ 22 6·3 ...	36	22 10	22 18	331
60	„ „ 27 12 ...	10	...	...	148
61	1884, February, 23 3 ...	47	...	...	110
62	„ „ 29 22·0 ...	74	29 22	30 7	113
63	„ March, 27 12 ...	8	...	...	112
64	„ „ 29 1 ...	21	...	...	76
65	„ April, 10 14·5 ...	30	10 15	11 17	148
66	„ „ 24 15 ...	28	...	...	117
67	„ May, 1 5 ...	20	...	...	163
68	„ „ 10 11 ...	31	...	...	121
69	„ June, 23 2 ...	40	...	...	184
70	„ July, 3 0·1 ...	35	3 0	3 21	190
71	„ August, 8 14 ...	60	...	...	93
72	„ September, 17 8 ...	51	...	...	143
73	„ „ 30 11 ...	11	...	...	120
74	„ October, 2 2·7 ...	33	2 3	2 8	183
75	„ „ 14 7 ...	19	...	...	120
76	„ „ 17 12 ...	7	...	...	115
77	„ „ 29 8 ...	20	...	...	115
78	„ November, 1 16 ...	72	...	...	225
79	„ „ 17 6 ...	18	...	...	153
80	1884, November, 28 2 ...	19	...	...	120
81	„ December, 23 0 ...	22	...	...	54
82	1885, January, 2 11 ...	22	...	...	165
83	„ „ 22 18 ...	10	...	...	127
84	„ „ 30 3 ...	17	...	...	145
85	„ February, 28 3 ...	25	...	...	151
86	„ March, 15 8 ...	27	...	...	242
87	„ April, 28 5·6 ...	19	28 12	28 17	146
88	„ May, 10 11·0 ...	10	10 11	10 20	122
89	„ „ 11 7 ...	20	...	...	181
90	„ „ 13 12·8 ...	18	13 13	14 6	135
91	„ „ 25 18·5 ...	23	25 19	26 12	211
92	„ June, 25 3·3 ...	23	25 9	25 20	227
93	„ July, 31 23 ...	27	...	...	144
94	„ September, 4 15 ...	33	...	...	67
95	„ „ 15 13 ...	11	...	...	130
96	„ „ 22 18 ...	36	...	...	87
97	„ November, 10 17 ...	33	...	...	169
98	„ „ 18 15 ...	12	...	...	129
99	1886, January, 9 13·0 ...	25	9 13	10 0	305
100	„ March, 3 3 ...	21	...	...	147
101	„ „ 23 12 ...	16	...	...	166
102	„ „ 30 13·2 ...	21	30 13	30 23	312
103	„ „ 31 14 ...	17	...	...	102
104	„ May, 9 0 ...	26	...	...	139
105	„ June, 29 22 ...	17	...	...	123
106	„ July, 27 22 ...	19	...	...	71
107	„ August, 12 2 ...	26	...	...	130
108	„ „ 24 2 ...	10	...	...	98
109	„ September, 9 16 ...	36	...	...	92
110	„ October, 6 14 ...	60	...	...	116
111	„ November, 2 13 ...	83	...	...	145
112	„ „ 30 14 ...	16	...	...	88
113	1887, April, 28 11 ...	19	...	...	142
114	„ June, 5 13 ...	9	...	...	146
115	„ August, 1 16 ...	20	...	...	93
116	„ September, 25 20 ...	28	...	...	128
117	„ October, 22 14 ...	36	...	...	140
118	„ „ 26 11 ...	13	...	...	142
119	„ November, 21 14 ...	14	...	...	116
120	1888, January, 7 21 ...	25	...	...	178
121	„ „ 13 11 ...	17	...	...	146
122	„ „ 23 17 ...	17	...	...	98
123	„ April, 11 8 ...	38	...	...	174
124	„ May, 1 8 ...	15	...	...	123
125	„ „ 7 5 ...	24	...	...	164
126	„ „ 20 14 ...	38	...	...	163
127	„ December, 24 6·3 ...	22	24 7	24 17	103
128	1889, May, 26 10 ...	17	...	...	132
129	„ June, 14 10 ...	12	...	...	157
130	„ July, 17 9·7 ...	10	17 10	17 18	223
131	„ September, 9 4 ...	26	...	...	123
132	„ November, 1 10 ...	20	...	...	195
133	„ „ 28 19 ...	10	...	...	106
134	1890, October, 5 12 ...	22	...	...	105
135	„ November, 7 22 ...	22	...	...	110
136	1891, January, 16 10 ...	16	...	...	152
137	„ March, 2 6·7 ...	18	2 12	3 0	213
138	„ „ 3 8 ...	25	...	...	144
139	„ April, 7 16 ...	10	...	...	77
140	„ „ 8 8 ...	20	...	...	136
141	„ „ 17 8 ...	17	...	...	195
142	„ May, 6 7 ...	17	...	...	132
143	„ „ 13 13·2 ...	92	13 13	15 19	292
144	„ „ 27 21 ...	35	...	...	148
145	„ June, 14 13·5 ...	14	14 14	14 19	205
146	„ July, 17 8 ...	15	...	...	150
147	„ August, 29 4 ...	44	...	...	140
148	„ September, 9 15 ...	81	...	...	110
149	„ „ 27 23 ...	30	...	...	146
150	„ November, 20 3 ...	23	...	...	151
151	„ December, 7 4 ...	46	...	...	154
152	„ „ 30 6·9 ...	19	30 10	30 20	192
153	1892, January, 4 23·6 ...	39	4 24	6 8	174
154	„ „ 28 23·1 ...	33	29 12	29 16	255
155	„ February, 13 9·9 ...	37	13 10	14 1	612
156	„ „ 21 0·0 ...	23	21 1	21 21	105
157	„ March, 1 2 ...	27	...	...	116
158	„ „ 6 14·6 ...	38	6 15	7 1	242

The times of the attainment of the maximum and minimum value of Horizontal Force are given only for 'X' disturbances and in these cases the times of commencement are given in tenths of an hour.

TABLE 386.—*List of principal magnetic disturbances at Colaba, Bombay, for the period 1882 to 1905.*
[The disturbances are determined from the Horizontal Force traces.]

Reference number.	Time of commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range unity = 1γ.	Reference number.	Time of commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range unity = 1γ
	d. h.		d. h.	d. h.			d. h.		d. h.	d. h.	
159	1892, March, 12 3·4 ...	31	12 4	13 3	239	238	1895, October, 17 0 ...	24	...	...	132
160	„ April, 24 2 ...	34	...	...	96	239	„ „ 26 18 ...	30	...	...	155
161	„ „ 9 9 ...	6	...	...	143	240	„ November, 8 10 ...	10	...	...	147
162	„ „ 25 20 ...	40	...	...	232	241	„ „ 9 20 ...	33	...	...	108
163	„ May, 1 9 ...	20	...	...	173	242	„ „ 23 10 ...	39	...	...	173
164	„ „ 17 2·8 ...	25	17 10	18 0	170	243	„ December, 7 11·8 ...	32	7 14	8 18	211
165	„ „ 18 13·2 ...	24	18 13	18 21	348	244	„ „ 21 14 ...	14	...	...	109
166	„ „ 19 20·2 ...	20	19 20	20 2	110	245	1896, January, 3 2 ...	32	...	...	105
167	„ June, 2 19 ...	28	...	...	186	246	„ „ 19 12 ...	14	...	...	142
168	„ „ 27 9·9 ...	20	27 12	27 19	388	247	„ „ 30 1 ...	27	...	...	114
169	„ July, 12 22·7 ...	23	12 23	13 3	290	248	„ February, 14 0 ...	24	...	...	148
170	„ „ 16 17·5 ...	33	16 18	17 0	240	249	„ „ 28 14 ...	13	...	...	139
171	„ „ 26 5·1 ...	22	26 12	26 16	180	250	„ March, 4 10 ...	23	...	...	188
172	„ August, 3 18·8 ...	36	3 19	4 23	138	251	„ „ 12 8 ...	16	...	...	135
173	„ „ 12 17·4 ...	19	12 23	13 1	403	252	„ „ 26 13 ...	59	...	...	97
174	„ September, 13 4 ...	8	...	...	165	253	„ May, 2 13 ...	39	...	...	268
175	„ „ 21 11 ...	41	...	...	170	254	„ „ 17 21 ...	23	...	...	93
176	„ October, 12 8 ...	18	...	...	155	255	„ June, 16 12 ...	18	...	...	146
177	„ „ 17 19 ...	30	...	...	145	256	„ July, 23 23·0 ...	19	24 3	24 17	68
178	„ November, 4 7·3 ...	35	4 10	5 16	213	257	„ August, 1 14 ...	33	...	...	108
179	„ „ 24 12 ...	10	...	...	144	258	„ „ 20 21 ...	27	...	...	116
180	„ December, 5 1·2 ...	29	5 1	5 22	183	259	„ September, 17 23·2 ...	26	18 10	18 16	206
181	1893, January, 5 11 ...	19	...	...	130	260	„ October, 11 17 ...	10	...	...	97
182	„ „ 21 17 ...	33	...	...	90	261	„ „ 12 11 ...	14	...	...	146
183	„ February, 4 16 ...	36	...	...	79	262	„ November, 6 4 ...	14	...	...	151
184	„ March, 14 20 ...	30	...	...	103	263	„ „ 7 11 ...	14	...	...	138
185	„ „ 25 9·4 ...	12	25 12	25 21	188	264	„ December, 3 21 ...	36	...	...	120
186	„ „ 26 12·7 ...	21	26 13	27 1	202	265	„ „ 13 10·6 ...	11	13 11	13 17	152
187	„ April, 26 21·2 ...	17	26 21	27 3	160	266	1897, January, 1 15 ...	54	...	...	263
188	„ June, 18 11·6 ...	30	18 12	19 17	152	267	„ „ 28 22 ...	24	...	...	116
189	„ July, 16 2 ...	12	...	...	99	268	„ February, 25 20 ...	8	...	...	83
190	„ August, 6 8·7 ...	43	6 9	7 18	197	269	„ April, 1 23 ...	20	...	...	75
191	„ „ 18 7 ...	20	...	...	286	270	„ „ 19 18 ...	34	...	...	261
192	„ September, 26 6 ...	31	...	...	184	271	„ „ 23 11 ...	39	...	...	147
193	„ „ 30 12 ...	12	...	...	166	272	„ May, 30 4 ...	14	...	...	132
194	„ October, 2 16 ...	11	...	...	138	273	„ July, 31 6 ...	20	...	...	103
195	„ „ 10 12 ...	12	...	...	160	274	„ August, 1 16 ...	5	...	...	101
196	„ „ 25 12 ...	10	...	...	144	275	„ December, 11 6 ...	24	...	...	191
197	„ „ 26 18 ...	40	...	...	146	276	„ „ 20 13 ...	15	...	...	273
198	„ November, 1 20 ...	23	...	...	137	277	1898, February, 11 8 ...	44	...	...	149
199	„ December, 5 16 ...	24	...	...	133	278	„ March, 2 6 ...	7	...	...	114
200	1894, January, 3 3·3 ...	39	3 3	3 23	259	279	„ „ 11 12 ...	16	...	...	159
201	„ „ 12 0·6 ...	14	12 1	12 13	89	280	„ „ 15 6 ...	41	...	...	230
202	„ February, 19 11·7 ...	9	19 12	19 17	135	281	„ April, 7 11 ...	13	...	...	122
203	„ „ 21 1·2 ...	28	21 1	21 17	197	282	„ June, 7 3 ...	23	...	...	143
204	„ „ 23 3·3 ...	33	23 4	24 7	179	283	„ August, 16 10 ...	24	...	...	122
205	„ „ 25 12·6 ...	17	25 13	25 20	384	284	„ September, 3 1 ...	19	...	...	77
206	„ „ 28 20·1 ...	31	28 21	1 1	370	285	„ „ 9 16·8 ...	33	9 17	10 3	340
207	„ March, 21 20 ...	34	...	...	85	286	„ October, 25 14 ...	14	...	...	104
208	„ „ 30 11 ...	41	...	...	279	287	„ November, 22 14 ...	11	...	...	99
209	„ April, 17 16 ...	22	...	...	218	288	1899, January, 28 23·6 ...	14	28 24	29 3	86
210	„ June, 10 1 ...	38	...	...	127	289	„ February, 12 2 ...	26	...	...	250
211	„ „ 19 10·7 ...	25	19 11	19 24	124	290	„ March, 22 2 ...	14	...	...	113
212	„ „ 21 5·7 ...	16	21 11	21 18	159	291	„ May, 3 18 ...	16	...	...	70
213	„ July, 2 22 ...	8	...	...	71	292	„ September, 26 3 ...	24	...	...	99
214	„ „ 20 10·8 ...	25	20 13	20 18	525	293	„ October, 23 20 ...	8	...	...	93
215	„ August, 20 7·8 ...	26	20 8	20 16	607	294	1900, January, 5 11 ...	12	...	...	156
216	„ September, 14 6·0 ...	32	14 12	15 9	250	295	„ „ 19 13·0 ...	20	19 13	20 2	116
217	„ „ 19 14 ...	11	...	...	129	296	„ March, 8 15 ...	14	...	...	125
218	„ „ 30 12 ...	12	...	...	163	297	„ „ 12 20 ...	33	...	...	205
219	„ November, 13 18·9 ...	12	13 19	13 21	265	298	„ May, 1 2 ...	21	...	...	61
220	„ „ 17 17·0 ...	35	18 12	18 23	145	299	„ „ 5 8·0 ...	18	5 8	5 18	279
221	„ „ 23 18 ...	8	...	...	97	300	„ October, 25 9 ...	9	...	...	129
222	„ „ 24 14 ...	12	...	...	93	301	1901, March, 24 16 ...	12	...	...	123
223	„ December, 15 16 ...	12	...	...	90	302	„ May, 10 13 ...	17	...	...	102
224	1895, February, 9 8 ...	23	...	...	136	303	„ August, 14 10 ...	20	...	...	138
225	„ „ 15 8 ...	20	...	...	96	304	„ December, 28 11 ...	10	...	...	115
226	„ „ 24 14 ...	13	...	...	218	305	1902, March, 24 11 ...	15	...	...	118
227	„ March, 8 8 ...	41	...	...	131	306	„ April, 11 3 ...	19	...	...	157
228	„ „ 13 8 ...	26	...	...	183	307	„ August, 21 21 ...	18	...	...	77
229	„ „ 14 17 ...	11	...	...	86	308	1903, April, 6 4·3 ...	21	6 6	6 19	230
230	„ „ 25 5 ...	27	...	...	133	309	„ July, 26 10 ...	10	...	...	103
231	„ April, 11 10 ...	16	...	...	186	310	„ August, 22 0 ...	28	...	...	82
232	„ „ 23 16 ...	12	...	...	108	311	„ „ 26 4 ...	13	...	...	132
233	„ May, 10 11·9 ...	14	10 12	10 19	154	312	„ September, 19 10 ...	40	...	...	92
234	„ „ 29 7·6 ...	21	29 9	29 19	140	313	„ October, 12 12 ...	43	...	...	148
235	„ September, 4 5 ...	21	...	...	150	314	„ „ 31 10·8 ...	41	31 12	31 20	819
236	„ „ 29 19 ...	29	...	...	133	315	„ December, 13 17 ...	13	...	...	189
237	„ October, 12 18 ...	34	...	...	134	316	„ „ 30 8·1 ...	29	30 8	31 11	155

The times of the attainment of the maximum and minimum value of Horizontal Force are given only for 'X' disturbances and in these cases the times of commencement are given in tenth of an hour.

TABLE 386.—*List of principal magnetic disturbances at Colaba, Bombay, for the period 1882 to 1905.*
[The disturbances are determined from the Horizontal Force traces.]

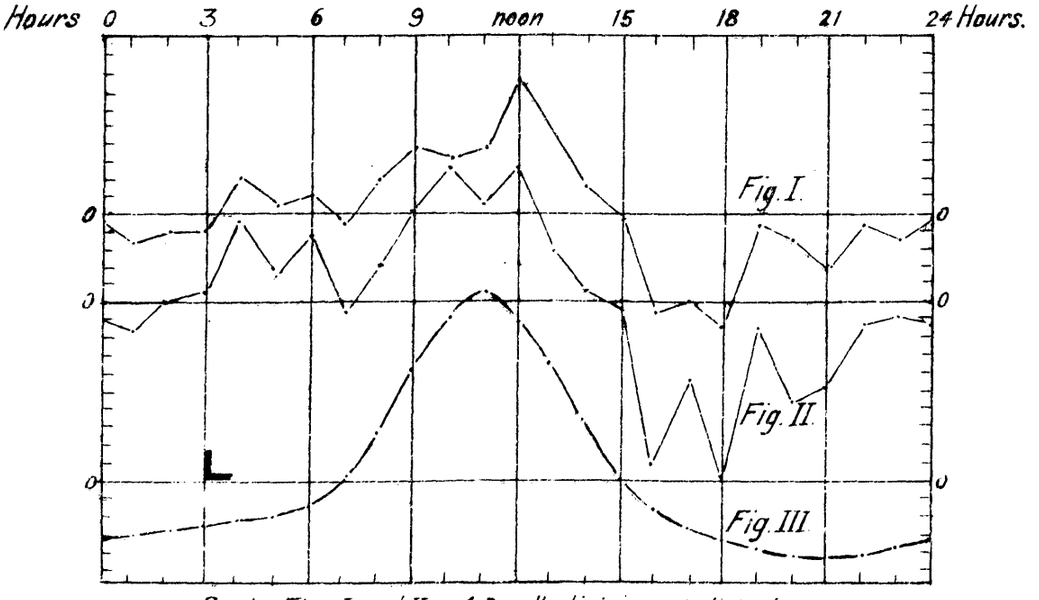
Reference number.	Time of commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range unity = 1γ.	Reference number.	Time of commencement.	Duration in hours.	Time of maximum.	Time of minimum.	Range unity = 1γ.
			d. h.	d. h.					d. h.	d. h.	
317	1904, January, 28 15 ...	14	...	...	148	333	1905, April, 1 6·0 ...	22	1 11	1 21	220
318	„ April, 1 4 ...	22	...	...	180	334	„ June, 5 7 ...	15	...	...	122
319	„ „ 18 9 ...	39	...	...	163	335	„ „ 10 14 ...	7	...	...	110
320	„ May, 12 10 ...	42	...	...	220	336	„ July, 6 2·5 ...	26	6 12	6 20	98
321	„ September, 25 1 ...	24	...	...	114	337	„ „ 23 14 ...	31	...	...	110
322	„ October, 21 16 ...	10	...	...	111	338	„ August, 2 5 ...	21	...	...	165
323	„ November, 2 16·5 ...	13	2 17	2 18	69	339	„ September, 3 12·8 ...	14	3 13	3 18	187
324	„ „ 4 11 ...	19	...	...	142	340	„ „ 18 7·4 ...	43	18 12	19 16	180
325	„ „ 25 12 ...	12	...	...	148	341	„ October, 6 14 ...	6	...	...	101
326	1905, January, 5 20 ...	10	...	...	100	342	„ „ 28 5·3 ...	19	28 11	28 23	168
327	„ „ 22 8 ...	19	...	...	121	343	„ November, 12 12 ...	16	...	...	247
328	„ February, 3 6·6 ...	42	3 8	3 18	228	344	„ „ 13 10 ...	13	...	...	109
329	„ „ 5 11 ...	19	...	...	96	345	„ „ 15 20·1 ...	30	15 20	16 2	259
330	„ March, 2 18·3 ...	18	2 19	2 23	160	346	„ December, 4 7 ...	19	...	...	148
331	„ „ 5 9 ...	15	...	...	108	347	„ „ 12 7·7 ...	30	12 8	13 13	135
332	„ „ 7 8 ...	18	...	...	137						

The times of the attainment of the maximum and minimum value of Horizontal Force are given only for 'X' disturbances and in these cases the times of commencement are given in tenths of an hour.

Examining similarly the distribution in regard to the time of maximum and minimum turning points in the disturbed day's curve we obtain the following results:—

	Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
'X' disturbances.	Frequency of occurrence of maximum ...	5	4	0	3	6	1	3	1	6	7	7	8	18	12	3	5	0	4	1	6	4	3	2	4
	Frequency of occurrence of minimum ...	6	7	2	5	2	0	1	2	2	1	1	1	3	3	0	5	11	14	14	7	7	9	3	7
	Frequency maximum less minimum ...	−1	−3	−2	−2	+4	+1	+2	−1	+4	+6	+6	+7	+15	+9	+3	0	−11	−10	−13	−1	−3	−6	−1	−3
Large disturbances.	Frequency of occurrence of maximum ...	3	4	1	4	10	3	8	1	5	11	15	11	18	10	3	6	0	4	1	5	4	2	1	4
	Frequency of occurrence of minimum ...	5	7	1	3	1	0	1	2	1	1	0	0	3	4	2	6	18	13	21	8	15	12	4	6
	Frequency maximum less minimum ...	−2	−3	0	+1	+9	+3	+7	−1	+4	+10	+15	+11	+15	+6	+1	0	−18	−9	−20	−3	−11	−10	−3	−2
Average diurnal inequality 1872—1904 ...		−104	−96	−89	−82	−75	−67	−50	−3	+83	+188	+276	+306	+270	+190	+96	+14	−50	−84	−104	−117	−128	−130	−127	−115

The analysis shows that the incidence of X disturbances at Colaba, is on the average such as to synchronise with the usual diurnal wave accentuating the rise in the ordinate at about 11 hours and the fall at about 21 hours. It should be remembered, however, that in these results the effects of the usual diurnal sweep over which are presumably superposed the disturbance effects, are clearly included, for which due allowance should be made. Combining the two results that of the maximum less minimum effects as shown in the above table in the last row for X disturbances, we get a curve shown below in figure 1 which when compared with that of the usual diurnal inequality shown in the last row of the

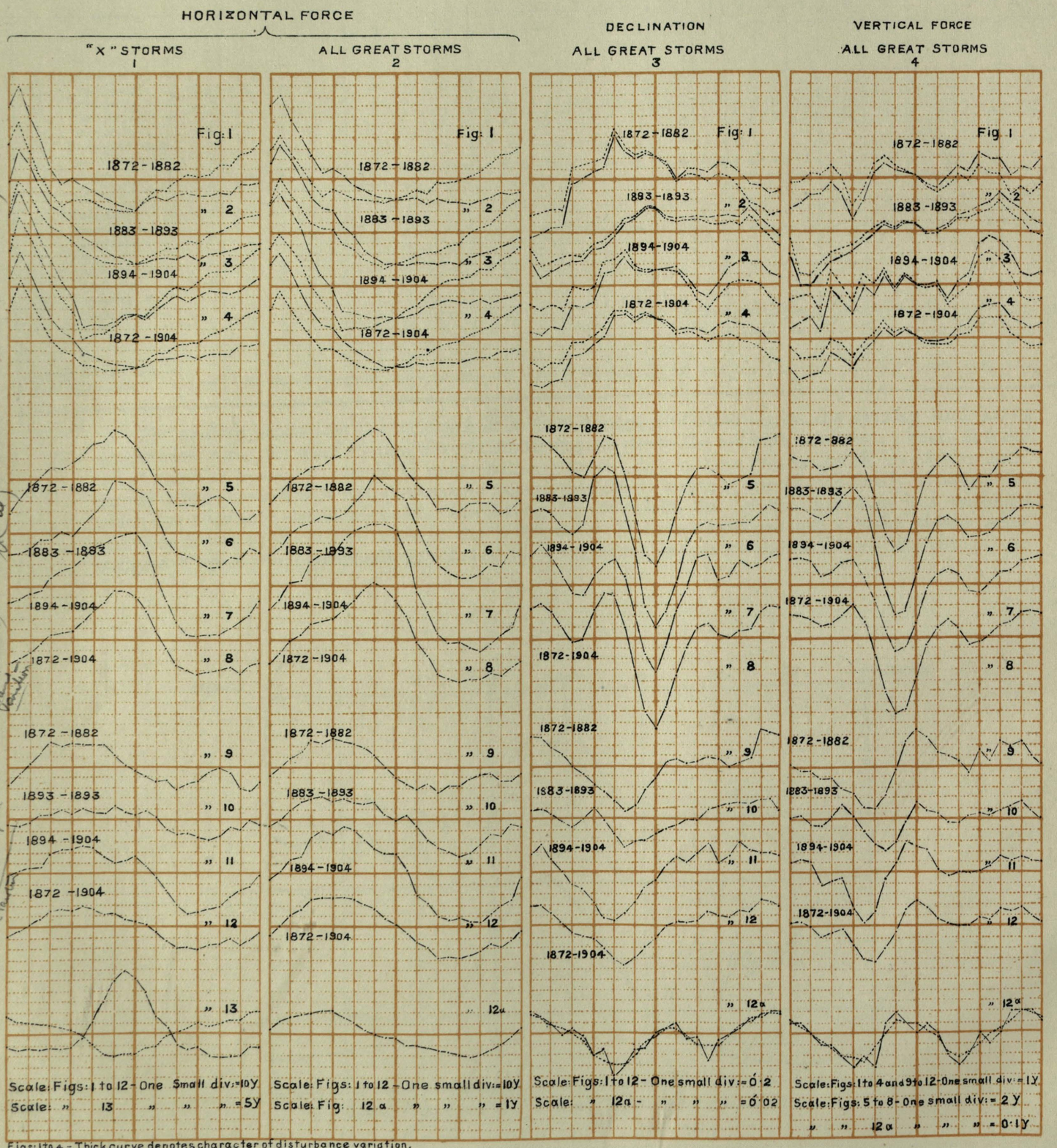


Scale Figs. I and II :- 1 Small division = 2 disturbances.
" Fig. III :- " " " = 3 γ.

COLABA OBSERVATORY.

Character curves and Diurnal Variation of Disturbances

Plate 73



Figs: 1 to 4 = Thick curve denotes character of disturbance variation.
" " Dotted " " " Corrected for secular Change.
" 12a = Thick " " Difference variation: quiet days and all days.
" " = Dotted " " " " " " smoothed.
" 13 = Thick curve " Diurnal variation of second day of great storms.
" " = Dotted " " disturbance variation or thick curve minus the corresponding average diurnal variation.

Figs: 5 to 8 = Curve denotes crude disturbance variation.
" 9 to 12 - " " disturbance variation. (corrected)

Govt Photozinco: Office, Poona, 1910.

table which is also charted side by side as figure 3, gives one a rough idea as to the manner in which the disturbance effects are likely to modify the usual diurnal wave. Figure 2 above shows the curve similarly derived from all large disturbances discussed in paragraph 444 and given in row 7 of the table above. It will be seen later how remarkably closely do the curves shown in figures 1 and 11, simulate the actual disturbance diurnal variations, *see* paragraph 441.

Character of an average X disturbance.

440. For the purpose of the examination of the character and progression of these X disturbances all of which appear to have a strong family resemblance, the disturbances 38, 47 and 28 in number registered respectively during the periods 1872—1882, 1883—1893 and 1894—1904, were taken separately in three groups and the twenty-four tabulated hourly ordinates* were so arranged for each day as to have the hour nearest to the starting point of the disturbances as the commencing hour, all in one line vertically coincident irrespective of their position in the day, the rest of the hours being arranged in 24 columns, and each hour being reckoned from the *commencing hour of the storm.* With such an arrangement of the hours as shown in table 394, the *character* curves of disturbances were derived one for each of the three 11-year groups. The final results, which are copied for ready reference in table 387 and charted in plate 73 in the first set of figures 1 to 3, all clearly exhibit precisely the same character of progression during twenty-four hours after the storm. The average curve of the whole period 1872—1904, charted in figure 4, may hence be taken as a typical curve, showing the following characteristics, *viz.* (1) a small initial rise; (2) a large rapid fall which attains its lowest value indicating the maximum effect of the disturbance from about 10 to 11 hours after the commencement of a storm; and (3) a slow and laboured rise back to normal conditions. The differences of 72γ, 58γ and 57γ made out between the values of the ordinates at the commencement and the twenty-fourth hour of the disturbance shown in columns 2, 3 and 4 in table 387, indicate the enormously large secular progressive change† in 24 hours exhibited by the average X disturbance day at Colaba during the three 11-year periods. The instrumental change being insignificantly small, the whole of this creep may be regarded as a magnetic effect in a day of 24 hours immediately following the commencement of an average X disturbance. And seeing that on the average result of 1872—1904 (see column 5), the loss in force in about 10 hours is 113γ, it is only partly made up in the next 14 hours completing the day of 24 hours, roughly at the rate of 2·0γ per hour. It must be remembered that here the hourly points indicate the interval measured from the commencing hour of a storm.

Diurnal variation of days of X disturbances.

441. Having so far examined the general features of this class of disturbances, the hourly ordinates of the 113 disturbances dealt with in the last paragraph, were, after being corrected for the aperiodic change, rearranged in the usual way for the derivation of the diurnal variations separately for each of the three 11-year groups. (See columns 10 to 13, table 387.)

The results which are charted as figures 5 to 7 in plate 73, show that the three variations bear a general family resemblance to one another, though each group consists of an unequal number of disturbances. Hence there is little hesitation in accepting the phenomenon as presented by the average curve of 113 disturbances as a typical variation. This is shown in figure 8. All these crude disturbance curves when duly corrected for the average diurnal curve of the corresponding epoch (which is about that of the mean maximum spot shown in column 19) may be regarded as the true disturbance diurnal variations for the X disturbances. These appear in columns 15 to 18 and are charted as figures 9 to 12 in plate 73. The correctness of the above result however depends upon what is taken away from the crude disturbance curve, as denoting the average undisturbed diurnal variation for the period. This is obviously an important factor. We know that the diurnal wave is normally enlarged in its sweep during the maximum spot years and it is not improbable that similar to this effect which is periodically incident every 11 years, there may also exist other smaller periods (a periodic incidence of disturbances every 13·5 days and 27 days is strongly suspected to exist, *vide* Chapter XIII) which affecting the curve from day to day though nearly cutting out in the month and thus giving no decided indication of the same in the average result of the month, may contribute an enlarged sweep of the diurnal wave on disturbed or stormy days whenever and wherever they occur. We shall recur to this again in due course.

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* In tabulating the disturbances here and elsewhere no smoothing operation is at all attempted and the ordinates are entered directly as measured at the exact hourly intervals. Only when the movements are very abrupt so as to bring two points on the same vertical line, that the mean of the two extreme readings, is adopted.

† The character curve of disturbances derived as above may not correctly admit of any such further analysis as suggested, and incidentally only the fall of force in the interval of 24 hours reckoned from the commencement of the storm, is referred to here. See paragraph 450 also.

TABLE 387.—*Showing the character and diurnal variation of the average "X" Disturbances.*

[Horizontal Force.]

Unity = 0·1γ = ·000001 C. G. S.

Hours showing interval after the commencement.	Character of "X" disturbances. Uncorrected for P change. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Corrected for P change. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Civil hours.	Diurnal variation of "X" disturbances. Crude disturbance variation. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Disturbance variation. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Diurnal variation mean maximum spot epoch.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0 ...	+703	+482	+652	+598	+345	+192	+367	+287	0 ...	-307	-197	-150	-222	-165	- 55	- 8	- 80	-142
1 ...	+896	+795	+920	+860	+568	+529	+658	+574	1 ...	-183	-191	-104	-167	- 49	- 57	+ 30	- 33	-134
2 ...	+596	+640	+704	+641	+298	+398	+466	+381	2 ...	- 77	-140	- 66	-101	+ 48	- 15	+ 59	+ 24	-125
3 ...	+386	+455	+482	+439	+118	+237	+268	+205	3 ...	+ 7	- 69	- 38	- 34	+122	+ 46	+ 77	+ 81	-115
4 ...	+124	+286	+258	+225	-115	+ 92	+ 68	+ 17	4 ...	+135	- 52	+ 92	+ 46	+240	+ 53	+197	+151	-105
5 ...	- 24	+218	+ 54	+ 96	-233	+ 49	-113	- 86	5 ...	+113	+ 6	+140	+ 75	+209	+102	+236	+171	- 96
6 ...	+ 7	+108	- 86	+ 26	-172	- 37	-229	-130	6 ...	+166	- 16	+178	+ 93	+239	+ 57	+251	+166	- 73
7 ...	- 34	- 10	-371	-107	-183	-131	-490	-237	7 ...	+226	+ 95	+276	+183	+237	+106	+287	+194	- 11
8 ...	- 70	- 92	-351	-149	-189	-189	-446	-253	8 ...	+332	+180	+358	+275	+231	+ 79	+257	+174	+101
9 ...	-150	-144	-358	-199	-239	-217	-429	-277	9 ...	+363	+297	+401	+345	+132	+ 66	+170	+114	+231
10 ...	-203	-201	-316	-230	-263	-249	-364	-282	10 ...	+466	+476	+456	+467	+116	+126	+106	+117	+350
11 ...	-245	-231	-269	-245	-275	-255	-293	-271	11 ...	+424	+465	+500	+460	+ 36	+ 77	+112	+ 72	+388
12 ...	-270	-273	-255	-267	-270	-273	-255	-267	12 ...	+333	+397	+510	+404	- 16	+ 48	+161	+ 55	+349
13 ...	-189	-258	-285	-242	-159	-234	-261	-216	13 ...	+165	+339	+346	+282	- 89	+ 85	+ 92	+ 28	+254
14 ...	-144	-221	-206	-191	- 84	-173	-158	-139	14 ...	- 1	+163	+102	+ 93	-137	+ 27	- 34	- 43	+136
15 ...	-186	-205	-142	-183	- 97	-132	- 71	-105	15 ...	- 89	- 57	-128	- 86	-121	- 89	-160	-118	+ 32
16 ...	-118	-216	- 86	-151	+ 1	-119	+ 9	- 47	16 ...	-255	-184	-335	-245	-206	-135	-286	-196	- 49
17 ...	-110	-193	-122	-148	+ 39	- 72	- 3	- 18	17 ...	-248	-222	-455	-288	-153	-127	-360	-193	- 95
18 ...	-143	-233	- 84	-166	+ 36	- 88	+ 59	- 10	18 ...	-261	-278	-471	-320	-145	-162	-355	-204	-116
19 ...	-151	-179	- 45	-136	+ 58	- 10	+122	+ 46	19 ...	-193	-330	-461	-316	- 56	-193	-324	-179	-137
20 ...	-106	-161	- 51	-115	+133	+ 33	+139	+ 93	20 ...	-149	-311	-456	-293	+ 7	-155	-300	-137	-156
21 ...	-119	-145	- 66	-117	+149	+ 73	+148	+117	21 ...	-208	-245	-388	-268	- 42	- 79	-222	-102	-166
22 ...	- 42	-123	- 5	- 66	+256	+119	+233	+194	22 ...	-372	-255	-314	-308	-206	- 89	-148	-142	-166
23 ...	- 38	-100	+ 27	- 48	+290	+166	+289	+238	23 ...	-372	-161	-275	-261	-219	- 8	-122	-108	-153
24 ...	- 13	- 99	+ 81	- 25	+345	+191	+366	+286	.....	...	...	...	...	...	...	...	...	.....
Progressive change in 24 hours.	-716	-581	-571	-623	...	...	...	...	.....	...	...	...	...	...	...	...	...	.....

The crude disturbance curves, figures 5 to 8, at any rate show that the maximum value in force is attained at about 10 or 11 a.m., when conditions are so determined as to provoke soon after this climax, a sudden drop in the value of the force, the minimum being reached at about 7 p.m., when the greatest effect of the storm is attained. Thereafter the curve slowly rises for the next 15 or 16 hours completing the remainder of the day.

A passing remark may be useful here in regard to the arrangement of the hourly ordinates irrespective of their position in the day, as attempted in paragraph 440. It will be seen that in the *character* curve so derived, the normal diurnal variation nearly cuts out; but the elimination would only be complete if the number of days in the data dealt with, were sufficiently large and the distribution of the commencing hours of the storms was well spread over the 24 hours of the day. Otherwise a residual variation may remain and may vitiate the character curve. As in the present case so many as 113 disturbances have been taken, it is not likely that the character curve on this account, is at least seriously contaminated, especially as the distribution of the hour of commencement of the storms, is fairly well spread over the 24 hours of the day. Similarly in the arrangement in paragraph 441 which furnishes the disturbance variation curve, the accidental irregularities may be expected to be almost eliminated and the curve smoothed sufficiently to leave the variation otherwise unvitiated.

The corrected or true disturbance variation—the average of 33 years' results—shown in figures 12 in the two first sets of figures will be referred to presently (see paragraph 445).

442. The determination of the exact time of commencement of storms which is possible in the X disturbances, enables us definitely to advance that the majority of these storms at least commence almost instantaneously* all over the earth presumably due to the incidence in some way of the disturbance pulses not improbably brought about by some effects affecting the conductivity of the atmosphere as advanced by Schuster. A comparison with the Colaba curves of some seven selected disturbance charts at Kew, Pawlowsk and Batavia kindly supplied by the courtesy of the Directors of these Observatories, shows (*vide* paragraph 450) that while the commencement of these disturbances is almost always synchronous, the secondary forces which are presumably called forth into existence locally, together with the local diurnal wave possibly enlarged as suggested elsewhere, seem so largely to modify the progress of the storm as to make the subsequent features in the disturbances difficult of identification. In spite however of these difficulties the broad punctuations of the larger wave movements of the direct exciting cause, as will appear later, can be fairly correctly identified in the disturbances at all the stations, see paragraph 450. If then the assumption of the simultaneous commencement of the X storms and their subsequent synchronous progression, apart however from the local diurnal wave and other irregularities which generally mask their subsequent progress, is accepted as correct, the remarks about the Colaba X disturbances, especially about their character, may be made applicable to similar disturbances at all other stations, proper allowance being made for the time, due to the difference in longitude of any particular place and the phase of the local diurnal wave (*vide* paragraph 450).

General Disturbance Phenomenon.

443. Having so far analysed the peculiarities of one particular class of storms, the phenomenon of disturbance generally, as presented by the 347 disturbances large and small recorded during the period 1882—1905 and listed in table 386, need our attention next, so that their results may be compared with those of the larger disturbances separated in table 383 and also with those of X disturbances which have been already dealt with.

The determination of the exact time of commencement of the storms as already remarked, cannot for obvious reasons be reliably depended upon in all cases; nor can their distribution over the 24 hours of the day remain altogether uninfluenced by fortuitous causes such as the number of disturbances selected, the process of their selection and separation into different groups. The uncertainty, though considerable, cannot however be so great as to preclude altogether the use of the data for the purposes of a rough general survey of the phenomenon.

* Within a minute or two as the time scale does not allow of a greater accuracy in the tabulation than of 1 minute.

TABLE 388.—*Showing the character and diurnal variation of average large disturbances.*

[Horizontal Force.]

Hours showing interval after the commencement.	Character of large disturbances.								Civil hours.	Diurnal variation of large disturbances.								
	Uncorrected for progressive change.				Corrected for progressive change.					Crude disturbance variation.				Disturbance variation.				Diurnal variation mean maximum spot epoch.
	1872—1882.	1883—1893.	1894—1904.	1872—1904.	1872—1882.	1883—1893.	1894—1904.	1872—1904.		1872—1882.	1883—1893.	1894—1904.	1872—1904.	1872—1882.	1883—1893.	1894—1904.	1872—1904.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0 ...	+715	+660	+784	+714	+301	+294	+357	+312	0 ...	−215	−201	−204	−208	− 73	− 59	− 62	− 66	−142
1 ...	+811	+851	+884	+842	+431	+515	+492	+474	1 ...	−122	−142	−116	−126	+ 12	− 8	+ 18	+ 8	−134
2 ...	+592	+686	+731	+658	+247	+381	+375	+323	2 ...	− 23	− 19	+ 14	− 13	+102	+106	+139	+112	−125
3 ...	+431	+526	+560	+495	+120	+251	+239	+194	3 ...	+ 54	+ 57	+ 38	+ 50	+169	+172	+153	+165	−115
4 ...	+254	+340	+304	+295	− 22	+ 96	+ 19	+ 27	4 ...	+135	+ 94	+229	+144	+240	+199	+334	+249	−105
5 ...	+ 96	+242	+129	+153	−146	+ 28	−120	− 81	5 ...	+134	+136	+300	+176	+230	+232	+396	+272	− 96
6 ...	+109	+210	− 2	+115	− 98	+ 27	−216	− 86	6 ...	+207	+119	+293	+199	+280	+192	+366	+272	− 73
7 ...	+ 50	+ 63	−224	− 14	−123	− 90	−402	−181	7 ...	+237	+189	+427	+268	+248	+200	+438	+279	− 11
8 ...	− 36	− 35	−241	− 87	−174	−157	−383	−221	8 ...	+335	+261	+511	+355	+234	+160	+410	+254	+101
9 ...	− 89	−152	−269	−154	−193	−244	−376	−254	9 ...	+421	+387	+551	+443	+190	+156	+320	+212	+231
10 ...	−130	−233	−286	−203	−199	−294	−357	−270	10 ...	+474	+516	+580	+514	+124	+166	+230	+164	+350
11 ...	−171	−299	−285	−241	−206	−330	−321	−274	11 ...	+411	+439	+582	+464	+ 23	+ 51	+194	+ 76	+388
12 ...	−191	−285	−295	−248	−191	−285	−295	−248	12 ...	+256	+352	+529	+355	− 93	+ 3	+180	+ 6	+349
13 ...	−193	−301	−269	−247	−158	−270	−233	−214	13 ...	+ 92	+294	+279	+205	−162	+ 40	+ 25	− 49	+254
14 ...	−164	−272	−242	−219	− 95	−211	−171	−152	14 ...	− 57	+ 75	− 67	− 15	−193	− 61	−203	−151	+136
15 ...	−221	−284	−196	−236	−117	−192	− 89	−136	15 ...	−119	−149	−245	−160	−151	−181	−277	−192	+ 32
16 ..	−175	−294	−163	−211	− 37	−172	− 21	− 77	16 ...	−290	−314	−454	−338	−241	−265	−405	−289	− 49
17 ...	−209	−290	−132	−217	− 36	−137	+ 46	− 50	17 ...	−281	−379	−532	−376	−186	−284	−437	−281	− 95
18 ...	−210	−297	−145	−223	− 3	−114	+ 69	− 22	18 ...	−314	−439	−527	−408	−198	−323	−411	−292	−116
19 ...	−216	−218	−154	−202	+ 26	− 4	+ 95	+ 32	19 ...	−243	−437	−586	−391	−106	−300	−449	−254	−137
20 ...	−199	−202	−116	−180	+ 77	+ 42	+169	+ 88	20 ...	−243	−386	−619	−383	− 87	−230	−463	−227	−156
21 ...	−176	−186	−164	−176	+135	+ 89	+157	+125	21 ...	−235	−308	−551	−337	− 69	−142	−385	−171	−166
22 ...	−121	−135	−106	−122	+224	+170	+250	+213	22 ...	−318	−327	−468	−359	−152	−161	−302	−193	−166
23 ...	−134	− 98	−103	−114	+246	+238	+289	+254	23 ...	−299	−183	−392	−284	−146	− 30	−239	−131	−153
24 ...	−114	− 73	− 71	− 90	+300	+293	+356	+312	.....	...	...	...	...	...	...	...	...	.....
Progressive change in 24 hours.	−829	−733	−855	−804	...	...	...	...	.....	...	...	...	...	...	...	...	...	.....

In table below are given two distribution series derived (1) from the 347 large and small disturbances and (2) from the 134 large disturbances only.

Hours ...	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Total.
All disturbances ...	10	10	14	15	13	9	13	15	30	8	20	27	23	18	23	9	15	12	11	8	18	10	9	7	347
Large disturbances ...	5	7	6	9	7	5	10	4	6	6	6	5	5	9	3	6	3	6	4	6	5	3	2	6	134

It will appear from the table above that when both large and small disturbances are considered together, a decided relation to the position of the sun is indicated, while the larger disturbances by themselves do not disclose any such relation. In view however of the uncertainty in the data already referred to, considerable hesitation must prevail in accepting this conclusion. Much of the doubt however is removed later, *vide* paragraph 449, when it will be seen that the disturbances regarded as a general average phenomenon* may be taken without hesitation to indicate this relation to the position of the sun, while the distribution of the larger disturbances by themselves over the 24 hours may be regarded in the main to be fortuitous.

444. The derivation of the character curve and disturbance variation from so many as 347 days of disturbance was not attempted, especially as that list includes a large number of disturbances the duration of which is considerably less than 24 hours, those lasting even up to 5 hours being also incorporated in it. It was therefore deemed advisable on the whole to take for the purpose in question, the group of the larger disturbances only which have been collected in table 383 for this special requirement. The actual tabulation numbers of the first 24 hours of each of these disturbances are shown in table 395, while the summary of the results is given separately in table 388 for ready reference here.

The character curves derived from the 134 larger disturbances given in columns 2, 3, 4 and 5 of table 388, are charted, as in the case of X disturbances, separately for each of the three 11-year groups, and for the average period in the second set of figures 1 to 4 in plate 73. In figures 5 to 8 similarly are charted the crude disturbance diurnal variation shown in columns 11, 12, 13 and 14 of the same table derived from these larger disturbances. The last curves are corrected for the diurnal variation at times of mean maximum sun-spot epoch shown in column 19 and the true disturbance variations so derived, columns 15 to 18, appear charted in figures 9 to 12.

The parallelism of each of the figures 1 to 12 in the first two sets of figures in plate 73, the one representing the phenomenon as given by X disturbances and the other by the larger disturbances generally, is so markedly close that little difference can be discerned anywhere in the various results. From the character curves (figure 4) it will appear that in about 11 hours the force falls rapidly by about 110γ during an average large disturbance at Colaba, and of this defect only about 16γ is made up in the next 12 or 13 hours, that is in 24 hours after the commencement of the storm, roughly at a rate of about 1·3γ per hour. The enormous defect of 94γ is then steadily made up by a slow creep during the succeeding day or two. It will thus appear that while the fall is rapid, the return to normal conditions is slow and laboured, and as referred to in the next paragraph, it is not quite accomplished on the average even in the next twenty-four hours.

Considering that little difference at any rate is discernible between the two sets of curves—and there is a close and a generally prevailing family resemblance exhibited between the larger disturbances classified in table 383 and the so-called X disturbances,—there seems no good reason why they should be classed as different phenomena† either in character or incidence. The differentiating feature, *viz.*, the jerky beginning which is so definitely characteristic of the latter class of storms, may after all be fortuitous and due merely to the incidence of these storms upon initially quieter conditions of the day's trace than those usually obtaining prior to the commencement of other larger storms. The magnetic traces when carefully examined do show on the whole a tendency to less disturbed conditions of the hours preceding the X disturbances, than in other large storms.

445. The two disturbance variations shown in figure 12 of the first two sets of figures in plate 73, exhibit anyway precisely the same character, though derived from different groups of disturbances. They

* It is made up of the actual disturbance effects and the restitution effects, the latter of which, it will be seen later, depend upon local conditions and therefore presumably upon the position of the sun.

† It is difficult to trace in all the Colaba disturbances the distinctive peculiarities which Birkland has shown to exist in his selected disturbances, as the days treated by him do not come near the class of the Colaba disturbances, treated above, by a long way.

TABLE 389.—*Showing the character and progress of the second twenty-four hours*

Date and hour of Commencement.				Interval in Hours after										
		d.	h.	24	25	26	27	28	29	30	31	32	33	34
1882	April ...	18	4	0·648	0·667	0·699	0·753	0·820	0·864	0·873	0·909	0·894	0·877	0·856
,,	October ...	3	14	2·739	2·739	2·731	2·677	2·699	2·681	2·658	2·650	2·660	2·661	2·694
1883	April ...	4	13	2·122	2·180	2·220	2·167	2·154	2·305	2·240	2·154	2·335	2·225	2·508
,,	September ...	17	7	0·660	0·703	0·537	0·607	0·724	0·986	1·042	0·746	0·897	0·742	0·660
,,	November ...	23	5	1·013	1·012	1·226	1·229	1·143	1·114	1·131	1·020	0·933	0·812	0·793
1884	October ...	3	2	0·152	0·249	0·306	0·097	0·092	0·057	−0·036	0·065	0·169	0·250	0·237
1886	May ...	10	0	1·963	1·950	2·047	1·983	1·983	1·913	1·993	2·000	2·135	2·134	2·239
1888	January ...	8	21	0·030	0·237	0·319	0·418	0·474	0·517	0·562	0·596	0·625	0·679	0·685
1889	June ...	15	10	2·928	2·968	2·948	2·890	2·840	2·776	2·719	2·722	2·697	2·690	2·698
1891	August ...	30	4	0·827	0·892	0·942	0·919	0·872	0·856	0·893	0·965	0·954	1·096	1·009
1892	January ...	29	22	0·310	0·282	0·368	0·434	0·458	0·528	0·573	0·588	0·650	0·660	0·763
,,	February ...	14	9	−0·769	−0·327	−0·041	−0·189	−0·294	−0·240	−0·565	−0·565	−0·429	−0·315	−0·454
,,	May ...	2	9	0·050	0·072	0·121	0·112	−0·022	−0·092	−0·206	−0·274	−0·207	−0·162	−0·284
,,	June ...	3	19	−0·372	−0·342	−0·128	−0·160	−0·078	−0·078	−0·073	−0·056	−0·052	000	000
,,	December ...	6	0	2·887	2·661	2·738	2·734	2·706	2·820	2·880	2·928	2·927	2·913	2·952
1893	August ...	19	7	2·386	2·511	2·662	2·833	2·811	2·819	2·751	2·624	2·679	2·568	2·441
,,	October ...	26	12	2·888	2·871	2·796	2·751	2·726	2·695	2·828	2·787	2·713	2·488	2·521
1894	February ...	26	12	2·143	2·019	1·973	2·062	2·057	2·041	2·049	2·069	2·259	2·116	2·275
,,	June ...	11	1	1·980	1·908	1·902	2·021	2·093	2·037	2·085	2·137	2·242	2·340	2·344
,,	July ...	21	10	1·698	1·600	1·516	1·376	1·152	0·984	1 046	1·266	1·399	1·363	1·404
,,	August ...	21	7	1·425	1·567	1·730	1·769	1·762	1·804	1·765	1·718	1·623	1·507	1·470
1895	September ...	30	19	1·120	1·004	1·053	1·079	1·178	1·308	1·305	1·312	1·396	1·399	1·370
1896	September ...	18	22	0·162	0·425	0·536	0·469	0·558	0·602	0·624	0·608	0·632	0·630	0·726
1899	February ...	13	2	2·656	2·404	2·428	2·380	2·374	2·408	2·444	2·574	2·654	2·666	2·665
1900	May ...	2	2	1·840	1·841	1·876	1·868	1·874	1·882	1·961	1·995	2·068	2·141	2·174
,,	,, ...	6	7	1·563	1·640	1·688	1·792	1·812	1·808	1·762	1·780	1·692	1·737	1·716
1902	April ...	12	3	2·225	2·305	2·350	2·435	2·550	2·720	2·995	3·112	3·000	2·955	2·925
1903	,, ...	7	3	0·300	0·390	0·400	0·435	0·540	0·685	0·822	0·960	1·020	0·990	0·900
,,	November ...	1	10	5·898	6·523	6·637	6·875	6·956	7·245	7·313	7·396	7·602	7·632	7·243
Average character curve ...				−216	−173	−104	−95	−88	−57	−51	−38	+14	0	−2
Civil Hour				0	1	2	3	4	5	6	7	8	9	10
Crude disturbance variation ...				−53	−69	−64	−64	−61	−61	−55	−27	+54	+150	+251
Disturbance variation corrected for variation maximum spot ...				+89	+65	+61	+51	+44	+35	+18	−16	−47	−81	−99

The tabulation ordinates for the second twenty-four hours after the commencement of a storm are given above in inches from 1882 to 1900 and in cms. from These are divided into convenient groups during which the scale co-efficient was nearly uniform. The variations of the sums of these periods converted in

after the commencement of the selected magnetic disturbances in Horizontal Force.

the commencement.

35	36	37	38	39	40	41	42	43	44	45	46	47	48
0·843	0·828	0·808	0·803	0·799	0·787	0·795	0·794	0·797	0·813	0·821	0·804	0·806	0·809
2·678	2·739	2·748	2·764	2·788	2·815	2·904	3·071	3·160	3·095	3·152	3·099	3·022	2·893
2·356	2·347	2·307	2·320	2·268	2·364	2·340	2·353	2·524	2·638	2·723	2·756	2·712	2·617
0·921	0·810	0·985	1·019	0·981	1·029	1·056	1·069	1·100	1·102	1·110	1·138	1·142	1·142
0·850	0·826	0·916	0·907	0·977	1·083	1·140	1·162	1·211	1·278	1·328	1·310	1·390	1·450
0·292	0·271	0·256	0·236	0·281	0·297	0·276	0·256	0·258	0·273	0·336	0·325	0·326	0·359
2·324	2·358	2·258	1·985	2·111	2·076	1·914	1·980	1·943	1·977	1·974	1·980	2·090	2·042
0·734	0·752	0·873	0·929	1·001	0·910	0·852	0·766	0·735	0·733	0·732	0·715	0·688	0·707
2·700	2·738	2·734	2·747	2·772	2·736	2·762	2·755	2·769	2·824	2·858	2·864	2·970	3·033
1·066	1·007	0·935	0·938	0·892	0·836	0·889	0·846	0·822	0·795	0·796	0·833	0·864	0·869
0·807	0·880	0·936	0·890	0·800	0·671	0·521	0·464	0·531	0·526	0·557	0·552	0·634	0·614
−0·419	−0·265	−0·273	−0·259	−0·239	−0·231	−0·197	−0·161	−0·145	−0·112	−0·043	0·004	0·114	0·264
−0·270	−0·270	−0·228	−0·040	−0·060	−0·076	0·066	0·146	0·076	0·119	0·070	0·173	0·217	0·262
0·032	0·127	0·200	0·337	0·400	0·413	0·406	0·400	0·437	0·489	0·324	0·256	0·188	0·122
3·054	2·932	2·970	2·968	2·970	2·896	2·887	2·810	3·095	2·985	2·829	2·813	2·795	2·943
2·465	2·405	2·523	2·484	2·477	2·549	2·598	2·563	2·584	2·622	2·593	2·621	2·613	2·627
2·607	2·691	2·447	2·530	2·654	2·613	2·586	2·593	2·732	2·961	3·153	3·402	3·431	3·259
2·110	2·060	2·105	2·181	2·214	2·229	2·275	2·283	2·291	2·331	2·406	2·511	2·592	2·670
2·385	2·396	2·122	2·099	2·099	2·074	2·050	1·967	2·045	2·002	2·026	2·064	2·048	2·121
1·461	1·531	1·602	1·626	1·621	1·612	1·610	1·666	1·660	1·736	1·807	2·036	2·194	2·383
1·466	1·464	1·466	1·467	1·483	1·547	1·537	1·543	1·543	1·551	1·563	1·580	1·631	1·599
1·377	1·364	1·377	1·502	1·530	1·549	1·495	1·302	1·147	1·135	1·315	1·316	1·370	1·391
0·931	0·979	1·009	1·030	0·944	0·816	0·708	0·679	0·739	0·750	0·723	0·699	0·743	0·750
2·656	2·610	2·543	2·520	2·573	2·569	2·540	2·484	2·531	2·519	2·525	2·600	2·604	2·634
2·165	2·110	2·060	1·999	1·972	1·970	1·952	1·951	1·954	1·955	1·942	2·021	2·052	2·016
1·650	1·651	1·635	1·612	1·632	1·652	1·665	1·718	1·613	1·630	1·639	1·611	1·610	1·594
2·790	2·795	2·650	2·500	2·475	2·405	2·440	2·450	2·432	2·437	2·467	2·482	2·495	2·475
0·835	0·730	0·695	0·760	0·835	0·805	0·860	0·840	0·770	0·780	0·810	0·980	0·895	0·900
7·305	7·493	7·438	7·525	7·655	7·489	7·671	7·536	7·584	7·603	7·536	7·649	8·149	8·391
+27	+32	+23	+35	+52	+37	+34	+23	+50	+77	+55	+139	+180	+199
11	12	13	14	15	16	17	18	19	20	21	22	23	24
+298	+264	+196	+80	+25	−46	−69	−54	−99	−109	−107	−101	−63	...
−90	−85	−58	−56	−7	+3	+26	+62	+38	+47	+59	+65	+90	...

1901 to 1903.

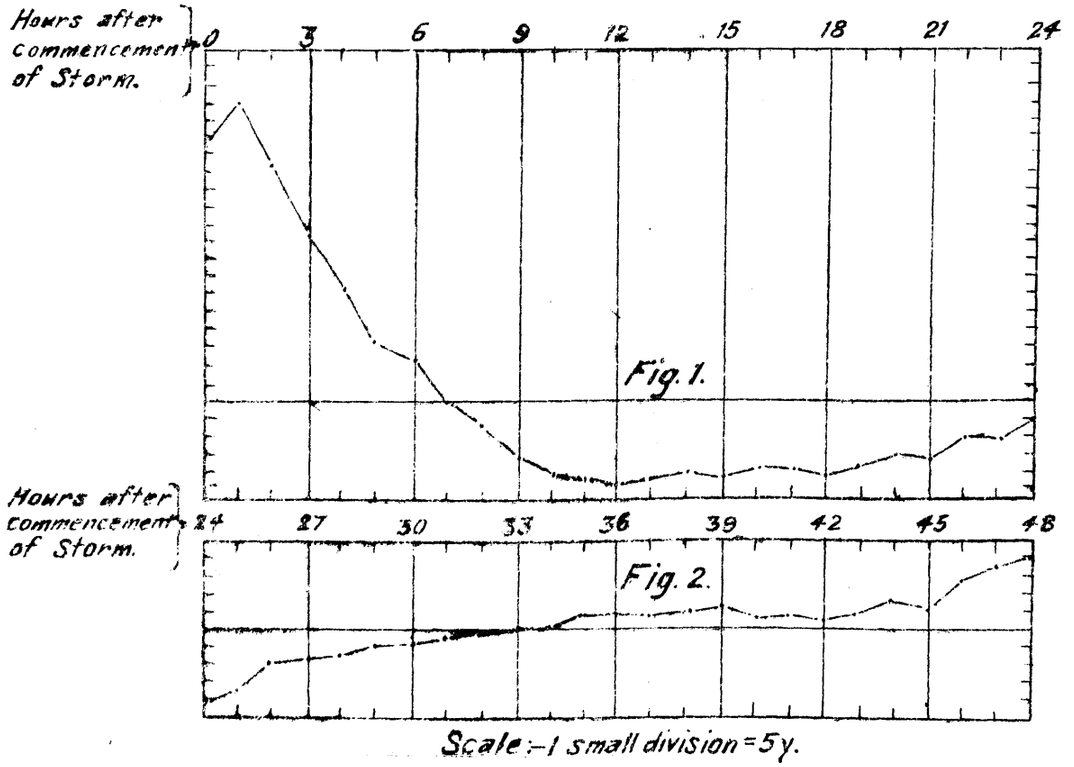
C. G. S. units (Unity = 0·17) are then added up to obtain the mean of the whole period.

may hence be accepted as definitely representing the character of the true disturbance variation. And this may be the more readily conceded when we find that the result is confirmed independently as will be seen later from two sources, one referred to in paragraph 448 and the other in paragraph 457.

The average disturbance variation at Colaba shows that the day commences at sunrise with the highest hourly ordinate which diminishes steadily as the day advances and acquires its minimum or greatest negative value as the sun disappears below the horizon, when apparently the exciting cause being removed the ordinate again steadily rises attaining its maximum value about sunrise. It will also be seen that exactly the same result is also derived from the analysis of disturbance results of the earlier period 1846 to 1872 (*vide* Observatory Volume of the years 1879—1882) made by an altogether different mode of treatment, *viz.*, that adopted by General Sabine, where the selection of disturbances is determined by separating values.

Character of disturbance variation of the second twenty-four hours of a storm.

446. A passing remark seems necessary here. It must have been noticed that in the arrangement of disturbance days in tables 394 and 395 for the derivation of the average disturbance variations, only the first 24 hours of each storm are included in the tables. The next days of the storms though heavily disturbed have been omitted on the assumption—and how far the assumption is justified will be seen presently—that the later or restitution effects cannot have the same characteristic variation as that of the actual initial disturbance and if they are considered together the true character of the variation of the first 24 hours would clearly be vitiated. In the average results of the month, which have in any case to be examined later, the second days of the storms would of course be included in and considered together with all other days of the month. It is hence interesting to examine here separately the *character* of the curve of those single days which constitute the *second* twenty-four hours of the larger storms. They are apparently almost as disturbed as the first days, but are, as we have seen, differentiated from the latter by a large rise in the daily mean instead of a fall which characterises the first day. Such picked 29 disturbance days have been arranged in table 389 precisely in the same manner as referred to in paragraph 440. The result given in the fourth row from the bottom of the table, which thus indicates the continuation of the *next* twenty-four hours of the disturbance, the character of the *first* twenty-four hours of which has already been discussed in paragraph 444, is charted below along with the latter for convenience of comparison in figures 1 and 2 respectively. It will be seen at a glance that the second day of the storm on an average has clearly



a distinct progression of its own widely differing in character from that of the first day. Both days are usually classed as heavily disturbed and it may be remarked that the peculiar progression of the second day appears to indicate a slow creep back to the normal condition strongly suggesting a phenomenon analogous to that which is usually noted in the strain of rigid bodies long after the initial stress has ceased to act.

For the derivation of the disturbance diurnal variation typical of these second days of the storm, the tabulation data were re-arranged in the usual manner and the result is shown in the last three rows of table 389, which is also charted as figure 13 (continuous curve) in plate 73. It will be readily seen that the diurnal disturbance variation of these days is also quite different from that of the first days of the storm. It resembles closely rather the usual diurnal inequality of an average day, but it is so effectually suppressed in its growth that if the average diurnal variation for the epoch of maximum spot is taken away from it, the net disturbance variation as shown in the last row of table 389, and represented by the dotted curve in figure 13, plate 73, clearly exhibits inverse conditions. The association hence of a distinctive disturbance variation in the first day of a storm, referred to in paragraph 445, with an enormously large aperiodic change which is negative in character, and also of another type of diurnal variation in the next 24 hours of the storm with a large aperiodic change though not quite as large as the former but positive in character, are notable features, which amongst other factors clearly differentiate these two kinds of the most heavily disturbed days in the month.

447. We have thus seen that in the magnetic phenomenon which is principally a day-to-day phenomenon, the fluctuations from one day to another appear to be more or less complementary in character. The average month may be regarded roughly to be made up of (1) a day of large disturbance which is characterised by a sudden dislocation of the magnetic conditions distinguished by an enormous negative aperiodic change in 24 hours (which may be more than 70γ, *vide* table 388); (2) a day or two less violently disturbed with somewhat smaller but positive aperiodic change which may be more than 40γ, *vide* table 389; (3) a large number of days of small disturbances which may have a small positive or negative aperiodic change; and (4) a few days of more or less quiet conditions but nearly always with a positive aperiodic change of about 4γ per day which though very small in comparison with the above figures, is large enough when compared with the actual secular change which in the average day is measured in tenths of a γ (*vide* tables 56 to 59). During the minimum spot epoch, days of class (1) and (2) are usually absent and those of (3) and (4) predominate, and as a consequence the aperiodic change in the quiet days on the average, falls to about 2γ, *vide* Chapter XI. And the reason is obvious. The larger negative excursions of the aperiodic change of days of class (1) to which the positive one are complementary, are more or less absent or much less intense; and hence the corresponding magnitude of the positive complementary changes also becomes less pronouncedly large.

448. The position of quiet days in the days of the month, appears hence to be so far fairly well defined. They are associated with high daily means and almost usually with a positive aperiodic change of the magnitude referred to. In the minimum epoch however when the disturbed days are very scanty or absent, the quiet days may have a negative aperiodic change as they then take the place of disturbed days in comparison with the other quieter days (*vide* Chapter XI). In the chapter which follows, quiet days have been discussed in relation to *all* days and some of the results may be conveniently anticipated here. If the phenomenon progresses in the way suggested in paragraph 447, and if the quiet days are regarded to connote conditions on one side of the average result of the month as the disturbance days do on the other (*vide* Chapter XIII) and if the average results in themselves are supposed to contain their share of the disturbance effects,* the quiet days may be supposed tentatively to approximate to the limit which determines some considerable freedom from disturbance. But there are quiet days and quiet days and the question whether they can be invariably accepted as being wholly or almost free from disturbance and are really quiet days in the full sense of the word will be examined later.

On this supposition however the examination of the difference curves of *quiet* days accepted tentatively as free from disturbances, and *all* days of the same epoch involving a disturbance factor, is of special interest. We have unfortunately the results of 11 years 1894—1904 only, available for this purpose, but the data, though limited, happen to be of a cycle of 11 years which is least disturbed in the period of 55 years considered here and on that account perhaps more appropriate for our purposes than a longer series consisting of a greater number of disturbed cycles. It will

* The disturbance effects in the average day alluded to here are in reference to the disturbance in the variation that is in the hourly ordinates, and not in the aperiodic change which for the average day is very small and nearly equals the true secular change (the instrumental change being duly allowed for); and therefore the average day connotes quiet rather than disturbed condition in this respect. On the other hand in the quiet days, which are free from irregularities in the hourly ordinates, the larger aperiodic change may be regarded tentatively to denote disturbed condition so far as that factor is concerned.

TABLE 390.—*Showing the character of seven selected disturbances as observed at Kew and Colaba.*

Unity = 0·1γ = ·000001 C. G. S.

Hours showing intervals after commencement.	Date and hour of commencement of disturbance at Kew.							Date and hour of commencement of disturbance at Colaba.						
	1892 February 13d 4h.	1892 June 27d 4h.	1892 July 12d 17h.	1892 August 12d. 12h.	1894 February 28d 14h.	1894 July 20d 5h.	1898 September 9d 11h.	1892 February 13d 9h.	1892 June 27d 9h.	1892 July 12d 22h.	1892 August 12d 17h.	1894 February 28d 19h.	1894 July 20d 10h.	1898 September 9d 16h.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0 ...	+ 562	+ 446	+1180	+ 321	+ 583	+ 531	+ 598	+1924	+1244	+ 796	+ 830	+ 756	+1991	+1500
1 ...	+ 611	+ 431	+2052	+ 594	+1128	+ 576	+1128	+3096	+1615	+1791	+1337	+1366	+2530	+2100
2 ...	+ 606	+ 176	+1950	+1081	+ 834	+ 616	+1200	+3487	+2252	+ 958	+ 952	+ 645	+2594	+1994
3 ...	+ 586	+ 821	+1442	+1926	+ 508	+ 453	+2065	+2820	+2161	+ 451	+1017	+ 87	+2408	+1176
4 ...	+ 846	- 553	- 80	+1674	+ 203	+ 568	- 101	+2305	+1772	- 580	+ 620	- 437	+2521	- 70
5 ...	+ 361	-1103	- 270	+2089	+ 269	- 424	+1483	+2026	+ 123	- 653	- 101	-1370	+1077	+ 455
6 ...	+ 536	- 728	+ 47	+1714	- 259	-1484	+ 723	+1247	- 723	- 503	-1619	- 905	- 688	- 116
7 ...	- 169	- 463	- 252	+ 556	- 669	- 596	+ 660	- 27	-1117	- 456	-1119	- 565	-1499	- 511
8 ...	- 199	+ 91	- 227	-1263	- 364	- 159	+ 545	- 169	- 845	- 175	- 853	- 620	-2405	- 162
9 ...	+ 361	- 193	- 207	- 788	- 504	+ 73	-1909	- 845	- 970	+ 4	-1453	- 552	-2283	- 69
10 ...	+ 401	+ 174	- 217	-1298	- 483	+ 106	- 927	-1518	-1404	+ 176	- 175	- 457	-1815	- 971
11 ...	+1663	+ 561	- 372	- 628	- 366	+2946	- 389	- 780	-1198	+ 282	-1010	- 360	-1305	- 994
12 ...	+1533	+ 621	- 575	- 456	- 386	+1318	- 406	- 941	- 890	+ 339	- 946	- 218	-1712	- 672
13 ...	+1836	+ 26	- 692	- 311	- 198	+ 133	- 383	-1210	- 952	+ 213	- 796	- 6	-1243	- 570
14 ...	+1556	- 43	-1276	- 418	- 238	+ 163	- 464	-1227	- 513	+ 20	- 519	+ 111	- 713	- 455
15 ...	+ 956	- 83	- 450	- 558	+ 11	- 294	- 402	-1844	- 348	- 133	- 357	+ 236	+ 34	- 328
16 ...	- 276	- 158	- 622	- 488	+ 21	+ 361	- 347	-2236	- 303	+ 10	- 147	+ 386	+ 372	- 161
17 ...	- 353	- 1	- 745	- 531	+ 76	-2039	- 289	-1614	- 180	- 273	+1256	+ 423	- 329	+ 28
18 ...	-1484	+ 82	- 490	- 356	- 16	- 819	- 279	-1054	- 172	- 349	+ 94	+ 292	+ 177	+ 36
19 ...	-1044	+ 212	- 92	- 536	- 46	- 924	- 257	- 877	+ 22	- 306	+ 116	+362	+ 89	+ 285
20 ...	- 226	+ 111	- 361	- 588	- 4	- 289	- 181	- 506	+ 141	- 482	+ 87	+ 238	- 64	+ 29
21 ...	-4601	- 73	+ 53	- 587	+ 91	- 59	- 922	- 806	+ 129	- 371	+ 54	+ 247	+ 32	- 581
22 ...	-2194	- 43	+ 532	- 466	- 226	- 189	- 714	- 266	+ 200	- 204	- 23	+ 278	+ 265	- 691
23 ...	-1001	- 83	+ 137	- 383	+ 211	- 179	- 152	+ 171	+ 335	- 110	- 46	+ 280	+ 591	- 311
24 ...	-1179	- 2	+ 247	- 266	+ 228	- 246	+ 30	- 386	+ 503	- 108	- 54	+ 337	+ 762	- 346
Progressive change.	1741	448	933	587	355	777	568	2310	741	904	884	419	1229	1846

TABLE 391.—*Showing the comparison and progression of the average of the seven selected disturbances as recorded at Kew and Colaba.*

Unity = 0·1γ.

Hours showing intervals after the commencement.	Kew character.	Kew character corrected for P. change (= 77·3γ).	Colaba character.	Colaba character corrected for P. change (= 119·1γ).	Difference between character at Kew and Colaba or column 5 less column 3.	Colaba residual duirnal variation.	Kew residual duirnal variation.	Difference residual duirnal variation Kew and Colaba.	Average character of 'X' disturbances at Colaba.	Difference character Kew minus average or column 3 less column 10.	Difference character Colaba minus average or column 5 less column 10.	Column 11 smoothed by taking overlapping means of 3 hours.
1	2	3	4	5	6	7	8	9	10	11	12	13
0 ...	+ 603	+ 217	+1292	+ 697	+ 480	+ 52	- 18	+ 70	+287	- 70	+410	- 53
1 ...	+ 931	+ 577	+1976	+1431	+ 854	+ 81	+ 2	+ 79	+574	+ 3	+857	+ 51
2 ...	+ 923	+ 601	+1840	+1344	+ 743	+ 81	+ 8	+ 73	+381	+220	+963	+281
3 ...	+1114	+ 825	+1446	+ 999	+ 174	+ 51	- 3	+ 54	+205	+620	+794	+310
4 ...	+ 365	+ 108	+ 876	+ 479	+ 371	+ 6	- 25	+ 31	+ 17	+ 91	+462	+305
5 ...	+ 344	+ 118	+ 222	- 125	- 243	- 41	- 43	+ 2	- 86	+204	- 39	+103
6 ...	+ 78	- 115	- 10	- 307	- 192	- 78	- 43	- 35	-130	+ 15	-177	+ 54
7 ...	- 133	- 294	- 756	-1004	- 710	-101	- 26	- 75	-237	- 57	-767	- 48
8 ...	- 225	- 354	- 747	- 945	- 591	-110	- 2	-108	-253	-101	-692	-143
9 ...	- 452	- 549	- 881	-1030	- 481	-106	+ 28	-134	-277	-272	-753	-159
10 ...	- 321	- 385	- 881	- 980	- 595	- 95	+ 37	-132	-282	-103	- 69 8	+117
11 ...	+ 488	+ 456	- 766	- 816	-1272	- 77	+ 48	-125	-271	+727	-545	+376
12 ...	+ 236	+ 236	- 720	- 720	- 956	- 52	+ 63	-115	-267	+503	-453	+512
13 ...	+ 59	+ 91	- 652	- 602	- 693	- 24	+ 61	- 85	-216	+307	-386	+304
14 ...	- 103	- 38	- 471	- 372	- 334	+ 7	+ 65	- 58	-139	+101	-233	+164
15 ...	- 117	- 21	- 391	- 243	- 222	+ 39	+ 53	- 14	-105	+ 84	-138	+ 48
16 ...	- 216	- 87	- 297	- 99	- 12	+ 66	+ 29	+ 37	- 47	- 40	- 52	-111
17 ...	- 555	- 394	- 98	+ 149	+ 543	+ 85	+ 11	+ 74	- 18	-376	+167	-231
18 ...	- 480	- 287	- 139	+ 158	+ 445	+ 87	- 5	+ 92	- 10	-277	+168	-286
19 ...	- 384	- 158	- 44	+ 303	+ 461	+ 67	- 22	+ 89	+ 46	-204	+257	-179
20 ...	- 220	+ 38	- 80	+ 317	- 279	+ 36	- 41	+ 77	+ 93	- 55	+224	-319
21 ...	- 871	- 581	- 185	+ 261	+ 842	+ 7	- 46	+ 53	+117	-698	+144	-365
22 ...	- 471	- 149	- 63	+ 433	+ 582	- 1	- 40	+ 39	+194	-343	+239	-377
23 ...	- 207	+ 147	+ 130	+ 676	+ 529	+ 19	- 42	+ 61	+238	- 91	+438	-168
24 ...	- 170	+ 216	+ 101	+ 696	+ 480	+ 52	- 18	+ 70	+286	- 70	+410	- 53
Progressive change.	773		1191									

appear from table 439 and plate 88, that these annual difference curves in which the accidental irregular effects of the storms are all smoothed and eliminated, are strikingly similar in character to the disturbance variations referred to in paragraphs 441 and 445, except of course in the magnitude of the amplitudes which for obvious reasons should be expected to be much larger in the latter, as they have been derived by taking the difference of the average curve of the large disturbances themselves (*vide* figures 12 and 12A, first two sets, plate 73). In both these results however a simple curve indicating a single Fourier wave in 24 hours with a maximum at 6 a.m. and a minimum at 6 p.m., is clearly exhibited. So far hence the similarity in the difference curves in both the results here, and in paragraphs 441 and 445 besides confirming the results of disturbance variations, tends to show indirectly in what exact relation do a heavy disturbed day, the average day, and the quiet day stand to one another.

449. It will be seen from plates 84 to 88, that this disturbance inequality as disclosed by the difference of *all* days and *quiet* days which as will be seen from the results of Fourier analysis in Chapter XI, consists of but one pulse of 24 hours, does not indicate any appreciably large seasonal change, while it is distinctly subject to the influence of the 11-year period becoming larger in amplitude at the maximum epoch and almost vanishing about the minimum. It is notable however that throughout the fluctuations, whether seasonal or yearly, the character of the pulse as a single wave of 24 hours is most markedly maintained.

Taking up the examination of the monthly differences of these disturbance curves derived from all days less quiet days which are shown in tables 424 to 435 and charted in plates 84 to 87, we find that the accidental irregularities which in the annual curve are smoothed and almost eliminated show out prominently here. Taking away now from each of these monthly difference curves, the average annual disturbance variation indicated in plate 88, for each year, we may obtain the residual irregularities due to disturbances as the average result of each month. The irregular movements appear more pronounced, as must be expected, in those months in which the heavy storms are incident, the peculiar characteristic of each storm specially the effects at the time of maximum, being clearly discerned in most of them. It must be remembered however that the curve of quiet days which has been accepted as an undisturbed curve is itself made up only of five days of the month in the selection of which there is some restriction imposed owing to the desirability of having the common epoch of the selected days coincident with the middle of the month. The mode of inspection of the traces and the selection of the days (*vide* Chapter XI) also introduce some uncertainty and the days may hence not necessarily be absolutely quiet, especially during the maximum spot epoch, when the number of quiet days is small; nor during the minimum spot years, when a large majority of the days in the month are quiet and the divergence between the disturbed day, the average day and the quiet day is on that account narrowed down considerably, may the selected days be the best as regards quiet conditions. A reference to table 403 in paragraph 463, Chapter XI, will show how the difference in the absolute value of force of a quiet day and the average day of the month is a positive quantity, which however, in some cases may indicate an opposite sign showing that the selected quiet-days are on the disturbed side of the average day.

The residual monthly irregularities referred to above which are shown in tables 424A to 435A, Chapter XI, hence for each month can hardly under the circumstances be accepted without reservation, but such as they are, they have been used here for the purpose of determining the susceptibility of each hour of the day to disturbances. The hourly ordinates of these monthly residual irregularities are summed up without regard to signs for each hour and the resultant arithmetical sums divided by the number of years, are given below, indicating the average condition of the period 1894—1904 :—

Unit = 0·1γ

Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Disturbance intensity of each hour	158	169	175	170	177	170	178	204	262	310	323	328	310	286	272	252	265	246	231	206	183	182	188	183

They are also charted for convenience of reference as figure 1 below, from which it will be seen that the run of the curve compared with that shown in figure 2 which measures the frequency of occurrence of the commencement of storms for each hour of the day and which has been discussed in paragraph 443,

indicates almost nearly the same relation to the positition of the sun. The ordinates of the curve in figure 1, which represent the disturbances to which each hour is subject, are the results of the contribution

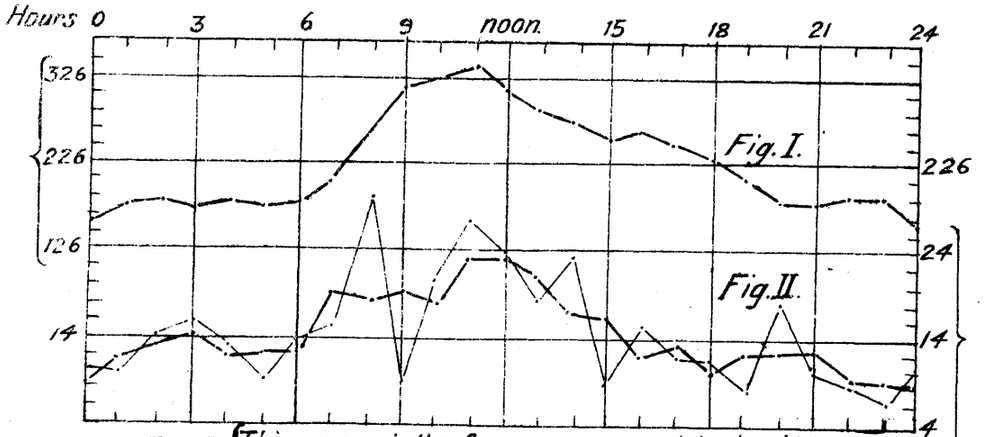


Fig. II.—{Thin curve is the frequency curve, while the thick curve is the same smoothed by taking overlapping means of 3 hours.

of effects of *all* days in the month and the relation to the position of the sun so far becomes intelligible. This may prove useful in explaining why in paragraph 443 this relation which the larger disturbances by themselves fail to indicate, is made explicit when all days including the smaller and larger disturbances are considered together, that is when the initial disturbance effects are supplemented by the restitution effects* which together with the former make up the whole phenomenon obtaining in the average results.

Comparison of disturbances and the average storms.

450. The fact that the larger disturbances at least have been noted to occur almost simultaneously all over the earth is now known for more than half a century. If as advanced by Schuster the regularly periodic magnetic variations are caused by the locally induced results of the steady ionising influence probably of the ultra violet radiation, depending upon the position of the sun, while the smaller magnetic disturbances or the occasional larger outbreaks which affect the whole earth simultaneously, are also due to this same trigger-like effects of ionisation but irregular in their incidence which induce comparatively large changes *locally* in the electric conductivity of the atmosphere brought about by meteorological conditions and atmospheric circulation, it may be interesting to compare some of the simultaneous disturbance traces recorded at different stations on the earth, and to attempt if possible to examine the progression of the storms in relation to the locally induced effects as differentiated from the common exciting pulse.

The following seven disturbances were selected from the Colaba records, *viz.*, those of February 13, 1892; June 27, 1892; July 12, 1892; August 12, 1892; February 28, 1894; July 20, 1894; and of September 9, 1898, for which the traces were requisitioned from other observatories. These are compared with the traces of the same disturbances registered at Kew, Pawlowsk and Batavia.

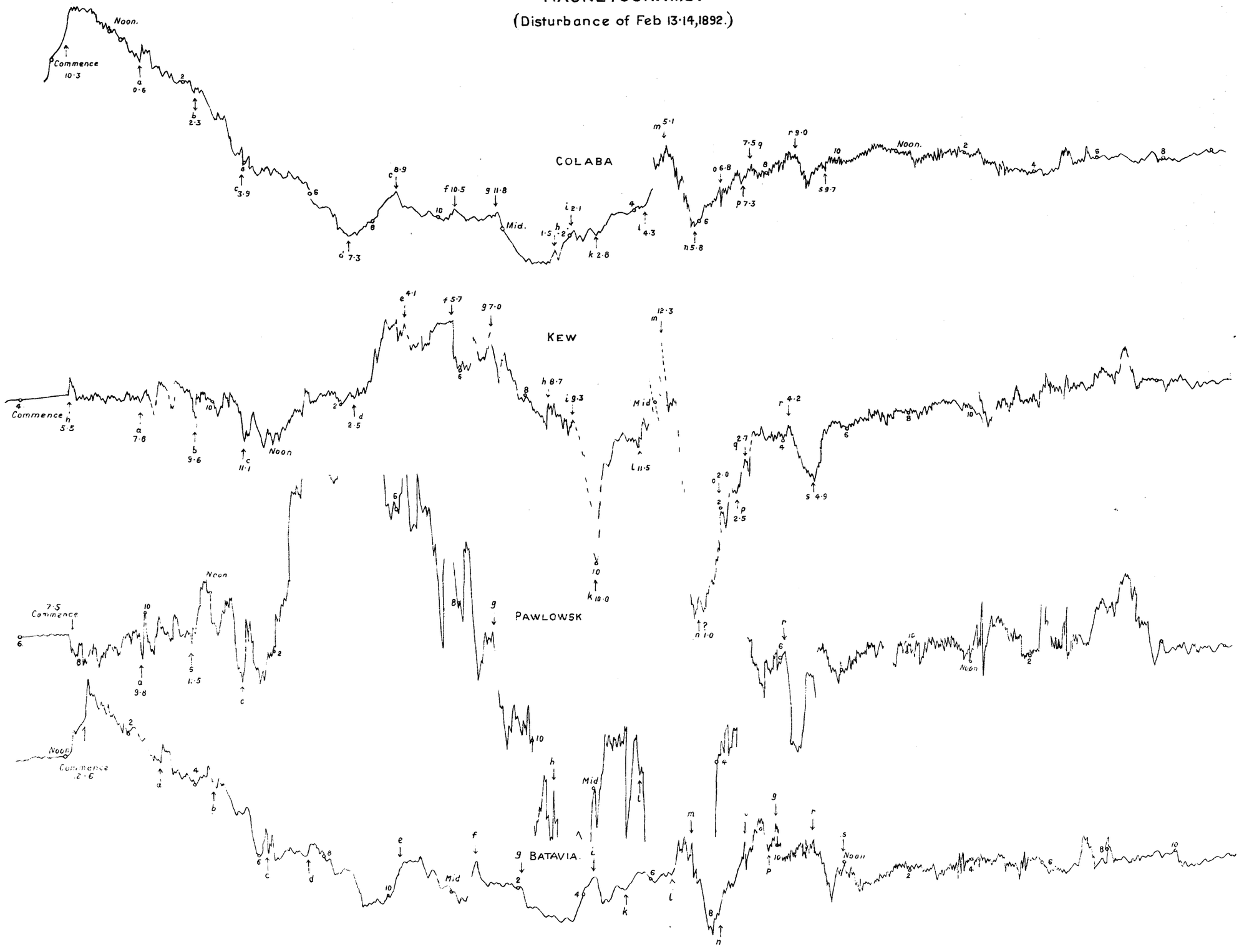
A glance at plates 74 to 80, where the pictures of the disturbances are given together for ready reference, shows how far the attempt made to indentify synchronous movements in the various curves during the progress of the storms has been successful. It will be observed that more often than not the movements coincide peak with peak and hollow with hollow, while on occasions the movements though simultaneously timed are curiously opposed. The apparently coincident points have been identified on the traces and marked with common distinctive letters, and on the Colaba and Kew traces the local times of these coincident features are also indicated. The difference in time from Greenwich of the Colaba meridian is $4{\cdot}8^h$ E, of Pawlowsk $2{\cdot}0^h$ E and of Batavia $7{\cdot}1^h$ E.

When all the traces are carefully examined the feature which strikes one as being singularly prominent, is that the local diurnal wave at each station, somehow largely accentuated just during the stormy day, appears to play an important part in the subsequent progression of the storm. If the existence of the initial disturbance pulse presumably demagnetising the earth, which runs independently of the position of the sun and affects all stations on the earth simultaneously, be admitted, whatever its cause, one is compelled to concede that the large irregular movements locally set up subsequently must be due to secondary forces which are brought somehow into existence locally to recuperate the dislocation of the magnetic conditions, and these in all probability then depend upon the position of the sun at each place. Take for example the disturbances in plates 74, 75 and 79 which commence

* These bring in the relation to the position of the sun.

MAGNETOGRAMS.

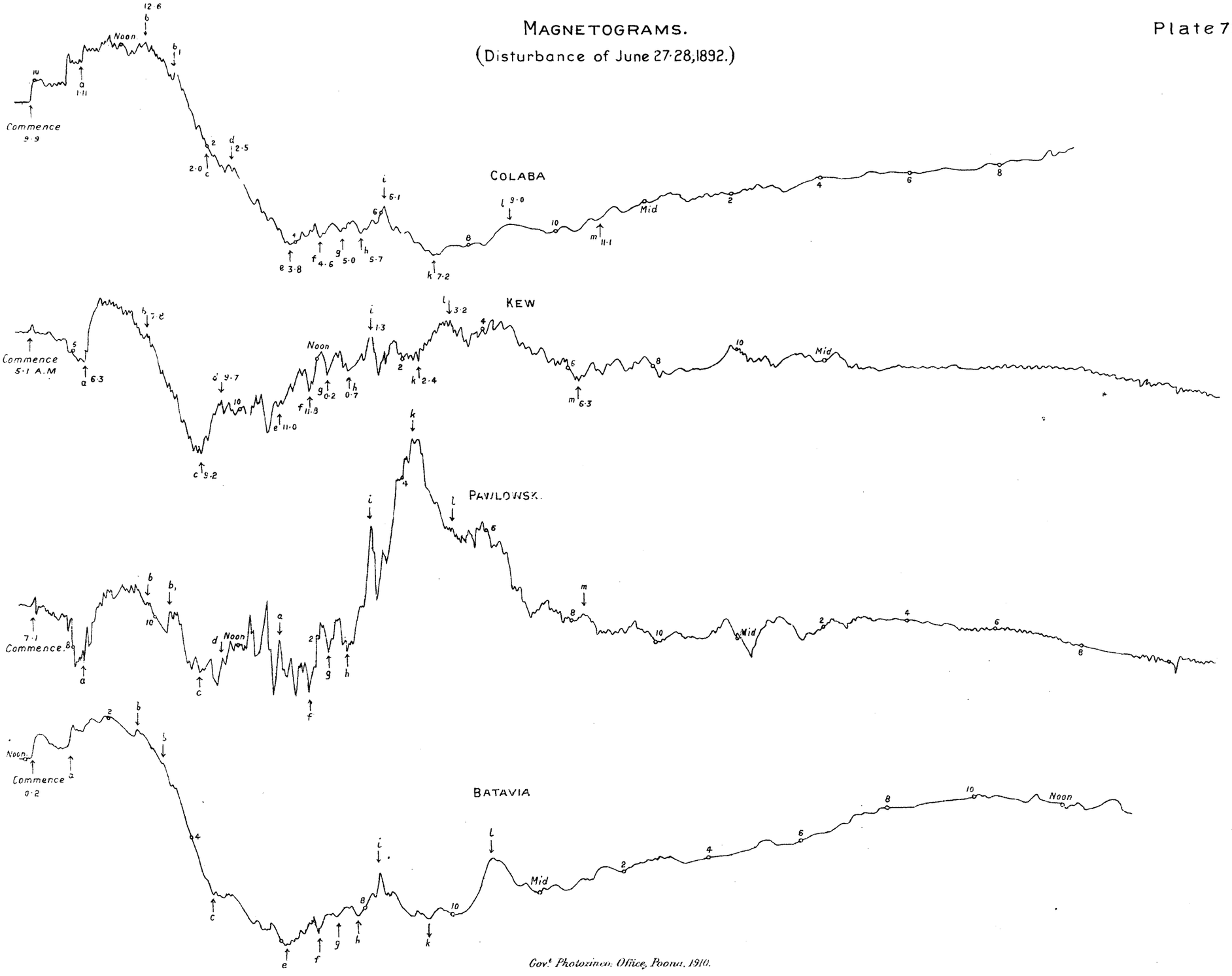
(Disturbance of Feb 13·14, 1892.)



Govt Photozinco: Office. Poona. 1910.

MAGNETOGRAMS.

(Disturbance of June 27-28, 1892.)



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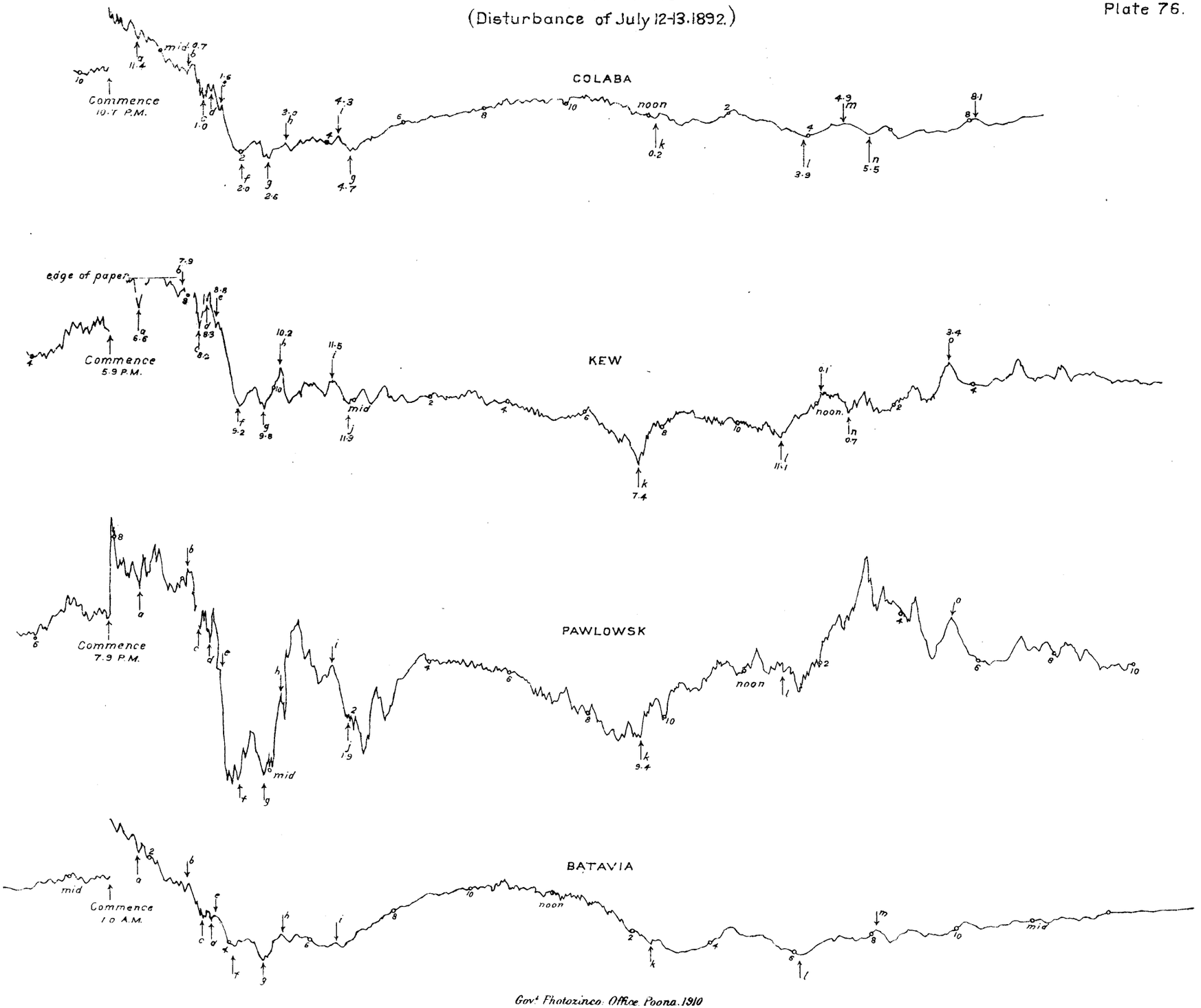
MAGNETOGRAMS
(Disturbance of July 12-13.1892.)



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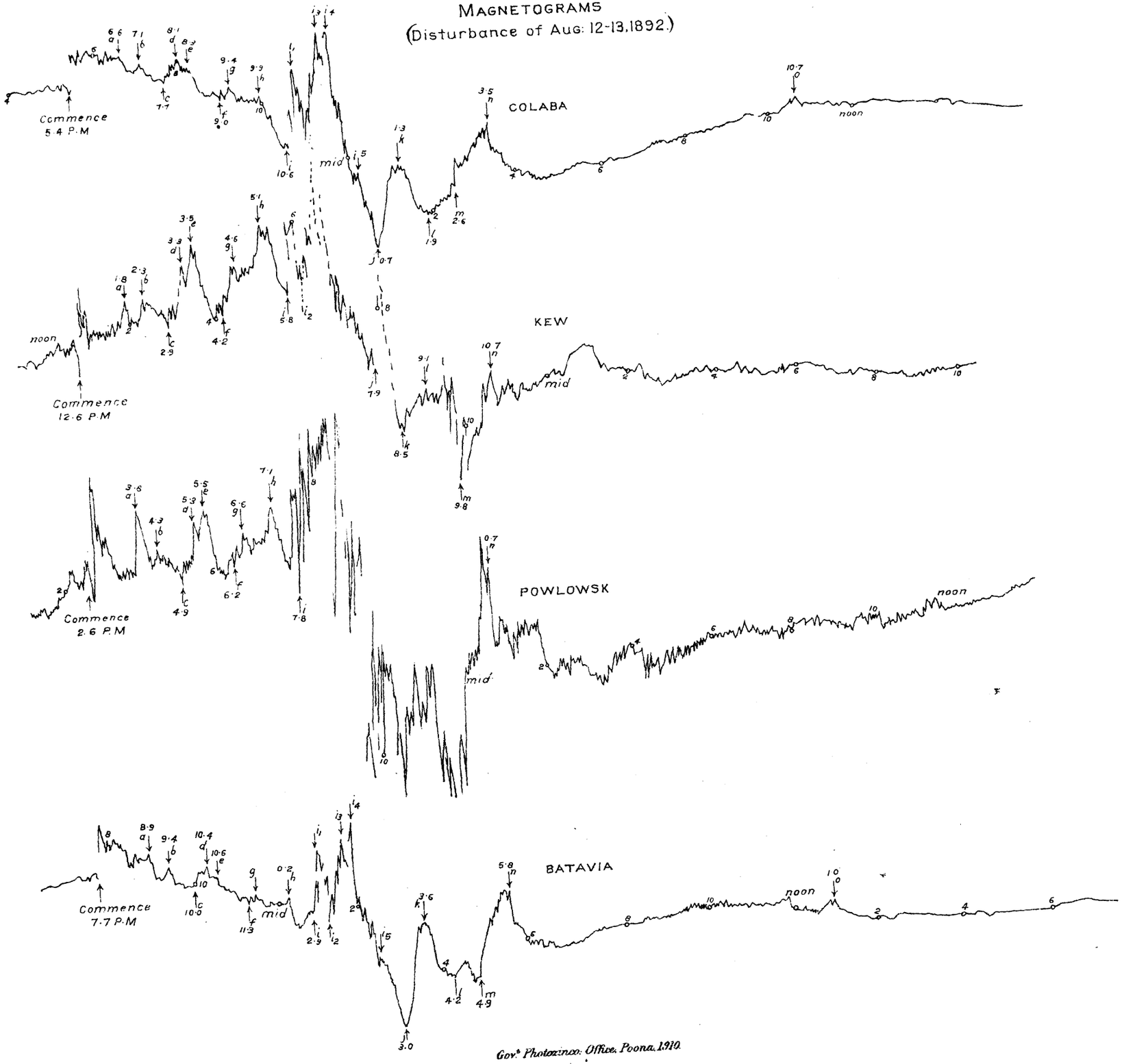
MAGNETOGRAMS
(Disturbance of Aug: 12-13, 1892.)



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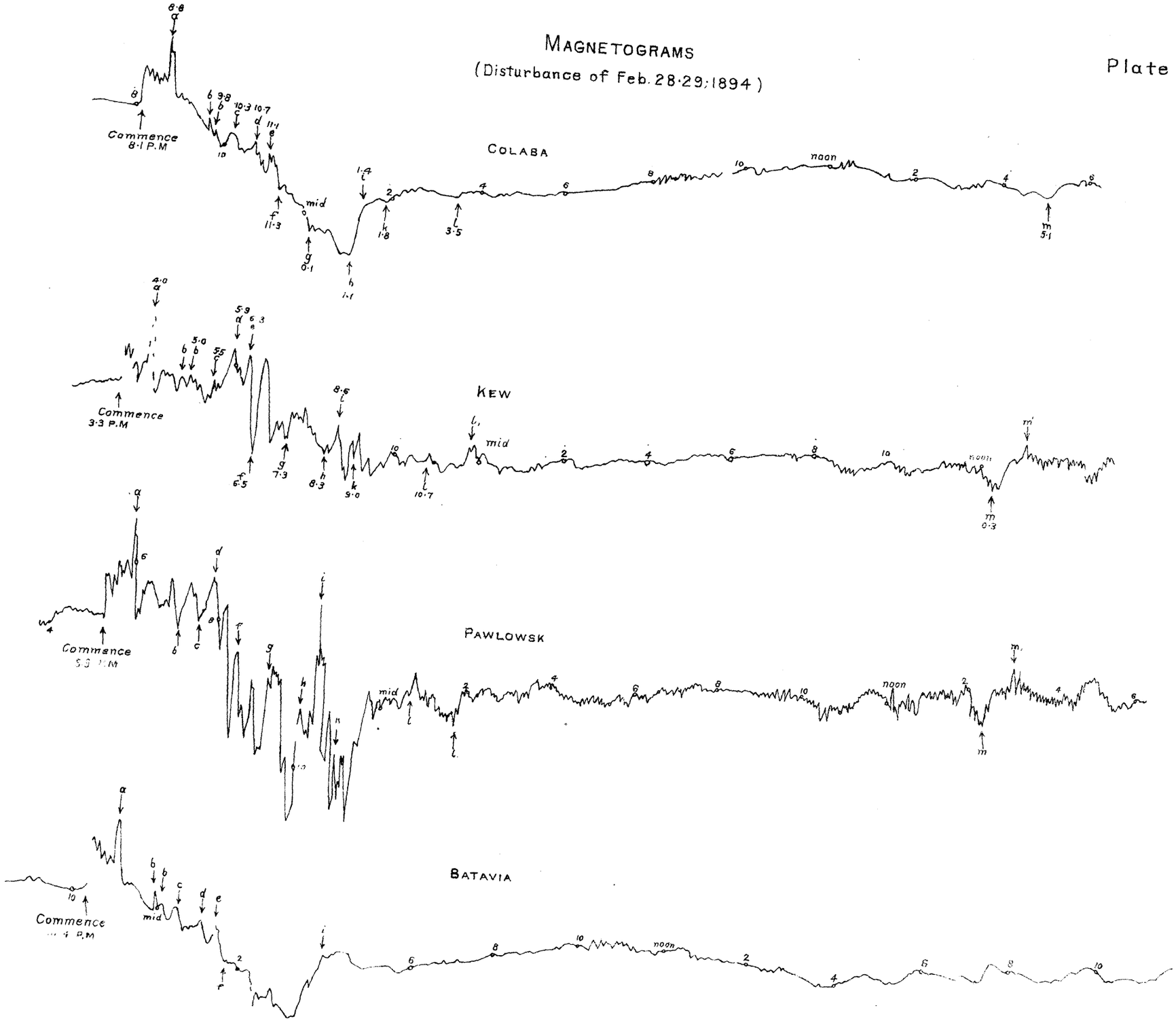
MAGNETOGRAMS

(Disturbance of Feb. 28-29; 1894)

Plate 78

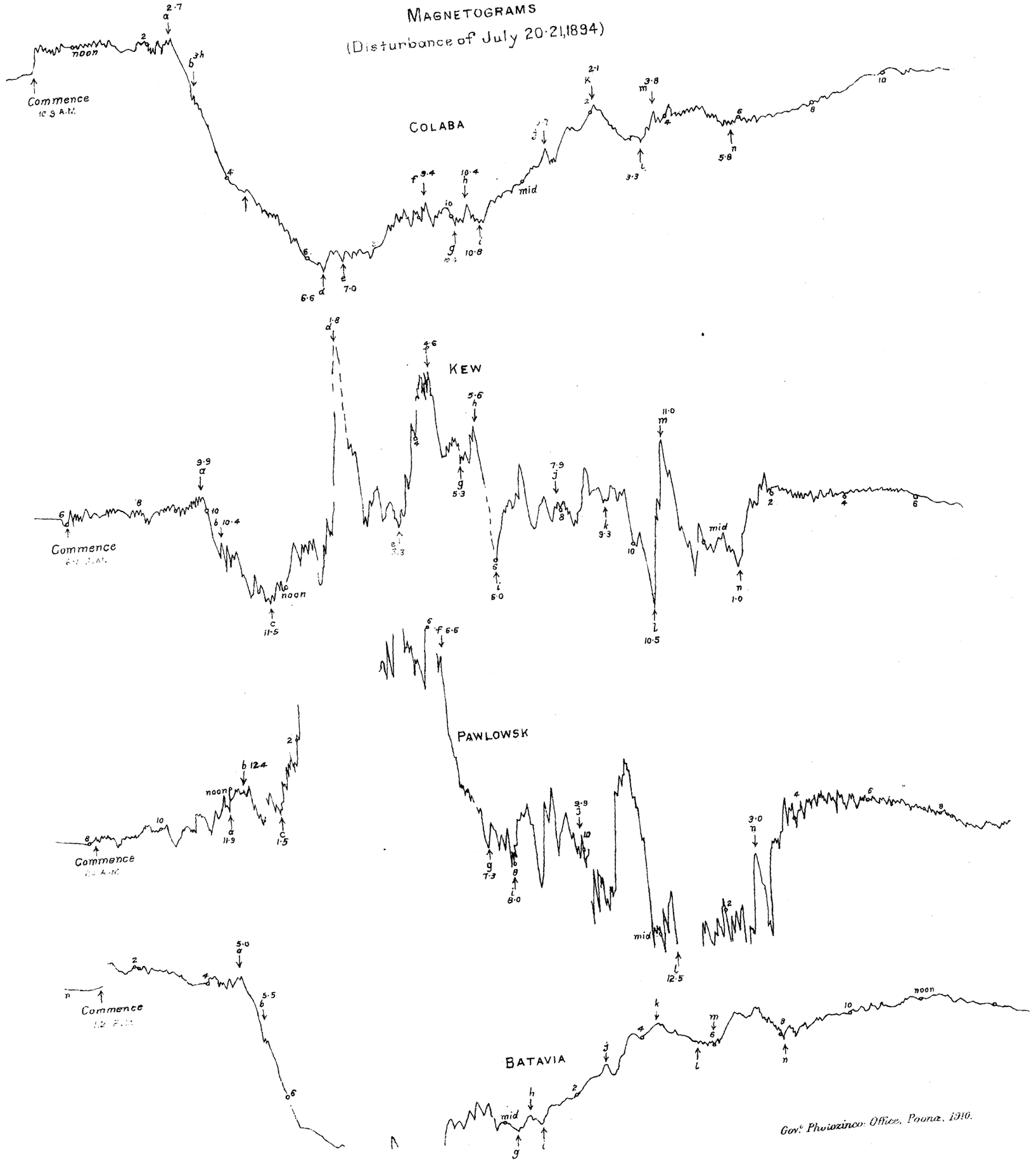


Gov^t Photozinco: Office, Poona, 1910.

Plate 79

MAGNETOGRAMS

(Disturbance of July 20-21, 1894)



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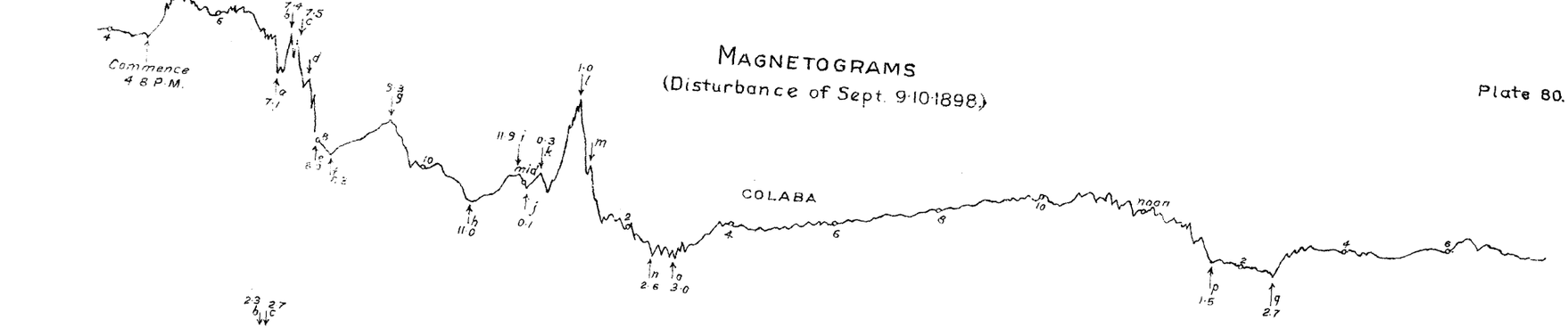
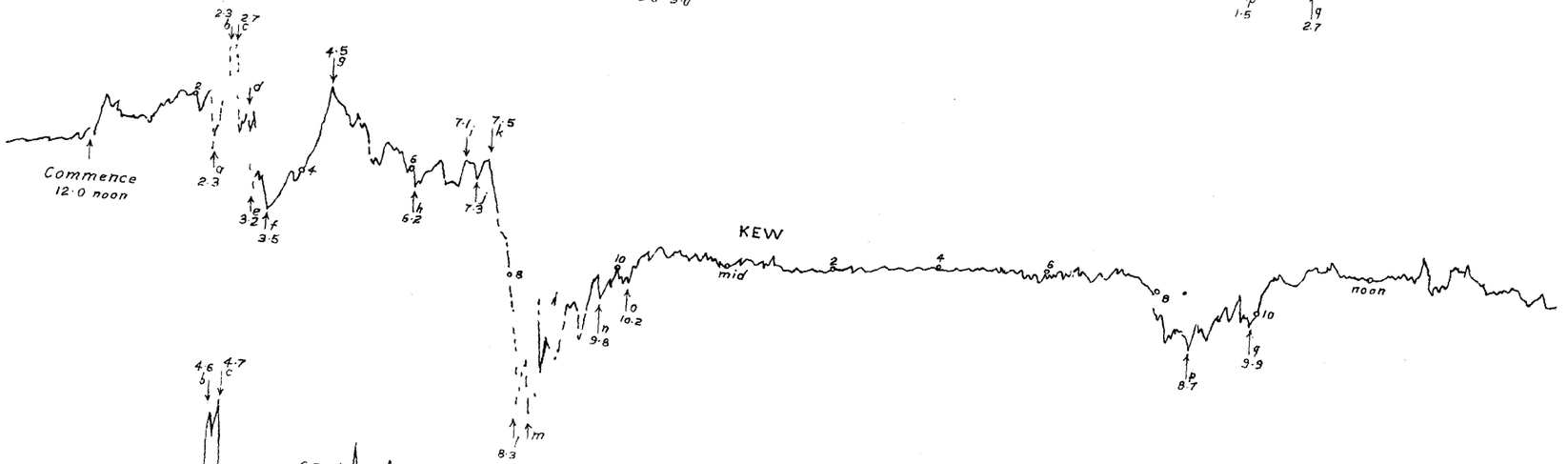
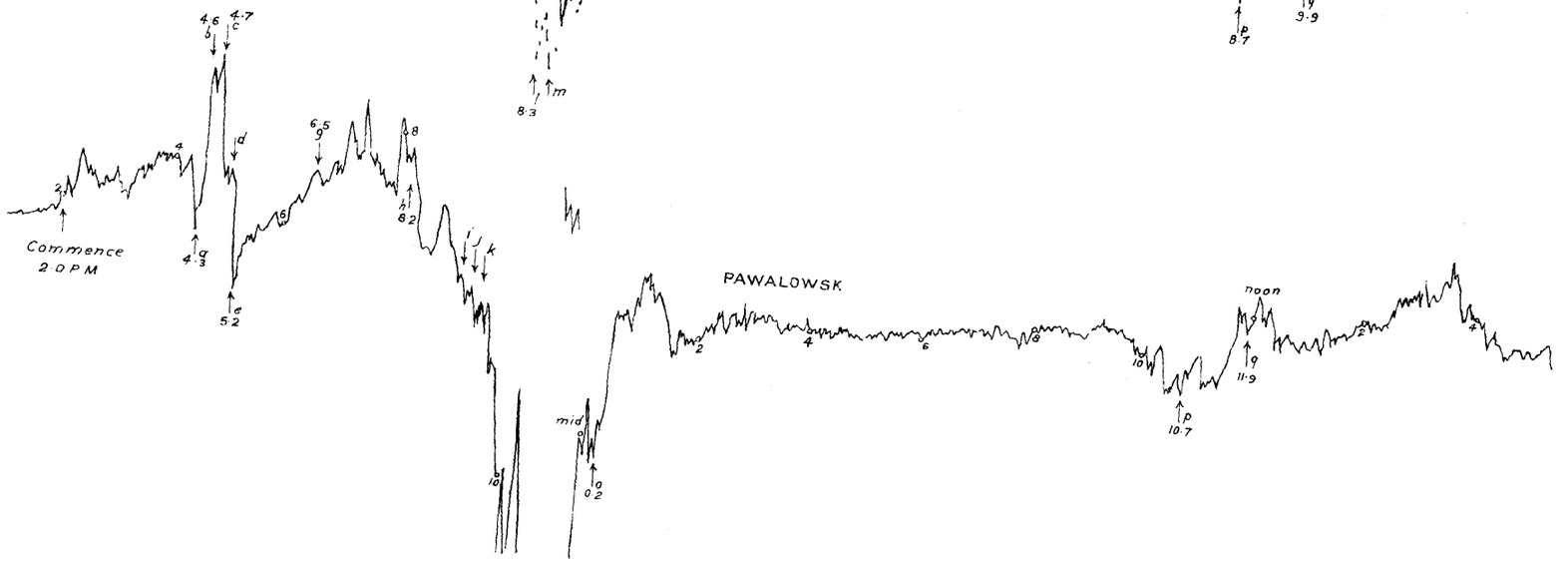
MAGNETOGRAMS

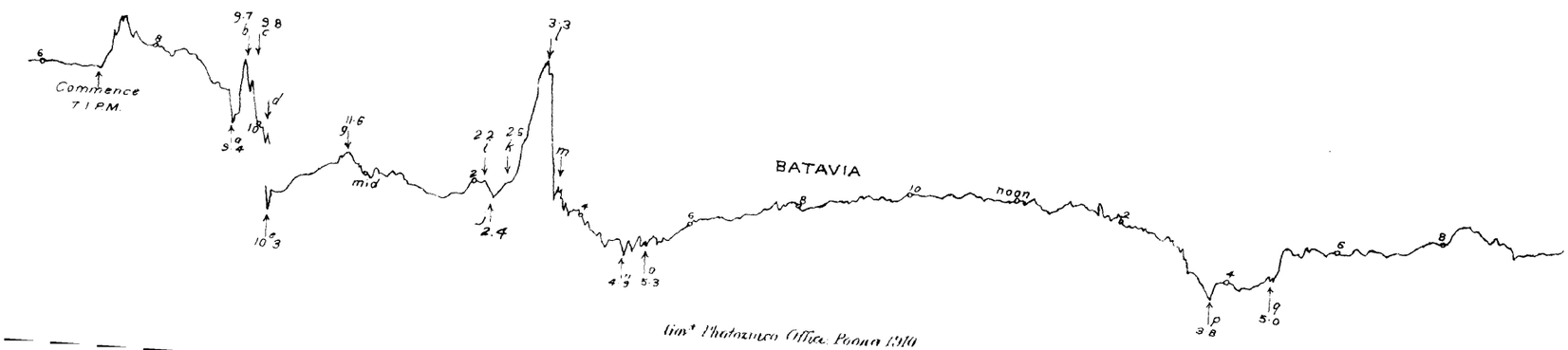
(Disturbance of Sept. 9-10-1898.)

Plate 80.









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at Colaba at about 10 A.M. or thereabout. It will be seen that in the Colaba traces the rise to the maximum and the subsequent fall to the minimum, indicating the greatest effect of the storm, synchronise with the movements of the diurnal wave throughout. At Kew however the time of commencement of these storms is 5 A.M. when the diurnal wave is falling which rises again after 10 P.M. The effect of the fall before 10 A.M. on the progression of the storm is as pronounced as is the rise in the diurnal wave after 10 A.M. The diurnal wave at Pawlowsk, which precedes Kew by two hours, clearly stamps the impress of its own local phase on the disturbance traces. So does Batavia leading with a difference of phase of about $2^h{\cdot}3$ when compared with the Colaba traces. Of the other four disturbances which have been so selected as to have their commencement to fall at different hours of the day, the first two commence about Greenwich noon that is about 5 P.M. at Colaba and the other two at 5 P.M. at Greenwich or 10 P.M. at Colaba. In all these disturbances the accentuated effects of the local phase disturbance which modifies the progression of the storm at each place, can be generally discerned. If therefore it be true as suggested, that the sudden heavy accentuation in the amplitude of the diurnal wave is one of the principal features accompanying a disturbance, we may attempt to ascertain if an *average* storm in which the irregular oscillations are sufficiently smoothed can be regarded to be made up mainly of two parts (1) a common pulse similar to the one referred to in paragraph 440, which commences everywhere simultaneously, takes on an average from 10 to 11 hours to attain its maximum effect and slowly to creep back to normal conditions, and (2) an accentuated diurnal wave depending at any place upon the position of the sun.

Taking up the Colaba and Kew records of the seven disturbances, the curves were measured and the ordinates tabulated in the usual manner. These are however arranged in the first instance in table 390, as explained in paragraph 440 for each day with the hours of the commencement of the storms all coincident; and two average curves showing the character of the 7 disturbances at each station derived from them are shown in columns 2 and 4 in table 391. In columns 3 and 5 they are corrected for the progressive change which is however markedly divergent for Colaba and Kew. This allows of the two curves as shown below in figures 1 and 2 both continuous and dotted, to be made conveniently comparable for discussion. The consideration of the progressive change in 24 hours apart thus from the character curve as a whole, may not perhaps be a strictly correct procedure, but in any measure of the intensity of a disturbance considered as a phenomenon spread over an unit of time, *viz.* 24 hours, the consideration separately of the change as given by the difference in the condition at 0^h and 24^h after the commencement of the disturbance is at least conveniently useful for the purposes of comparison of the same phenomenon at two places. Referring hence to this factor we find that it is clearly larger at Colaba than at Kew. It will also be seen from the last row of table 390 that all disturbances, except the one of 12th July 1892 which shows about the same change, indicate this difference in one direction. Though no inference is justifiable on the result of such scanty data as the seven disturbances dealt with, the presumption that it is probably correct in the main, becomes strong when we find that the total average aperiodic change during the Astronomer Royal's quiet days, which is always positive, is smaller at Kew where it is about $3{\cdot}0\gamma$ than at Colaba where it is $3{\cdot}9\gamma$ during the period of 11 years (*vide* table 447 and paragraph 480, Chapter XI). As the sum of the negative excursions of the aperiodic changes during disturbed days, together with the positive changes of the quiet and other days, constitute the comparatively minute secular change at each place, the smaller positive aperiodic numbers at Kew for the quiet days, suggest corresponding smaller complementary negative excursions indicating a total lesser intensity of disturbance in the H element at Kew than at Colaba where the excursions on both sides are relatively larger. To this subject of the aperiodic change we shall recur in Chapter XI.

Returning, after the digression, to the character curves of disturbances at Colaba and Kew shown in columns 3 and 5 in table 391, which are charted in figures 1 and 2 below, it may be remarked that though the manner of arrangement of the hours adopted in the table to secure the average *character* curve of the 7 disturbances, cuts out to some extent the diurnal variation, some considerable portion of it must remain mixed up with the curve, as the number of days considered is not very large nor the distribution uniform. It is difficult of course to correct the curves for this residual effect of diurnal variation for we do not know what exact intensity of amplitude one should adopt for the variation which may correctly eliminate just the average effect during the 7 disturbances. In absence of any definite data, an indirect method is adopted.

We have the diurnal variation at the time of mean maximum spot both for Colaba and Kew* stations. Seven such inequalities are, in each case, arranged in seven rows in the manner indicated in paragraph 440 so as to have the hours of the day at which each storm commenced, all in one line. The residual effects of the variation so obtained for Colaba and Kew are given in table 391, columns 7 and 8,

* Taken from table XIII, page 362, Vol. 202, Phil. Transactions, Series A, duly corrected for 28 minutes, by interpolation to the exact time of Colaba tabulations which are made at 19 minutes past the full local hour.

and charted in figures 6 and 8 below. The difference of these curves given in column 9 is shown in figure 4. If what has been suggested above is correct, a close parallelism between it and the curve obtained from the difference of the character curves in figures 1 and 2, which is shown in figure 3, should exist. This resemblance between figures 3 and 4 is strikingly close and fairly supports the suggestion made that the character of the difference between an average storm at Colaba and Kew is of the nature of the difference of the diurnal variations at the two places.

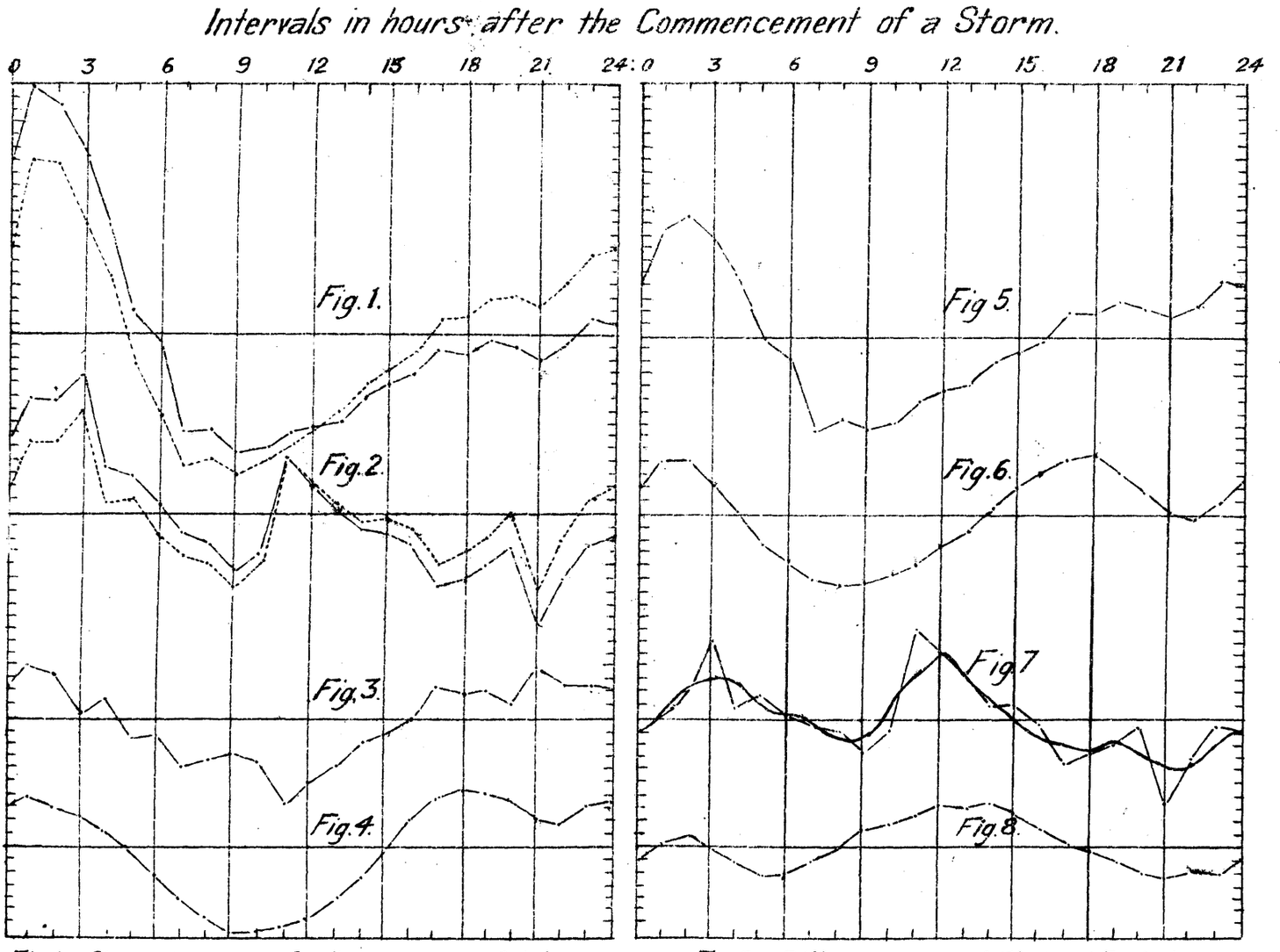


Fig. 1:- Character curve of 7 disturbances at Colaba.
Dotted curve:- Above curve corrected for progressive change.
Fig. 2:- Character curve of 7 disturbances at Kew.
Dotted curve:- Above curve corrected for progressive change.
Fig. 3:- Difference curve of Fig. 1 and Fig. 2 (dotted curves).
Fig. 4:- Difference curve of Fig. 6 and Fig. 8.
Fig. 5:- Difference curve of Fig. 1 and Fig. 4 plate 73
Fig. 7:- ..... " ..... " ..... Fig. 2 .. " ..... " ..... " .....
Fig. 6:- Residual effect, diurnal variation, Colaba.
Fig. 8:- ..... " ..... " ..... " ..... " ..... Kew.

Scale for Figs. 1, 2, 5, and 7 :- one small division = 10 γ.
..... " ..... " ..... Fig. 3 ..... :- " ..... " ..... " ..... = 20 γ.
..... " ..... " ..... Figs. 4, 6, and 8 :- " ..... " ..... " ..... = 2 γ.

If the inference is correct the examination of the curves among themselves for each station, ought to give some consistent results. The character curve of Colaba discussed in paragraph 440 recopied in column 10 of table 391 which is similarly derived but from a large number (113) of disturbances, may be presumed to be free from the local effects of any residual diurnal variation and to represent the character curve of the true average disturbance. The difference between that curve shown in figure 4, plate 73, set 1, and the average result of a restricted number (7) of disturbances at Colaba shown in

figure 1 above, should give apart from accidental irregularities which if not heavy enough to mask the results, the residual diurnal effect we wish to seek. This difference curve is shown in column 12 and charted in figure 5, and it will be readily seen that, though unequal in magnitude to the residual Colaba diurnal curve in figure 6, its parallelism to it is unmistakably close.

With regard to the Kew data we are in a much more difficult position. No curve of the average disturbance at Kew, like the one derived from 113 disturbances at Colaba, is available. But considering that X disturbances are known to be recorded simultaneously over all stations on the earth, it may be for the moment presumed that the initial disturbance pulse at Colaba which is free from accidental irregularities and the locally accentuated diurnal wave already referred to, may be common to all stations. We can hence as a trial take the Colaba curve of paragraph 440, which is presumably free from the local effects, to be common to Kew also. The difference hence of this curve and the average of the 7 disturbance curves at Kew, which is shown in column 11 and charted in figure 7, apparently sustains the assumption initially made, for it runs fairly parallel to the curve of residual diurnal inequality at Kew, *vide* figure 8 derived from Kew's own curves of diurnal variation at the maximum spot epoch treated and re-arranged in 7 rows as in the manner of the days of the storms. So far then *apart from the question of magnitude*, the statement advanced, *viz.*, that the differences of disturbance curves at Colaba and Kew are of the nature of the diurnal variations at each place, or which is the same thing, the larger disturbances when analysed seem on the average to be made up in the main of a common pulse of the kind noted in paragraph 440 and a more or less largely accentuated local diurnal variation, is supported by the data. It is the latter which after the synchronous commencement of the average storm modifies its subsequent progress at different stations on the earth according to local conditions depending upon the position of the sun.

No strict parallelism can of course be expected from the results of a few disturbances, such as have been dealt with, as the accidental irregularities would obviously mask the real progression. The results here evidenced however are fairly suggestive and warrant further investigation in this direction. For, if disturbances sufficiently large in number at Kew or any other place are arranged and dealt with as indicated in paragraph 440 and corrected for progressive change which alone may differ at different places, we should obtain a resulting character curve, which if the inference above arrived at is correct, should be nearly identical with that at Colaba. In each case the local effects and the diurnal variation cut out completely and leave the pure initial exciting pulse unaffected. Whether such a disturbance wave is or is not common to all stations can then be definitely ascertained and if such is not the case, the differences may be further examined for the distinctive local factors besides the progressive (secular) change in 24 hours which from the above discussion appears at least to be different for different stations.

2. *Disturbances : Declination and Vertical Force.*

451. It has been already remarked that disturbances do not affect the declination and vertical force elements at Colaba to any very large extent even during the greatest of storms, and naturally on this account any definitely pronounced or large disturbance results can scarcely be expected from the Colaba curves. And yet as will be seen presently, though the amplitudes of the disturbance results are small their consistent characteristics are so persistently exhibited that one is inclined without much hesitation to accept them as denoting a real phenomenon.

The same 134 days of large disturbances discussed in paragraph 444 have been utilised here and the treatment also is precisely the same as the one adopted for the H data. These are shown in detail in tables 396 and 397 while their results for convenience of reference appear separately in tables 392 and 393, which are also charted in plate 73 as the 3rd and 4th sets of figures numbered 1 to 12.

TABLE 392.—*Showing the Character and Diurnal Variation of Average large Disturbances.*

[Declination.]

Unity = 1 minute of arc.

Hours showing intervals after the commencement.	Character of large Disturbances. Uncorrected for progressive change. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Corrected for progressive change. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Civil Hours.	Diurnal variation of large Disturbances. Crude disturbance variation. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Disturbance variation. 1872—1882.	1883—1893.	1894—1904.	1872—1904.	Diurnal variation mean maximum spot epoch.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0 ...	−1·09	−·52	−·86	−·84	−·65	−·28	−·35	−·45	0 ...	+·79	+·36	+·55	+·59	+·59	+·16	+·35	+·39	+·20
1 ...	−1·00	−·83	−·92	−·92	−·59	−·61	−·45	−·56	1 ...	+·77	+·42	+·76	+·65	+·52	+·17	+·51	+·40	+·25
2 ...	−·92	−·72	−·76	−·81	−·55	−·52	−·34	−·48	2 ...	+·60	+·34	+·52	+·50	+·35	+·09	+·27	+·25	+·25
3 ...	−·89	−·60	−·80	−·77	−·56	−·42	−·42	−·47	3 ...	+·40	+·07	+·14	+·22	+·25	−·08	−·01	+·07	+·15
4 ...	−·09	−·57	−·34	−·31	+·21	−·41	0	−·05	4 ...	+·06	−·11	−·15	−·04	−·01	−·18	−·22	−·11	+·07
5 ...	+·03	−·57	−·39	−·27	+·29	−·43	−·09	−·04	5 ...	−·02	+·14	−·17	−·01	−·17	−·01	−·32	−·16	+·15
6 ...	+·14	−·34	−·30	−·13	+·36	−·22	−·05	+·07	6 ...	+·40	+·96	+·19	+·53	−·35	+·21	−·56	−·22	+·75
7 ...	+·23	−·26	+·24	+·07	+·42	−·16	+·45	+·23	7 ...	+·79	+1·22	+·39	+·83	−·48	−·05	−·88	−·44	+1·27
8 ...	+·83	−·06	+·31	+·41	+·98	+·02	+·48	+·54	8 ...	+·72	+1·12	+·49	+·80	−·68	−·28	−·91	−·60	+1·40
9 ...	+·57	+·20	+·55	+·44	+·68	+·26	+·68	+·54	9 ...	+·07	+·42	+·17	+·21	−·85	−·50	−·75	−·71	+·92
10 ...	+·40	+·26	+·31	+·33	+·47	+·30	+·39	+·40	10 ...	−·74	−·40	−·57	−·58	−·74	−·40	−·57	−·58	·00
11 ...	+·49	+·46	+·28	+·43	+·53	+·48	+·32	+·46	11 ...	−1·48	−1·44	−1·31	−1·42	−·43	−·39	−·26	−·37	−1·05
12 ...	+·40	+·43	+·30	+·39	+·40	+·43	+·30	+·39	12 ...	−1·69	−1·75	−1·63	−1·70	−·21	−·27	−·15	−·22	−1·48
13 ...	+·32	+·29	+·33	+·31	+·28	+·27	+·29	+·28	13 ...	−1·23	−1·52	−1·15	−1·31	+·10	−·19	+·18	+·02	−1·33
14 ...	0	+·23	+·35	+·16	−·07	+·19	+·27	+·09	14 ...	−·68	−·95	−·52	−·73	+·14	−·13	+·30	+·09	−·82
15 ...	+·20	+·26	+·13	+·20	+·09	+·20	0	+·10	15 ...	−·19	−·28	−·07	−·19	+·08	−·01	+·20	+·08	−·27
16 ...	+·20	+·32	−·12	+·16	+·05	+·24	−·29	+·03	16 ...	+·18	+·06	+·47	+·21	+·10	−·02	+·39	+·13	+·08
17 ...	+·17	+·29	−·21	+·12	−·02	+·19	−·42	−·04	17 ...	+·19	+·17	+·55	+·27	+·19	+·17	+·55	+·27	·00
18 ...	+·32	+·26	+·05	+·23	+·10	+·14	−·20	+·03	18 ...	+·03	+·08	+·08	+·06	+·1	+·21	+·21	+·19	−·13
19 ...	+·26	+·32	+·33	+·30	0	+·18	+·03	+·07	19 ...	−·16	+·09	+·16	0	+·02	+·27	+·34	+·18	−·18
20 ...	+·11	+·29	+·44	+·25	−·19	+·13	+·10	−·01	20 ...	−·05	+·14	+·44	+·13	+·10	+·29	+·59	+·28	−·15
21 ...	−·11	+·52	+·44	+·23	−·44	+·34	+·06	−·07	21 ...	+·05	+·18	+·31	+·16	+·17	+·30	+·43	+·28	−·12
22 ...	−·14	+·26	+·42	+·13	−·51	+·06	0	−·20	22 ...	+·71	+·37	+·36	+·51	+·71	+·37	+·36	+·51	·00
23 ...	−·29	+·11	+·22	−·03	−·70	−·11	−·25	−·39	23 ...	+·74	+·48	+·50	+·59	+·64	+·38	+·40	+·49	+·10
24 ...	−·20	−·03	+·16	−·05	−·64	−·27	−·35	−·44										
Progressive change in 24 hours.	+·89	+·49	+1·02	+·79														

TABLE 393.—*Showing the Character and Diurnal Variation of Average large Disturbances.*

[Vertical Force.]

Unity = 0·1γ = ·000001 C. G. S.

Character of large Disturbances.									Diurnal variation of large Disturbances.									
Hours showing the intervals after the commencement.	Uncorrected for progressive change.				Corrected for progressive change.				Civil Hours.	Crude disturbance variation.				Disturbance variation.				Diurnal variation mean maximum spot epoch.
	1873—1882.	1883—1893.	1894—1904.	1873—1904.	1873—1882.	1883—1893.	1894—1904.	1873—1904.		1873—1882.	1883—1893.	1894—1904.	1873—1904.	1873—1882.	1883—1893.	1894—1904.	1873—1904.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0 ...	−27	−20	−39	−28	− 3	− 6	−13	− 7	0 ...	+ 44	+ 42	+ 51	+ 45	+ 3	+ 1	+10	+ 4	+ 41
1 ...	−24	−50	−34	−37	− 2	−37	−10	−18	1 ...	+ 34	+ 41	+ 50	+ 42	− 4	+ 3	+12	+ 4	+ 38
2 ...	−15	−52	−30	−34	+ 5	−40	− 8	−17	2 ...	+ 31	+ 31	+ 46	+ 35	− 4	− 4	+11	0	+ 35
3 ...	−14	−37	−43	−32	+ 4	−27	−24	−16	3 ...	+ 18	+ 24	+ 19	+ 21	−12	− 6	−11	− 9	+ 30
4 ...	− 3	−28	− 2	−13	+13	−19	+15	+ 1	4 ...	+ 21	+ 34	+ 24	+ 27	−11	+ 2	− 8	− 5	+ 32
5 ...	−12	−23	−15	−17	+ 2	−15	0	− 5	5 ...	+ 26	+ 61	+ 41	+ 43	−20	+15	− 5	− 3	+ 46
6 ...	−38	−18	−27	−27	−26	−11	−14	−17	6 ...	+ 54	+ 81	+ 47	+ 63	−26	+ 1	−33	−17	+ 80
7 ...	−20	− 9	0	−10	−10	− 3	+11	− 1	7 ...	+ 24	+ 53	+ 16	+ 33	−39	−10	−47	−30	+ 63
8 ...	+ 6	− 2	− 8	− 1	+14	+ 3	+ 1	+ 6	8 ...	− 37	− 20	− 32	− 29	−40	−23	−35	−32	+ 3
9 ...	+15	+ 7	+12	+11	+21	+10	+18	+16	9 ...	−106	−107	− 85	− 99	−28	−29	− 7	−21	− 78
10 ...	+ 9	+ 3	− 6	+ 2	+13	+ 5	− 2	+ 5	10 ...	−139	−156	−126	−142	− 3	−20	+10	− 6	−136
11 ...	+ 7	+ 9	+10	+ 9	+ 9	+10	+12	+11	11 ...	−126	−153	−119	−135	+23	− 4	+30	+14	−149
12 ...	+ 2	+ 8	0	+ 4	+ 2	+ 8	0	+ 4	12 ...	− 64	− 85	− 74	− 75	+34	+13	+24	+23	− 98
13 ...	− 4	0	− 1	− 1	− 6	− 1	− 3	− 3	13 ...	− 5	− 24	− 10	− 15	+27	+ 8	+22	+17	− 32
14 ...	− 9	+ 1	+ 2	− 2	−13	− 1	− 2	− 5	14 ...	+ 26	+ 19	+ 16	+ 20	+12	+ 5	+ 2	+ 6	+ 14
15 ...	+ 1	+ 7	−12	0	− 5	+ 4	−18	− 5	15 ...	+ 41	+ 27	+ 28	+ 32	+10	− 4	− 3	+ 1	+ 31
16 ...	+13	+17	+ 2	+11	+ 5	+12	− 7	+ 4	16 ...	+ 23	+ 15	+ 19	+ 19	+ 4	− 4	0	0	+ 19
17 ...	+ 9	+19	+11	+14	− 1	+13	0	+ 5	17 ...	− 22	− 11	− 14	− 14	− 8	+ 3	0	0	− 14
18 ...	+25	+25	+39	+29	+13	+18	+26	+19	18 ...	− 2	− 10	− 15	− 8	+14	+ 6	+ 1	+ 8	− 16
19 ...	+20	+29	+47	+32	+ 6	+21	+32	+20	19 ...	− 1	− 1	+ 1	+ 1	+ 4	+ 4	+ 6	+ 6	− 5
20 ...	+20	+39	+42	+34	+ 4	+30	+25	+20	20 ...	+ 29	+ 15	+ 22	+ 22	+23	+ 9	+16	+16	+ 6
21 ...	+ 3	+29	+31	+21	−15	+19	+12	+ 5	21 ...	+ 33	+ 26	+ 25	+ 28	+19	+12	+11	+14	+ 14
22 ...	+12	+23	+12	+16	− 8	+11	−10	− 1	22 ...	+ 54	+ 46	+ 45	+ 47	+24	+16	+15	+17	+ 30
23 ...	+ 9	+14	+ 9	+11	−13	+ 1	−15	− 8	23 ...	+ 49	+ 47	+ 49	+ 48	+11	+ 9	+11	+10	+ 38
24 ...	+21	+ 8	+13	+14	− 3	− 6	−13	− 7										
Progressive change in 24 hours.	+48	+28	+52	+42														

452. The series of curves denoting the character of the disturbances shown in columns 2, 3, 4 in each table and charted in figures 1 to 3 are remarkably similar, for each of the three 11-year groups; and the average curve hence shown in column 5 of each table and charted in figure 4 may with fair reason be accepted as typical of the character of the average disturbance in D and V elements at Colaba.

Examining the character of the D curve, figure 4 (set 3), we see that the incidence of an average disturbance on this element results in a rapid progression of the needle to the east, the greatest easterly elongation being reached in about 10 hours after the commencement of the storm precisely as in the H results causing a movement of about 1′·2 minutes in arc corresponding to a fall of 110γ in H. The declination character curve if inverted would practically fall parallel to that of H, easterly movement in declination corresponding to a fall in horizontal force, and westerly motion to a rise in force. In the average conditions a creep or progressive change of 0′·8 minutes in arc of easterly declination during the twenty-four hours of an average disturbance, corresponds to a fall of 80γ in H.

453. Referring now to figures 5 to 8 (set 3) which show the crude disturbance diurnal variations, it will be seen that they resemble the actual diurnal variation very closely ; and assuming as we have done in H, that the usual diurnal variation at the mean maximum spot epoch may be adopted as the normal diurnal variation, the difference between the crude disturbance curve and this diurnal variation would furnish the net disturbance variation we wish to seek in each element. These are shown in figures 9 to 11 and the average curve shown in figure 12 may be taken to represent the real character of the *disturbance variation.*

454. The curve 12*a* drawn in the same plate denotes the difference curve in each of the two elements D and V obtained by taking the difference of all-day and quiet-day data; and the striking similarity of the two curves, figure 12 and figure 12*a*, derived thus by two independent modes of treatment makes it difficult to resist the conviction that they indicate a real phenomenon. Comparing the amplitudes, in which they alone differ, of the disturbance variations derived directly from the larger disturbances, and from the difference of *all* and *quiet* days, we find that the ratio in H is 14 : 1 ; in D it is 10 : 1 ; and in V it is 9 : 1.

455. The character of the incidence of an average disturbance on the vertical force element as shown in figures 1 to 4 (set 4) needs a passing reference. If the variations in horizontal force and declination as suggested by Schuster are affected by atmospheric circulation and other modifying factors reversing the results on each side of the equator, the examination of the vertical force data which remain nearly unaffected by such influences in both hemispheres, derive additional interest.

It will be seen as shown by figure 4, which represents the average result of 33 years, that if the smaller fluctuations are neglected the general run of the character curve of V, unlike the progressions in H and D results, unmistakably indicates a steady progressive increase or a rise of vertical force of about 7γ, for about 19 hours after the commencement of the average storm. After which the restitution forces prevailing the vertical force begins to fall. After the lapse of 24 hours an excess of 4·2γ, appears to remain uncompensated. The lengthening out of the duration of the effects of the storm to 19 hours as against the 11 hours indicated in the H and D results when the lowest value in H and the greatest easterly elongation in D, are reached before the ascendancy of the forces of recuperation is well established, is an unexpected but a notable feature in the vertical force curve. The declination curve however if carefully examined does disclose some such tendency also but not convincingly to any marked degree. That a turning point in the curves of V is indicated as in H and D about 11 hours after the commencement of a storm there is little doubt, but the general upward motion though checked in rate goes on and a decided tendency to fall is only seen about 19 hours after the beginning of the storm. Whether this is a real differentiating feature it is extremely difficult to say. Dividing the 24 hours into four intervals of six hours each, the change of force in the four intervals, roughly derived by smoothing the curve by taking 3 hourly overlapping means, is 1γ, 2·2γ, 2·1γ, and —1·1γ respectively for the four six-hour intervals from the commencement of a storm.

456. If the disturbance phenomenon as indicated above by the average data be accepted as correct, the incidence of an average storm at Colaba results in reducing H by 80γ in an interval of 24 hours after the commencement of the storm with a corresponding rise of 4·2γ in the vertical force, *see* tables 388, 393. The progression of the total force can well be discerned from the above data.

3. Disturbances : 1846 to 1872.

457. The treatment adopted in the earlier publications of the observatory in regard to disturbances is intrinsically different. The method is the one first adopted by Sabine, see Proceedings of the Royal Society, Vol. X, pp. 624—626, by which the selection and separation of disturbances were made by the adoption of a convenient " separating value ". The separating value for the H results was 33·4γ used throughout the period 1847 to 1872. The value for declination was 1′·4 which was used from 1846 to 1865 in minutes of arc ; and for the subsequent period 1866 to 1872 its equivalent (·204) in scale division was adopted to suit the entries in the monthly abstracts.

The data so treated, for full details of which a reference is invited to Appendix II, pages [90] to [99], to Appendix III, pages 159 to 167, to figure 163, plate XI, and figure 478, plate XXV, of the Observatory publication of the years 1879—1882, give precisely the same results as those derived and discussed above; and as these results obtained by two dissimilar methods of treatment, are so closely accordant little doubt can remain that they connote a genuine phenomenon.

TABLE 394.—*Showing the character and progress for the first twenty-four hours*

1872—

Date and hour of Commencement.				Hours showing interval after the										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1872	January ...	6	22	+ 109	+ 350	+ 184	+ 184	+ 170	+ 271	+ 315	+ 315	+ 393	+ 581	+ 345
„	February ...	4	18	+2567	+3219	+2348	+ 158	−4932	−6369	−4822	−4371	−3460	−1480	− 815
„	„ ...	20	5	+ 342	+ 692	+ 740	+ 872	+ 981	+ 565	+ 491	+ 512	+ 228	− 114	− 92
„	March ...	1	23	+ 359	+ 632	+ 516	+ 491	+ 591	+ 673	+ 706	+ 578	+ 545	+ 690	+ 244
„	April ...	10	18	+ 998	+1358	+ 592	+ 811	+ 244	− 269	− 774	− 654	− 377	− 348	− 414
„	July ...	7	21	+ 941	+1541	+1109	+ 815	+ 424	+ 365	− 395	− 109	0	+ 143	+ 294
„	„ ...	19	8	+ 903	+1365	+ 596	+ 449	+ 244	+ 8	− 8	+ 84	− 126	− 252	− 311
„	„ ...	20	14	+ 168	+ 319	+ 113	+ 21	+ 50	+ 29	− 13	− 17	− 38	+ 8	+ 8
„	August ...	3	12	+ 852	+1169	+ 949	+ 743	+ 156	+ 388	+ 338	+ 169	+ 38	− 198	+ 460
„	„ ...	8	23	+ 527	+1072	+ 675	+ 527	+ 717	+ 321	+ 97	+ 329	+ 300	− 34	+ 110
„	„ ...	14	22	+ 823	+1055	+ 768	+ 262	− 84	+ 101	+ 460	+ 519	+ 409	+ 667	+ 253
„	September ...	2	16	+ 334	+ 550	+ 563	+ 495	+ 554	+ 355	− 300	− 525	− 317	− 588	− 195
„	„ ...	29	14	+ 453	+ 601	+ 406	− 4	− 228	− 478	− 393	− 338	− 431	− 364	− 372
„	October ...	15	2	+1484	+2294	+2480	+ 38	− 98	+ 191	+ 411	+ 280	+ 729	+ 131	− 331
„	November ...	24	5	+ 429	+ 952	+ 888	+ 591	+ 489	+ 306	+ 64	− 217	− 195	− 276	− 310
1873	March ...	9	12	+1467	+ 562	− 519	− 764	− 802	− 330	− 339	+ 112	+ 39	− 746	− 472
1874	February ...	4	12	+1130	+1329	+1329	+1056	+ 604	+ 729	+ 849	+ 774	− 286	− 820	−1238
„	April ...	13	1	+ 149	+ 274	+ 253	+ 232	+ 199	+ 237	+ 436	+ 672	+ 863	+ 444	+ 415
„	September ...	29	11	+1053	+ 895	+ 142	+ 25	+ 75	− 117	− 280	+ 59	− 293	− 644	− 903
„	October ...	3	18	+ 725	+1073	+ 918	+ 909	+ 918	+ 901	+ 926	+ 821	+ 637	+ 708	+ 348
1876	February ...	19	8	+ 385	+ 723	+ 715	+ 479	+ 308	+ 4	− 9	+ 81	+ 39	+ 111	+ 47
„	December ...	10	5	+ 346	+ 624	+ 637	+ 628	+ 719	+ 637	+ 649	+ 485	+ 277	− 4	− 346
1877	May ...	28	22	+ 398	+ 443	+ 488	+ 451	+ 365	+ 455	+ 549	+ 291	+ 143	− 139	− 164
1878	January ...	24	4	+ 431	+ 613	+ 654	+ 604	+ 277	+ 161	+ 149	− 46	− 174	− 327	− 335
„	June ...	3	12	+ 838	+ 129	+ 58	+ 510	+ 187	− 282	− 58	+ 79	− 183	+ 320	− 216
1880	August ...	12	16	+ 220	+ 503	− 140	− 567	− 550	+1036	− 634	− 465	− 245	+ 245	+ 182
„	„ ...	19	8	+ 584	+ 914	+1041	+1163	+ 880	+ 224	− 127	− 499	− 448	− 702	− 689
„	February ...	20	19	+ 43	+ 686	− 4	− 9	− 550	− 337	− 558	− 209	− 328	− 362	− 307
1882	April ...	17	4	+2041	+2339	+2062	+1798	+1759	+ 792	+ 281	−1453	− 895	−1597	−1150
„	„ ...	20	8	+ 839	− 422	+ 750	+ 848	+ 673	+ 878	+ 124	− 251	− 375	− 728	− 673
„	May ...	15	0	− 290	+ 324	− 200	− 379	− 256	− 141	− 64	− 132	+ 175	+ 277	+ 392
„	August ...	4	10	+ 776	+1003	+ 924	+ 758	+ 619	+ 379	+ 111	+ 227	+ 338	+ 342	+ 198
„	October ...	2	14	+1641	+ 915	− 49	− 202	− 487	− 807	−1010	− 932	−1275	−1007	− 721
„	November ...	12	3	+ 234	+ 658	+ 676	+ 655	+ 642	+ 679	+1082	+1364	+1169	+ 449	− 60
„	„ ...	16	12	+ 365	+ 669	+ 203	+ 212	+ 82	+ 118	− 276	− 260	− 257	− 291	− 206
„	„ ...	17	14	+1823	+2378	− 239	− 255	+ 4	− 435	+1752	+ 756	− 67	− 137	− 466
„	„ ...	25	20	+ 19	− 85	− 102	− 154	− 552	− 387	− 84	− 197	+ 74	− 22	− 156
„	December ...	16	4	+ 222	+ 320	+ 111	+ 226	+ 319	+ 309	+ 622	+ 791	+ 729	+ 361	− 85

The figures in this table represent the excesses for each hour over the mean of the first

after the commencement of the "X" magnetic disturbances (Horizontal Force).

1882.

commencement of the storm.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
+ 153	− 22	+ 39	+ 13	− 22	− 197	− 48	− 433	− 328	− 459	− 669	− 494	− 481	− 433
+ 26	+ 109	+ 858	+2251	+1901	+2216	+1520	+1577	+1577	+1612	+1599	+1607	+1581	+1656
− 434	− 771	− 802	− 539	− 434	− 241	− 337	− 293	− 202	− 250	− 245	− 254	− 88	− 105
+ 219	+ 335	+ 70	− 153	− 578	− 591	− 863	−1119	−1144	− 640	− 442	− 368	− 434	− 285
− 70	− 211	− 385	− 116	0	+ 199	+ 414	+ 385	+ 298	+ 33	− 393	− 472	− 273	− 203
+ 340	+ 718	+ 672	+ 546	+ 185	+ 17	− 176	− 580	−1121	−1000	−1273	−1336	−1323	− 580
− 328	− 386	− 370	− 294	− 265	− 286	− 269	− 244	− 197	− 160	− 139	+ 4	+ 210	+ 407
+ 17	+ 50	+ 42	− 193	− 29	+ 34	− 4	− 55	+ 4	+ 126	− 38	+ 13	− 252	− 634
+ 122	− 156	− 68	− 156	− 937	− 228	− 473	− 823	− 836	− 612	− 527	− 51	+ 101	+ 114
− 105	− 211	− 468	− 452	− 169	− 333	− 321	− 363	− 452	− 414	− 354	− 333	− 249	− 211
− 169	− 101	− 143	− 257	− 414	− 557	− 692	− 422	− 532	− 734	− 625	+ 42	− 152	− 55
− 110	− 220	− 233	− 140	− 30	+ 216	+ 419	+ 470	+ 398	+ 338	− 118	− 440	− 825	− 952
− 182	− 114	− 173	− 76	− 38	− 135	− 224	− 38	+ 300	+ 503	+ 558	+ 512	+ 393	+ 216
−1018	−1391	−1408	− 360	− 852	− 729	− 560	+ 4	− 254	− 594	− 242	+ 153	+ 314	+ 237
− 497	− 459	− 331	− 280	− 174	− 132	− 102	− 89	− 64	− 85	− 123	− 102	− 72	− 68
− 811	− 772	− 605	− 137	+ 47	+ 335	+ 214	+ 197	+ 433	+ 588	+ 686	+1047	+ 867	+ 819
−1428	−1490	−1114	− 799	− 451	− 451	− 381	− 228	− 50	+ 145	+ 319	+ 385	+ 493	+ 377
+ 228	+ 41	− 83	− 253	− 369	− 369	− 469	− 531	− 452	− 369	− 593	− 282	− 373	− 481
− 309	− 184	− 42	− 75	− 42	− 17	+ 25	+ 67	− 38	+ 33	+ 150	+ 284	+ 405	+ 543
+ 222	− 34	− 218	− 297	− 138	− 117	− 29	− 725	− 968	−1257	−1550	−1182	−1374	−1722
− 34	− 205	− 257	— 248	− 244	− 235	− 231	− 218	− 210	− 210	− 201	− 180	− 146	− 60
− 494	− 637	− 602	− 455	− 619	− 546	− 346	− 294	− 273	− 87	+ 87	− 78	− 78	− 126
− 213	0	+ 197	− 94	+ 45	− 242	− 545	− 541	− 463	− 295	− 279	− 295	− 205	− 217
− 215	− 128	− 339	− 228	− 161	− 141	− 137	− 190	− 112	+ 8	− 54	− 75	− 54	− 21
− 398	− 602	+ 129	− 83	− 249	− 224	− 79	− 137	− 37	+ 158	+ 116	+ 187	+ 183	+ 220
− 25	+ 630	+ 262	+ 85	+ 123	+ 114	+ 59	+ 245	+ 237	+ 292	+ 313	+ 169	+ 118	+ 38
− 431	− 410	− 541	− 406	− 313	− 178	− 51	− 51	0	+ 51	+ 34	+ 34	+ 123	+ 152
− 209	− 47	+ 141	+ 277	+ 332	+ 388	+ 371	+ 285	+ 187	+ 128	+ 89	+ 26	+ 9	+ 26
−1555	−1836	− 673	−1052	−1056	−1018	+ 243	− 290	+ 179	+ 362	+ 452	+ 520	+ 520	+ 567
− 413	− 609	− 264	− 264	− 409	− 596	+ 136	+ 268	+ 166	+ 213	+ 234	+ 102	+ 115	+ 239
+ 435	+ 354	+ 273	+ 124	− 13	− 68	− 81	− 111	− 128	− 145	− 141	− 128	− 145	− 136
+ 89	− 679	− 464	− 729	− 564	− 380	− 364	+ 72	− 300	− 471	− 570	− 539	− 292	− 199
− 367	− 21	+ 42	− 8	+ 162	+ 280	+ 449	+ 448	+ 532	+ 700	+ 748	+ 743	+ 697	+ 677
− 264	− 241	− 330	− 702	−1062	− 776	− 686	− 682	− 703	− 499	− 532	− 498	352	− 197
− 185	− 149	− 82	− 145	− 55	− 128	− 158	− 35	+ 45	+ 145	− 14	+ 262	+ 194	+ 246
− 326	+ 201	+ 379	+ 141	− 220	+ 697	− 375	− 744	− 957	− 948	− 827	− 570	− 473	− 345
− 20	+ 93	+ 266	+ 385	+ 432	+ 342	+ 282	+ 116	+ 6	− 35	− 59	− 48	− 104	− 10
− 564	− 721	− 553	− 311	− 375	− 394	− 311	− 336	− 186	− 194	+ 112	+ 36	31	+ 9

twenty-four hours after the commencement of the storm expressed in C. G. S. unit (Unity = 0·1γ).

TABLE 394.—*Showing the character and progress for the first twenty-four hours*

1883—

Date and hour of Commencement.				Hours showing interval after the										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1883	February ...	24	18	2·700	2·631	2·699	2·300	2·229	2·549	2·572	2·470	2·518	2·308	2·351
,,	April ...	3	13	3·192	3·350	2·922	2·398	1·056	0·952	0·618	0·970	0·445	0·901	1·610
,,	July ...	30	4	2·096	2·461	2·392	1·852	1·975	1·746	1·970	2·004	1·944	1·998	2·134
,,	August ...	18	10	2·368	2·643	2·636	2·462	2·354	2·176	2·030	1·770	1·630	1·544	1·545
,,	September ...	16	7	2·052	2·407	2·214	1·880	0·692	0·874	1·224	0·600	−0·184	−0·131	−0·054
,,	,, ...	18	20	1·344	1·579	1·611	1·510	1·703	1·665	1·585	1·546	1·467	1·401	1·406
,,	October ...	16	20	1·608	1·722	1·759	1·648	1·481	1·400	1·446	1·684	1·571	1·428	1·460
,,	November ...	22	5	1·459	1·472	1·745	1·860	1·845	2·271	1·952	1·405	0·988	0·606	0·198
1884	February ...	29	21	1·473	1·645	1·406	1·477	1·333	1·229	1·276	1·127	1·137	1·044	1·230
,,	April ...	10	14	1·769	1·770	1·733	1·526	1·538	1·222	1·078	1·275	1·268	1·305	1·290
,,	July ..	3	23	0·001	−0·002	0·112	0·452	0·398	0·326	0·516	0·296	0·230	0·205	0·252
,,	October ...	2	2	0·722	1·078	1·134	0·907	0·858	0·664	−0·446	−0·190	0·206	0·024	0·011
1885	April ...	28	5	3·389	3·638	3·666	3·714	3·852	3·912	3·934	3·766	3·622	3·320	3·095
,,	May ...	10	10	3·750	4·156	4·114	4·010	3·826	3·698	3·810	3·709	3·557	3·448	3·254
,,	,, ...	13	12	3·602	3·676	3·542	3·390	3·351	3·346	3·324	3·025	3·147	3·130	3·025
,,	,, ...	25	18	3·331	3·841	3·158	3·120	3·149	3·233	3·233	3·052	3·108	3·141	3·051
,,	June ...	25	2	3·161	3·178	3·458	3·302	3·063	3·186	3·205	3·673	3·571	3·363	3·177
1886	January ...	9	12	3·038	3·730	2·434	1·694	1·999	1·994	2·294	2·287	2·210	2·524	1·750
,,	March ...	30	12	2·838	3·075	2·639	1·998	1·642	1·996	1·836	1·871	1·767	1·679	1·220
1888	December ...	24	5	3·405	3·488	3·793	3·422	3·505	3·443	3·316	3·370	3·344	3·402	3·384
1889	July ...	17	9	3·129	3·705	3·787	3·545	2·584	2·716	2·553	2·341	2·373	2·098	2·293
1891	March ...	2	6	1·611	1·851	1·922	2·001	2·112	2·161	2·127	2·099	1·927	1·843	1·733
,,	May ...	13	12	1·552	1·626	1·588	1·535	1·450	1·312	1·186	0·963	0·951	0·983	0·886
,,	June ...	14	13	1·650	1·833	1·694	1·613	1·435	0·953	0·557	0·532	0·840	0·879	0·896
,,	December ...	30	6	0·946	1·240	1·400	1·337	1·538	1·410	1·220	1·149	1·075	1·178	1·116
1892	January ...	4	23	0·951	1·154	0·920	0·691	0·512	0·542	0·513	0·514	0·662	0·868	1·000
,,	,, ...	28	22	0·675	0·909	0·920	0·944	0·944	0·876	0·872	0·854	0·916	0·937	0·974
,,	February ...	13	9	1·037	1·954	2·259	1·738	1·335	1·117	0·508	−0·488	−0·599	−1·128	−1·654
,,	,, ...	21	23	0·419	0·445	0·437	0·452	0·505	0·501	0·501	0·503	0·489	0·544	0·646
,,	March ...	6	14	0·822	0·642	0·322	0·366	0·321	0·278	0·312	0·230	0·112	−0·454	−0·538
,,	,, ...	12	3	0·504	0·804	0·090	0·076	−0·072	0·114	0·330	0·426	0·516	0·156	0·126
,,	May ...	17	2	0·432	0·584	0·458	0·453	0·467	0·466	0·527	0·662	0·924	0·669	0·546
,,	,, ...	18	12	0·757	1·290	0·211	−0·520	−0·672	−0·728	−0·899	−0·880	−1·159	−1·050	−0·966
,,	,, ...	19	19	−0·148	0·270	0·068	0·000	−0·016	−0·036	−0·034	−0·113	0·030	0·003	−0·024
,,	June ...	27	9	0·584	0·874	1·371	1·300	0·996	−0·292	−0·953	−1·261	−1·048	−1·146	−1·485
,,	July ...	12	22	3·644	4·430	3·772	3·371	2·557	2·499	2·618	2·655	2·877	3·018	3·154
,,	,, ...	16	17	3·504	3·752	3·652	3·680	3·508	4·458	3·160	3·638	2·629	3·028	2·878
,,	,, ...	26	4	3·396	3·598	3·410	3·666	3·723	3·892	3·705	3·928	3·765	3·908	3·736
,,	August ...	3	18	3·467	3·600	3·373	3·458	3·501	3·515	3·492	3·393	3·206	3·225	3·283
,,	,, ...	12	17	3·574	3·974	3·670	3·721	3·408	2·838	4·197	2·034	2·244	1·770	2·780
,,	November ...	4	6	3·569	3·678	4·315	4·210	4·338	4·135	4·098	4·040	3·910	3·796	3·720
,,	December ...	5	0	3·469	3·754	3·405	3·005	3·226	3·224	2·685	2·756	2·694	2·790	2·718
1893	March ...	25	9	3·788	4·143	4·146	3·844	3·482	3·226	3·197	3·290	3·289	3·800	3·443
,,	,, ...	26	12	3·613	3·676	3·503	3·414	3·243	3·093	2·854	2·826	2·603	2·581	2·481
,,	April ...	26	20	3·012	3·440	3·315	3·250	3·112	2·746	2·493	2·547	2·579	2·684	2·668
,,	June ...	18	11	3·651	3·773	3·623	3·612	3·558	3·382	3·280	3·144	3·137	2·909	2·944
,,	August ...	6	8	3·133	3·453	3·389	3·296	3·263	3·320	3·427	3·303	2·956	2·888	2·691

The figures given above represent the hourly ordinates (in inches) for the first twenty-four hours after the commencement of a storm. These are divided into
up to obtain the whole mean of

after the commencement of the "X" magnetic disturbances (Horizontal Force).

1893.

commencement of the storm.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·631	2·512	2·327	2·212	2·230	2·338	1·995	1·984	1 884	1·904	1·727	1·820	2·029	2·178
1·630	1·764	1·690	2·036	2·130	1·974	1·984	2·064	2·158	2·338	2·387	2·373	2·317	2·122
1·974	1·690	1·300	1·156	1·271	1·348	1·617	1·468	1·384	1·448	1·456	1·469	1·624	1·597
1·401	1·560	1·886	1·816	1·707	1·732	1·756	1·843	1·740	1·770	1·690	1·890	2·094	2·092
0·246	0·209	0·444	0·570	0·739	0·669	0·569	0·670	0·878	1·023	1·074	1·231	0·947	0·660
1·379	1·455	1·718	1·729	2·098	2·156	1·950	1·723	1·636	1·620	1·546	1·500	1·480	1·472
1·336	1·506	1·610	1·300	1·364	1·438	1·808	1·686	1·576	1·510	1·502	1·466	1·399	1·377
0·000	− 0·280	− 0·538	− 0·490	0·150	0·612	0·799	0·746	0·774	0·634	0·948	0·784	0·783	1·013
1·158	1·040	1·202	1·320	1·360	1·287	1·248	1·181	1·144	1·220	1·169	1·086	1·001	1·359
1·307	1·199	1·408	1·139	1·336	1·227	1·230	1·388	1·582	1·760	1·712	1·572	1·185	1·012
0·498	0·586	0·592	0·473	0·492	0·475	0·411	0·412	0·418	0·416	0·479	0·452	0·340	0·513
− 0·165	− 0·357	− 0·110	− 0·144	− 0·196	− 0·209	− 0·108	− 0·336	0·117	− 0·149	0·029	0·000	0·082	0·152
2·939	2·912	2·932	3·040	3·179	3·124	3·130	3·115	3·193	3·151	3·164	3·181	3·204	3·242
3·376	3·334	3·356	3·340	3·392	3·380	3·450	3·452	3·482	3·460	3·535	3·610	3·892	3·962
3·490	3·030	2·946	2·777	2·920	3·220	2·925	2·700	2·732	2·822	2·941	3·020	3·019	3·011
3·142	3·225	3·241	3·301	3·164	2·986	2·539	2·504	2·538	2·762	2·915	2·879	2·831	2·766
2·841	2·829	2·662	2·449	2·353	2·233	2·196	2·270	2·385	2·509	2·522	2·628	2·627	2·828
1·867	1·324	1·890	2·020	1·896	1·869	1·984	1·990	2·161	2·198	2·186	2·202	2·305	2·254
1·192	1·528	1·450	1·112	1·578	1·486	1·992	1·620	1·670	1·836	1·922	2·033	2·084	2·078
3·176	3·054	3·071	3·202	3·048	3·114	3·119	3·173	3·238	3·268	3·284	3·242	3·244	3·248
2·480	2·467	2·445	2·546	2·537	2·573	2·558	2·547	2·570	2·600	2·611	2·702	2·742	2·832
1·767	1·458	1·404	1·432	1·227	0·892	0·782	0·741	0·940	1·038	1·077	1·132	1·190	1·228
0·889	0·990	1·037	1·103	1·143	1·106	1·125	1·177	1·252	1·097	1·104	1·108	1·137	1·009
1·074	0·943	0·978	0·981	1·009	1·069	1·106	1·270	1·306	1·342	1·291	1·266	1·249	1·213
0·908	0·442	0·361	0·211	0·139	0·249	0·350	0·468	0·662	0·659	0·709	0·736	0·737	0·816
0·917	0·888	0·835	0·700	0·752	0·785	0·781	0·830	0·755	0·530	0·310	0·465	0·512	0·590
1·112	1·219	1·412	1·102	0·926	0·500	− 0·093	− 0·548	− 0·260	− 0·256	− 0·106	0·092	0·089	0·310
− 1·077	− 1·203	− 1·413	− 1·426	− 1·909	− 2·215	− 1·729	− 1·291	− 1·153	− 0·863	− 1·097	− 0·675	− 0·333	− 0·769
0·765	0·829	0·821	0·768	0·656	0·603	0·576	0·532	0·562	0·551	0·580	0·592	0·588	0·567
− 0·786	− 0·210	− 0·204	− 0·194	− 0·250	− 0·184	0·000	0·036	0·104	0·128	0·100	0·116	− 0·018	− 0·068
− 0·118	− 0·408	− 0·446	− 0·150	− 0·316	− 0·126	− 0·280	0·050	− 0·140	− 0·196	− 0·237	0·060	− 0·220	− 0·610
0·414	0·261	0·108	− 0·042	0·073	− 0·065	− 0·175	− 0·082	− 0·240	− 0·301	− 0·342	− 0·394	− 0·242	− 0·131
− 0·856	− 0·670	− 0·504	0·246	0·058	− 0·335	− 0·365	− 0·554	− 0·346	− 0·815	− 0·930	− 0·715	− 0·738	− 0·602
0·000	0·094	0·165	0·267	0·414	0·616	0·628	0·536	0·537	0·367	0·281	0·186	0·130	0·101
− 1·324	− 1·083	− 1·132	− 0·789	− 0·660	− 0·625	− 0·529	− 0·522	− 0·371	− 0·278	− 0·287	− 0·232	− 0·126	0·005
3·238	3·283	3·183	3·031	2·910	3·023	2·799	2·739	2·773	2·634	2·722	2·854	2·928	2·930
2·936	2·848	2·666	2·978	3·026	2·975	3·028	3·052	3·052	3·074	3 107	3·026	3·312	2·770
3·126	2·886	3·139	3·228	3·118	3·079	2·919	2·962	2·993	2·994	3·308	3·162	3·127	3·152
3·342	3·289	3·403	3·403	3·551	3·675	3·696	3·579	3·451	3·429	3·284	3·232	3·335	3·170
2·120	2·171	2·289	2·508	2·636	2·802	3·910	2·992	3·010	2·987	2·961	2·900	2·882	2·875
3·599	3·489	3·120	2·972	3·060	3·211	3·210	3·285	3·284	3·569	3·500	3·112	3·039	3·200
2·747	2·778	2·764	2·784	2·752	2·662	2·603	2·678	2·673	2·828	2·723	2·363	2·610	2·887
3·012	2·955	2·986	3·032	3·050	3·089	3·172	3·181	3·147	3·147	3·181	3·262	3·366	3·547
2·256	2·390	2·231	2·641	2·529	2·654	2·769	2·713	2·904	3·026	3·109	3·203	3·138	3·098
2·742	2·872	3·010	3·150	3·055	3·030	2·984	2·916	2·817	2·834	2·876	2·846	2·837	2·823
2·930	2·897	2·901	3·059	3·090	2·966	2·928	2·977	2·960	3·068	3·104	3·132	3·274	3·215
2·702	2·684	2·693	2·752	2·719	2·690	2·691	2·594	2·656	2·598	2·789	2·765	2·461	2·495

convenient groups during which the scale co-efficient was nearly uniform. The variations of the sums of these periods converted in C. G. S. units are then added 11 years given in table 388.

TABLE 394.—*Showing the character and progress for the first twenty-four hours*

1894—

Date and hour of Commencement.				Hours showing interval after the										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1894	January ...	3	2	2·741	2·756	2·927	2·871	2·858	2·757	2·611	2·713	2·597	2·591	2·656
,,	,, ...	12	0	2·761	3·085	2·689	2·640	2·838	2·699	2·786	2·758	2·810	2·743	2·793
,,	February ...	19	11	3·252	3·320	3·000	2·770	2·518	2·588	2·336	2·450	2·560	2·492	2·477
,,	,, ...	21	0	2·622	2·969	2·506	2·503	2·526	2.662	2·639	2·729	2·829	2·894	2·642
,,	,, ...	23	2	2·397	2·364	2·860	2·629	2·473	2·560	1·912	1·712	2·212	2·142	2·292
,,	,, ...	25	12	2·663	2·660	2·511	2·378	1·390	0·682	0·803	0·183	0·501	0·889	0·910
,,	,, ...	28	19	2·449	2·928	2·362	1·923	1·512	0·779	1·144	1·411	1·368	1·421	1·496
,,	June ...	19	10	2·698	2·962	2·867	2·701	2·609	2·545	2·357	2·201	2·099	2·138	2·189
,,	,, ...	21	5	2·295	2·475	2·655	2·817	2·893	2·959	2·899	2·888	2·822	2·764	2·422
,,	July ...	20	10	2·663	3·086	3·136	2·990	3·079	1·945	0·560	−0·077	−0·788	−0·692	−0·325
,,	August ...	20	7	2·097	1·898	1·357	0·578	−0·036	−0·033	0·140	−1·812	−1·721	−1·579	−0·461
,,	September ...	14	5	2·198	2·401	2·423	2·431	2·600	2·641	2·716	2·779	2·624	2·452	2·214
,,	November ...	13	18	2·035	1·833	0·692	0·236	0·982	0·661	0·577	0·338	1·021	1·053	1·098
,,	,, ...	17	16	1·976	1·994	1·736	1·790	1·574	1·689	1·751	1·861	1·874	1·863	1·972
1895	May ...	10	11	2·197	2·560	2·396	2·230	1·913	1·676	1·632	1·635	1·375	1·406	1·504
,,	,, ...	29	7	1·944	2·326	2·484	2·306	2·124	1·902	1·696	1·673	1·584	1·630	1·579
,,	December ...	7	11	2·013	2·508	2·372	2·515	1·924	1·739	1·703	1·624	1·408	1·306	1·418
1896	July ...	23	22	1·220	1·500	1·514	1·440	1·423	1·488	1·309	1·336	1·370	1·410	1·424
,,	September ...	17	22	1·006	1·122	0·872	0·770	1·062	0·982	1·027	1·020	1·030	0·924	0·894
,,	December ...	13	10	1·208	1·449	1·383	1·322	1·359	1·059	0·783	0·325	0·651	0·794	0·606
1898	September ...	9	16	3·137	3·606	3·523	2·883	1·908	2·319	1·872	1·563	1·836	1·909	1·203
1899	January ...	28	23	2·795	2·786	2·604	2·440	2·590	2·694	2·672	2·554	2·804	2·696	2·695
1900	January ...	19	12	2·518	2·711	2·448	2·143	2·150	2·173	2·209	2·222	2·248	2·226	2·196
,,	May ...	5	7	2·101	2·411	2·314	2·224	1·984	1·830	1·530	1·570	1·490	0·982	0·593
1903	April ...	6	3	1·575	1·925	2·290	2·210	2·212	2·040	1·460	0·937	1·367	1·440	1·880
,,	October ...	31	10	1·335	2·665	1·740	- 0·395	4·551	−6·878	−5·518	−10·193	−11·438	−11·223	−9·188
,,	December ...	30	7	6·925	8·165	7·920	7·890	7·990	7·497	6·710	6·362	5·945	5·440	5·157
1904	November ...	2	16	5·367	5·370	4·500	4·840	4·850	4·760	5·410	5·390	5·300	5·500	5·515

The figures given above represent the hourly ordinates (in inches from 1894 to 1900 and in cms. from 1901 to 1904) for the first twenty-four
The variations of the sums of these periods converted in C. G. S. unit are

after the commencement of the "X" magnetic disturbances (Horizontal Force).

1904.

commencement of the storm.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·656	2·658	2·780	2·744	2·632	2·738	2·719	2·702	2·512	2·543	2·126	2·416	2·277	2·355
2·963	2·663	2·608	2·736	2·619	2·608	2·626	2·590	2·607	2·631	2·647	2·612	2·616	2·651
2·472	2·512	2·605	2·542	2·530	2·554	2·560	2·580	2·603	2·678	2·788	2·889	3·098	3·172
2·382	2·428	2·236	2·277	2·372	2·306	1·538	1.785	2·035	1·986	1·726	1·932	1·643	2·114
1·936	1·750	1·581	1·780	1·979	1·915	1·904	1·725	1·659	2·228	2·299	2·560	2·307	2·115
1·065	1·309	1·632	1·540	1·527	1·760	1·736	1·767	1·760	1·857	1·959	2·218	2·082	2·143
1·572	1·684	1·850	1·942	2·040	2·158	2·187	2·084	2·139	2·042	2·049	2·073	2·075	2·120
2·363	2·235	2·134	2·099	2·236	2·183	2·223	2·298	2·278	2·261	2·357	2·455	2·648	2·704
1·957	1·889	1·712	1·740	1·925	1·952	1·976	2·018	2·039	2·042	2·043	2·054	2·053	2·052
0·076	−0·244	0·124	0·540	1·127	1·392	0·842	1·239	1·170	1·050	1·125	1·308	1·564	1·698
0·045	0·090	0·300	0·388	0·558	0·684	0·796	0·867	0·789	0·989	0·880	0·961	1·065	1·425
1·969	2·030	2·042	1·742	1·752	1·742	1·426	1·480	1·543	1·251	1·337	1·642	1·590	1·435
1·458	1·290	1·333	1·410	1·524	1·596	1·467	1·382	1·274	1·100	1·100	1·132	1·328	1·505
1·982	2·100	2·070	2·116	2·280	2·251	2·182	2·173	2·108	2·247	2·124	2·060	2·011	1·874
1·590	1·616	1·550	1·499	1·646	1·589	1·644	1 697	1·649	1·675	1·770	1·801	1·900	1·964
1·597	1·596	1·576	1·728	1·685	1·666	1·776	1·750	1·702	1·650	1·730	1·672	1·715	1·820
1·224	1·272	1·146	1·244	1·358	1·204	1·243	1·318	1·502	1·532	1·642	1·651	1·806	1·655
1·420	1·568	1·459	1·456	1·452	1·364	1·240	1·199	1·070	1·080	1·093	1·074	1·014	1·029
0·956	0·950	0·974	0·749	0·356	−0·068	0·029	−0·358	0·185	−0·098	0·116	0·039	0·252	0·162
0·733	0·738	0·768	0·760	0·654	0·856	0·839	0·722	0·830	0·815	0·798	0·739	0·817	0·848
1·185	1·437	1·517	1·607	1·706	1·837	1·985	1·991	2·186	1·986	1·508	1·422	1·720	1·692
2·759	2·770	2·782	2·883	2·682	2·582	2·418	2·542	2·552	2·649	2·623	2·615	2·656	2·690
2·482	2·598	2·126	2·068	2·066	2·086	2·083	2·184	2·181	2·203	2·235	2·286	2·298	2·349
0·492	0·720	0·570	0·734	1·020	1·338	1·335	1·382	1·314	1·352	1·440	1·472	1·509	1·563
1·530	0·045	−1·271	−1·670	−1·810	−1·095	−0·360	−0·010	0·040	0·190	0·175	0·230	0·290	0·300
−8·973	−7·560	−7·398	−4·863	−4·873	−4·135	−3·328	−2·703	−2·343	−2·693	−2·683	−2·918	−3.238	−2·683
5·785	5·960	5·895	5·837	5·900	5·935	5·972	6·025	6·230	6·030	5·970	5·880	5·627	5·440
5·510	5·370	5·380	5·485	5·605	5·810	6·030	6·260	6·345	6·295	6·050	5·760	5·580	5·420

hours after the commencement of a storm. These are divided into convenient groups during which the scale co-efficient was nearly uniform, then added up to obtain the whole mean of 11 years given in table 388.

TABLE 395.—*Showing the character and progress for the first twenty-four hours after*

1872—

Date and hour of Commencement.			d.	h.	Hours showing interval 0	1	2	3	4	5	6	7	8	9	10
1872	January	...	6	22	+ 109	+ 350	+ 184	+ 184	+ 170	+ 271	+ 315	+ 315	+ 393	+ 581	+ 345
,,	February	...	4	18	+2567	+3219	+2348	+ 158	−4932	−6369	−4822	−4371	−3460	−1480	− 815
,,	,,	...	20	5	+ 342	+ 692	+ 740	+ 872	+ 981	+ 565	+ 491	+ 512	+ 228	− 114	− 92
,,	March	...	1	23	+ 359	+ 632	+ 516	+ 491	+ 591	+ 673	+ 706	+ 578	+ 545	+ 690	+ 244
,,	April	...	10	18	+ 998	+1358	+ 592	+ 811	+ 244	− 269	− 774	− 654	− 377	− 348	− 414
,,	,,	...	15	8	+ 658	+ 948	+1047	+ 915	+ 621	+ 667	+ 542	+ 489	+ 70	− 435	− 642
,,	June	...	3	14	+ 874	+ 686	+ 464	+ 514	+ 493	+ 472	+ 359	− 293	− 631	− 698	− 405
,,	,,	...	9	21	+ 330	+ 313	+ 355	+ 439	+ 522	+ 405	+ 155	+ 188	− 121	− 188	− 67
,,	July	...	7	21	+ 941	+1541	+1109	+ 815	+ 424	+ 365	− 395	− 109	0	+ 143	+ 294
,,	,,	...	19	8	+ 903	+1365	+ 596	+ 449	+ 244	+ 8	− 8	+ 84	− 126	− 252	− 311
,,	,,	...	20	14	+ 168	+ 319	+ 113	+ 21	+ 50	+ 29	− 13	− 17	− 38	+ 8	+ 8
,,	August	...	3	12	+ 852	+1169	+ 949	+ 743	+ 156	+ 388	+ 338	+ 169	+ 38	− 198	+ 460
,,	,,	...	8	23	+ 527	+1072	+ 675	+ 527	+ 717	+ 321	+ 97	+ 329	+ 300	− 34	+ 110
,,	,,	...	14	22	+ 823	+1055	+ 768	+ 262	− 84	+ 101	+ 460	+ 519	+ 409	+ 667	+ 253
,,	,,	...	25	2	+ 338	+ 329	+ 422	+ 405	+ 245	+ 152	+ 17	+ 316	+ 430	+ 667	+ 574
,,	September	...	2	16	+ 334	+ 550	+ 563	+ 495	+ 554	+ 355	− 300	− 525	− 317	− 588	− 195
,,	,,	...	29	14	+ 453	+ 601	+ 406	− 4	− 228	− 478	− 393	− 338	− 431	− 364	− 372
,,	October	...	15	2	+1484	+2294	+2480	+ 38	− 98	+ 191	+ 411	+ 280	+ 729	+ 131	− 331
,,	,,	...	17	1	+ 700	+ 695	+ 708	+ 734	+ 767	+ 585	+ 564	+ 653	+ 492	+ 962	+ 729
,,	November	...	24	5	+ 429	+ 952	+ 888	+ 591	+ 489	+ 306	+ 64	− 217	− 195	− 276	− 310
1873	January	...	19	1	+ 552	+ 274	+ 214	+ 475	+ 454	+ 475	+ 368	+ 381	+ 415	+ 467	+ 659
,,	March	...	9	12	+1467	+ 562	− 519	− 764	− 802	− 330	− 339	+ 112	+ 39	− 746	− 472
,,	April	...	1	20	+ 568	+ 258	+ 43	− 168	− 206	− 357	+ 103	+ 52	− 4	− 56	− 107
1874	February	...	4	12	+1130	+1329	+1329	+1056	+ 604	+ 729	+ 849	+ 774	− 286	− 820	−1238
,,	March	...	8	0	+ 621	+ 546	+ 517	+ 468	+ 501	+ 335	+ 542	+ 286	+ 385	+ 319	+ 315
,,	April	...	13	1	+ 149	+ 274	+ 253	+ 232	+ 199	+ 237	+ 436	+ 672	+ 863	+ 444	+ 415
,,	September	...	29	11	+1053	+ 895	+ 142	+ 25	+ 75	− 117	− 280	+ 59	− 293	− 644	− 903
,,	October	...	3	18	+ 725	+1073	+ 918	+ 909	+ 918	+ 901	+ 926	+ 821	+ 637	+ 708	+ 348
1875	February	...	26	16	+ 320	+ 269	+ 143	+ 63	− 29	+ 101	+ 152	+ 198	+ 143	+ 173	+ 84
,,	April	...	7	6	+ 688	+ 620	+ 772	+ 992	+1198	+1101	+ 523	+ 241	− 131	− 367	− 532
,,	September	...	16	2	+ 561	+ 574	+ 552	+ 561	+ 467	+ 319	+ 327	+ 144	− 102	− 246	− 327
1876	February	...	19	8	+ 385	+ 723	+ 715	+ 419	+ 308	+ 4	− 9	+ 81	+ 39	+ 111	+ 47
,,	December	...	10	5	+ 346	+ 624	+ 637	+ 628	+ 719	+ 637	+ 649	+ 485	+ 277	− 4	− 346
1877	May	...	28	22	+ 398	+ 443	+ 488	+ 451	+ 365	+ 455	+ 549	+ 291	+ 143	− 139	− 164
,,	September	...	18	20	+ 523	+ 474	+ 490	+ 420	+ 334	+ 206	+ 214	+ 190	+ 251	+ 243	+ 111
1878	January	...	24	4	+ 431	+ 613	+ 654	+ 604	+ 277	+ 161	+ 149	+ 46	− 174	− 327	− 335
,,	June	...	3	12	+ 838	+ 129	+ 58	+ 510	+ 187	− 282	− 58	+ 79	− 183	+ 320	− 216
,,	December	...	1	6	+ 522	+ 531	+ 447	+ 514	+ 364	+ 280	+ 180	− 46	− 297	− 489	− 598
1879	June	...	17	15	+ 440	+ 318	+ 318	+ 130	+ 17	+ 25	− 17	− 34	+ 138	+ 168	+ 193
1880	August	...	12	16	+ 220	+ 503	− 140	− 567	− 550	−1036	− 634	− 465	− 245	+ 245	+ 182
,,	,,	...	19	8	+ 584	+ 914	+1041	+1163	+ 880	+ 224	− 127	− 499	− 448	− 702	− 689
,,	September	...	15	4	+ 647	+ 605	+ 689	+ 626	+ 558	+ 444	+ 495	+ 457	+ 275	+ 114	− 25
,,	October	...	31	5	+ 609	+ 664	+ 783	+ 948	+ 838	+ 736	+ 453	− 13	− 381	− 601	− 609
,,	November	...	3	3	+ 416	+ 568	+ 513	+ 462	+ 411	+ 445	+ 505	+ 517	+ 581	+ 335	+ 161
1881	January	...	31	9	+1361	+1480	+1480	+1289	+1382	+ 844	+ 844	+ 649	+ 220	− 301	− 399
,,	September	...	12	18	+ 750	+ 85	− 47	+ 307	+ 405	+ 498	+ 179	+ 409	+ 456	+ 724	+ 511
,,	November	...	9	11	+1304	+ 511	− 273	− 618	− 550	− 976	− 976	− 878	− 669	− 532	− 469
1882	April	...	17	4	+2041	+2339	+2062	+1798	+1759	+ 792	+ 281	−1453	− 895	−1597	−1150
,,	June	...	24	17	+1072	+ 875	+ 679	+ 252	+ 94	− 397	− 687	−1046	−1012	− 495	− 397
,,	July	...	30	22	+ 34	+ 63	+ 70	+ 55	+ 38	+ 29	+ 127	+ 411	+ 366	+ 281	+ 300
,,	October	...	2	14	+1641	+ 915	− 49	− 202	− 487	− 807	−1010	− 932	−1275	−1007	− 721
,,	,,	...	5	12	+ 274	+ 340	+ 341	+ 359	+ 334	+ 223	+ 211	+ 129	− 30	− 16	− 78
,,	November	...	12	3	+ 234	+ 658	+ 676	+ 655	+ 642	+ 679	+1082	+1364	+1169	+ 449	− 60
,,	,,	...	13	7	+ 577	+1138	+ 934	+ 551	+ 206	− 62	− 88	− 406	− 641	− 609	− 500
,,	,,	...	17	14	+1823	+2378	− 239	− 255	+ 4	− 435	+1752	+ 756	− 67	− 137	− 466
,,	,,	...	19	17	+ 558	+ 713	+ 558	+ 350	+ 405	+ 553	+ 607	+1051	+ 758	+ 882	+1120

The figures in this table represent the excesses for each hour over the mean of the first

the commencement of the principal magnetic disturbances of H collected in table 383.

1882.

after the commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
+ 153	− 22	+ 39	+ 13	− 22	− 197	− 48	− 433	− 328	− 459	− 669	− 494	− 481	− 433
+ 26	+ 109	+ 858	+2251	+1901	+2216	+1520	+1577	+1577	+1612	+1599	+1607	+1581	+1656
− 434	− 771	− 802	− 539	− 434	− 241	− 337	− 293	− 302	− 250	− 245	− 254	− 88	− 105
+ 219	+ 335	+ 70	− 153	− 578	− 591	− 863	−1119	−1144	− 640	− 442	− 368	− 434	− 285
− 70	− 211	− 385	− 116	0	+ 199	+ 414	+ 385	+ 298	+ 33	− 393	− 472	− 273	− 203
− 687	− 683	− 667	− 455	− 460	− 592	− 302	− 116	− 99	− 306	− 286	+ 33	− 41	+ 186
− 50	− 380	− 322	− 184	− 247	− 301	− 171	− 63	+ 63	+ 180	+ 50	+ 4	+ 54	+ 13
+ 121	+ 121	+ 263	+ 238	+ 205	− 42	− 330	− 196	− 297	− 564	− 690	− 460	− 389	− 272
+ 340	+ 718	+ 672	+ 546	+ 185	+ 17	− 176	− 580	−1121	−1000	−1273	−1336	−1323	− 580
− 328	− 386	− 370	− 294	− 265	− 286	− 269	− 244	− 197	− 160	− 139	+ 4	+ 210	+ 407
+ 17	+ 50	+ 42	− 193	− 29	+ 34	− 4	− 55	+ 4	+ 126	− 38	+ 13	− 252	− 634
+ 122	− 156	− 68	− 156	− 937	− 228	− 473	− 823	− 836	− 612	− 527	− 51	+ 101	+ 114
− 105	− 211	− 468	− 452	− 169	− 333	− 321	− 363	− 452	− 414	− 354	− 333	− 249	− 211
− 169	− 101	− 143	− 257	− 414	− 557	− 692	− 422	− 532	− 734	− 625	+ 42	− 152	− 55
+ 468	+ 253	+ 84	− 25	− 114	− 219	− 203	− 152	− 287	− 490	− 726	−1009	− 852	− 827
− 110	− 220	− 233	− 140	− 30	+ 216	+ 419	+ 470	+ 398	+ 338	− 118	− 440	− 825	− 952
− 182	− 114	− 173	− 76	− 38	− 135	− 224	− 38	+ 300	+ 503	+ 558	+ 512	+ 393	+ 216
−1018	−1391	−1408	− 360	− 852	− 729	− 560	+ 4	− 254	− 594	− 242	+ 153	+ 314	+ 237
+ 958	+ 140	− 619	− 979	−1225	−1314	−1437	− 496	− 886	−1204	+ 432	− 38	− 416	− 318
− 497	− 459	− 331	− 280	− 174	− 132	− 102	− 89	− 64	− 85	− 123	− 102	− 72	− 68
+ 835	+ 676	+ 146	− 360	− 920	− 869	−1079	− 685	− 856	− 479	− 304	− 304	− 180	− 51
− 811	− 772	− 605	− 137	+ 47	+ 335	+ 214	+ 197	+ 433	+ 588	+ 686	+1047	+ 867	+ 819
+ 9	+ 146	+ 335	+ 391	+ 258	+ 129	+ 133	− 30	+ 9	− 26	− 34	− 236	− 606	− 654
−1428	−1490	−1114	− 799	− 451	− 451	− 381	− 228	− 50	+ 145	+ 319	+ 385	+ 493	+ 377
+ 236	− 91	− 327	− 501	− 667	− 517	− 451	− 381	− 468	− 567	− 426	− 294	− 174	+ 199
+ 228	+ 41	− 83	− 253	− 369	− 369	− 469	− 531	− 452	− 369	− 593	− 282	− 373	− 481
− 309	− 184	− 42	− 75	− 42	− 17	+ 25	+ 67	− 38	+ 33	+ 150	+ 284	+ 405	+ 543
+ 222	− 34	− 218	− 297	− 138	− 117	− 29	− 725	− 928	−1257	−1550	−1182	−1374	−1722
− 88	− 55	+ 21	− 210	− 413	− 278	− 46	+ 59	+ 716	+ 223	0	− 303	− 307	−1490
− 747	− 747	− 599	− 603	− 392	− 371	− 481	− 384	− 426	− 253	− 34	+ 42	+ 169	+ 114
− 246	− 510	− 446	− 217	− 187	− 361	− 106	− 136	− 314	− 106	− 21	+ 17	+ 47	+ 72
− 34	− 205	− 257	− 248	− 244	− 234	− 231	− 218	− 210	− 210	− 201	− 180	− 146	− 60
− 494	− 637	− 602	− 455	− 619	− 545	− 346	− 294	− 273	− 87	+ 87	− 78	− 78	− 126
− 213	0	+ 197	− 94	+ 45	− 242	− 545	− 541	− 463	− 295	− 279	− 295	− 205	− 217
− 33	+ 87	+ 144	+ 194	+ 111	− 132	− 255	− 350	− 507	− 614	− 639	− 486	− 585	− 268
− 215	− 128	− 339	− 228	− 161	− 141	− 137	− 190	− 112	+ 8	− 54	− 75	− 54	− 21
− 398	− 602	+ 129	− 83	− 249	− 224	− 79	− 137	− 37	+ 158	+ 116	+ 187	+ 183	+ 220
− 723	− 456	− 238	− 71	− 29	+ 29	− 54	+ 222	− 29	+ 113	− 29	+ 13	+ 79	+ 113
+ 117	+ 29	− 67	− 34	+ 113	+ 163	− 59	+ 75	− 25	− 251	− 268	− 423	− 574	− 444
− 25	+ 630	+ 262	+ 85	+ 123	+ 114	+ 59	+ 245	+ 237	+ 292	+ 313	+ 169	+ 118	+ 38
− 431	− 410	− 541	− 406	− 313	− 178	− 51	− 51	0	+ 51	+ 34	+ 34	+ 123	+ 152
− 440	− 385	− 537	− 702	− 664	− 575	− 431	− 596	− 250	− 89	− 72	+ 102	+ 51	+ 80
− 406	− 406	− 516	− 563	− 402	− 288	− 250	− 127	− 76	− 76	− 34	+ 13	+ 42	− 8
+ 85	− 157	− 852	− 628	− 174	− 123	− 360	− 661	− 636	− 326	− 496	− 326	− 55	− 81
− 653	− 729	−1247	−1683	− 984	− 755	− 717	− 530	− 458	− 310	− 85	− 42	− 51	+ 187
+ 243	+ 558	+ 315	+ 843	+ 839	+ 814	− 439	−1227	−1734	−1708	−1440	− 682	− 153	− 273
− 209	− 187	+ 4	+ 222	+ 290	+ 319	+ 226	+ 375	+ 345	+ 430	+ 494	+1005	+ 993	+ 882
−1555	−1836	− 673	−1052	−1056	−1018	+ 243	− 290	+ 179	+ 362	+ 452	+ 520	+ 520	+ 567
− 427	− 320	− 137	− 30	+ 111	+ 209	+ 350	+ 401	+ 333	+ 316	+ 269	+ 269	+ 209	196
+ 383	+ 362	+ 490	+ 76	− 348	− 246	− 149	− 207	− 165	− 240	− 101	− 629	− 681	− 579
− 367	− 21	+ 42	− 8	+ 162	+ 280	+ 449	+ 448	+ 532	+ 700	+ 748	+ 743	+ 697	+ 677
+ 48	− 28	− 47	− 103	− 178	− 107	− 92	− 152	+ 8	− 317	− 106	− 222	− 359	− 603
− 264	− 241	− 330	− 702	−1062	− 776	− 686	− 682	− 703	+ 499	− 532	− 498	− 352	− 197
− 823	− 182	− 567	+ 542	− 323	− 389	− 401	+ 186	+ 290	+ 62	+ 269	+ 116	+ 246	+ 313
− 326	+ 201	+ 379	+ 141	− 220	+ 697	− 375	− 744	− 957	− 948	− 827	− 570	− 473	− 345
+ 927	+ 753	+1083	+ 490	− 158	− 347	− 555	− 883	− 834	− 891	−1390	−1611	−2758	−2192

twenty-four hours after the commencement of the storm expressed in C. G. S. unit (unity = 0·1γ).

TABLE 395.—*Showing the character and progress for the first twenty-four hours after*

1883—

Date and hour of Commencement.				Hours showing interval										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1883	March ...	13	9	3·177	2·959	2·870	2·653	2·500	2·534	2·436	2·194	1·924	1·756	2·211
,,	April ...	3	13	3·192	3·350	2·922	2·398	1·056	0·952	0·618	0·970	0·445	0·901	1·610
,,	July ...	30	4	2·096	2·461	2·392	1·852	1·975	1·746	1·970	2·004	1·944	1·998	2·134
,,	September ...	16	7	2·052	2·407	2·214	1·880	0·692	0·874	1·224	0·600	−0·184	−0·131	−0·054
,,	November ...	20	1	1·772	1·969	1.750	1·760	1·615	1·586	1·712	1·952	2·019	2·030	2·128
,,	,, ...	22	5	1·459	1·472	1·745	1·860	1·845	2·271	1·952	1·405	0·988	0·606	0·198
1884	July ...	3	23	0·001	−0·002	0·112	0·452	0·398	0·326	0·516	0·296	0·230	0·205	0·252
,,	October ...	2	2	0·722	1·078	1·134	0·907	0·858	0·664	−0·446	−0·190	0·206	0·024	0·011
,,	November ...	1	16	0·755	0·783	0·645	0·584	0·386	0·257	0·250	0·403	0·512	0·574	0·488
1885	March ...	15	8	3·801	4·002	4·048	3·860	3·684	3·550	3·802	3·652	3·130	2.738	2·461
,,	May ...	11	7	3·535	3·610	3·892	3·962	3·710	3·588	3·376	3·200	3·015	2·917	2·802
,,	,, ...	25	18	3·331	3·841	3·158	3·120	3·149	3·233	3·233	3·052	3·108	3·141	3·051
,,	June ...	25	2	3·161	3·178	3·458	3·302	3·063	3·186	3·205	3·673	3·571	3·363	3·177
1886	January ...	9	12	3·038	3·730	2·434	1·694	1·999	1·994	2·294	2·287	2·210	2·524	1·750
,,	March ...	30	12	2·838	3·075	2·639	1·998	1·642	1·996	1·836	1·871	1·767	1·679	1·220
,,	May ...	9	0	2·238	2·275	2·307	1·983	1·956	1·919	1·743	1·840	1·627	1·814	1 841
1888	January ...	7	21	1·058	0·974	1·018	0·982	0·882	0·817	0·904	0·934	0·780	0·999	0·863
1889	June ...	14	10	3·146	3·033	2·932	2·706	2·540	2·374	2·188	2·070	1·927	1·957	2·022
,,	November ...	1	10	2·978	2·964	2·539	2·474	2·260	2·308	2·134	2·159	2·028	1·618	1·822
1891	May ...	13	12	1·552	1·626	1·588	1·535	1·450	1·312	1·186	0·963	0·951	0·983	0·886
,,	August ...	29	4	1·269	1·341	1·293	1·192	1·193	1·089	0·900	0·681	0·625	0·761	0·642
,,	November ...	20	3	0·999	1·307	1·277	1·138	1·063	1·147	1·272	1·270	1·192	0·878	0·718
,,	December ...	7	4	0·954	0·826	0·816	0·760	0·856	0·847	0·814	0·849	0·817	0·730	0·521
1892	January ...	28	22	0·675	0·909	0·920	0·944	0·944	0·876	0·872	0·854	0·916	0·937	0·974
,,	February ...	13	9	1·037	1·954	2·259	1·738	1·335	1·117	0·508	−0·488	−0·599	−1·128	−1·654
,,	March ...	1	2	0·712	0·637	0·590	0·652	0·669	0·555	0·496	0·503	0·441	0·472	0·550
,,	,, ...	6	14	0·822	0·642	0·322	0·366	0·321	0·278	0·312	0·230	0·112	−0·454	−0·538
,,	,, ...	12	3	0·504	0·804	0·090	0·076	−0·072	0·114	0·330	0·426	0·516	0·156	0·126
,,	April ...	24	2	0·702	0·534	0·394	0·544	0·348	0·212	0·076	0·174	0·227	0·402	0·472
,,	,, ...	25	20	0·234	0·208	0·156	0·336	0·064	−0·230	0·308	0·120	0·150	−0·158	0·029
,,	May ...	1	9	0·550	0·450	0·131	0·094	−0·178	−0·428	−0·140	−0·190	−0·433	−0·520	−0·730
,,	,, ...	17	2	0·432	0·584	0·458	0·453	0·467	0·466	0·527	0·662	0·924	0·669	0·546
,,	,, ...	18	12	0·757	1·290	0·211	−0·520	−0·672	−0·728	−0·899	−0·880	−1·159	−1·050	−0·966
,,	June ..	2	19	0·239	0·257	0·498	0·250	0·393	0·456	0·444	0·341	0·354	0·406	0·038
,,	,, ...	27	9	0·584	0·874	1·371	1·300	0·996	−0·292	−0·953	−1·261	−1·048	−1·146	−1·485
,,	July ...	12	22	3·644	4·430	3·772	3·371	2·557	2·499	2·618	2·655	2·877	3·018	3·154
,,	August ...	12	17	3·574	3·974	3·670	3·721	3·408	2·838	4·197	2·034	2·244	1·770	2·780
,,	November ...	4	6	3·569	3·678	4·315	4·210	4·338	4·135	4·098	4·040	3·910	3·796	3·720
,,	December ...	5	0	3·469	3·754	3·405	3·005	3·226	3·224	2·685	2·756	2·694	2·790	2·718
1893	March ...	26	12	3·613	3·676	3·503	3·414	3·243	3·093	2·854	2·826	2·603	2·581	2·481
,,	August ...	6	8	3·133	3·453	3·389	3·296	3·263	3·320	3·427	3·303	2·956	2·888	2·691
,,	,, ...	18	7	3·057	3·224	3·351	3·536	3·619	3·676	3·636	3·337	3·133	2·841	2·479
,,	September ...	26	6	2·888	2·760	2·832	3·080	2·982	3·130	3·216	3·056	2·812	2·401	1·997
,,	October ...	25	12	3·072	2·863	2·583	2·685	2·599	2·324	2·188	2·088	2·568	2·234	2·210

The figures given above represent the hourly ordinates (in inches) for the first twenty-four hours after the commencement of the storm. These are divided into up to obtain the whole mean of 11 years given in table 388.

the commencement of the principal magnetic disturbances of H collected in table 383.

1893.

after the commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·262	2·350	2·398	2·413	2·471	2·488	2·490	2·528	2·518	2·551	2·528	2·571	2·705	2·841
1·630	1·764	1·690	·2·036	2·130	1·974	1·984	2·064	2·158	2·338	2·387	2·373	2·317	2·122
1·974	1·690	1·300	1·156	1·271	1·348	1·617	1·468	1·384	1·448	1·456	1·469	1·624	1·597
0·246	0·209	0·444	0·570	0·739	0·669	0·569	0·670	0·878	1·023	1·074	1·231	0·947	0·660
1·904	1·722	1·550	1·326	1·426	1·102	1·084	1·080	0·874	0·831	0·728	0·929	1·152	1·203
0·000	−0·280	− ·538	− ·490	0·150	0·612	0·799	0·746	0·774	0·634	0·948	0·784	0·783	1·013
0·498	0·586	0·592	0·473	0·492	0·475	0·411	0·412	0·418	0·416	0·479	0·452	0·340	0·513
−0·165	−0·357	0·110	−0·144	−0·196	−0·209	−0·108	−0·336	0·117	−0·149	0·029	0·000	0·082	0·152
0·540	0·660	0·552	0·718	0·930	0·839	1·011	0·924	0·687	0·864	0·627	0·565	0·473	0·500
2·432	2·205	2·609	2·486	2·377	2·584	2·478	2·620	2·998	2·984	3·108	2·940	2·870	2·944
2·822	2·722	2·612	2·594	2·624	2·680	2·804	2·835	3·118	3·061	3·081	3·082	3·112	3·134
3·142	3·225	3·241	3·301	3·164	2·986	2·539	2·504	2·538	2·762	2·915	2·879	2·831	2·766
2·841	2·829	2·662	2·449	2·353	2·233	2·196	2·270	2·385	2·509	2·522	2·628	2·627	2·828
1·867	1·324	1·890	2·020	1·896	1·869	1·984	1·990	2·161	2·198	2·186	2·202	2·305	2 254
1·192	1·528	1·450	1·112	1·578	1·486	1·992	1·620	1·670	1·836	1·922	2·033	2·084	2·078
1·754	1·604	1·325	1·460	1·370	1·430	1·526	1·681	1·708	1·753	1·781	1·754	1·798	1·963
0·876	0·886	0·875	0·791	0·685	0·479	0·295	− ·042	− ·196	− ·276	− ·159	− ·256	− ·109	0·030
2·123	2·392	2·400	2·454	2·500	2·534	2·622	2·647	2·673	2·696	2·811	2·882	2·914	2·928
1·619	2·008	2·080	2·246	2·130	2·156	2·240	2·270	2·370	2·276	2·300	2·330	2·430	2·482
0·889	0·990	1·037	1·103	1·143	1·106	1·125	1·177	1·252	1·097	1·104	1·108	1·137	1·009
0·643	0·582	0·626	0·564	0·352	0·430	0·428	0·505	0·724	0·790	0·749	0·759	0·843	0·827
0·460	0·280	0·191	0·333	0·356	0·570	0·280	0·524	0·513	0·488	0·440	0·502	0·576	0·590
0·253	0·126	0·086	−0·074	0·000	0·339	0·129	0·680	0·440	0·520	0·540	0·912	0·629	0·869
1·112	1·219	1·412	1·102	0·926	0·500	−0·093	−0·548	−0·260	−0·256	−0·106	0·092	0·089	0·310
−1·077	−1·203	−1·413	−1·426	−1·909	−2·215	−1·729	−1·291	−1·153	−0·863	−1·097	−0·675	−0·333	−0·769
0·524	0·572	0·518	0·449	0·236	0·160	−0·061	−0·146	0·296	0·140	−0·138	0·009	0·396	0·250
−0·786	−0·210	−0·204	−0·194	−0·250	−0·184	0·000	0·036	0·104	0·128	0·100	0·116	−0·018	−0·068
−0·118	−0·408	−0·446	−0·150	−0·316	−0·126	−0·280	0·050	−0·140	−0·196	−0·237	0·060	−0·220	−0·610
0·480	0·484	0·432	0·380	0·340	0·178	0·023	0·134	0·202	0·227	0·278	0·190	1·114	0·065
0·200	0·092	0·238	0·186	−0·056	−0·265	−0·424	−0·868	−1·068	−1·008	−1·204	−1·118	−0·624	−0·822
−0·740	−0·714	−0·670	−0·648	−0·474	−0·428	−0·372	−0·060	0·003	−0·076	0·006	−0·048	−0·024	0·050
0·414	0·261	0·108	−0·042	+0·073	−0·065	−0·175	−0·082	−0·240	−0·301	−0·342	−0·394	−0·242	−0·131
−0·856	−0·670	−0·504	0·246	0·058	−0·335	−0·365	−0·554	−0·346	−0·815	−0·930	−0·715	−0·738	−0·602
−0·202	0·044	−0·026	0·120	−0·134	−0·210	−0·324	−0·410	−0·604	−0·688	−0·666	−0·372	−0·360	−0·372
−1·324	−1·083	−1·132	−0·789	−0·660	−0·625	−0·529	−0·522	−0·371	−0·278	−0·287	−0·232	−0·126	0·005
3·238	3·283	3·183	3·031	2·910	3·023	2·799	2·739	2·773	2·634	2·722	2·854	2·928	2·930
2·120	2·171	2·289	2·508	2·636	2·802	3·910	2·992	3·010	2·987	2·961	2·900	2·882	2·875
3·599	3·489	3·120	2·972	3·060	3·211	3·210	3·285	3·284	3·569	3·500	3·112	3·039	3·200
2·747	2·778	2·764	2·784	2·752	2·662	2·603	2·678	2·673	2·828	2·723	2·363	2·610	2·887
2·256	2·390	2·231	2·641	2·529	2·654	2·769	2·713	2·904	3·026	3·109	3·203	3·138	3·098
2·702	2·684	2·693	2·752	2·719	2·690	2·691	2·594	2·656	2·598	2·789	2·765	2·461	2·495
1·995	2·118	1·707	1·269	1·211	1·793	1·515	1·680	1·939	2·079	2·102	2·193	2·288	2·386
1·774	1·863	2·247	2·341	2·624	2·418	2·324	2·473	2·572	2·556	2·627	2·615	2·626	2·796
2·178	2·222	2·291	2·410	2·424	2·471	2·533	2·494	2·591	2·629	2·741	2·922	2·928	2·888

convenient groups during which the scale co-efficient was nearly uniform. The variations of the sums of these periods converted in C. G. S. unit are then added

TABLE 395.—*Showing the character and progress for the first twenty-four hours after*

1894—

Date and hour of Commencement.			d.	h.	Hours showing interval 0	1	2	3	4	5	6	7	8	9	10
1894	February	...	21	0	2·622	2·969	2·506	2·503	2·526	2·662	2·639	2·729	2·829	2·894	2·640
,,	,,	...	23	2	2·397	2·364	2·860	2·629	2·473	2·560	1·912	1·712	2·212	2·142	2·292
,,	,,	...	25	12	2·663	2·660	2·511	2·378	1·390	0·682	0·803	0·183	0·501	0·889	0·910
,,	,,	...	28	19	2·449	2·928	2·362	1·923	1·512	0·779	1·144	1·411	1·368	1·421	1·496
,,	March	...	30	11	3·143	3·155	3·069	3·062	2·978	2·892	2·783	2·634	2·434	1·998	1·765
,,	June	...	10	1	1·996	2·166	2·172	2·184	2·102	1·965	1·816	2·126	1·951	1·887	1·851
,,	July	...	20	10	2·663	3·086	3·136	2·990	3·079	1·945	0·560	−0·077	−0·788	−0·692	−0·325
,,	August	...	20	7	2·097	1·898	1·357	0·578	−0·036	−0·033	0·140	−1·812	−1·721	−1·579	−0·461
,,	September	...	14	5	2·198	2·401	2·423	2·431	2·600	2·641	2·716	2·779	2·624	2·452	2·214
,,	November	...	13	18	2·035	1·833	0·692	0·236	0·982	0·661	0·577	0·338	1·021	1·053	1·098
1895	April	...	11	10	2·405	2·587	2·211	2·046	1·375	1·309	1·235	1·379	1·458	1·313	1·314
,,	September	...	4	5	2·130	1·970	1·950	2·026	2·079	2·200	2·239	1·971	1·622	1·437	1·325
,,	,,	...	29	19	1·862	1·900	1·882	1·736	1·685	1·661	1·632	1·690	1·763	1·785	1·711
,,	October	...	26	18	1·540	1·316	1·492	1·512	1·512	1·588	1·594	1·823	1·711	1·676	1·733
1896	May	...	2	13	1·589	1·276	0·733	0·370	0·191	0·180	−0·031	−0·044	−0·004	−0·149	0·033
,,	August	...	20	21	1·163	1·146	1·100	1·119	1·072	1·122	1·166	1·240	1·246	1·149	1·111
,,	September	...	17	22	1·006	1·122	0·872	0·770	1·062	0·982	1·027	1·020	1·030	0·924	0·894
1897	January	...	1	15	1·294	1·266	1·287	1·123	1·133	1·063	1·037	1·022	0·965	0·995	0·852
,,	April	...	19	18	0·793	0·798	0·740	0·728	0·726	0·833	0·678	0·660	0·602	0·609	0·636
,,	July	...	31	6	0·669	0·546	0·568	0·449	0·302	0·140	− ·039	− ·088	− ·079	− ·002	− ·008
,,	December	...	11	6	0·358	0·630	0·710	0·658	0·104	0·405	0·439	0·360	0·152	0·106	−0·560
,,	,,	...	20	13	0·861	0·845	0·798	0·781	0·553	−0·195	−0·834	−0·926	−1·182	−0·819	−0·471
1898	March	...	15	6	3·437	3·132	3·205	3·176	3·176	3·332	3·416	2·963	3·109	3·082	3·074
,,	September	...	9	16	3·137	3·606	3·523	2·883	1·908	2·319	1·872	1·563	1·836	1·909	1·203
1899	February	...	12	2	2·952	3·128	2·852	3·078	2·928	2·876	2·851	2·864	2·843	2·729	2·543
1900	March	...	12	20	2·226	2·199	2·193	2·111	2·142	2·166	2·204	2·262	2·210	2·171	2·184
,,	May	...	1	2	2·123	2·127	2·135	2·087	2·064	1·979	1·991	1·900	1·949	1·994	1·969
,,	,,	...	5	7	2·101	2·411	2·314	2·224	1·984	1·830	1·530	1·570	1·490	0·982	0·593
1902	April	...	11	3	3·005	3·460	3·045	2·845	2·650	2·620	2·520	2·560	2·150	1·975	1·540
1903	April	...	6	3	1·575	1·925	2·290	2·210	2·212	2·040	1·460	0·937	1·367	1·440	1·880
,,	October	...	31	10	1·335	2·665	1·740	−0·395	−4·551	−6·878	−5·518	−10·193	−11·438	−11·223	−9·188
,,	December	...	13	17	6·162	5·830	5·300	4·290	3·640	3·132	2·365	3·267	3·950	4·090	4·045
1904	April	...	1	4	6·517	6·575	6·200	7·135	6·317	7·005	7·175	6·765	6·680	5·835	4·765
,,	May	...	12	10	7·300	7·150	7·330	7·580	6·760	5·405	4·937	4·925	4·825	5·182	5·415

The figures given above represent the hourly ordinates (in inches from 1894 to 1900 and in centimetres from 1901 to 1904) for the first twenty-four hours of these periods converted into C. G. S. unit are then added up to obtain the whole mean of 11 years given in table 388.

the commencement of the principal magnetic disturbances of H collected in table 383.

1904.

after the commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·382	2·428	2·236	2·277	2·372	2·306	1·538	1·785	2·035	1·986	1·726	1·932	1·643	2·114
1·936	1·750	1·581	1·780	1·979	1·915	1·904	1·725	1·659	2·228	2·299	2·560	2·307	2·115
1·065	1·309	1·632	1·540	1·527	1·760	1·736	1·767	1·760	1·857	1·959	2·218	2·082	2·143
1·572	1·684	1·850	1·942	2·040	2·158	2·187	2·084	2·139	2·042	2·049	2·073	2·075	2·120
1·635	1·620	1·827	1·835	1·640	1·657	1·831	1·437	1·246	1·360	1·586	1 565	1·564	1·760
1·697	1·651	1·512	1·491	1·760	1·750	1·812	1·712	1·478	1·656	1·693	1·681	1·999	1·980
0·076	−0·244	0·124	0·540	1·127	1·392	0·842	1·239	1·170	1·050	1·125	1·308	1·564	1·698
0·045	0·090	0·300	0·388	0·558	0·684	0·796	0·867	0·789	0·989	0·880	0·961	1·065	1·425
1·969	2·030	2·042	1·742	1·752	1·742	1·426	1·480	1·543	1·251	1·337	1·642	1·590	1·435
1·458	1·290	1·333	1·410	1·524	1·596	1·467	1·382	1·274	1·100	1·100	1·132	1·328	1·505
1·344	1·264	1·567	1·535	1·424	1·529	1·605	1·592	1·606	1·648	1·626	1·853	1·885	1·920
1·260	1·269	1·356	1·241	1·200	1·215	1·386	1·491	1·345	1·560	1·568	1·398	1·437	1·548
1·761	1·663	1·585	1·511	1·481	1·370	1·508	1·228	1·062	1·090	1·121	1·075	1·173	1·120
1·808	1·797	1·756	1·878	1·901	1·916	1·921	1·797	1·594	1·514	1·413	1·382	1·238	1·048
0·441	0·475	0·381	0·437	0·495	0·536	0·792	0·755	0·789	0 813	0·856	0·952	0·836	0·681
1·173	1·035	0·860	0·685	0·560	0·522	0·600	0·681	0·720	0·664	0·576	0·496	0·559	0·585
0·956	0·950	0·974	0·749	0·356	−0·068	0·029	−0·358	0·185	−0·098	0·116	0·039	0·252	0·162
0·921	0·866	0·967	1·013	0·967	1·004	0·982	0·950	0·998	0·885	0·663	0·519	0·461	0·352
0·788	0·700	0·851	0·940	1·217	1·241	0·916	0·838	0·566	0·401	0·198	0·057	−0·212	−0·417
0·018	− ·009	0·006	0·008	0·148	0·157	0·268	0·458	0·327	0·287	0·284	0·319	0·328	0·418
0·650	−0·241	−0·218	−0·200	−0·122	−0·306	−0·160	−0·285	−0·183	−0·174	−0·076	−0·035	−0·053	0·000
0·464	−0·549	−0·012	−0·286	−0·291	−0·198	−0·136	−0·041	0·056	0·193	0·266	0·205	0·264	0·258
3·053	3·144	2·559	2·479	2·403	1·928	2·234	2·326	2·164	2·940	2·416	3·151	2·544	2·322
1·185	1·437	1·517	1·607	1·706	1·837	1·985	1·991	2·186	1·986	1·508	1·422	1·720	1·692
2·412	2·135	1·990	1·662	1·244	1·418	1·606	1·996	2·135	2·238	2·300	2·330	2·270	2·656
2·241	2·250	2·348	2·137	2·160	1·732	1·562	1·301	1·136	0·996	0·842	0·864	1·229	0·965
1·870	1·840	1·812	1·734	1·662	1·722	1·783	1·796	1·844	1·853	1·864	1·844	1·842	1·840
0·492	0·720	0·570	0·734	1·020	1·338	1·335	1·382	1·314	1·352	1·440	1·472	1·509	1·563
1·240	0·825	0·635	0·960	1·870	2·065	2·075	2·010	1·980	2·145	2·180	2·185	2·210	2·225
1·530	0·045	−1·271	−1·670	−1·810	1·095	−0·360	−0·010	0·040	0·190	0·175	0·230	0·290	0·300
8·973	−7·560	−7·398	−4·863	−4·873	−4·153	−3·328	−2·703	−2·343	−2·693	−2·683	−2·918	−3·238	−2·683
4·120	4·410	4·350	4·820	5·132	5·420	5·347	5·375	5·280	5·135	5·075	5·105	5·100	5·140
4·385	3·975	4·447	4·412	4·285	4·512	5·562	4·985	5·055	5·965	5·405	5·452	5·477	5·477
5·190	5·425	5·450	5·720	5·410	5·392	5·840	5·412	5·695	5·700	5·542	5·437	5·347	5·075

after the commencement of a storm. These are divided into convenient groups during which the scale co-efficient was nearly uniform. The variations of the sums

TABLE 396.—*Showing the character and progress for the first twenty-four hours*

1872—

Date and hour of commencement.				Hours showing interval										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1872	January ...	6	22	3·006	3·010	3·011	3·018	3·019	3·030	3·050	3·056	3·056	3·088	3·054
,,	February ...	4	18	2·997	2·976	3·009	2·980	2·210	2·494	2·414	2·504	2·630	2·716	2·876
,,	,, ...	20	5	2·992	3·048	3·034	3·037	3·024	2·998	3·015	2·993	2·964	2·956	2·969
,,	March ...	1	23	2·970	2·984	2·982	2·985	2·994	3·010	3·029	3·020	3·025	2·980	2·988
,,	April ...	10	18	3·027	3·062	3·031	3·032	2·960	2·938	2·888	2·913	2·905	2·912	2·920
,,	,, ...	15	8	2·920	2·928	2·949	2·996	3·009	3·025	3·001	2·980	2·981	2·968	2·983
,,	June ...	3	14	3·054	3·045	3·009	2·995	3·000	3·036	3·054	2·964	2·940	2·930	2·942
,,	,, ...	9	21	2·984	2·986	2·972	2·974	2·977	2·965	2·944	2·925	2·958	2·926	2·857
,,	July ...	7	21	2·988	2·975	2·983	3·010	2·913	2·886	2·864	2·850	2·877	2·789	2·772
,,	,, ...	19	8	2·901	2·995	2·986	3·075	3·067	3·003	2·907	2·909	2·924	2·933	2·980
,,	,, ...	20	14	3·010	3·013	2·978	2·948	2·988	3·004	3·028	3·020	3·009	2·999	2·988
,,	August ...	3	12	3·069	3·070	3·040	3·015	2·983	2·984	2·984	3·009	3·035	2·992	2·984
,,	,, ...	8	23	2·976	2·980	2·957	2·952	2·921	2·926	2·907	2·882	2·828	2·832	2·947
,,	,, ...	14	22	2·964	2·976	2·992	2·959	2·837	2·867	2·902	2·876	2·764	2·742	2·795
,,	,, ...	25	2	2·973	2·970	2·969	2·943	2·915	2·905	2·896	2·953	3·013	3·076	3·101
,,	September ...	2	16	2·943	2·970	3·000	3·026	3·034	3·011	2·964	2·934	2·930	2·894	2·936
,,	,, ...	29	14	2·990	2·966	2·982	2·971	2·974	2·956	2·923	2·951	2·933	2·926	2·908
,,	October ...	15	2	2·960	3·020	3·040	3·004	3·060	2·956	2·876	2·908	2·888	2·908	2·906
,,	,, ...	17	1	2·912	2·916	2·910	2·929	2·931	2·890	2·814	2·814	2·825	2·913	2·937
,,	November ...	24	5	3·006	3·074	3·060	3·010	2·956	2·951	2·906	2·888	2·864	2·893	2·925
1873	January ...	19	1	2·940	2·948	2·976	3·003	3·008	3·047	3·054	3·022	2·955	2·909	2·908
,,	March ...	9	12	2·989	2·858	2·808	2·796	2·799	2·860	2·972	2·927	2·892	2·906	2·850
,,	April ...	1	20	2·995	2·963	2·926	2·898	2·899	2·891	2·928	2·940	2·950	2·956	2·909
1874	February ...	4	12	2·910	2·953	2·988	3·007	2·960	2·961	2·959	2·934	2·803	2·821	2·775
,,	March ...	8	0	2·888	2·866	2·836	2·848	2·840	2·880	2·892	2·924	2·944	2·906	2·904
,,	April ...	13	1	2·931	2·937	2·942	2·938	2·932	2·892	2·854	2·853	2·882	2·883	2·921
,,	September ...	29	11	3·000	2·993	2·962	2·956	2·912	2·884	2·861	2·926	2·894	2·845	2·920
,,	October ...	3	18	2·939	2·971	2·960	2·953	2·953	2·939	2·934	2·923	2·915	2·895	2·908
1875	February ...	26	16	2·896	2·896	2·899	2·854	2·890	2·909	2·917	2·920	2·916	2·910	2·908
,,	April ...	7	6	2·923	2·898	2·924	2·932	2·952	2·968	2·972	2·978	2·936	2 896	2·868
,,	September ...	16	2	2·900	2·892	2·890	2·886	2·828	2·794	2·820	2·870	2·912	2·980	3·010
1876	February ...	19	8	2·871	2·880	2·890	2·863	2·882	2·860	2·869	2·873	2·885	2·910	2·917
,,	December ...	10	5	2·874	2·899	2·909	2·900	2·866	2·850	2·872	2·876	2·860	2·822	2·850
1877	May ...	28	22	2·850	2·844	2·827	2·816	2·800	2·784	2·782	2·792	2·760	2·690	2·746
,,	September ...	18	20	2·844	2·834	2·836	2·828	2·815	2·802	2·783	2·774	2·771	2·763	2·731
1878	January ...	24	4	2·836	2·850	2·850	2·862	2·822	2·839	2·851	2·852	2·839	2·810	2·803
,,	June ...	3	12	2·872	2·873	2·892	2·899	2·851	2·865	2·829	2·870	2·813	2·807	2·776
,,	December ...	1	6	2·840	2·860	2·856	2·850	2·820	2·824	2·808	2·760	2·702	2·725	2·758
1879	June ...	17	15	2·884	2·863	2·865	2·860	2·860	2·862	2·866	2·848	2·840	2·842	2·835
,,	August ...	12	16	2·863	2·794	2·850	2·859	2·850	2·776	2·791	2·792	2·798	2·795	2·776
,,	,, ...	19	8	2·757	2·795	2·865	2·920	2·907	2·860	2·841	2·794	2·748	2·770	2·748
,,	September ...	15	4	2·821	2·815	2·793	2·772	2·753	2·780	2·863	2·910	2·898	2·873	2·814
,,	October ...	31	5	2·851	2·842	2·823	2·820	2·807	2·795	2·810	2·788	2·771	2·744	2·760
,,	November ...	3	3	2·814	2·830	2·818	2·824	2·772	2·758	2·780	2·806	2·827	2·788	2·776
1881	January ...	31	9	2·789	2·800	2·846	2·860	2·882	2·840	2·796	2·765	2·735	2·740	2·786
,,	September ...	12	18	2·832	2·806	2·811	2·820	2·832	2·807	2·807	2·828	2·839	2·875	2·821
,,	November ...	9	11	2·866	2·830	2·683	2·691	2·661	2·638	2·718	2·671	2·682	2·751	2·712
1882	April ...	17	4	2·846	2·876	2·818	2·836	2·716	2·662	2·740	2·650	2·781	2·819	2·801
,,	June ...	24	17	2·874	2·881	2·904	2·822	2·830	2·770	2·758	2·703	2·700	2·692	2·715
,,	July ...	30	22	2·844	2·839	2·839	2·836	2·834	2·816	2·822	2·803	2·733	2·709	2·737
,,	October ...	2	14	2·875	2·724	2·733	2·794	2·750	2·724	2·714	2·712	2·666	2·666	2·701
,,	,, ...	5	12	2·868	2·849	2·840	2·816	2·810	2·828	2·830	2·830	2·824	2·822	2·812
,,	November ...	12	3	2·808	2·850	2·848	2·881	2·841	2·822	2·840	2·852	2·825	2·766	2·755
,,	,, ...	13	7	2·852	2·685	2·736	2·749	2·758	2·770	2·752	2·720	2·750	2·771	2·755
,,	,, ...	17	14	2·802	2·789	2·734	2·692	2·750	2·782	2·720	2·740	2·718	2·706	2·685
,,	,, ...	19	17	2·784	2·722	2·757	2·779	2·786	2·813	2·801	2·809	2·798	2·799	2·830

The figures in this table represent the ordinates (in inches from 1872 to 1900 and in cms. from

after the commencement of the principal magnetic disturbances in Declination.

1882.

after the commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·975	2·930	2·950	2·950	2·926	2·966	3·018	2·990	2·984	2·979	2·940	2·960	2·967	2·959
2·957	2·912	2·964	3·097	3·020	2·958	2·907	2·880	2·876	2·900	2·913	2·918	2·911	2·924
2·973	2·992	2·984	2·970	2·958	2·960	2·950	2·941	2·921	2·924	2·932	2·940	2·944	2·949
3·003	2·995	2·905	2·912	2·870	2·909	2·935	2·969	2·981	2·954	2·968	2·960	2·936	2·923
2·921	2·870	2·846	2·890	2·940	2·973	3·043	3·101	3·098	3·037	3·002	2·922	2·954	3·007
2·928	2·963	2·953	2·946	2·931	2·896	2·900	2·906	2·896	2·940	2·893	2·910	2·888	2·890
2·901	2·908	2·869	2·925	2·916	2·882	2·856	2·872	2·910	2·970	2·993	3·025	3·026	3·021
2·868	2·972	3·018	3·035	3·096	3·091	3·020	3·012	2·990	2·940	2·906	2·993	3·000	2·997
2·820	2·909	2·958	3·091	3·026	3·077	2·973	2·902	2·870	2·843	2·885	2·900	2·924	2·886
2·976	2·961	2·950	2·958	2·952	2·946	2·936	2·930	2·928	2·929	2·916	2·890	2·912	2·960
2·963	2·949	2·940	2·936	2·940	2·886	2·858	2·895	2·954	2·976	3·010	3·039	2·986	2·963
2·995	2·966	2·974	2·963	2·884	2·894	2·844	2·754	2·678	2·770	2·841	2·965	3·078	3·145
2·990	3·027	3·054	3·059	3·030	2·987	2·972	2·938	2·944	2·952	2·945	2·936	2·935	2·952
2·840	2·895	2·912	2·936	2·920	2·910	2·882	2·849	2·874	2·867	2·853	2·896	2·910	2·950
3·123	3 098	3·041	3·011	2·975	2·973	2·989	2·989	2·984	2·967	2·942	2·909	2·903	2·880
2·928	2·939	2·938	2·901	2·884	2·904	2·940	2·994	3·058	3·076	3·032	2·990	2·938	2·930
2·918	2·916	2·919	2·942	2·930	2·872	2·866	2·900	2·955	3·027	3·070	3·098	3·064	3·007
2·821	2·817	2·813	2·882	2·913	2·862	2·898	2·910	2·902	2·852	2·856	2·869	2·877	2·850
2·999	2·928	2·885	2·865	2·800	2·788	2·834	2·858	2·825	2·866	2·925	2·831	2·850	2·860
2·928	2·950	2·933	2·950	2·958	2·955	2·953	2·952	2·950	2·960	2·954	2·960	2·974	2·992
2·931	2·930	2·920	2·882	2·870	2·855	2·869	2·824	2·844	2·904	2·909	2·927	2·941	2·967
2·820	2·832	2·860	2·884	2·880	2·902	2·872	2·888	2·907	2·930	2·964	3·005	3·036	3·032
2·887	2·864	2·880	2·958	3·008	3·009	3·000	2·930	2·906	2·916	2·958	2·971	2·942	2·911
2·724	2·720	2·729	2·824	2·868	2·894	2·908	2·914	2·939	2·927	2·904	2·886	2·893	2·901
2·916	2·920	2·902	2·878	2·854	2·876	2·859	2·872	2·878	2·878	2·878	2·876	2·880	2·898
2·944	2·961	2·991	3·001	2·979	2·914	2·951	2·947	2·929	2·924	2·890	2·882	2·859	2·855
2·889	2·900	2·901	2·902	2·904	2·904	2·909	2·907	2·881	2·870	2·891	2·919	2·945	2·992
2·929	2·909	2·881	2·867	2·885	2·889	2·938	2·923	2·921	2·950	2·893	2·901	2·913	2·887
2·896	2·886	2·937	2·964	2·922	2·904	2·897	2·900	2·939	2·933	2·955	2·879	2·860	2·757
2·863	2·860	2·880	2·876	2·849	2·854	2·843	2·830	2·828	2·838	2·854	2·850	2·870	2·829
2·984	2·945	2·928	2·916	2·886	2·874	2·852	2·870	2·850	2·878	2·882	2·882	2·880	2·872
2·908	2·900	2·901	2·874	2·833	2·834	2·834	2·838	2·856	2·904	3·011	2·921	2·946	2·925
2·837	2·808	2·784	2·816	2·806	2·806	2·818	2·826	2·826	2·844	2·851	2·840	2·876	2·870
2·771	2·841	2·864	2·868	2·892	2·877	2·858	2·853	2·842	2·826	2·842	2·840	2·829	2·830
2·706	2·734	2·797	2·857	2·899	2·917	2·888	2·856	2·816	2·796	2·800	2·817	2·790	2·800
2·791	2·803	2·803	2·784	2·807	2·808	2·809	2·800	2·803	2·809	2·800	2·803	2·824	2·830
2·744	2·759	2·771	2·781	2·774	2·766	2·775	2·718	2·690	2·747	2·799	2·833	2·850	2·848
2·785	2·786	2·789	2·794	2·800	2·794	2·772	2·783	2·770	2·795	2·780	2·793	2·802	2·806
2·824	2·810	2·806	2·798	2·764	2·740	2·723	2·817	2·851	2·855	2·870	2·836	2·800	2·795
2·777	2·816	2·783	2·742	2·747	2·745	2·765	2·798	2·828	2·869	2·869	2·868	2·838	2·821
2·742	2·764	2·776	2·769	2·774	2·775	2·772	2·782	2·806	2·780	2·757	2·713	2·710	2·746
2·769	2·750	2·734	2·758	2·766	2·736	2·776	2·742	2·761	2·770	2·770	2·784	2·762	2·767
2·777	2·800	2·775	2·772	2·767	2·765	2·767	2.767	2·766	2·763	2·766	2·769	2·771	2·784
2·780	2·755	2·719	2·775	2·782	2·793	2·793	2·742	2·694	2·717	2·727	2·755	2·793	2·809
2·694	2·655	2·700	2·640	2·657	2·604	2·695	2·712	2·750	2·763	2·799	2·833	2·865	2·852
2·855	2·756	2·714	2·761	2·780	2·834	2·828	2·884	2·873	2·874	2·859	2·822	2·821	2·858
2·736	2·806	2·804	2·838	2·838	2·853	2·847	2·854	2·849	2·844	2·821	2·860	2·893	2·901
2·766	2·730	2·737	2·654	2·747	2·815	2·780	2·756	2·763	2·772	2·776	2·778	2·772	2·766
2·700	2·658	2·637	2·669	2·750	2·809	2·886	2·910	2·905	2·890	2·870	2·852	2·831	2·812
2·788	2·904	2·950	2·915	2·884	2·866	2·828	2·792	2·794	2·811	2·860	2·806	2·797	2·774
2·726	2·720	2·730	2·730	2·712	2·748	2·770	2·789	2·806	2·828	2·868	2·881	2·862	2·821
2·810	2·783	2·772	2·781	2·819	2·821	2·819	2·800	2·810	2·792	2·841	2·858	2·887	2·896
2·744	2·766	2·781	2·804	2·778	2·781	2·780	2·770	2·786	2·774	2·772	2·796	2·819	2·840
2·770	2·771	2·765	2·772	2·732	2·760	2·785	2·834	2·816	2·796	2·782	2·783	2·815	2·808
2·678	2·710	2·804	2·817	2·776	2·897	2·856	2·761	2·789	2·713	2·739	2·743	2·787	2·789
2·819	2·830	2·886	2·889	2·779	2·720	2·774	2·700	2·682	2·612	2·660	2·626	2·636	2·509

1901 to 1904) for the first twenty-four hours after the commencement of a storm.

TABLE 396.—*Showing the character and progress for the first twenty-four hours*

1883—

Date and hour of commencement.				Hours showing interval										
		D.	h.	0	1	2	3	4	5	6	7	8	9	10
1883 March	...	13	9	2·803	2·799	2·830	2·844	2·857	2·837	2·808	2·846	2·821	2·750	2·824
„ April	...	3	13	2·908	2·957	2·920	2·866	2·759	2·767	2·805	2·776	2·758	2·734	2·808
„ July	...	30	4	2·836	2·824	2·793	2·702	2·761	2·786	2·838	2·875	2·870	2·877	2·870
„ September	...	16	7	2·717	2·760	2·804	2·804	2·860	2·902	2·880	2·820	2·804	2·804	2·787
„ November	...	20	1	2·849	2·856	2·844	2·864	2·870	2·862	2·866	2·870	2·890	2·910	2·926
„ „	...	22	5	2·852	2·842	2·859	2·845	2·846	2·886	2·839	2·871	2·782	2·802	2·750
1884 July	...	3	23	2·837	2·813	2·849	2·894	2·867	2·858	2·806	2·840	2·758	2·752	2·792
„ October	...	2	2	2·890	2·894	2·912	2·907	2·882	2·842	2·739	2·791	2·818	2·867	2·853
„ November	...	1	16	2·902	2·915	2·906	2·890	2·881	2·878	2·845	2·873	2·883	2·896	2·900
1885 March	...	15	8	2.882	2·884	2·882	2·886	2·920	2·916	2·913	2·880	2·868	2·844	2·850
„ May	...	11	7	2·810	2·831	2·895	2·962	3·004	3·014	2·995	2·924	2·878	2·858	2·834
„ „	...	25	18	2·902	3·005	2·926	2·934	2·948	2·918	2·920	2·886	2·880	2·865	2·860
„ June	...	25	2	2·895	2·890	2·848	2·874	2·785	2·830	2·826	2·900	2·907	2·964	2·974
1886 January	...	9	12	2·916	2·920	2·798	2·829	2·800	2·882	2 888	2·886	2·890	2·902	2·876
„ March	...	30	12	2·975	2·954	2·884	2·796	2·862	2·923	2·990	2·965	2·920	2·948	2·886
„ May	...	9	0	2·928	2·913	2·893	2·854	2·845	2·861	2·804	2·809	2·802	2·870	2·978
1888 January	...	7	21	3·052	3·046	3·049	3·054	3·058	3·052	3·060	3·058	3·060	3·067	3·074
1889 June	...	14	10	3·172	3·184	3·202	3·207	3·162	3·114	3·084	3·064	3·068	3·074	3·083
„ November	...	1	10	3·145	3·162	3·139	3·145	3·092	3·091	3·081	3·067	3·056	3·048	3·051
1891 May	...	13	12	3·304	3·290	3·277	3·259	3·240	3·240	3·250	3·214	3·220	3·215	3·197
„ August	...	29	4	3·248	3·237	3·196	3·151	3·184	3·238	3·271	3·259	3·282	3·294	3·294
„ November	...	20	3	3·273	3·311	3·325	3·298	3·286	3·266	3·251	3·252	3·275	3·265	3·233
„ December	...	7	4	3·258	3·259	3·267	3·267	3·276	3·268	3·270	3·286	3·290	3·264	3·246
1892 January	...	28	22	3·255	3·275	3·279	3·289	3·296	3·303	3·331	3·325	3·332	3·309	3·262
„ February	...	13	9	3·244	3·183	3·277	3·256	3·250	3·202	3·032	3·192	3·228	3·190	3·172
„ March	...	1	2	3·270	3·281	3·300	3·319	3·290	3·297	3·296	3·245	3·256	3·294	3·293
„ „	...	6	14	3·303	3·316	3·328	3·304	3·325	3·257	3·287	3·268	3·200	3·212	3·173
„ „	...	12	3	3·286	3·330	3·234	3·202	3·188	3·148	3·172	3·178	3·183	3·199	3·199
„ April	...	24	2	3·282	3·266	3·271	3·274	3·234	3·184	3·186	3·232	3·284	3·338	3·379
„ „	...	25	20	3·280	3·276	3·258	3·263	3·248	3·199	3·247	3·214	3·204	3·128	3·150
„ May	...	1	9	3·223	3·272	3·302	3·290	3·257	3·239	3·264	3·260	3·244	3·246	3·217
„ „	...	17	2	3·286	3·302	3·292	3·296	3·270	3·236	3·249	3·278	3·340	3·366	3·388
„ „	...	18	12	3·370	3·405	3·352	3·278	3·286	3·290	3·258	3·248	3·240	3·200	3·224
„ June	...	2	19	3·330	3·323	3·362	3·325	3·311	3·326	3·327	3·299	3·359	3·332	3·307
„ „	...	27	9	3·217	3·270	3·376	3·386	3·478	3·461	3·430	3·319	3·325	3·268	3·230
„ July	...	12	22	3·319	3·348	3·318	3·252	3·162	3·200	3·210	3·171	3·103	3·078	3·111
„ August	...	12	17	3·308	3·358	3·361	3·379	3·331	3·294	3·200	3·187	3·216	3·152	3·242
„ November	...	4	6	3·372	3·423	3·381	3·333	3·336	3·385	3·378	3·375	3·384	3·350	3·333
„ December	...	5	0	3·333	3·355	3·315	3·309	3·379	3·367	3·387	3·452	3·394	3·349	3·276
1893 March	...	26	12	3·412	3·424	3·401	3·395	3·393	3·376	3·296	3·286	3·309	3·268	3·263
„ August	...	6	8	3·296	3·333	3·398	3·489	3·542	3·546	3·549	3·518	3·457	3·415	3·436
„ „	...	18	7	3·304	3·313	3·356	3·435	3·480	3·501	3·498	3·481	3·444	3·373	3·329
„ September	...	26	6	3·340	3·302	3·292	3·343	3·366	3·443	3·495	3·487	3·439	3·387	3·324
„ October	...	25	12	3·411	3·373	3·362	3·370	3·417	3·433	3·422	3·405	3·389	3·370	3·361

The figures in this table represent the ordinates (in inches from 1872 to 1900 and in cms. from

after the commencement of the principal magnetic disturbances in Declination.

1893.

after the commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·826	2·821	2·834	2·834	2·838	2·834	2·836	2·842	2·850	2·850	2·865	2·851	2·830	2·810
2·806	2·807	2·801	2·826	2·849	2·775	2·756	2·736	2·754	2·799	2·841	2·871	2·902	2·872
2·871	2·836	2·818	2·806	2·836	2·832	2·860	2·832	2·835	2·804	2·824	2·832	2·854	2·812
2·840	2·808	2·820	2·815	2·807	2·784	2·772	2·764	2·768	2·788	2·780	2·722	2·649	2·648
2·886	2·844	2·846	2·835	2·800	2·838	2·866	2·880	2·801	2·824	2·812	2·820	2·830	2·834
2·752	2·744	2·791	2·755	2·789	2·795	2·784	2·779	2·804	2·792	2·806	2·792	2·780	2·803
2·865	2·927	2·969	2·982	2·969	2·934	2·870	2·838	2·830	2·859	2·859	2·862	2·855	2·871
2·866	2·826	2·838	2·836	2·848	2·866	2·874	2·842	2·838	2·802	2·826	2·842	2·834	2·838
2·910	2·924	2·908	2·956	2·917	2·864	2·850	2·842	2·910	2·914	2·908	2·908	2·904	2·896
2·808	2·816	2·825	2·825	2·808	2·820	2·805	2·827	2·853	2·860	2·875	2·888	2·872	2·851
2·859	2·877	2·878	2·868	2·875	2·886	2·890	2·896	2·922	2·914	2·899	2·873	2·828	2·816
2·833	2·769	2·810	2·856	2·856	2·892	2·926	2·938	2·911	2·915	2·915	2·901	2·902	2·902
2·962	2·965	2·949	2·892	2·898	2·879	2·878	2·870	2·863	2·882	2·867	2·866	2·866	2·883
2·782	2·836	2·926	2·940	2·945	2·928	2·951	2·934	2·936	2·930	2·938	2·927	2·950	2·963
2·832	2·873	2·800	2·776	2·823	2·864	2·904	2·847	2·834	2·846	2·882	2·920	2·936	2·950
3·026	3·049	3·031	2·990	2·947	2·908	2·936	2·957	2·957	2·958	2·948	2·942	2·927	2·941
3·044	3·014	3·026	3·052	3·018	2·986	3·011	3·010	2·970	2·966	2·948	2·954	2·974	2·992
3·070	3·078	3·074	3·078	3·064	3·059	3·063	3·054	3·047	3·026	3·032	3·051	3·089	3·141
3·058	3·070	3·095	3·110	3·111	3·134	3·140	3·186	3·147	3·148	3·155	3·147	3·141	3·149
3·210	3·219	3·207	3·220	3·216	3·216	3·216	3·184	3·184	3·178	3·192	3·230	3·264	3·262
3·287	3·261	3·249	3·239	3·188	3·228	3·189	3·226	3·245	3·246	3·245	3·225	3·250	3·233
3·234	3·182	3·226	3·224	3·219	3·206	3·207	3·219	2·220	3·191	3·204	3·235	3·252	3·250
3·253	3·250	3·262	3·240	3·164	3·164	3·193	3·265	3·243	3·220	3·218	3·270	3·264	3·321
3·229	3·225	3·266	3·276	3·242	3·201	3·201	3·218	3·277	3·276	3·255	3·240	3·242	3·237
3·180	3·231	3·200	3·214	3·195	3·143	3·148	3·200	3·270	3·288	3·240	3·262	3·283	3·209
3·296	3·296	3·323	3·319	3·296	3·258	3·260	3·264	3·250	3·241	3·203	3·210	3·224	3·240
3·156	3·207	3·206	3·222	3·240	3·210	3·194	3·196	3·200	3·228	3·237	3·261	3·282	3·270
3·148	3·152	3·180	3·200	3·212	3·245	3·213	3·260	3·258	3·190	3·197	3·240	3·192	3·261
3·377	3·352	3·324	3·300	3·286	3·268	3·276	3·296	3·273	3·269	3·275	3·270	3·260	3·249
3·104	3·134	3·240	3·294	3·355	3·334	3·300	3·284	3·204	3·224	3·168	3·199	3·282	3·276
3·204	3·212	3·210	3·214	3·212	3·203	3·202	3·230	3·236	3·240	3·173	3·172	3·180	3·234
3·360	3·312	3·270	3·244	3·216	3·268	3·280	3·266	3·268	3·242	3·224	3·227	3·227	3·230
3·227	3·222	3·224	3·176	3·206	3·132	3·160	3·114	3·064	3·168	3·229	3·269	3·327	3·355
3·209	3·190	3·196	3.254	3·281	3·324	3·354	3·324	3·315	3·279	3·227	3·206	3·268	3·291
3·251	3·238	3·257	3·284	3·291	3·272	3·282	3·270	3·272	3·242	3·178	3·162	3·174	3·217
3·229	3·293	3·324	3·336	3·344	3·353	3·304	3·257	3·243	3·224	3·255	3·281	3·298	3·285
3·218	3·189	3·078	3·096	3·174	3·261	3·286	3·338	3·359	3·337	3·293	3·255	3·226	3·217
3·348	3·341	3·315	3·303	3·304	3·304	3·307	3·309	3·312	3·323	3·329	3·355	3·385	3·395
3·231	3·201	3·199	3·218	3·275	3·291	3·283	3·289	3·299	3·312	3·288	3·260	3·254	3·270
3·279	3·323	3·333	3·316	3·296	3·296	3·281	3·264	3·273	3·301	3·145	3·376	3·404	3·431
3·408	3·425	3·401	3·411	3·416	3·410	3·403	3·398	3·415	3·415	3·416	3·365	3·344	3·350
3·335	3·281	3·301	3·279	3·292	3·302	3·321	3·311	3·305	3·336	3·323	3·286	3·214	3·207
3·314	3·393	3·417	3·403	3·373	3·376	3·368	3·374	3·360	3·379	3·376	3·383	3·377	3·343
3·346	3·338	3·349	3·350	3·350	3·387	3·379	3·375	3·359	3·340	3·359	3·406	3·440	3·445

1901 to 1904) for the first twenty-four hours after the commencement of a storm.

TABLE 396.—*Showing the character and progress for the first twenty-four hours*

1894—

Date and hour of Commencement.				Hours showing interval										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1894	February ...	21	0	3·431	3·452	3·416	3·414	3·413	3·420	3·455	3·430	3·414	3·391	3·378
,,	,, ...	23	2	3·434	3·444	3·513	3·538	3·508	3·493	3·476	3·402	3·432	3·429	3·418
,,	,, ...	25	12	3·434	3·388	3·370	3·358	3·288	3·350	3·350	3·351	3·389	3·371	3·366
,,	,, ...	28	19	3·422	3·423	3·423	3·408	3·345	3·337	3·403	3·381	3·406	3·407	3·410
,,	March ...	30	11	3·496	3·537	3·550	3·510	3·465	3·450	3·467	3·474	3·446	3·426	3·400
,,	June ...	10	1	3·436	3·482	3·464	3·408	3·421	3·364	3·314	3·312	3·362	3·415	3·468
,,	July ...	20	10	3·478	3·544	3·589	3·610	3·614	3·594	3·520	3·410	3·371	3·392	3·270
,,	August ...	20	7	3·374	3·268	3·264	3·372	3·317	3·304	3·361	3·200	3·117	3·155	3·303
,,	September ...	14	5	3·457	3·411	3·376	3·392	3·475	3·489	3·586	3·635	3·593	3·525	3·463
,,	November ...	13	18	3·490	3·458	3·288	3·397	3·409	3·424	3·410	3·412	3·407	3·459	3·500
1895	April ...	11	10	3·483	3·549	3·564	3·572	3·543	3·557	3·503	3·528	3·538	3·531	3·477
,,	September ...	4	5	3·544	3·500	3·494	3·535	3·597	3·642	3·682	3·693	3·654	3·614	3·562
,,	,, ...	29	19	3·594	3·604	3·591	3·582	3·564	3·566	3·570	3·566	3·572	3·578	3·570
,,	October ...	26	18	3·558	3·559	3·584	3·583	3·580	3·577	3·570	3·600	3·586	3·588	3·589
1896	August ...	20	21	3·646	3·634	3·628	3·626	3·610	3·613	3·616	3·612	3·602	3·540	3·532
,,	September ...	17	22	3·627	3·641	3·608	3·609	3·616	3·620	3·620	3·627	3·583	3·543	3·525
1897	January ...	1	15	3·671	3·666	3·675	3·662	3·663	3·660	3·659	3·650	3·667	3·651	3·651
,,	April ...	19	18	3·690	3·700	3·692	3·684	3·678	3·680	3·632	3·642	3·633	3·640	3·688
,,	July ...	31	6	3·689	3·667	3·680	3·693	3·707	3·709	3·721	3·728	3·718	3·730	3·720
,,	December ...	11	6	3·742	3·776	3·799	3·793	3·716	3·686	3·675	3·642	3·645	3·625	3·646
,,	,, ..	20	13	3·738	3·749	3·769	3·750	3·754	3·705	3·679	3·627	3·634	3·664	3·692
1898	March ...	15	6	3·768	3·694	3·724	3·698	3·729	3·712	3·807	3·716	3·719	3·719	3·737
,,	September ...	9	16	3·829	3·852	3·890	3·840	3·780	3·761	3·748	3·710	3·673	3·394	3·724
1899	February ...	12	2	3·870	3·892	3·887	3·927	3·910	3·921	3·876	3·854	3·858	3·833	3·800
1900	March ...	12	20	3·959	3·949	3·948	3·941	3·946	3·936	3·946	3·946	3·947	3·940	3·942
,,	May ...	1	2	3·959	3·962	3·967	3·975	3·956	3·953	3·935	3·939	3·938	3·952	3·973
,,	,, ...	5	7	3·913	3·928	3·943	3·962	4·035	4·089	4·048	4·015	3·991	3·970	3·914
1902	April ...	11	3	10·420	10·427	10·382	10·407	10·305	10·315	10·285	10·362	10·430	10·505	10·450
1903	April ...	6	3	10·635	10·660	10·645	10·627	10·612	10·600	10·550	10·555	10·720	10·790	10·810
,,	October ...	31	10	10·770	10·975	10·822	10·600	10·165	10·420	10·235	9·740	9·740	9·915	9·980
,,	December ...	13	17	10·750	10·670	10·650	10·647	10·555	10·565	10·450	10·475	10·365	10·477	10·537
1904	April ..	1	4	10·855	10·852	10·745	10·745	10·640	10·685	10·855	10·985	11·045	10·912	10·845
,,	May ...	12	10	10·945	10·960	10·940	10·900	10·827	10·710	10·620	10·657	10·777	10·837	10·907

The figures in this table represent the ordinates (in inches from 1872 to 1900 and in cms. from

after the commencement of the principal magnetic disturbances in Declination.

1904.

after commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
3·384	3·336	3·362	3·380	3·386	3·381	3·317	3·421	3·412	3·391	3·409	3·360	3·335	3·345
3·422	3·446	3·421	3·412	3·401	3·425	3·395	3·366	3·394	3·431	3·408	3·421	3·407	3·348
3·352	3·363	3·368	3·348	3·392	3·427	3·371	3·383	3·370	3·381	3·415	3·458	3·461	3·454
3·392	3·369	3·350	3·346	3·370	3·429	3·453	3·438	3·417	3·393	3·400	3·386	3·421	3·396
3·397	3·383	3·354	3·338	3·266	3·316	3·352	3·365	3·305	3·294	3·276	3·296	3·365	2·414
3·451	3·495	3·495	3·484	3·474	3·456	3·450	3·436	3·396	3·390	3·404	3·394	3·426	3·424
3·364	3·343	3·404	3·405	3·455	3·442	3·440	3·297	3·259	3·226	3·256	3·274	3·322	3·375
3·432	3·422	3·409	3·409	3·424	3·424	3·414	3·401	3·389	3·374	3·372	3·368	3·346	3·345
3·418	3·450	3·464	3·430	3·438	3·426	3·423	3·420	3·416	3·393	3·436	3·426	3·484	3·470
3·465	3·479	3·502	3·494	3·507	3·489	3·480	3·485	3·440	3·427	3·433	3·437	3·437	3·438
3·498	3·476	3·468	3·450	3·450	3·485	3·515	3·511	3·512	3·464	3·449	3·459	3·451	3·489
3·522	3·518	3·540	3·523	3·544	3·552	3·551	3·551	3·538	3·560	3·558	3·550	3·560	3·532
3·547	3·522	3·493	3·513	3·536	3·607	3·648	3·569	3·531	3·516	3·450	3·518	3·554	3·508
3·608	3·603	3·592	3·580	3·590	3·613	3·625	3·603	3·561	3·551	3·544	3·552	3·552	3·535
3·604	3·636	3·624	3·621	3·681	3·677	3·699	3·617	3·614	3·610	3·612	3·624	3·620	3·623
3·563	3·587	3·622	3·647	3·642	3·632	3·574	3·568	3·568	3·627	3·608	3·595	3·604	3·598
3·670	3·694	3·694	3·689	3·690	3·691	3·636	3·605	3·624	3·630	3·608	3·562	3·585	3·600
3·694	3·680	3·622	3·614	3·660	3·689	3·701	3·729	3·731	3·718	3·685	3·638	3·647	3·620
3·706	3·713	3·716	3·704	3·726	3·713	3·713	2·722	3·686	3·674	3·684	3·688	3·694	3·685
3·670	3·697	3·701	3·693	3·713	3·708	3·715	3·676	3·693	3·705	3·719	3·726	3·738	3·761
3·677	3·676	3·720	3·703	3·725	3·740	3·749	3·762	3·746	3·730	3·715	3·700	3·712	3·729
3·752	3·780	3·762	3·776	3·750	3·662	3·648	3·614	3·630	3·571	3·676	3·736	3·740	3·720
3·676	3·698	3·696	3·662	3·684	3·735	3·782	3·840	3·898	3·883	3·814	3·734	3·739	3·717
3·786	3·764	3·770	3·772	3·716	3·750	3·800	3·828	3·810	3·841	3·840	3·847	3·842	3·847
3·918	3·893	3·889	3·924	3·956	3·923	3·909	3·904	3·872	3·879	3·854	3·868	3·830	3·820
3·976	3·974	3·953	3·928	3·928	3·944	3·949	3·952	3·946	3·941	3·934	3·930	3·929	3·929
3·923	3·846	3·893	3·886	3·908	3·901	3·888	3·881	3·894	3·880	3·882	3·893	3·891	3·893
10·425	10·365	10·305	10·325	10·285	10·470	10·475	10·460	10·430	10·430	10·410	10·415	10·420	10·427
10·730	10·630	10·520	10·395	10 420	10·565	10·620	10·630	16·600	10·590	10·580	10·565	10·570	10·580
9·860	10·100	10·000	10·320	10·280	10·205	10·475	10·445	10·505	10·700	10·887	10·845	10·745	10·920
10·597	10·685	10·717	10·807	10·790	10·755	10·735	10·690	10·685	10·657	10·682	10·727	10·690	10·700
10·740	10·645	10·695	10·715	10·780	10·777	10·820	10·737	10·750	10·780	10·740	10·715	10·690	10·765
10·880	10·830	10·820	10 830	10·745	10 705	10·715	10·745	10·660	10·590	10·570	10·635	10·747	10·840

1901 to 1904) for the first twenty-four hours after the commencement of a storm.

TABLE 397.—*Showing the character and progress for the first twenty-four hours*

1873—

Date and hour of Commencement.			d.	h.	Hours showing interval 0	1	2	3	4	5	6	7	8	9	10
1873	January	...	19	1	+ 51	+ 32	0	+ 4	+ 8	+ 12	+ 48	+ 131	+ 190	+ 186	+ 63
„	March	...	9	12	− 42	+ 109	+ 121	+ 109	− 17	− 146	− 142	− 21	+ 38	+ 17	+ 75
1874	April	...	1	20	− 19	+ 19	+ 32	+ 46	+ 42	+ 28	− 5	− 14	− 9	− 5	+ 60
„	February	...	4	12	− 82	− 133	− 133	− 109	− 35	− 47	− 43	− 16	+ 117	+ 20	+ 47
„	March	...	8	0	− 4	+ 4	+ 49	+ 20	+ 8	− 53	− 40	− 45	− 69	− 57	− 121
„	April	...	13	1	+ 69	+ 78	+ 56	+ 65	+ 78	+ 121	+ 52	− 52	− 138	− 177	− 168
„	September	...	29	11	− 192	− 165	− 82	+ 23	+ 110	+ 101	+ 41	− 27	+ 64	+ 78	+ 69
„	October	...	3	18	− 60	− 55	− 23	0	− 5	+ 5	+ 9	+ 37	+ 32	+ 51	+ 46
1875	February	...	26	16	+ 17	− 17	+ 4	+ 17	− 21	− 34	− 21	− 8	− 13	0	+ 8
„	April	...	7	6	+ 82	+ 34	− 39	− 19	− 150	− 150	− 131	− 92	+ 34	+ 58	+ 34
„	September	...	16	2	+ 93	+ 102	+ 107	+ 137	+ 205	+ 127	− 73	− 210	− 371	− 395	− 249
1876	February	...	19	8	+ 49	− 13	− 85	− 36	− 85	− 22	− 36	− 36	− 27	− 58	− 18
„	December	...	10	5	− 68	− 93	− 88	− 20	+ 39	+ 78	+ 10	+ 54	+ 49	+ 20	− 20
1877	May	...	28	22	− 16	− 21	+ 16	+ 11	+ 21	+ 27	+ 37	+ 53	+ 96	+ 176	+ 5
„	September	...	18	20	+ 27	+ 38	+ 11	+ 11	+ 11	+ 16	+ 5	0	0	0	+ 43
1878	January	...	24	4	− 53	− 53	− 63	− 87	− 101	− 126	− 121	− 34	+ 130	+ 184	+ 159
„	June	...	3	12	− 196	− 207	− 190	115	+ 58	− 6	− 17	− 23	+ 127	+ 40	+ 63
„	December	...	1	6	− 5	− 20	− 15	− 15	+ 35	+ 40	+ 35	+ 76	+ 76	+ 20	− 30
1879	June	...	17	15	− 28	+ 22	− 6	0	− 50	− 28	− 11	− 17	− 6	− 17	+ 6
1880	August	...	12	16	+ 39	− 181	+ 110	+ 16	+ 24	+ 118	+ 79	+ 95	+ 79	+ 110	+ 118
„	„	...	19	8	− 134	− 236	− 339	− 236	− 142	− 47	+ 39	+ 158	+ 134	+ 79	+ 47
„	September	...	15	4	+ 54	+ 70	+ 132	+ 117	− 39	− 148	− 233	− 287	− 117	− 23	+ 47
„	October	...	31	5	− 8	+ 31	− 8	− 62	− 62	− 132	− 78	+ 8	− 8	+ 70	+ 23
„	November	...	3	3	− 23	− 46	0	− 23	+ 46	− 23	− 170	− 201	− 139	+ 31	+ 39
1881	January	...	31	9	+ 15	− 62	− 62	− 10	− 21	− 5	+ 15	− 15	− 46	− 46	− 103
„	September	...	12	18	0	0	− 31	− 26	0	0	+ 42	− 31	0	− 73	+ 42
„	November	...	9	11	− 129	− 40	+ 109	+ 10	+ 40	+ 35	− 74	+ 40	− 20	− 25	+ 55
1882	April	...	17	4	− 54	+ 5	+ 83	− 59	+ 25	− 167	− 354	− 201	− 290	+ 59	− 59
„	June	...	24	17	− 58	− 74	− 47	+ 63	+ 37	+ 89	+ 58	+ 105	+ 74	+ 142	+ 79
„	July	...	30	22	+ 23	+ 28	+ 20	+ 28	+ 18	+ 41	+ 25	+ 84	+ 130	+ 41	− 122
„	October	...	2	14	− 140	+ 86	− 16	− 179	− 20	− 9	− 36	− 7	+ 102	+ 72	+ 47
„	„	...	5	12	− 131	− 66	− 66	+ 20	+ 14	− 32	− 9	+ 2	+ 20	+ 23	+ 43
„	November	...	12	3	+ 72	+ 8	+ 55	+ 21	+ 47	− 17	− 157	− 180	− 153	− 8	+ 36
„	„	...	13	7	+ 45	+ 89	− 32	− 138	− 106	− 25	+ 2	+ 4	− 17	− 66	− 11
„	„	...	17	14	− 68	− 123	− 59	− 45	− 119	− 45	− 136	− 2	+ 153	+ 23	+ 21
„	„	...	19	17	− 95	+ 2	− 55	− 42	− 11	− 4	+ 11	− 40	− 4	− 15	− 57

The figures in this table represent the excesses for each hour over the mean of the first twenty-four hours after the commencement of the

after the commencement of the principal magnetic disturbances in Vertical Force.

1882.

after commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
− 48	− 24	− 48	+ 4	− 28	− 51	− 83	− 55	− 83	− 103	− 75	− 59	− 44	− 59
+ 92	+ 54	0	+ 25	+ 63	+ 88	+ 67	+ 13	− 50	− 84	− 117	− 201	− 79	+ 46
+ 60	+ 42	− 102	− 213	− 102	+ 65	+ 79	+ 157	+ 51	− 60	− 102	− 74	− 14	− 9
+ 66	+ 51	+ 43	− 51	+ 4	+ 16	+ 16	+ 23	− 23	+ 12	+ 31	+ 74	+ 31	+ 86
− 105	− 65	+ 32	+ 53	+ 53	− 12	+ 12	+ 12	+ 32	+ 40	+ 57	+ 77	+ 81	+ 65
− 117	− 91	− 65	− 13	− 17	+ 39	− 4	+ 35	+ 52	+ 52	+ 73	+ 48	+ 73	+ 48
+ 14	+ 32	+ 41	+ 41	+ 37	+ 32	+ 27	+ 37	+ 60	+ 23	− 78	− 128	− 151	− 165
+ 18	+ 83	+ 55	+ 28	− 60	− 18	− 143	− 97	+ 5	− 69	+ 42	+ 28	+ 28	+ 111
− 8	+ 8	− 55	− 42	+ 42	+ 25	− 25	− 59	− 92	+ 25	0	+ 122	+ 101	+ 134
− 19	− 10	− 5	+ 29	+ 44	+ 39	+ 58	+ 63	+ 34	+ 29	+ 10	+ 48	+ 24	+ 63
− 137	− 29	− 10	− 15	+ 49	+ 73	+ 68	+ 54	+ 93	+ 78	+ 93	+ 88	+ 102	+ 107
+ 4	+ 22	+ 27	+ 40	+ 63	+ 49	+ 54	+ 27	+ 13	− 13	− 81	+ 90	+ 40	+ 76
+ 5	+ 24	+ 59	− 24	+ 20	0	+ 20	+ 20	+ 15	− 15	− 20	− 5	− 39	− 20
− 59	− 197	− 187	− 187	− 128	− 16	− 5	+ 53	+ 69	+ 37	+ 27	+ 48	+ 64	+ 69
− 65	− 163	− 238	− 293	− 222	− 70	+ 60	+ 157	+ 195	+ 163	+ 98	+ 92	+ 108	+ 81
+ 97	+ 53	+ 19	+ 10	− 5	+ 34	+ 24	+ 29	− 10	+ 5	− 10	− 14	− 53	− 43
+ 86	+ 52	+ 109	+ 58	+ 58	+ 75	+ 69	+ 104	+ 86	− 6	− 92	− 104	− 132	− 86
− 50	− 40	− 25	− 25	− 25	+ 5	+ 15	− 5	− 5	+ 10	+ 5	− 10	− 10	− 20
+ 28	+ 22	+ 22	+ 45	+ 100	+ 56	− 17	− 78	− 106	− 61	− 6	+ 72	+ 67	+ 50
+ 87	+ 71	+ 118	+ 158	+ 87	+ 24	− 95	− 181	− 221	− 236	− 189	− 134	− 71	− 8
+ 71	+ 16	+ 16	+ 63	+ 55	+ 71	+ 71	+ 32	+ 32	+ 63	+ 126	+ 150	− 8	− 150
+ 101	+ 78	+ 54	+ 8	− 23	+ 54	0	+ 47	+ 16	+ 31	+ 39	+ 47	+ 62	+ 31
− 70	− 47	− 16	+ 8	+ 55	+ 31	+ 39	+ 55	+ 39	+ 16	+ 16	+ 39	+ 39	+ 39
+ 46	+ 93	+ 39	− 93	− 23	+ 15	+ 46	+ 116	+ 131	+ 93	+ 31	+ 31	+ 46	+ 31
+ 67	+ 57	+ 5	+ 88	+ 26	+ 150	+ 77	+ 77	+ 46	+ 46	+ 31	− 103	− 119	− 129
− 21	+ 178	+ 168	− 42	− 94	− 335	− 309	− 157	+ 52	+ 215	+ 136	+ 141	+ 100	+ 147
+ 25	− 45	+ 5	0	0	0	+ 25	+ 10	+ 10	+ 45	+ 45	− 129	− 10	+ 25
+ 25	+ 20	− 15	+ 108	+ 10	+ 93	+ 113	+ 133	+ 113	+ 128	+ 74	+ 64	+ 69	+ 59
+ 89	+ 147	+ 137	− 37	− 205	− 231	− 189	− 137	− 95	− 79	− 37	+ 42	+ 79	+ 58
− 25	− 365	− 303	− 161	− 51	+ 92	+ 133	+ 153	+ 87	+ 5	− 33	+ 76	+ 33	+ 54
− 2	+ 50	+ 47	+ 34	+ 70	+ 7	− 36	− 63	− 77	− 36	− 43	− 27	+ 45	+ 108
+ 43	+ 81	+ 59	+ 59	+ 9	+ 32	+ 47	+ 99	+ 36	− 5	− 147	− 115	− 72	− 77
+ 38	− 17	− 34	− 28	+ 15	+ 8	+ 51	+ 76	+ 47	+ 55	+ 40	+ 30	+ 30	+ 17
− 19	− 4	+ 47	0	+ 68	+ 25	+ 17	− 4	+ 45	+ 28	+ 66	+ 28	− 30	+ 57
− 21	− 4	− 47	− 40	− 23	− 70	+ 59	+ 93	+ 134	+ 242	+ 151	+ 45	− 123	− 95
− 32	− 47	− 91	+ 87	+ 127	+ 89	− 25	+ 51	+ 4	+ 32	− 55	+ 45	+ 42	+ 45

storm expressed in C. G. S. unit (Unity = 0·1γ) as the scale co-efficient changes rapidly, and the tabulation ordinates are not comparable.

TABLE 397.—*Showing the character and progress for the first twenty-four hours*

1883—

Date and hour of Commencement.			d.	h.	Hours showing interval 0	1	2	3	4	5	6	7	8	9	10
1883	March	...	3	9	+ 5	− 40	− 159	− 89	− 23	+ 37	− 10	− 91	− 52	+ 30	− 47
,,	April	...	3	13	− 51	− 57	− 6	+ 6	+ 29	− 14	− 41	+ 18	+ 71	+ 22	+ 4
,,	July	...	30	4	+ 23	+ 52	+ 88	+ 62	− 52	− 81	− 227	− 153	− 45	+ 23	+ 6
,,	September	...	16	7	− 22	− 186	− 417	− 409	− 143	− 48	− 46	+ 40	− 24	− 19	− 13
,,	November	...	20	1	+ 45	+ 24	+ 21	− 8	− 11	+ 8	− 18	− 92	− 108	− 76	− 60
,,	,,	...	22	5	+ 97	+ 116	+ 118	+ 134	+ 124	− 145	− 100	− 145	+ 92	− 50	− 8
1884	July	...	3	23	+ 38	+ 65	+ 21	− 17	+ 99	+ 123	+ 161	+ 154	+ 171	+ 27	− 144
,,	October	...	2	2	− 50	− 37	− 56	− 47	+ 25	+ 19	+ 87	+ 19	− 100	− 44	− 37
,,	November	...	1	16	− 69	− 77	− 42	− 18	− 12	− 21	+ 48	+ 12	+ 18	+ 21	+ 30
1885	March	...	15	8	− 21	− 57	− 124	− 149	− 192	− 32	+ 39	+ 71	− 50	− 50	− 28
,,	May	...	11	7	+ 40	− 84	− 239	− 307	− 251	− 176	− 24	+ 88	+ 96	+ 84	+ 72
,,	,,		25	18	− 52	− 116	+ 12	− 32	− 28	+ 12	+ 12	+ 76	+ 20	+ 28	+ 32
,,	June	...	25	2	− 33	− 33	+ 58	+ 8	+ 82	+ 41	− 21	0	+ 8	− 70	− 62
1886	January	...	9	12	− 206	− 201	− 25	− 131	− 48	− 161	− 70	+ 10	+ 10	+ 38	+ 83
,,	March	...	30	12	− 67	− 119	+ 2	+ 187	+ 25	− 92	− 108	− 52	+ 54	+ 29	+ 79
,,	May	...	9	0	+ 10	+ 36	+ 20	− 13	+ 13	+ 46	+ 105	+ 16	− 20	− 227	− 319
1888	January	...	7	21	− 42	− 16	− 19	− 30	− 23	− 19	− 30	− 19	− 23	− 9	− 7
1889	June	...	14	10	− 139	− 80	− 108	− 3	+ 101	+ 108	+ 104	+ 66	+ 31	+ 24	− 3
,,	November	...	1	10	− 141	− 114	− 23	+ 3	+ 23	− 12	− 12	− 3	0	+ 3	+ 3
1891	May	...	13	12	− 127	− 68	+ 25	+ 42	+ 17	+ 8	+ 8	+ 21	+ 8	+ 25	+ 51
,,	August	...	29	4	+ 33	+ 38	+ 75	+ 59	− 59	− 138	− 150	− 13	+ 17	− 4	− 25
,,	November	...	20	3	+ 14	− 22	− 14	+ 22	+ 22	+ 19	− 49	− 162	− 159	− 77	− 8
,,	December	...	7	4	+ 14	+ 19	+ 25	+ 47	+ 44	+ 19	− 36	− 66	− 25	+ 25	+ 22
1892	January	...	28	22	+ 61	+ 39	+ 56	+ 56	+ 47	+ 53	+ 11	+ 42	+ 42	+ 81	+ 103
,,	February	...	13	9	+ 6	− 429	− 570	− 200	− 15	+ 106	+ 215	− 112	− 103	+ 26	+ 26
,,	March	...	1	2	− 51	− 69	− 99	− 105	− 63	− 54	− 81	− 45	− 6	− 3	+ 27
,,	,,	...	6	14	− 6	− 27	− 48	− 42	− 54	+ 6	− 36	+ 42	+ 60	− 6	− 6
,,	,,	...	12	3	− 15	+ 60	+ 144	+ 21	+ 90	+ 36	− 114	− 218	− 218	− 75	− 3
,,	April	...	24	2	+ 40	+ 44	+ 36	+ 28	+ 88	+ 68	− 4	− 52	− 125	− 177	− 181
,,	,,	...	25	20	+ 88	+ 92	+ 76	+ 80	+ 64	+ 113	− 44	+ 56	+ 88	+ 177	+ 161
,,	May	...	1	9	− 113	− 186	− 204	− 32	+ 68	+ 41	+ 41	+ 59	+ 50	− 5	+ 32
,,	,,	...	17	2	− 14	− 14	+ 5	+ 9	+ 54	+ 77	+ 23	− 59	− 190	− 181	− 136
,,	,,	...	18	12	− 217	− 331	− 109	+ 63	+ 63	+ 45	+ 27	+ 5	+ 18	+ 54	+ 45
,,	June	...	2	19	− 72	− 77	− 63	− 27	− 14	− 36	− 14	0	− 36	+ 54	+ 18
,,	,,	...	27	9	+ 158	− 86	− 267	− 136	− 321	− 185	− 32	+ 99	+ 14	+ 50	+ 59
,,	July	...	12	22	+ 57	+ 79	+ 131	+ 188	+ 166	+ 61	+ 109	+ 184	+ 245	+ 215	+ 26
,,	August	...	12	17	− 120	− 160	− 100	− 56	− 8	+ 96	+ 40	+ 156	+ 12	+ 76	− 20
,,	November	...	4	6	− 71	− 32	− 85	− 46	− 181	− 174	− 60	− 18	+ 21	+ 43	+ 25
,,	December	...	5	0	− 93	− 114	− 76	− 38	− 162	− 59	− 97	− 152	+ 107	+ 24	+ 131
1893	March	...	26	12	− 11	+ 28	+ 53	− 11	− 67	− 35	+ 81	+ 32	+ 18	+ 60	+ 46
,,	August	...	6	8	+ 22	− 137	− 204	− 244	− 208	− 49	− 44	− 9	+ 9	+ 35	0
,,	,,	...	18	7	+ 102	− 35	− 155	− 195	− 186	− 124	− 137	− 75	− 53	+ 35	+ 35
,,	September	...	26	6	+ 144	+ 122	− 44	− 227	− 267	− 358	− 302	− 157	− 26	+ 22	+ 48
,,	October	...	25	12	− 64	+ 9	0	− 43	− 103	− 124	− 17	+ 13	− 17	+ 39	+ 64

The figures in this table represent the excesses for each hour over the mean of the first twenty-four hours after the commencement of the

after the commencement of the principal magnetic disturbances in Vertical Force.

1893.

after commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
− 12	+ 17	+ 26	+ 33	+ 31	+ 35	+ 33	+ 33	+ 23	+ 28	+ 19	+ 72	+ 86	+ 49
+ 43	+ 57	+ 53	+ 45	+ 47	+ 73	+ 78	+ 78	+ 4	− 71	− 155	− 151	− 98	+ 8
− 23	+ 32	+ 39	+ 32	− 13	+ 32	− 13	+ 42	+ 39	+ 65	+ 26	+ 29	+ 26	+ 84
− 56	+ 51	+ 51	+ 67	+ 105	+ 121	+ 100	+ 105	+ 94	+ 73	+ 94	+ 143	+ 234	+ 132
+ 74	+ 74	− 8	− 5	+ 32	− 45	− 47	− 29	+ 45	+ 39	+ 55	+ 50	+ 55	+ 68
− 79	− 92	− 71	− 3	− 29	+ 24	+ 24	+ 60	− 3	+ 8	− 18	0	0	− 50
− 261	− 285	− 254	− 185	− 110	+ 27	+ 99	+ 89	+ 58	+ 7	+ 27	+ 41	+ 62	+ 34
− 28	+ 56	0	− 19	− 56	− 37	+ 12	+ 31	+ 31	+ 50	+ 28	+ 22	+ 50	+ 53
+ 9	+ 15	+ 39	− 3	+ 54	+ 104	+ 21	− 51	− 113	− 9	+ 18	− 12	− 18	− 3
+ 21	+ 39	0	+ 57	+ 67	+ 71	+ 85	+ 50	+ 43	+ 57	+ 35	0	+ 28	− 18
+ 20	+ 24	+ 36	+ 32	+ 16	+ 32	+ 24	+ 40	+ 12	+ 60	+ 84	+ 128	+ 128	+ 112
+ 68	+ 80	− 68	− 192	− 199	− 203	− 116	− 116	+ 168	+ 176	+ 136	+ 116	+ 132	+ 108
+ 29	− 12	− 58	− 29	− 37	0	+ 4	+ 4	+ 8	+ 4	+ 25	+ 29	+ 41	+ 8
+ 166	+ 20	− 75	+ 18	+ 45	+ 75	+ 55	+ 105	+ 95	+ 85	+ 48	+ 45	− 43	− 45
+ 47	− 11	+ 115	+ 83	+ 45	+ 20	+ 20	+ 52	− 2	− 16	− 38	− 126	− 121	− 49
− 234	− 148	− 16	+ 92	+ 92	+ 118	+ 66	+ 53	+ 33	+ 36	+ 56	+ 66	+ 66	+ 56
+ 84	+ 98	− 44	− 37	+ 33	− 16	− 89	− 5	+ 23	+ 28	+ 40	+ 47	+ 47	+ 42
+ 31	+ 10	+ 38	+ 24	+ 38	+ 38	+ 31	+ 24	+ 35	+ 21	− 42	− 108	− 198	− 240
− 32	− 15	+ 3	+ 9	+ 6	0	+ 15	− 32	+ 76	+ 26	+ 53	+ 56	+ 44	+ 3
+ 17	+ 17	+ 34	+ 25	− 4	− 8	+ 25	+ 85	+ 64	+ 25	− 93	− 144	− 110	− 17
− 42	+ 21	+ 8	− 4	+ 33	+ 4	+ 75	+ 8	+ 4	+ 13	+ 25	+ 42	+ 17	+ 50
+ 11	+ 58	− 11	− 8	+ 33	+ 19	+ 55	+ 16	+ 52	+ 77	+ 49	+ 27	+ 27	+ 52
− 14	− 17	− 33	− 8	+ 61	+ 61	− 36	− 47	+ 28	+ 33	− 8	− 36	− 22	− 97
+ 53	− 81	− 189	− 69	− 75	− 95	− 103	− 75	− 103	− 17	+ 31	+ 42	+ 81	+ 78
+ 6	+ 12	+ 112	+ 59	+ 135	+ 132	+ 65	+ 59	+ 50	+ 388	+ 100	+ 123	− 141	− 44
+ 36	+ 45	+ 33	+ 63	+ 84	+ 75	+ 39	+ 24	+ 15	+ 45	+ 51	+ 6	+ 3	− 27
+ 6	− 66	0	− 24	− 24	+ 27	+ 12	− 24	− 84	− 12	+ 66	+ 84	+ 105	+ 132
+ 108	+ 93	+ 42	− 18	− 6	− 21	+ 30	− 21	+ 24	+ 36	0	− 18	+ 36	− 30
− 117	− 36	+ 20	+ 44	+ 28	+ 28	+ 20	+ 20	+ 52	+ 44	+ 36	+ 56	+ 60	+ 68
+ 113	− 72	− 193	− 245	− 233	− 129	− 12	0	− 20	− 20	+ 8	0	− 72	+ 24
+ 50	+ 36	+ 23	+ 23	+ 23	+ 41	+ 59	+ 41	+ 50	+ 41	+ 68	− 5	− 95	− 222
− 36	+ 63	+ 109	+ 154	+ 109	− 9	0	− 18	+ 5	+ 27	+ 41	− 23	− 36	− 23
+ 54	+ 63	+ 72	+ 136	+ 86	+ 163	+ 45	+ 154	+ 91	− 45	− 163	− 127	− 163	− 190
+ 77	+ 108	− 63	− 271	− 149	− 122	− 86	+ 32	+ 113	+ 163	+ 212	+ 172	+ 54	+ 54
+ 50	+ 45	+ 32	+ 23	+ 59	+ 77	+ 59	+ 68	+ 77	+ 113	+ 122	+ 90	+ 14	− 122
− 158	− 289	− 263	− 188	− 114	− 105	− 26	0	− 53	− 35	− 57	− 74	− 44	0
+ 52	+ 132	+ 196	+ 12	− 120	− 184	− 184	− 144	− 108	+ 12	+ 96	+ 108	+ 104	+ 52
− 35	+ 14	+ 46	+ 43	+ 32	+ 57	+ 64	+ 67	+ 71	+ 53	+ 43	+ 60	− 4	+ 85
+ 152	+ 131	+ 90	+ 17	− 69	− 59	− 31	− 10	+ 10	+ 3	+ 69	+ 66	+ 97	+ 45
										− 116	− 145	− 85	+ 11
+ 18	− 14	− 11	+ 11	+ 39	+ 42	+ 85	+ 60	− 14	− 113				
+ 9	0	+ 58	+ 49	+ 44	+ 75	+ 89	+ 80	+ 40	+ 58	+ 84	+ 151	+ 102	− 27
− 9	+ 58	+ 40	+ 53	+ 27	+ 80	+ 49	+ 58	+ 62	+ 49	+ 66	+ 137	+ 142	+ 53
+ 39	− 44	− 13	+ 79	+ 92	+ 105	+ 101	+ 87	+ 131	+ 105	+ 118	+ 109	+ 122	+ 153
+ 86	+ 64	+ 51	+ 60	+ 60	+ 21	+ 60	+ 56	+ 60	+ 26	− 68	− 154	− 94	− 43

storm expressed in C. G. S. unit (Unity = 0·1γ) as the scale co-efficient changes rapidly, and the tabulation ordinates are not comparable.

TABLE 397.—*Showing the character and progress for the first twenty-four hours*

1894—

Date and hour of Commencement.				Hours showing interval										
		d.	h.	0	1	2	3	4	5	6	7	8	9	10
1894	February ...	21	0	2·111	2·084	2·120	2·105	2·106	2·108	2·095	2·120	2·115	2·119	2·093
,,	,, ...	23	2	2·110	2·107	2·094	2·093	2·107	2·114	2·078	2·111	2·079	2·079	2·082
,,	,, ...	25	12	2·097	2·103	2·104	2·100	2·106	2·066	2·089	2·089	2·079	2·118	2·141
,,	,, ...	28	19	2·087	2·091	2·088	2·080	2·116	2·095	2·056	2·085	2·091	2·102	2·100
,,	March ...	30	11	2·019	2·030	2·039	2·061	2·064	2·052	2·036	2·041	2·057	2·056	2·056
,,	June ...	10	1	1·926	1·920	1·932	1·951	1·944	1·958	1·966	1·941	1·906	1·903	1·873
,,	July ...	20	10	1·882	1·876	1·886	1·909	1·937	1·962	1·961	1·996	1·994	1·920	2·000
,,	August ...	20	7	1·939	1·984	1·930	1·847	1·943	1·962	1·946	1·936	1·914	1·883	1·861
,,	September ...	14	5	1·922	1·941	1·911	1·843	1·816	1·829	1·808	1·849	1·898	1·937	1·949
,,	November ...	13	18	1·881	1·902	1·911	1·856	1·887	1·897	1·896	1·886	1·905	1·890	1·885
1895	April ...	11	10	1·655	1·644	1·675	1·700	1·725	1·737	1·749	1·719	1·717	1·737	1·759
,,	September ...	4	5	1·559	1·572	1·530	1·471	1·468	1·485	1·509	1·532	1·548	1·567	1·576
,,	,, ...	29	19	1·526	1·526	1·533	1·536	1·541	1·536	1·537	1·540	1·539	1·531	1·542
,,	October ...	26	18	1·520	1·517	1·506	1·517	1·526	1·525	1·530	1·522	1·528	1·521	1·524
1896	August ...	20	21	1·484	1·494	1·489	1·488	1·494	1·494	1·492	1·496	1·500	1·516	1·476
,,	September ...	17	22	1·491	1·482	1·499	1·493	1·494	1·494	1·498	1·502	1·526	1·513	1·466
1897	January ...	1	15	1·441	1·444	1·440	1·452	1·444	1·446	1.450	1·456	1·448	1·448	1·448
,,	April ...	19	18	1·401	1·401	1·414	1·416	1·419	1·424	1.436	1·420	1·419	1·418	1·400
,,	July ...	31	6	1·440	1·434	1·421	1·407	1·397	1·410	1·411	1·422	1·427	1·414	1·417
,,	December ...	11	6	1·439	1·427	1·425	1·440	1·485	1·492	1·500	1·503	1·472	1·470	1·460
,,	,, ...	20	13	1·441	1·432	1·457	1·479	1·475	1·483	1·478	1·479	1·462	1·466	1·484
1898	March ...	15	6	1·480	1·492	1·500	1·492	1·508	1·497	1·444	1·511	1·493	1·493	1·474
,,	September ...	9	16	1·471	1·463	1·453	1·493	1·484	1·480	1·476	1·482	1·505	1·620	1·458
1899	February ...	12	2	1·617	1·605	1·613	1·613	1·612	1·622	1·640	1·625	1·615	1·621	1·632
1900	March ...	12	20	1·628	1·636	1·627	1·632	1·626	1·627	1·624	1·628	1·627	1·629	1·629
,,	May ...	1	2	1·593	1·593	1·590	1·591	1·602	1·585	1·585	1·575	1·564	1·563	1·553
,,	,, ...	5	7	1·598	1·576	1·550	1·543	1·536	1·547	1·575	1·604	1·600	1·599	1·605
1902	April ...	11	3	4·650	4·647	4·670	4·667	4·687	4·645	4·590	4·535	4·510	4·520	4·607
1903	,, ...	6	3	4·785	4·767	4·790	4·8co	4·760	4·707	4·710	4·720	4·675	4·720	4·755
,,	October ...	31	10	5·015	4·925	4·992	5·100	5·170	4·995	5·085	5·145	5·107	5·045	5·052
,,	December ...	13	17	5·090	5·130	5·110	5·100	5·135	5·105	5·125	5·120	5·142	5·142	5·105
1904	April ...	1	4	5·087	5·100	5·147	5·095	5·145	5·000	4·880	4·935	4·990	5·125	5·132
,,	May ...	12	10	4·880	4·975	5·025	5·020	5·077	5·110	5·087	5·060	5·030	5·037	5·045

The figures given above represent the hourly ordinates (in inches from 1894 to 1900 and in cms. from 1901 to 1904) for the first
These are divided into convenient groups during which the scale co-efficient was nearly uniform. The variations of the sums of

after the commencement of the principal magnetic disturbances in Vertical Force.

1904.

after commencement.

11	12	13	14	15	16	17	18	19	20	21	22	23	24
2·120	2·136	2·114	2·085	2·089	2·093	2·118	2·075	2·100	2·109	2·116	2·126	2·139	2·113
2·084	2·075	2·095	2·103	2·097	2·102	2·111	2·116	2·106	2·099	2·116	2·109	2·104	2·129
2·142	2·122	2·115	2·136	2·112	2·103	2·133	2·107	2 111	2·090	2·074	2·052	2·067	2·103
2·108	2·101	2·079	2·072	2·049	2·050	2·065	2·089	2·099	2·103	2·098	2·086	2·089	2·109
2·053	2·062	2·067	2·072	2·093	2·066	2·051	2·059	2·076	2·074	2·055	2·011	1·990	1·981
1·892	1·872	1·893	1·921	1·921	1·928	1·922	1·929	1·931	1·927	1·933	1·940	1·932	1·934
1·961	1·993	1·964	1·987	1·974	2·007	1·983	2·045	2·036	2·023	1·991	1·964	1·940	1·938
1·875	1·933	1·939	1·940	1·939	1·946	1·953	1·956	1·954	1·953	1·950	1·948	1·958	1·950
1·936	1·892	1·903	1·903	1·911	1·908	1·911	1·920	1·909	1·921	1·892	1·925	1·926	1·928
1·908	1·891	1·898	1·906	1·890	1·902	1·902	1·897	1·905	1·904	1·900	1·902	1·894	1·906
1·749	1·759	1·760	1·770	1·750	1·739	1·741	1·745	1·750	1·765	1·747	1·725	1·709	1·691
1·582	1·555	1·549	1·563	1·545	1·550	1·561	1·557	1·562	1·555	1·562	1·560	1·558	1·576
1·554	1·521	1·502	1·477	1·480	1·486	1·511	1·564	1·570	1·554	1·552	1·508	1·522	1·548
1·518	1·520	1·521	1·524	1·513	1·509	1·510	1·520	1·538	1·531	1·523	1·505	1·508	1·514
1·452	1·454	1·462	1·457	1·447	1·472	1·460	1·500	1·496	1·498	1·495	1·488	1·494	1·498
1·449	1·420	1·413	1·442	1·459	1·480	1·503	1·484	1·470	1·464	1·496	1·515	1·511	1·508
1·438	1·438	1·448	1·454	1·450	1·456	1·475	1·463	1·413	1·413	1·433	1·433	1·422	1·426
1·412	1·428	1·426	1·404	1·383	1·385	1·386	1·398	1·418	1·434	1·452	1·449	1·428	1·425
1·412	1·412	1·421	1·423	1·420	1·426	1·427	1·425	1·430	1·430	1·424	1·421	1·424	1·435
1·455	1·455	1·467	1·467	1·461	1·471	1·460	1·480	1·474	1·470	1·468	1·468	1·464	1·452
1·491	1·486	1·483	1·483	1·476	1·472	1·473	1·478	1·491	1·50	1·496	1·484	1·481	1·486
1·466	1·454	1·488	1·479	1·474	1·512	1·484	1·495	1·484	1·512	1·452	1·466	1·486	1·459
1·476	1·481	1·488	1·488	1·458	1·443	1·434	1·430	1·434	1·459	1·491	1·510	1·498	1·496
1·636	1·638	1·627	1·617	1·628	1·619	1·604	1·614	1·632	1·621	1·624	1·625	1·627	1·621
1·642	1·638	1·626	1·612	1·602	1·612	1·617	1·625	1·643	1·636	1·640	1·629	1·627	1·640
1·560	1·568	1·585	1·595	1·594	1·590	1·591	1·594	1·599	1·600	1·603	1·597	1·601	1·596
1·613	1·619	1·604	1·600	1·615	1·621	1·633	1·628	1·613	1·616	1·610	1·608	1·607	1·607
4·640	4·642	4·650	4·645	4·650	4·610	4·645	4·665	4·685	4·680	4·677	4·675	4·670	4·665
4·815	4·800	4·815	4·790	4·800	4·730	4·775	4·805	4·815	4·817	4·815	4·805	4·805	4·795
5·135	5·090	5·075	5·065	5·100	5·135	5·047	5·085	5·102	5·000	5·017	5·060	5·140	5·110
5·097	5·092	5·082	5·062	5·105	5·140	5·195	5·200	5·172	5·160	5·117	5·127	5·137	5·125
5·140	5·137	5·080	5·080	5·070	5·095	5·090	5·137	5·105	5·082	5·110	5·110	5·110	5·090
5·090	5·110	5·120	5·127	5·127	5·140	5·110	5·100	5·145	5·137	5·090	5·020	4·985	4·995

twenty-four hours after the commencement of the storm.

these periods converted into C. G. S. unit are then added up to obtain the whole mean of 11 years given in table 388.

CHAPTER XI.

QUIET-DAYS FOR THE PERIOD 1894—1905 AND THEIR COMPARISON WITH THE CORRESPONDING DATA OF ALL-DAYS.

1. Horizontal Force. Absolute Phenomenon.

458. We have seen in the last chapter in what relation roughly does the average quiet-day stand to the average all-day and to the average disturbance-day.

For the correct derivation of the numerical values of the mean diurnal variability of force, the law of probable error has to be resorted to. But they can be readily obtained accurate enough for all practical purposes for each month and each year by simply summing up without regard to signs, the differences of the daily means from one day to the next given in table 381, and dividing them by the number of days in the month or the year as the case may be. The results so worked out have already been shown in table 385, from which it will be seen that the mean diurnal variability of H varies in magnitude from year to year. It attains its greatest value 17γ in 1872, the year of maximum disturbance, and diminishes to 5γ in 1901, the year of minimum disturbance. The mean diurnal variability derived from the results of the whole period of 33 years, 1872—1904, is 8·6γ; while for each of the three 11-year periods, 1872—1882, 1883—1893, 1894—1904, the variability is represented by 8·9γ, 8·7γ, and 8·0γ respectively.

459. It is difficult for the purposes of comparison to secure the corresponding figures of variability of any particular class or group of days such as quiet-days by a similar treatment, as the preceding day may or may not belong to the same class. If however a table is prepared in which are entered solely the difference of the daily means from the preceding day of all quiet-days which occur in the month, we may indirectly secure approximately rough numerical values of the variability of the quiet-day, as against the diurnal variability of the average all-day referred to in the previous paragraph, if due allowance, as will be seen later, can be correctly made for the character of the preceding day. Such uncorrected values of variability of the quiet-day from the preceding day as roughly indicated in table 398 for the year 1894 may be taken as 6·6γ as against 13·0γ, the mean diurnal variability of the average all-day as shown in table 385. In 1901, the year of minimum disturbance, the quiet-day value is 3·9γ, while that of the all-day, is 5·0γ. On the average of 11 years 1894—1904 the figures of variability are respectively 4·9γ and 8·0γ (see paragraphs 460 and 466; also table 401).

TABLE 398.—*Showing the rough numerical values of the variability per day of quiet-days shown in table 381; that is the sum without regard to signs of the difference of the daily mean of these quiet-days from that of the preceding day divided by the number of days.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Mean of all days in the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	6·4	8·3	10·8	7·1	5·4	6·2	8·5	6·7	5·4	3·8	7·8	4·4	6·6
1895 ...	8·7	16·7	...*	7·7	7·9	8·2	6·9	5·3	6·2	6·2	6·6	5·1	7·1
1896 ...	5·8	6·7	7·4	7·2	9·0	5·0	7·4	7·1	7·5	4·8	5·6	6·0	6·4
1897 ...	7·5	6·9	2·9	7·7	6·8	3·6	5·0	4·9	4·9	5·5	4·6	7·0	5·5
1898 ...	3·3	4·3	7·4	5·8	4·7	3·2	3·3	6·5	8·3	3·9	6·2	4·5	4·9
1899 ...	3·3	5·9	5·2	4·6	6·3	3·7	3·5	4·4	3·6	3·8	3·7	4·9	4·3
1900 ...	4·9	4·9	6·7	4·6	5·3	3·1	4·3	5·3	4·1	3·7	2·9	3·9	4·4
1901 ...	3·4	3·6	4·9	4·2	3·0	3·9	4·6	5·3	3·5	3·3	3·2	3·4	3·9
1902 ...	2·9	4·1	3·7	4·8	5·0	3·1	4·8	3·9	3·6	3·6	5·5	3·6	4·0
1903 ...	3·7	5·3	3·1	3·0	4·1	5·0	4·3	5·0	4·6	7·7	7·4	6·9	4·5
1904 ...	7·9	3·8	4·5	6·6	5·1	5·6	5·3	5·7	4·5	5·7	5·4	5·7	5·4
1905 ...	3·7	10·0	5·2	3·9	3·6	4·5	5·2	4·5	4·3	5·7	7·7	5·6	5·1
Mean 1894—1904.	4·8	5·3	5·2	5·3	5·3	4·4	4·9	5·3	4·8	4·3	4·8	4·7	4·9

* There are no quiet-days in this month.

TABLE 399.—*Showing the average value of the difference of the daily mean of all quiet-days shown in table 381, from that of the preceding day.*

Unity = 1γ.

Years.	Month.												Mean of all days in the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	+4·8	+ 1·7	+6·6	+7·1	+4·6	+6·2	+5·5	+6·3	+3·4	+3·0	+7·4	+2·5	+5·0
1895 ...	+2·2	+16·7	...	+5·7	+3·2	+6·3	+6·2	+1·1	+5·7	+6·2	+5·4	+4·2	+4·7
1896 ...	+4·2	+ 5·7	+6·6	+4·6	+2·0	+2·8	+1·5	+0·4	+1·2	+2·9	+2·9	+3·0	+3·0
1897 ...	+4·7	+ 2·1	+2·0	+7·7	+6·8	+1·7	+0·5	+0·8	+1·2	+3·1	+1·7	+6·8	+2·7
1898 ...	+2·9	+ 3·0	+4·9	+0·2	0·0	+2·6	+0·6	+3·3	+7·3	+2·2	+1·4	+3·9	+2·3
1899 ...	+2·8	+ 3·0	+4·1	+3·2	+4·0	+1·9	+1·6	+2·4	+2·8	+2·9	+1·6	+2·0	+2·6
1900 ...	+2·1	+ 3·9	+4·9	+1·8	0·0	+0·6	+0·7	+0·7	+1·2	+1·1	+0·3	−0·4	+1·2
1901 ...	+0·5	+ 1·5	+2·0	+1·1	+0·7	+0·8	+1·1	+0·8	+1·2	+0·5	+1·6	+1·2	+1·1
1902 ...	+1·5	+ 2·3	+1·2	+3·4	+0·7	+0·1	+1·3	+0·3	+0·9	−0·6	+4·6	+0·7	+1·3
1903 ...	+0 3	+ 1·7	+0·7	+2·7	+1·2	+1·3	+0·5	+0·9	+3·8	+7·7	+0·6	+6·1	+1·6
1904 ...	+7·9	+ 0·9	+2·2	+2·3	+3·6	+3·7	+1·9	+3·0	+1·3	+1·1	+5·4	+3·0	+2·9
1905 ...	+0·7	+10·0	+3·2	+3·0	+0·8	+4·3	+2·6	+1·8	+4·1	+3·2	+3·2	+2·9	+3·1
Mean* 1894–1904.	+2·7	+ 2·7	+3·0	+2·9	+1·9	+2·1	+1·5	+1·6	+2·2	+1·9	+2·6	+2·5	+2·3

460. Viewing the phenomenon from another stand point, the differences of the daily means of all days in the month, which are denominated as quiet, are summed up *with* regard to signs, and are then divided by the number of days. These figures collected in table 399 show that the mean quiet-day is distinguished, on the average, by an increase of secular force from the value of the preceding day. This increase shows a rate of 2·3γ per day on the average of 11 years. The rate is larger in 1894 and equals 5·0γ, while in 1901, the year of minimum activity, it diminishes to 1·1γ. It appears hence that the rate per day at which the restitution forces work during the quiet-days to recuperate the loss of secular force incident during a stormy or disturbed month, is obviously greater during the maximum spot epoch when the magnetic disturbances are more frequent and the loss of secular force greater, than in the minimum spot epoch when opposite conditions prevail. We shall recur to this question in connection with the aperiodic element in the quiet-day inequalities examined in paragraph 480.

In differentiating the average quiet-day from the average all-day more definitely, we may briefly examine here, leaving the fuller discussion to the next chapters, the mean probable departures of the daily means of all-days from the mean of the month, as compared with the departures of the quiet-days similarly derived from their own mean. It may be advantageous to employ here also the law of probable error, but to avoid labour, simply the mean departures in both cases have been derived, instead of squaring them and otherwise treating the data according to the law of probable error. In tables 400 and 401 these departures are collected together, and in the last column in each table appear the annual values divided by the number of days, which represent the mean departures respectively for the average all-day, and the average quiet-day. It will be seen that the average quiet-day records in the year 1894, a mean departure of 6·8γ from its own mean, while the average all-day gives a departure of 16·5γ from the mean of the month. In the year 1901 the departures respectively reduce themselves to 3·9γ and 5·0γ, and in the average condition of 11 years the figures stand at 4·9γ and 9·0γ. It will also appear from table 401 that the mean departures of quiet-days from their own mean are in close agreement with the variability numbers in table 398 discussed in paragraph 459. We shall recur to this relation in further detail in Chapter XIII.

* As the number of quiet-days in each month is not the same, there will remain a small uncertainty in the monthly and annual means due to difference in the treatment adopted. The mean of means will not be accordant with the mean of the whole result derived directly.

TABLE 400.—*Showing the mean departure of the daily mean of all-days from their corresponding monthly mean.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Mean of all days in the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	10·4	31·6	17·5	12·3	10·7	11·7	23·4	26·7	17·1	7·8	20·1	8·3	16·5
1895 ...	9·3	11·5	10·0	9·1	9·3	11·5	8·2	12·9	13·3	14·1	12·0	8·2	10·8
1896 ...	9·2	10·9	13·6	11·7	18·1	7·1	7·2	9·7	16·0	11·9	14·4	12·7	11·9
1897 ...	14·0	7·8	9·6	10·2	10·3	8·7	6·7	6·0	6·7	6·2	5·9	15·2	8·9
1898 ...	6·6	10·2	15·1	11·5	8·9	6·8	5·7	6·5	19·9	9·6	7·2	7·2	9·6
1899 ...	6·5	11·6	10·8	8·5	10·2	8·4	8·7	6·5	5·5	6·3	4·6	5·1	7·7
1900 ...	7·3	5·9	13·7	4·9	13·9	4·1	4·0	4·1	3·7	7·5	3·3	4·8	6·4
1901 ...	4·6	5·1	7·0	4·2	5·0	4·6	4·4	6·2	4·6	3·7	4·0	6·9	5·0
1902 ...	4·9	4·0	4·0	6·8	4·1	3·4	5·2	4·6	3·6	7·1	8·7	3·9	5·0
1903 ...	3·6	4·7	4·3	11·4	5·0	6·3	5·6	8·2	8·3	23·1	12·6	14·1	8·9
1904 ...	9·5	6·9	6·6	10·7	10·7	11·0	6·5	7·5	6·8	8·5	10·6	5·2	8·4
1905 ...	6·3	11·0	15·5	9·8	5·3	8·9	7·2	11·9	11·0	6·9	18·1	8·1	10·0
Mean 1894—1904.	7·8	10·0	10·2	9·2	9·7	7·6	7·8	9·0	9·6	9·6	9·4	8·3	9·0

TABLE 401.—*Showing the mean departure of the daily mean of all quiet-days from their corresponding monthly mean value.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Mean of all days in the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	6·7	3·7	6·7	7·6	3·7	3·2	16·2	10·2	7·2	3·2	1·0	5·7	6·8
1895 ...	5·9	5·7	...	8·7	7·7	7·0	2·4	8·9	9·8	11·4	6·2	5·2	7·4
1896 ...	7·8	7·7	9·2	8·0	7·0	5·0	4·7	4·4	6·2	8·0	8·5	6·9	6·9
1897 ...	7·8	6·5	4·1	4·3	7·3	4·0	3·3	4·6	4·9	3·9	5·1	10·2	5·5
1898 ...	4·0	3·6	8·0	4·8	7·8	4·3	3·5	5·6	5·7	3·7	3 9	2·5	4·6
1899 ...	5·5	4·4	9·0	7·0	6·4	3·7	4·1	4·8	2·0	4·7	2·6	4·1	4·8
1900 ...	5·1	3·9	8·7	4·4	5·6	3·7	4·2	3·7	3·4	5·9	2·9	4·4	4·5
1901 ...	3·8	4·2	4·8	4·6	4·7	4·1	3·2	5·1	2·7	3·1	2·6	3·5	3·9
1902 ...	3·4	2·5	3·3	4·6	3·5	2·7	4·1	3·2	3·1	3·5	6·6	2·7	3·6
1903 ...	3·1	4·4	3·5	3·3	3·8	4·4	3·6	4·5	6·2	4·0	2·8	5·2	3·9
1904 ...	5·2	4·7	5·6	5·6	5·9	5·8	5·3	5·8	4·2	4·8	4·7	4·7	5·2
1905 ...	5 2	6·4	6·8	4·5	3·0	4·3	5·7	5·2	6·4	4·7	11·2	4·4	5·3
Mean 1894—1904.	5·0	4·4	5·9	5·4	5·5	4·3	4·4	5·4	4·7	4·8	4·4	4·8	4·9

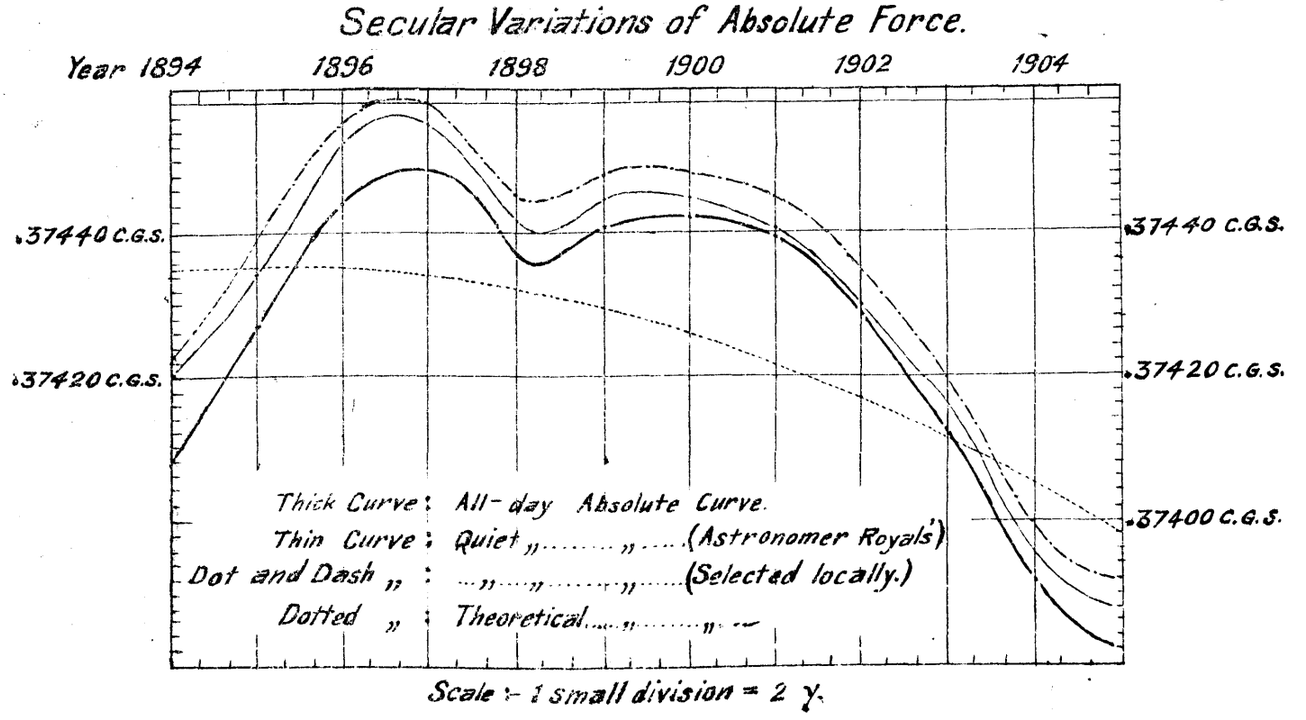
461. Passing from the quiet-days generally, as shown in table 381, to those especially selected by the Astronomer Royal for comparison with the all-day results, it must be noted that while there is something definite about the average all-day, as it is not affected by any arbitrary mode of selection, the average quiet-day made up as it is of only five selected days in the month, can scarcely be regarded as strictly comparable to the former. Not only is the process affected by a personal equation in the separation initially of the quiet-days from all days and subsequently by the further selection of the five days out of the quiet-days thus separated, but it has to be so controlled as to allow of the common epoch of the selected days to be as nearly as possible coincident with the middle date of the month. The

selection besides is determined purely by the quiescent conditions as presented by the diurnal sweep of the curve, and whether the days so selected can with equal appropriateness connote quiet conditions also of the absolute phenomenon, is a question which needs elucidation.

The coincidence of the mean epoch of the quiet-days with the mean of all-days may not be of much import in the question of the diurnal variations* but it is plainly essential in the case of the absolute phenomenon, where if the epoch of the quiet-day result is not made strictly comparable to that of all-day, appreciably large differences are likely to creep in the results. The Astronomer Royal's quiet-days, which have been used in the discussion, do not appear always to fulfil this condition strictly, and it is necessary to make certain that on this account the results are not so appreciably affected as to detract much of their usefulness.

The all-day results of Colaba have besides been derived from 24 hours commencing from 10 hours to 10 hours of the following day, while the quiet-days have been treated and arranged in the usual way from 0^h to 24^h. Thus there is a difference of 10 hours† in the epoch of the daily mean by the two processes. The objection to this difference in epoch of 10 hours in the absolute values is, at least for the Colaba record, more apparent than real, as under average conditions and more so in the quiet, the error due to this shift is rarely large and whenever necessary can be reliably allowed for by interpolation. But it has been carefully ascertained that this difference has no appreciable effect at least on the average results of 11 years, and this is also independently confirmed, as will be seen later, by the results of another set of quiet-days locally selected which have been especially derived to provide an effective check for other purposes as well. The differences in the monthly means due to this shift of 10 hours are, at any rate, much smaller than the possible effects on the absolute values when the mean epoch of the selected day differs from the middle of the month by more than two or three days as is some time the case in the quiet-days selected by the Astronomer Royal.

462. In table 402 are collected the monthly and annual means of absolute force derived from the quiet-days selected by the Astronomer Royal. The secular changes which occur from year to year under the influence of the 11-year period disturbance are reproduced, it will be observed, as fairly faithfully by the 60 selected days in the year as by all-days the results of which have already been discussed in Chapter I. These secular variations of force derived from all-day and quiet-day results are charted respectively as thick and thin curves‡ in figure below, while the theoretical curve of secular change referred to previously in Chapter I (see paragraph 299) is also shown as dotted curve in the same figure.



* At least in H the change from month to month is not so great as in D and V.

† In passing it may be noted that for the purposes of comparison of diurnal variations of quiet days at different stations on the earth with those at Greenwich, it is desirable that either the days should be synchronous, or that if local days are considered it should be carefully made certain that the day so shifted by the difference in longitude does not thereby lose the important characteristic of a quiet day for which it has been selected by the Astronomer Royal. At Colaba, the exact day corresponding to Greenwich day is 5 a.m. to 5 a.m. of the next day while the day taken in the reduction, is 0 h. to 24 h. of Colaba time and it has been carefully examined that the day so shifted by five hours satisfies the requirements of a quiet-day as fully as the former.

‡ The dot and dash curve in the figure shows the secular variation derived from the quiet days locally selected (see paragraph 463).

TABLE 402.—*Mean monthly values of H derived from the five quiet-days selected by the Astronomer Royal and their secular and annual variations.*

0·370000 C. G. S. +

Years.	Month.												Year.	Theoretical curve for quiet days.	Observed minus theoretical curve.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1894	4127	3985	4133	4175	4423	4260	4097	4175	4094	4303	4354	4297	4202	4399	−197
1895	4194	4128	4226	4279	4461	4328	4246	4393	4276	4476	4471	4611	4341	4399	− 58
1896	4618	4336	4509	4542	4458	4595	4460	4486	4490	4587	4643	4601	4527	4399	+128
1897	4589	4557	4559	4439	4568	4652	4678	4505	4574	4518	4537	4421	4550	4389	+161
1898	4447	4553	4465	4351	4406	4455	4403	4462	4178	4363	4365	4562	4417	4369	+ 48
1899	4575	4431	4277	4389	4557	4490	4422	4406	4365	4383	4491	4563	4446	4339	+107
1900	4463	4323	4469	4485	4249	4454	4405	4392	4550	4495	4566	4450	4442	4319	+123
1901	4449	4368	4442	4462	4412	4487	4402	4425	4369	4301	4417	4295	4402	4259	+143
1902	4300	4365	4345	4294	4271	4349	4320	4282	4184	4264	4296	4266	4295	4219	+ 76
1903	4255	4318	4216	4105	4122	4330	4273	4136	4063	4146	3984	3967	4160	4159	+ 1
1904	4150	3998	4036	3859	3949	3933	3915	3943	3939	3820	3850	3969	3947	4099	−152
1905	3836	3852	3913	3789	3852	3898	3952	3857	3874	3739	3945	3979	3874	4029	−155
Annual inequalities corrected for secular change. 1894 to 1904 ...	+28	−43	−13	−37	+10	+54	− 9	− 8	−54	+ 1	+32	+37	...	...	...
Maximum sun-spot years 1894, 1895, 1905.	− 2	−82	+ 6	−19	+83	+31	−49	−20	−97	−20	+49	+72	...	..	...
Minimum sun-spot years 1899 to 1902.	+14	−54	−36	− 6	−34	+46	− 6	−10	−12	−12	+76	+34	...	...	...

TABLE 403.—*Differences in the mean monthly absolute values of H derived from the Astronomer Royal's quiet-days less all-days.*

Unity = 0·1γ

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	+ 92	+ 93	+154	+ 48	+117	+ 94	+135	+180	+160	+ 56	+209	+ 76	+118
1895 ...	+ 85	+ 57	+ 58	+ 68	+ 49	+ 59	+ 34	+108	+ 15	+ 89	+108	+ 86	+ 68
1896 ...	+153	+ 76	+110	+112	+ 87	+ 23	+ 25	+ 45	+119	+ 97	+ 98	+ 36	+ 82
1897 ...	+109	+ 70	+ 52	+101	+ 92	+ 91	+ 25	+ 29	+ 27	+ 44	+ 57	+ 42	+ 62
1898 ...	+ 24	+ 65	+115	+ 61	+ 45	+ 51	+ 41	+ 76	+ 59	+ 64	+ 19	− 11	+ 51
1899 ...	+ 61	+121	− 17	− 6	+107	+ 35	+ 58	+ 5	+ 26	+ 14	+ 19	+ 51	+ 39
1900 ...	+ 57	− 26	+ 83	+ 11	+ 46	+ 8	− 5	− 35	+ 27	+ 29	+ 19	+ 42	+ 21
1901 ...	− 7	+ 8	+ 64	+ 19	− 15	− 3	+ 3	+ 8	+ 11	+ 10	+ 3	+ 15	+ 9
1902 ...	+ 26	+ 11	− 6	+ 3	+ 2	− 1	+ 7	+ 6	+ 24	+ 42	+ 17	+ 24	+ 12
1903 ...	− 10	+ 30	+ 4	+ 12	+ 8	+ 60	+ 17	+ 49	+ 29	+146	+ 65	+102	+ 43
1904 ...	+ 36	− 31	+ 49	+ 70	+ 62	+ 37	+ 11	+ 14	+ 30	+ 65	+ 34	+ 27	+ 34
1905 ...	+ 19	+ 68	+ 63	+ 51	− 3	+ 19	+ 75	+ 40	+ 76	− 51	+214	+ 44	+ 51
Means 1894 to 1904.	+ 57	+ 43	+ 61	+ 45	+ 55	+ 41	+ 30	+ 44	+ 48	+ 60	+ 59	+ 45	+ 49
Variation ...	+ 8	− 6	+ 12	− 4	+ 6	− 8	− 19	− 5	− 1	+ 11	+ 10	− 4	

It will be seen that the quiet-day curve stands higher in its general run than the all-day curve throughout the secular sweep by about 5γ on the average of 11 years 1894—1904. During the maximum-

spot year 1894, the difference made out is 11·8γ, which grows less as the years advance to the minimum-spot epoch when in 1901 it becomes less than 1γ; after this it again increases and becomes 5·1γ in 1905 (*vide* table 403).

463. The differences of the monthly means and the annual means of force derived from all-day and quiet-day results are given in the table above referred to. As the probability of any error in the average result of the whole period of 11 years is small, provisionally at least that part of it which shows that the value of force on the average always stands higher on quiet-day than on the average all-day, may be regarded as specifically correct. The monthly differences in the table however show that large negative figures, such as those shown in the months of February and August 1900, do sometimes occur, which would seem to indicate that the natural position of the quiet-day in the monthly averages is somehow displaced, and instead of being represented on the correct side of the average all-day, it may fall on the same side of it as the disturbance day. It is not difficult to explain this discrepancy. During the minimum epoch almost usually most days in the month are quiet-days. In August 1900 Colaba registers all days of the month as quiet, which are denominated as either C or Ca and the divergence between the average disturbance day and the average day of the month on the one hand, and between the latter and the average day of the five selected days on the other, which during the maximum sun-spot years is definitely broad in each case, is reduced and becomes very narrow during the minimum epoch. This would obviously increase the difficulties of selection of the quieter five of the thirty-one quiet-days, as the mere inspection of the magnetograph traces, all of which apparently exhibit smooth sweeps of the diurnal wave, can furnish little information in another direction such as the daily mean. And sometimes, though not often, a discrepancy like this is glaringly indicated even during the maximum-spot year (*vide* result of October 1905 in the table). It will appear that the uncertainty here is in part due to the cause referred to in paragraph 461, and in part to the absolute factor not being represented in the selection. For if a day which is apparently quiet and follows hard upon a heavy disturbance, happens to be selected, its daily mean is almost always likely to be low, which fact thus introduces some element of uncertainty in the results. If the absolute value itself of a day and the change in the daily mean from the value of the preceding day, together form an index of disturbance of the absolute phenomenon, the latter factor is usually much too large on a quiet-day which immediately follows a disturbance day, and its daily mean also is invariably low. In any case in view of this uncertainty an additional condition, namely, that the daily mean of the selected day should, if possible, be higher than the average value of the month, besides the two usually employed in the selection of quiet days, obviously thus becomes essential. Hence not sacrificing in any way the condition which requires the diurnal sweep of the trace to be absolutely quiet and smooth, which is the principal one of the three factors considered, the selection of the days locally made at Colaba is so devised as to satisfy, if possible, all the three conditions together. Without doubt a more consistent series of quiet-days is thereby secured for general purposes, *vide* paragraphs 532 and 533.

464. Considering that the mean monthly values of absolute force in table 402 thus appear to be influenced now and again by the process of selection and that the number of years dealt with is only eleven, one may hesitate, without further investigation at least, to accept as typically correct the finer fluctuations shown by the average result in column 14 of table 403, which gives the *difference* secular variation, or that in the last row of the same table which gives the *difference* annual variation of absolute force derived from all-day and the Astronomer Royal's quiet-day results. To make certain that these indications are typical of a true phenomenon, another set of absolute results, similar to the one above referred to but wherein the quiet-days are especially selected locally (*vide* tables 404, 405 and 406) has been supplemented.

The comparison of the two sets of results in tables 403 and 406, clearly shows that though the monthly means are not in agreement here and there as might be expected, the irregularities are at any rate all sufficiently smoothed in the average annual results, so as to make the character of at least the annual and secular variations practically identical in both, and any one indifferently, may be discussed without hesitation.

It will be noticed however (see tables 403 and 406 and figures in paragraph 462, thin curve and dot and dash curve) that in the difference results in the absolute values of H of the quiet-days of the Astronomer Royal, and the average of all-days, the figures for the maximum sun-spot year 1894, the minimum sun-spot year 1901, and for the average of 11 years are respectively 11·8γ, 0·9γ, and 4·9γ, while similar differences derived from the specially selected quiet-days are 14·6γ, 5·4γ and 8·5γ. That such discrepancies must prevail in results which depend upon selective methods, is obvious, and this should be borne in mind in the discussion, as it is clear that a fairly broad zone of quiet-days exists and the

TABLE 404.—*Showing the dates of quiet-days locally selected and the mean date of the month to which their mean epoch corresponds.*

	Month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1894											
	9	8	5	3	6	7	7	2	3	8	9	4
	15	14	12	9	9	14	10	7	8	10	10	11
	16	15	13	15	10	15	11	18	13	12	11	18
	17	16	20	23	19	16	12	27	17	23	21	26
	20	18	29	27	26	26	27	31	29	24	22	28
Mean ...	15·4	14·2	15·8	15·4	14·0	15·6	13·4	17·0	14·0	15·4	14·6	17·4
	1895											
	5	4	1	2	4	8	7	4	2	3	6	4
	8	12	7	4	6	14	10	8	11	7	7	5
	14	13	12	21	16	15	19	17	13	19	18	16
	23	22	24	22	23	20	22	22	21	24	20	20
	26	23	28	30	27	21	24	27	24	25	22	31
Mean ...	15·2	14·8	14·4	15·8	15·2	15·6	16·4	15·6	14·2	15·6	14·6	15·2
	1896											
	1	7	2	7	9	3	2	5	4	5	2	2
	8	10	10	12	10	4	10	11	9	6	3	12
	16	12	18	13	14	20	18	14	10	20	22	18
	24	20	19	16	16	23	22	16	26	21	23	19
	28	24	24	30	29	25	29	31	27	25	27	22
Mean ...	15·4	14·6	14·6	15·6	15·6	15·0	16·2	15·4	15·2	15·4	15·4	14·6
	1897											
	7	2	2	3	7	6	5	6	2	5	3	3
	9	9	12	8	9	10	12	7	8	13	7	8
	18	16	17	12	12	13	18	12	18	14	12	14
	21	20	21	15	27	14	20	22	25	21	28	19
	22	22	26	29	28	25	29	29	28	25	30	28
Mean ...	15·4	13·8	15·6	13·4	16·6	13·6	16·8	15·2	16·2	15·6	16·0	14·4
	1898											
	5	1	4	2	2	5	4	1	6	5	6	1
	7	7	8	11	10	13	11	10	7	12	11	10
	14	8	9	19	19	14	13	15	16	15	13	12
	23	23	25	22	22	17	18	25	20	18	19	26
	31	28	29	26	26	21	31	30	27	24	28	29
Mean ...	16·0	13·4	15·0	16·0	15·8	14·0	15·4	16·2	15·2	14·8	15·4	15·6
	1899											
	8	5	4	3	9	6	9	1	5	3	2	6
	10	9	5	13	12	9	15	12	11	10	10	4
	11	10	17	15	13	16	16	15	14	13	16	15
	24	18	18	16	19	22	17	19	20	21	20	17
	27	27	31	27	24	25	20	28	25	30	28	24
Mean ...	16·0	13·8	15·0	14·8	15·4	15·6	15·4	15·0	15·0	15·4	15·2	13·2

	Month.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	1900											
	3	2	5	3	2	6	6	3	6	3	5	6
	9	7	7	14	10	12	12	6	9	13	10	13
	11	13	19	15	15	17	15	15	13	18	11	14
	24	19	20	16	23	19	22	22	21	19	21	18
	30	28	25	29	28	22	23	31	26	22	30	24
Mean ...	15·4	13·8	15·2	15·4	15·6	15·6	15·6	15·4	15·0	15·0	15·4	15·0
	1901											
	8	5	8	6	1	5	3	2	2	1	2	8
	10	9	10	11	8	6	9	9	9	4	10	14
	13	11	16	18	17	12	15	13	15	19	14	16
	19	16	21	19	22	23	24	25	23	24	23	19
	29	27	22	21	30	28	26	29	26	31	24	22
Mean ...	15·8	13·6	15·4	15·0	15·6	14·8	15·4	15·6	15·0	15·8	14·6	15·8
	1902											
	6	1	5	2	3	4	7	6	5	7	5	3
	9	11	7	7	6	9	13	8	6	10	12	7
	14	18	14	16	17	18	17	15	14	16	17	18
	21	19	20	23	23	19	18	19	25	21	19	21
	28	23	31	28	28	25	22	29	26	22	20	31
Mean ...	15·6	14·4	15·4	15·2	15·4	15·0	15·4	15·4	15·2	15·2	14·6	16·0
	1903											
	3	2	4	1	3	7	4	3	3	3	7	6
	8	7	11	14	11	10	9	7	9	9	14	11
	14	13	18	16	13	13	17	18	17	20	15	12
	25	19	19	20	20	20	20	19	18	21	16	19
	29	28	25	24	31	27	24	29	30	28	25	24
Mean ...	15·8	13·8	15·4	15·0	15·6	15·4	14·8	15·2	15·4	16·2	15·4	14·4
	1904											
	7	3	2	5	4	5	4	1	3	1	1	2
	8	12	13	14	9	11	12	12	13	11	10	8
	14	15	17	15	16	13	19	14	15	18	14	13
	20	21	19	16	22	23	21	20	20	24	21	23
	26	22	28	23	26	25	23	28	23	26	28	27
Mean ...	15·0	14·6	15·8	14·6	15·4	15·4	15·8	15·0	14·8	16·0	14·8	14·6
	1905											
	2	9	1	9	6	1	4	10	7	3	1	1
	9	11	11	11	9	7	12	12	11	10	9	10
	13	12	18	13	16	14	15	18	15	16	11	16
	23	20	22	18	21	21	16	19	16	22	20	26
	28	24	26	24	23	29	31	22	24	23	29	27
Mean ...	15·0	15·2	15·6	15·0	15·0	14·4	15·6	16·2	14·6	14·8	14·0	16·0

selection, in order that it may be satisfactorily made should pick out the best and the quietest days from this zone (*vide* also paragraphs 532 and 533, Chapter XIII).

TABLE 405.—*Mean monthly values of H derived from five quiet-days (locally selected) and their secular and annual variations.*

0·370000 C. G. S. +

Years.	Month.												Year.	Theoretical curve for quiet days.	Observed minus theoretical curve.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1894	4173	4150	4194	4212	4406	4267	4188	4140	4091	4328	4300	4317	4230	4399	−169
1895	4202	4232	4314	4335	4510	4381	4260	4384	4384	4509	4559	4618	4391	4399	− 8
1896	4581	4347	4565	4557	4574	4618	4519	4533	4493	4569	4671	4694	4560	4399	+161
1897	4620	4569	4594	4469	4575	4665	4683	4557	4613	4512	4533	4529	4577	4389	+188
1898	4485	4568	4475	4367	4452	4443	4420	4457	4320	4396	4393	4630	4450	4369	+ 81
1899	4580	4409	4396	4483	4502	4533	4435	4502	4409	4447	4513	4575	4482	4339	+143
1900	4510	4391	4499	4529	4287	4485	4466	4470	4575	4541	4584	4461	4483	4319	+164
1901	4476	4419	4446	4496	4475	4558	4460	4490	4416	4341	4451	4336	4447	4259	+188
1902	4320	4389	4398	4347	4320	4376	4374	4314	4183	4287	4363	4283	4329	4219	+110
1903	4304	4346	4260	4166	4176	4335	4306	4171	4109	4162	4006	3976	4193	4159	+ 34
1904	4211	4045	4035	3888	3990	3994	3954	4019	3964	3826	3886	4006	3985	4099	−114
1905	3887	3896	3971	3800	3905	3922	3965	3957	3888	3844	3918	4009	3913	4029	−116
Annual inequalities corrected for secular change. 1894 to 1904 ...	+19	−34	− 3	−30	+10	+47	− 4	− 5	−47	−11	+22	+39	...	...	...
Maximum sun-spot years 1894, 1895, 1905.	− 6	−16	+36	−23	+119	+20	−48	−41	−97	− 5	+12	+52	...	...	...
Minimum sun-spot years 1899 to 1902.	+ 4	−59	−20	+15	−48	+50	+ 2	+18	−25	−11	+69	+11	...	...	...

TABLE 406.—*Differences in the mean monthly values of H, derived from locally selected quiet-days less all-days.*

Unity = 0·1γ = 0·000001 C. G. S.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	+138	+258	+215	+ 85	+100	+101	+226	+145	+157	+ 81	+155	+ 96	+146
1895 ...	+ 93	+161	+146	+124	+ 98	+112	+ 48	+ 99	+123	+122	+196	+ 93	+118
1896 ...	+116	+ 87	+166	+127	+203	+ 46	+ 84	+ 92	+122	+ 79	+126	+129	+115
1897 ...	+140	+ 82	+ 87	+131	+114	+104	+ 30	+ 81	+ 66	+ 38	+ 53	+150	+ 90
1898 ...	+ 62	+ 80	+125	+ 77	+ 91	+ 39	+ 58	+ 71	+201	+ 97	+ 47	+ 57	+ 83
1899 ...	+ 66	+ 99	+102	+ 88	+ 52	+ 78	+ 71	+101	+ 70	+ 78	+ 41	+ 63	+ 76
1900 ...	+104	+ 42	+113	+ 55	+ 84	+ 39	+ 56	+ 43	+ 52	+ 75	+ 37	+ 53	+ 63
1901 ...	+ 20	+ 59	+ 68	+ 53	+ 48	+ 68	+ 55	+ 73	+ 58	+ 50	+ 37	+ 56	+ 54
1902 ...	+ 46	+ 35	+ 47	+ 57	+ 51	+ 26	+ 47	+ 38	+ 23	+ 65	+ 84	+ 41	+ 46
1903 ...	+ 39	+ 58	+ 48	+ 73	+ 62	+ 65	+ 50	+ 84	+ 75	+162	+ 87	+111	+ 76
1904 ...	+ 97	+ 16	+ 48	+ 99	+103	+ 98	+ 50	+ 90	+ 55	+ 71	+ 70	+ 64	+ 72
1905 ...	+ 70	+112	+121	+ 62	+ 50	+ 43	+ 88	+140	+ 90	+ 54	+187	+ 74	+ 90
Mean, 1894 to 1904.	+ 84	+ 89	+106	+ 88	+ 91	+ 71	+ 70	+ 83	+ 91	+ 83	+ 85	+ 83	+ 85
Variation ...	− 1	+ 4	+ 21	+ 3	+ 6	− 14	− 15	− 2	+ 6	− 2	0	− 2	...

465. The average magnitude of the difference by which the quiet-day secular curve marches above the all-day curve, may hence be anything between 5γ and 9γ, at Colaba for the 11-year period under examination depending upon the character of the quiet-days selected. Which of the two limits gives the better approximation to the truth, that is, which set of days connotes relatively the quieter conditions, must, if possible, be definitely answered. If *all* calm days (marked C in table 381) in the month are taken and the mean value of absolute force of the month is derived from them we get yet a third result.* This may be called the mean quiet-day result (*vide* table below).

TABLE 407.—*Difference in the mean monthly values of H derived from all quiet-days less all-days.*

Unity = 0·1γ = 0·000001 C. G. S.

Years.	Month.												Mean of all days in the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	+ 87	+197	+194	+ 82	+ 45	+134	+110	+140	+154	+ 66	+158	+ 60	+110
1895 ...	+111	+112	0	+ 54	+ 64	+ 28	+ 20	+ 17	+ 38	+ 92	+165	+ 37	+ 54
1896 ...	+118	+117	+134	+ 60	+130	+ 18	+ 35	+ 72	+ 92	+ 87	+ 85	+ 84	+ 78
1897 ...	+ 72	+ 24	+ 81	+113	+ 47	+ 47	+ 33	+ 4	+ 31	+ 13	+ 29	+ 97	+ 42
1898 ...	+ 45	+ 76	+ 93	+ 81	+ 58	+ 8	+ 23	+ 50	+193	+ 57	+ 12	+ 27	+ 52
1899 ...	+ 31	+ 71	+ 35	+ 27	+ 42	+ 58	+ 67	+ 12	+ 10	+ 34	+ 7	+ 26	+ 35
1900 ...	+ 56	+ 9	+ 33	+ 8	+ 72	− 4	0	− 8	+ 9	+ 15	− 2	+ 2	+ 12
1901 ...	− 3	+ 19	+ 23	+ 1	+ 5	0	+ 16	+ 5	+ 13	+ 12	+ 16	+ 18	+ 11
1902 ...	+ 26	+ 21	+ 7	+ 18	+ 2	− 4	+ 2	+ 5	+ 7	+ 29	+ 24	+ 8	+ 11
1903 ...	− 8	0	+ 12	+ 71	+ 14	+ 24	+ 13	+ 35	+ 78	+165	+104	+ 87	+ 30
1904 ...	+ 72	+ 42	+ 21	+ 58	+ 80	+ 32	+ 9	+ 16	+ 12	+ 51	+ 61	+ 22	+ 37
1905 ...	− 2	+120	+ 60	+ 39	+ 10	+ 36	+ 14	+ 72	+ 60	+ 21	+150	+ 37	+ 43
Annual Variation .	+ 7	0	+ 11	+ 4	+ 7	− 15	− 11	− 14	+ 1	+ 6	+ 6	0	+ 43

It will be readily seen that the result of the five quiet-days of the Astronomer Royal is almost nearly the same as this result, the figures of departures from the average all-days being 11·0γ, 1·1γ, and 4·3γ respectively for the years 1894 and 1901, and for the average conditions of 11 years, as against 11·8γ, 0·9γ and 4·9γ in table 403 for the days selected by the Astronomer Royal. One may hence legitimately infer that on the average, the Astronomer Royal's quiet-day appropriately represents the condition of the *mean* quiet-day; while the Colaba selected days appear to stand higher up in the grade. That the latter however connote somewhat quieter conditions generally than the former will be seen from the results in Chapter XIII, where the daily means are discussed at greater length.

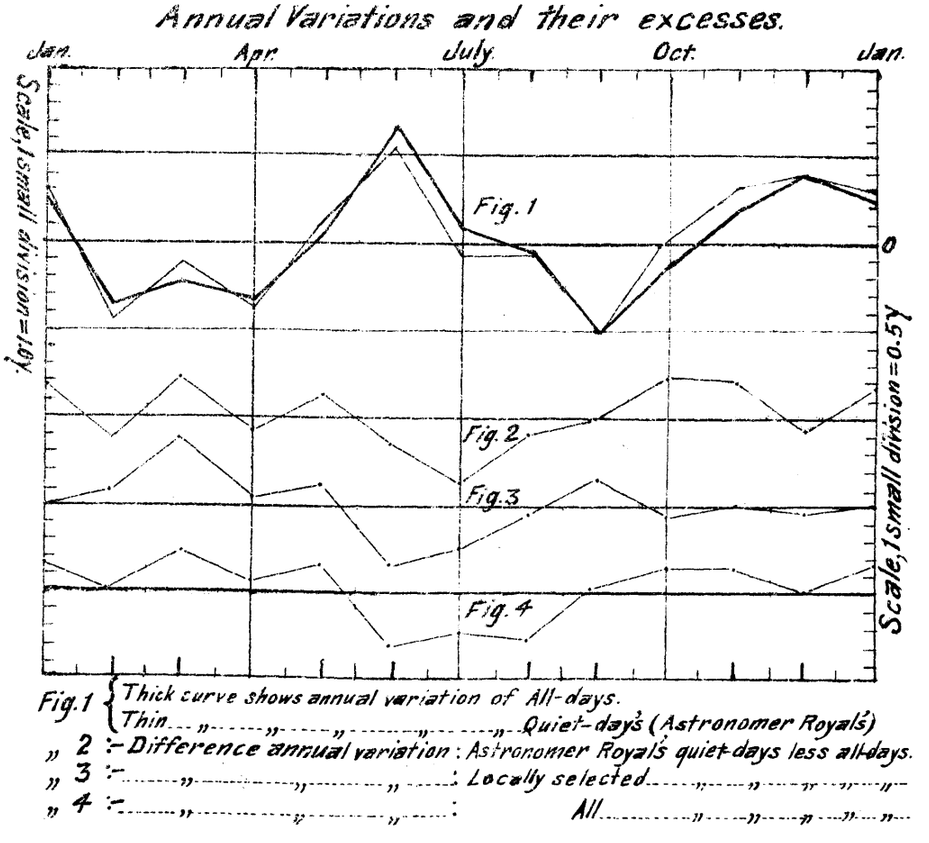
466. Comparing now the result in table 407 with that indicated in table 399 and summarised in paragraph 460, where the increase in the daily mean of the mean quiet-day above that of the preceding day is shown, it will be noted that as the quiet days are the same in both the results, the average *preceding day* alluded to in the paragraph referred to and in 459, falls coincident with the average all-day in the year 1901 when the disturbances are a minimum, but deviates from it by about 2·0γ in the average conditions of 11 years, and by about 6·0γ in 1894, the year of maximum disturbance.

467. Apart however from the question of the exact magnitude of the difference between the quiet and all-day means, two facts unquestionably remain, *viz.*, that the absolute value stands higher on a quiet-day than on the average all-day; and that the secular fluctuations under the influence of the 11-year period disturbance, appear to be also appreciably smaller in amplitude in the quiet-day than in the all-day results (*vide* column 14, tables 403, 406 and 407). These results are in accordance with and confirm the general inference already referred to, namely, that higher values of force and contracted amplitudes of variations seem to be usually associated with quiet conditions, while opposite effects obtain during disturbed conditions generally.

* Strictly these monthly means should be corrected for epoch to reduce them to the middle of the month. This has not been done.

468. The examination of the seasonal march of absolute force shows that the variations derived from the quiet and all-day results are in the main the same (*vide* figure 1 below). And so far it may be accepted that all kinds of days whether quiet or average, appear to be almost equally influenced by the disturbing action of the annual variation, whatever its cause. There is however a small but appreciable difference (see table 403, also figure 2 below); and as this difference is also indicated precisely similarly when either the locally selected quiet-days or *all* quiet-days are considered (see tables 406 and 407 and figures 3 and 4 below), minute though the variation is, it cannot be passed over as accidental. If the all-day absolute results involve, as we know the diurnal variations at least do, some portion of the disturbance effects due to storms, it is obvious that if on comparison with the quiet-day results which are comparatively free from such effects, the annual variations indicate at least a significantly large difference, it should be regarded as the disturbance annual variation of the absolute force. Such difference variations shown in the last row of each table above referred to, indicate that the monthly values of force stand about the equinoctial months higher generally on a quiet-day than on the average all-day and lower about the solstices. This semi-annual pulse is also indicated by the results derived from the locally selected days and especially by those derived from all quiet-days referred to in paragraph 465, both of which are charted in figures 3 and 4 below :—

Annual variations of Absolute Force from quiet-days and all-days.



* The result in table 403 charted above is slightly different from that derived from the difference of thick and thin curve in figure 1, as the secular correction is not the same in both.

These variations of course show, as expected, the relatively greater freedom of the quiet-day absolute values from storm and disturbance effects; but the point to be noted is, that it confirms in another way the result derived in paragraph 436 about the existence of the semi-annual pulse due to storms, etc., which thus influence both the diurnal variation of the element and its absolute values.

With the exception of this small contribution due to the incidence of disturbances, the annual variation itself is exhibited with almost equal significance by the quiet-day as the average all-day result. And as also in the secular variation of this annual variation, the waxing and waning during the maximum and minimum sun-spot epochs are also almost equally exhibited by the quiet-day as by the average all-day (*vide* last two rows of tables 402 and 405) one is forced to infer either that the cause or causes to which the annual variation and its secular growth are due, can scarcely have any intimate relation with storms and disturbances, the effects of which, we know, are excluded from the quiet-day by the selective process employed in their separation; or that if due to a common origin their differentiating effects, apparently not strong enough, fail to influence the mean annual results and the secular phenomena.

TABLES 408 & 409.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1894 and 1895 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1894.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−138	−161	−178	−143	−168	−170	**−157**	**−162**	−108	**−164**	−131	− 73	−146
1 19	−127	−156	**−185**	−153	−175	−161	−150	−159	−125	−144	−136	− 97	**−147**
2 19	−109	−165	−171	−165	−190	−166	−131	−149	−109	−137	−136	**−109**	−145
3 19	−126	−165	−177	**−169**	**−196**	−163	−127	−153	−117	−122	−139	− 82	−144
4 19	**−158**	−134	−177	−157	−187	−156	−118	−162	−117	−132	−133	− 89	−144
5 19	−156	−125	−159	−166	−166	−167	−112	−141	−119	−161	−119	− 78	−140
6 19	−105	−100	−149	−145	−130	− 94	− 72	−112	−120	−145	− 67	− 58	−108
7 19	− 67	− 37	− 65	− 83	− 71	+ 15	− 4	− 77	−115	−113	+ 31	− 8	− 49
8 19	+ 32	+110	+ 76	+ 42	+130	+110	+ 87	+ 49	− 13	+ 12	+150	+ 66	+ 71
9 19	+156	+236	+266	+249	+296	+271	+221	+199	+162	+180	+273	+124	+220
10 19	+266	+323	+411	+415	+421	+419	+351	+345	+287	+384	+395	+190	+351
11 19	**+331**	**+385**	**+451**	**+427**	**+428**	**+459**	**+362**	**+379**	**+336**	**+461**	**+449**	**+206**	**+390**
12 19	+322	+384	+396	+392	+385	+440	+334	+373	+322	+449	+343	+179	+360
13 19	+246	+276	+279	+248	+296	+340	+262	+290	+250	+301	+199	+144	+261
14 19	+160	+128	+161	+134	+175	+221	+154	+222	+146	+152	+ 99	+ 94	+154
15 19	+ 95	+ 91	+ 72	+ 62	+ 57	+ 69	+ 36	+101	+ 85	+ 58	+ 4	+ 56	+ 65
16 19	+ 25	− 19	− 14	+ 4	− 34	− 49	− 49	− 13	+ 16	− 5	− 71	− 27	− 20
17 19	− 19	− 62	− 49	− 40	− 67	−153	−103	− 99	− 37	− 65	−117	− 58	− 73
18 19	− 42	− 79	− 69	− 76	− 82	**−208**	− 99	−102	− 38	− 67	−131	− 53	− 87
19 19	− 81	−106	−102	−100	−117	−172	−106	−109	− 77	−112	−153	− 60	−107
20 19	−109	−133	−122	−131	−140	−158	−136	−138	−105	−143	−157	− 66	−128
21 19	−127	−146	−150	−149	−144	−184	−147	−124	−139	−159	**−165**	− 61	−141
22 19	−132	−156	−178	−149	−155	−184	−153	−122	**−143**	−163	−140	− 67	−145
23 19	−127	**−196**	−169	−141	−163	−159	−151	−130	−118	−163	−138	− 74	−144
Range ...	489	581	636	596	624	667	519	541	479	625	614	315	537

1895.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 80	−100	−126	−144	**−174**	−152	−156	−143	−104	− 94	−115	−109	−125
1 19	−124	−116	−143	**−163**	−153	−144	− 89	**−144**	−150	**−124**	− 64	− 88	−125
2 19	**−136**	− 91	−124	−130	−148	−163	−124	−138	−119	−111	− 96	− 86	−122
3 19	−127	− 96	−112	−149	−154	−169	−119	−128	−114	−119	−123	− 78	−123
4 19	−112	− 75	−112	−142	−166	−158	−130	−132	−122	−121	−137	− 69	−123
5 19	− 92	− 70	−109	−125	−144	−157	−116	−118	−125	−104	−114	− 60	−111
6 19	− 44	− 44	−102	−108	− 65	−123	− 93	− 91	**−158**	− 82	− 63	− 20	− 82
7 19	+ 29	− 25	− 25	− 44	+ 16	− 22	+ 15	− 45	−157	− 45	+ 41	+ 66	− 16
8 19	+125	+105	+127	+ 81	+139	+134	+123	+ 41	− 53	+ 55	+158	+181	+101
9 19	+206	+201	+277	+253	+258	+295	+243	+170	+120	+200	+268	+262	+230
10 19	+268	+287	+387	+363	+372	+420	+331	+278	+282	+303	+308	**+310**	+326
11 19	**+300**	**+315**	**+419**	**+408**	**+391**	**+472**	**+396**	**+347**	**+367**	**+349**	**+318**	+280	**+364**
12 19	+209	+277	+386	+355	+374	+428	+377	+340	+365	+315	+244	+221	+324
13 19	+117	+204	+276	+288	+292	+332	+284	+281	+305	+175	+144	+103	+233
14 19	+ 49	+112	+136	+120	+156	+194	+169	+195	+199	+ 82	+ 60	+ 46	+127
15 19	+ 2	− 9	+ 10	+ 5	+ 36	+ 43	+ 65	+ 99	+ 85	− 3	− 5	− 18	+ 25
16 19	− 57	**−133**	− 57	− 31	− 54	− 88	− 65	− 7	+ 8	− 43	− 91	− 59	− 53
17 19	− 64	−124	−139	− 69	− 94	−160	−144	− 73	− 30	− 55	− 79	− 72	− 92
18 19	− 58	−112	**−173**	− 78	−129	**−178**	**−175**	−100	− 55	− 52	− 96	−128	−112
19 19	− 60	− 97	−165	−123	−139	−167	−170	−112	− 96	− 88	−105	−147	−122
20 19	− 67	−101	−169	−140	−146	−176	−161	−119	−108	− 95	**−141**	−142	−131
21 19	−100	−102	−164	−156	−144	−164	−153	−125	−112	−111	−107	**−162**	**−134**
22 19	− 97	− 96	−160	−131	−160	−156	−157	−140	−123	−115	−129	−131	−133
23 19	− 79	−102	−129	−142	−163	−149	−160	−134	−105	−115	−126	− 95	−125
Range ...	436	448	592	571	565	650	571	491	525	473	459	472	498

TABLES 410 & 411.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1896 and 1897 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1896. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−100	−114	−151	−166	−145	−119	−122	− 90	−130	−128	−113	− 83	−122
1 19	− 50	− 91	−150	**−200**	−150	−142	**−132**	− 72	−103	−102	**−118**	− 81	−116
2 19	− 49	− 96	−140	−192	**−164**	**−148**	− 76	− 75	−105	−113	− 91	− 70	−110
3 19	−100	− 91	−136	−159	−160	−145	−115	− 80	−113	−134	− 85	− 57	−115
4 19	− 81	− 82	−137	−169	−147	−130	−118	− 75	−113	−119	− 94	− 44	−109
5 19	− 58	− 77	−121	−161	−152	−114	−104	− 70	−107	−108	− 78	− 39	− 99
6 19	− 44	− 61	− 87	−140	−125	− 73	− 77	− 63	−114	−109	− 66	− 28	− 82
7 19	+ 12	− 27	− 20	− 49	− 38	− 5	− 31	− 42	−106	− 55	+ 15	+ 30	− 26
8 19	+ 73	+ 53	+117	+113	+ 91	+ 86	+ 32	+ 31	− 30	+ 88	+114	+ 80	+ 71
9 19	+ 94	+142	+271	+278	+229	+211	+115	+114	+178	+257	+218	+162	+189
10 19	+199	+217	+378	+396	+354	+317	+213	+180	+317	+369	+295	**+237**	+289
11 19	**+260**	+252	**+396**	**+432**	**+401**	**+329**	+278	+216	**+364**	**+402**	**+319**	+234	**+324**
12 19	+246	**+256**	+322	+386	+360	+279	**+318**	**+217**	+351	+359	+261	+201	+296
13 19	+173	+209	+223	+283	+294	+188	+296	+177	+259	+219	+159	+129	+217
14 19	+102	+101	+133	+174	+183	+114	+217	+116	+137	+116	+ 65	+ 48	+126
15 19	+ 22	+ 27	+ 40	+ 81	+ 83	+ 37	+104	+ 36	+ 22	+ 20	− 17	− 18	+ 37
16 19	− 45	− 7	− 30	+ 2	− 17	− 32	+ 2	− 7	− 24	− 62	− 79	− 74	− 31
17 19	− 31	− 22	− 59	− 48	− 88	− 70	− 81	− 37	− 55	− 92	− 92	− 90	− 64
18 19	− 71	− 43	− 82	− 77	−122	− 91	−112	− 57	− 47	−103	− 91	− 87	− 82
19 19	− 86	− 48	−120	−119	−130	− 90	−116	− 72	− 71	−131	− 96	**−103**	− 98
20 19	−118	− 84	−156	−158	−149	− 98	−124	− 82	−102	−144	−106	− 90	−118
21 19	**−131**	−115	−153	−172	−146	−100	−124	− 94	−127	**−157**	−115	− 87	−126
22 19	−110	**−167**	**−176**	−164	−143	−105	−123	**−100**	**−154**	−151	−115	− 89	**−133**
23 19	−110	−138	−173	−171	−130	−104	−126	− 77	−117	−130	−102	− 86	−122
Range ...	391	423	572	632	565	477	450	317	518	559	437	340	457

1897. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−122	−119	− 96	−140	− 91	−104	− 91	− 77	− 85	− 78	− 96	− 81	− 98
1 19	−123	− 98	−125	−127	−118	− 99	−113	− 82	**−117**	− 92	−103	− 90	−107
2 19	−124	− 87	−118	−129	−112	− 94	−103	− 97	− 91	−100	−103	− 68	−102
3 19	−113	− 79	−111	−128	−112	−102	−105	− 75	− 73	**−110**	− 77	− 93	− 98
4 19	− 96	− 80	−115	−119	−118	− 84	−100	− 57	− 67	− 83	− 67	− 98	− 90
5 19	− 89	− 74	−114	−111	−113	− 86	− 96	− 56	− 70	− 86	− 60	− 96	− 87
6 19	− 62	− 61	− 96	− 91	− 91	− 41	− 54	− 49	− 84	− 71	− 28	− 71	− 66
7 19	− 20	− 45	− 34	− 36	− 33	+ 32	+ 19	− 28	− 82	− 25	+ 80	− 17	− 16
8 19	+ 80	+ 28	+ 75	+102	+ 69	+ 99	+ 92	+ 51	− 32	+ 76	+183	+ 78	+ 75
9 19	+180	+137	+209	+239	+172	+177	+163	+151	+ 91	+177	+257	+150	+175
10 19	+291	+246	+321	+330	+283	+242	+251	+210	+215	+248	**+296**	+232	+264
11 19	**+362**	**+310**	**+362**	**+356**	**+323**	**+266**	**+281**	**+240**	**+260**	**+272**	+286	**+278**	**+300**
12 19	+325	+273	+284	+325	+310	+234	+269	+233	+243	+239	+203	+249	+266
13 19	+201	+197	+173	+230	+228	+201	+229	+202	+176	+135	+108	+175	+188
14 19	+ 93	+ 84	+ 79	+132	+122	+119	+139	+134	+124	+ 53	+ 15	+ 89	+ 99
15 19	+ 12	+ 30	+ 20	+ 66	+ 39	+ 34	+ 30	+ 42	+ 83	+ 7	− 37	+ 12	+ 28
16 19	− 28	− 17	+ 1	− 1	− 24	− 45	− 54	− 34	+ 26	− 22	− 90	− 37	− 27
17 19	− 69	− 31	− 22	− 48	− 86	−102	− 89	− 89	− 25	− 45	−109	− 57	− 64
18 19	− 91	− 74	− 58	− 99	−117	−107	−121	**−116**	− 43	− 51	**−116**	− 84	− 90
19 19	−115	− 81	−111	−126	**−126**	−104	**−124**	−111	− 55	− 88	−113	− 86	−103
20 19	−128	−101	−124	−154	−126	−107	−115	−111	− 79	− 89	−113	− 91	−111
21 19	**−133**	−103	**−146**	**−166**	−113	−111	−104	− 98	− 97	− 98	−105	− 95	**−114**
22 19	−123	**−130**	−118	−163	− 91	**−115**	−102	− 92	−107	− 91	−115	**− 98**	−112
23 19	−118	−130	−128	−145	− 83	−110	− 96	− 85	−104	− 72	− 89	− 92	−104
Range ...	495	440	508	522	449	381	405	356	377	382	412	376	414

2. *Horizontal Force. Diurnal Variation.*

469. The diurnal variations for each month of the year and each year derived from the selected days of the Astronomer Royal for the period 1894—1905 are given in tables 408 to 419, while the variations typical of the groups of the summer and winter months and the group of years of maximum and minimum spot, appear in tables 420 to 423. The excess diurnal inequalities of all-days less quiet-days, of each month for the period 1894—1905, and of the groups of winter and summer months, are also collected for reference in tables 424 to 437.

The average diurnal variation for each year with their differences from the corresponding all-day variation and those for the average months of the period dealt with, with their differences from the corresponding all-day average months, are given in tables 438 to 441.

The results shown in tables 420 to 423 and in 438 and 440 are all charted in plates 82 and 83; as are also the departures of the quiet-day variations of each month from the corresponding all-day variations in plates 84 to 87.

In plate 88 the departures of the quiet-day results from those of all-day for each year and for the winter and summer groups of months are given separately.

The aperiodic correction.

470. Before however examining the above data in detail it may be advantageous perhaps to refer here incidentally to the aperiodic corrections applied to the quiet-day variations, which, as they happen to be large, while they are negligibly small in all-days, need an especial reference here. These corrections—the differences of the ordinates at 0^h and 24^h for the whole period of 11 years—have already appeared in table 59, while the corrections used in the reductions for the quiet-days selected by the Astronomer Royal, are collected separately for ready reference in table 446.

These are in the main due to magnetic secular change. The aperiodic correction which is ordinarily made up of the instrumental creep and the magnetic secular change, is in all-day results at Colaba principally made up of the former which is also usually very small. The secular change of force however is still smaller, and hence this correction which when the instrument was young, that is, during the first ten or fifteen years of its life (*vide* tables 56 to 59), was appreciably large, became smaller and smaller and almost negligible thereafter. It was certainly very small during the last 11 years, 1894—1904, the period under examination. The necessity however of a careful examination of the correction whenever its application in the all-day data is called forth in the event of either the first or last day of the month being a stormy or disturbed day resulting in an abruptly large increase in the magnitude of the correction as given by the difference of the hourly ordinates, has been already referred to. And the more is this precaution justifiable when we know (*vide* paragraph 440 and figures 1 to 4, plate 73) that the character of the progression of a disturbance does not certainly suggest the idea of an uniform propagation of the secular element throughout the 24 hours of the day (also see figures in paragraph 472). The objection hence to the acceptance generally of the magnitude of the correction and its mode of application which exists in the case of all-day results, loses much of its force in the case of the quiet-day result as it may with fair reason be contended, that if the days are specifically selected as being free from disturbances, the difference in the two extreme hours of the inequality may be regarded to have steadily and uniformly grown from hour to hour during the twenty-four quiet hours considered. How far of course this assumption of the uniform growth of the change even in quiet-days is justified will be presently examined. Accepting it however for the moment as correct, the mathematical necessity of the application of the correction to the variation, to enable the 0^h and 24^h ordinates to be made equal in value in order to secure a truly cyclic variation comparable to similar cyclic variations from all-days, is of course plainly apparent. This has been done in the quiet-days under examination.

471. The supposition however which is tacitly accepted, namely, that the non-cyclic element progresses uniformly varying with the linear function of time, is of course admittedly empirical. From the progression of the various magnetic phenomena at Colaba already examined it cannot have failed to strike the reader that the day-hours somehow persistently appear to be more susceptible to the influence of the unknown cause or causes which induce the various fluctuations, periodic or aperiodic, in the magnetic elements, than the night-hours. One is hence inclined to suspect that the secular changes also, which are so irregular from day to day, can scarcely progress from hour to hour at a rate which is on the average the same at least for the night as for the day-hours.

Any treatment satisfactorily dealing with this question must obviously necessitate the preparation, entailing heavy labour, of the data of a very large number of years which is of course out of the question with the very limited resources of the computing staff made available for the volume. The quiet-day data, however, which are presumably free from disturbances especially of the years 1900 and 1901, which out of the 55 years considered are known to be least subject to the disturbance effects, offer promising material, scanty though it is, for the examination of the question.

TABLES 412 & 413.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1898 and 1899 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1898. Bombay Civil Time.	January.	February.	March.	April.	May	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	- 38	- 99	-141	-120	- 82	-103	-110	- 47	- 52	- 47	- 61	- 43	- 79
1 19	- 47	- 75	-133	-105	- 91	- 83	-111	- 45	- 25	- 80	- 53	- 67	- 76
2 19	- 48	- 67	-119	-110	- 98	- 81	-111	- 35	- 20	- 78	- 61	- 48	- 74
3 19	- 50	- 58	- 91	- 71	- 96	- 99	-126	- 53	- 35	- 64	- 58	- 15	- 68
4 19	- 52	- 47	- 88	- 88	- 85	-100	-122	- 67	- 30	- 62	- 51	- 15	- 67
5 19	- 29	- 41	- 71	- 89	- 90	-122	-109	- 58	- 36	- 63	- 35	- 39	- 66
6 19	+ 5	- 21	- 59	- 88	- 78	- 76	- 77	- 40	- 62	- 69	- 27	- 23	- 51
7 19	+ 58	- 2	- 15	- 36	- 15	- 14	- 6	- 19	-116	- 55	+ 20	+ 17	- 15
8 19	+104	+ 57	+ 83	+ 83	+ 95	+ 81	+ 71	+ 27	- 76	+ 6	+107	+ 35	+ 55
9 19	+146	+124	+179	+214	+208	+181	+152	+113	+ 48	+123	+176	+ 78	+145
10 19	+163	+182	+248	+313	+267	+267	+237	+167	+137	+183	+231	+119	+209
11 19	+159	+215	+313	+326	+284	+293	+265	+188	+183	+243	+210	+139	+235
12 19	+ 86	+197	+290	+259	+238	+263	+261	+190	+176	+221	+139	+123	+204
13 19	+ 26	+146	+210	+186	+167	+235	+214	+147	+158	+144	+ 62	+ 54	+145
14 19	- 15	+ 67	+127	+118	+ 84	+167	+153	+ 86	+102	+ 66	- 1	+ 22	+ 82
15 19	- 24	+ 14	+ 37	+ 62	0	+ 78	+ 70	+ 19	+ 31	- 9	- 58	+ 14	+ 19
16 19	- 47	- 19	- 11	+ 12	- 66	- 24	- 8	- 27	- 18	- 40	- 49	- 36	- 27
17 19	- 56	- 13	- 43	- 59	- 85	- 86	- 62	- 55	- 26	- 34	- 53	- 36	- 50
18 19	- 57	- 35	- 95	-123	- 98	-141	- 89	- 66	- 49	- 29	- 61	- 42	- 74
19 19	- 63	- 74	- 99	-132	- 99	-141	- 97	- 94	- 76	- 60	- 77	- 48	- 88
20 19	- 58	- 95	-110	-153	-100	-137	-102	-110	- 57	- 81	- 94	- 65	- 97
21 19	- 49	-121	-131	-145	- 99	-128	- 97	- 86	- 59	- 83	- 90	- 56	- 96
22 10	- 60	-120	-142	-132	- 88	-117	-107	- 76	- 61	- 84	- 73	- 39	- 91
23 19	- 57	-107	-141	-129	- 83	-106	- 96	- 65	- 47	- 51	- 53	- 37	- 81
Range ...	226	336	455	479	384	434	391	300	299	327	325	206	332

1899. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	Dcember.	Year.
H. m.													
0 19	- 59	- 44	-125	-101	- 78	- 78	- 92	- 63	- 46	- 70	- 79	- 75	- 76
1 19	- 42	- 66	- 97	- 88	-102	- 72	-111	- 72	- 59	- 68	- 80	- 74	- 78
2 19	- 32	- 55	- 94	- 90	-108	- 77	-117	- 77	- 70	- 48	- 88	- 58	- 76
3 19	- 53	- 67	- 87	- 91	- 99	- 80	-120	- 71	- 62	- 58	- 74	- 61	- 77
4 19	- 42	- 63	- 93	- 86	- 80	- 79	-118	- 70	- 51	- 50	- 84	- 64	- 74
5 19	- 33	- 36	- 88	-105	- 83	- 83	-104	- 73	- 48	- 62	- 68	- 47	- 69
6 19	- 18	- 48	- 85	- 91	- 55	- 50	- 65	- 44	- 61	- 63	- 39	- 37	- 55
7 19	+ 10	- 45	- 36	- 64	+ 6	+ 24	+ 1	+ 29	- 83	- 40	+ 31	+ 36	- 11
8 19	+ 34	- 28	+ 97	+ 63	+131	+109	+ 90	+133	- 39	+ 21	+116	+ 87	+ 68
9 19	+ 60	+ 25	+239	+185	+229	+190	+179	+230	+ 66	+110	+195	+135	+154
10 19	+120	+108	+321	+273	+255	+246	+253	+138	+198	+254	+173	+219	
11 19	+154	+189	+349	+275	+279	+265	+262	+242	+188	+272	+249	+183	+242
12 19	+142	+186	+296	+227	+241	+199	+263	+195	+192	+226	+170	+158	+208
13 19	+110	+148	+175	+183	+176	+146	+207	+118	+149	+125	+ 74	+119	+144
14 19	+ 64	+ 71	+105	+135	+ 93	+ 72	+145	+ 46	+ 79	+ 42	+ 20	+ 64	+ 78
15 19	+ 40	+ 33	+ 27	+ 70	+ 5	- 14	+ 71	- 17	+ 14	- 15	- 19	+ 5	+ 17
16 19	- 13	+ 11	- 57	+ 13	- 84	- 75	+ 3	- 71	- 37	- 36	- 57	- 25	- 36
17 19	- 49	- 5	- 83	- 51	- 97	- 94	- 64	-106	- 42	- 30	- 68	- 57	- 62
18 19	- 48	- 33	-100	- 83	-114	-106	-117	-114	- 24	- 47	- 70	- 62	- 76
19 19	- 53	- 29	-115	-104	-116	- 99	-116	-102	- 29	- 61	- 72	- 81	- 81
20 19	- 77	- 63	-129	-130	-123	- 99	-119	-107	- 39	- 85	- 69	- 89	- 93
21 19	- 87	- 58	-139	-122	-114	- 90	-119	-103	- 41	- 91	- 77	- 85	- 94
22 19	- 69	- 63	-134	-119	- 92	- 87	-111	- 90	- 42	- 83	- 83	- 81	- 87
23 19	- 67	- 62	-141	- 98	- 91	- 80	- 91	- 60	- 44	- 79	- 81	- 73	- 84
Range ...	241	256	490	405	408	371	383	367	277	363	342	272	336

TABLES 414 & 415.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1900 and 1901 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1900. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	- 63	- 70	- 107	- 97	- 95	- 85	- 107	- 79	- 99	- 93	- 81	- 88	- 89
1 19	- 67	- 74	- 98	- 101	- 98	- 75	- 106	- 83	- 99	- 92	- 77	- 82	- 87
2 19	- 60	- 65	- 107	- 93	- 91	- 80	- 113	- 74	- 99	- 99	- 79	- 64	- 85
3 19	- 66	- 75	- 108	- 87	- 94	- 88	- 108	- 70	**- 102**	**- 107**	- 77	- 70	- 88
4 19	- 49	- 35	- 115	- 83	- 97	- 90	- 98	- 71	- 89	- 97	- 76	- 53	- 80
5 19	- 32	- 40	- 103	- 73	- 92	**- 93**	- 101	- 56	- 89	- 100	- 61	- 50	- 74
6 19	- 24	- 24	- 91	- 69	- 71	- 60	- 92	- 44	96	- 80	- 27	- 34	- 59
7 19	+ 23	- 26	- 37	- 45	- 17	+ 8	- 28	- 16	- 67	- 38	+ 55	+ 55	- 11
8 19	+ 37	+ 57	+ 71	+ 37	+ 104	+ 61	+ 80	+ 60	+ 10	+ 51	+ 138	+ 127	+ 69
9 19	+ 78	+ 130	+ 196	+ 174	+ 213	+ 118	+ 198	+ 157	+ 136	+ 170	+ 195	+ 168	+ 161
10 19	+ 129	+ 194	+ 291	+ 252	**+ 295**	+ 193	+ 307	+ 230	+ 248	+ 273	**+ 236**	+ 195	+ 238
11 19	+ 173	**+ 228**	**+ 307**	**+ 277**	+ 287	+ 231	**+ 340**	**+ 249**	**+ 280**	**+ 330**	+ 219	**+ 197**	**+ 260**
12 19	**+ 191**	+ 211	+ 268	+ 245	+ 230	**+ 240**	+ 311	+ 214	+ 260	+ 292	+ 143	+ 143	+ 229
13 19	+ 138	+ 133	+ 186	+ 192	+ 176	+ 205	+ 254	+ 133	+ 204	+ 184	+ 58	+ 81	+ 162
14 19	+ 72	+ 35	+ 102	+ 115	+ 116	+ 116	+ 123	+ 66	+ 120	+ 64	+ 11	+ 28	+ 80
15 19	+ 29	- 11	+ 41	+ 36	+ 47	+ 21	+ 21	+ 11	+ 47	- 6	- 20	- 9	+ 18
16 19	0	- 25	- 24	- 11	- 14	- 49	- 64	- 48	- 12	- 38	- 40	- 43	- 30
17 19	- 37	- 50	- 52	- 38	- 72	- 75	- 106	- 64	- 47	- 53	- 57	- 54	- 50
18 19	- 50	- 70	- 71	- 81	+ 121	- 88	- 123	- 78	- 60	- 77	- 62	- 67	- 79
19 19	- 77	- 83	- 96	- 96	**- 135**	- 84	- 122	- 85	- 77	90	- 71	- 69	- 91
20 19	- 79	**- 91**	- 109	- 108	- 122	- 78	**- 123**	- 93	- 93	- 96	- 76	- 72	- 95
21 19	- 95	- 81	**- 125**	**- 121**	- 125	- 83	- 113	**- 94**	- 96	- 102	**- 88**	- 76	- 100
22 19	**- 98**	- 85	- 123	- 111	- 120	- 87	- 120	- 92	**- 102**	- 105	- 83	- 79	**- 101**
23 19	- 75	- 88	- 107	- 107	- 98	- 88	- 114	- 82	- 90	- 95	- 84	**- 89**	- 93
Range ...	289	319	432	398	430	333	463	343	382	437	324	286	361

1901. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	- 73	- 76	- 105	- 113	- 81	- 81	- 66	- 41	- 62	- 61	- 61	- 65	- 74
1 19	- 63	**- 86**	- 100	- 119	- 76	- 82	- 71	- 43	- 68	- 57	- 64	- 59	- 74
2 19	- 56	- 86	- 101	- 130	- 70	- 77	- 72	- 51	- 63	- 56	- 57	- 50	- 73
3 19	- 55	- 78	- 86	- 120	- 69	- 78	- 79	- 65	- 61	- 54	- 53	- 35	- 70
4 19	- 43	- 62	- 75	- 113	- 71	- 81	- 81	- 63	- 52	- 53	- 56	- 37	- 66
5 19	- 27	- 58	- 75	- 111	- 72	- 88	- 83	- 52	- 52	- 47	- 45	- 33	- 62
6 19	- 22	- 35	- 67	- 93	- 81	- 59	- 63	- 38	- 61	- 43	- 39	- 14	- 51
7 19	+ 12	- 2	- 25	- 42	- 64	+ 25	- 8	- 5	- 62	- 21	+ 24	+ 41	- 11
8 19	+ 41	+ 66	+ 65	+ 85	+ 9	+ 123	+ 62	+ 47	0	+ 43	+ 99	+ 84	+ 60
9 19	+ 75	+ 150	+ 200	+ 250	+ 135	+ 235	+ 144	+ 102	+ 109	+ 137	+ 159	+ 126	+ 152
10 19	+ 124	+ 206	+ 292	+ 354	+ 228	**+ 296**	+ 196	+ 154	+ 191	+ 213	+ 201	**+ 154**	+ 218
11 19	**+ 158**	**+ 227**	**+ 300**	**+ 369**	**+ 294**	+ 284	**+ 229**	**+ 164**	**+ 211**	**+ 243**	**+ 203**	+ 136	**+ 235**
12 19	+ 136	+ 180	+ 228	+ 305	+ 259	+ 232	+ 223	+ 152	+ 195	+ 197	+ 151	+ 108	+ 197
13 19	+ 103	+ 105	+ 146	+ 214	+ 183	+ 151	+ 180	+ 108	+ 137	+ 115	+ 71	+ 67	+ 131
14 19	+ 90	+ 60	+ 66	+ 110	+ 99	+ 56	+ 103	+ 70	+ 72	+ 28	+ 10	+ 18	+ 65
15 19	+ 42	+ 23	+ 16	+ 14	+ 28	- 31	+ 22	+ 25	+ 18	- 19	- 24	- 14	+ 9
16 19	- 21	- 17	- 17	- 49	- 39	- 89	- 51	- 25	- 34	- 43	- 48	- 15	- 37
17 19	- 25	- 46	- 48	- 80	- 62	- 109	- 75	- 53	- 46	- 53	- 58	- 25	- 57
18 19	- 55	- 73	- 87	- 103	- 82	**- 123**	- 94	**- 74**	- 55	- 73	- 67	- 50	- 78
19 19	- 57	- 79	- 99	- 131	- 95	- 118	**- 95**	- 72	- 59	- 77	- 70	- 52	- 84
20 19	- 56	- 83	- 98	**- 136**	**- 97**	- 117	- 92	- 70	- 64	**- 90**	- 75	- 58	- 86
21 19	- 64	- 84	- 111	- 133	- 96	- 102	- 91	- 65	- 66	- 86	**- 76**	- 68	**- 87**
22 19	**- 81**	- 80	**- 119**	- 129	- 91	- 93	- 80	- 61	**- 72**	- 72	- 70	**- 79**	- 85
23 19	- 75	- 80	- 107	- 110	- 85	- 87	- 67	- 47	- 64	- 63	- 63	- 75	- 77
Range ...	239	313	419	505	391	419	324	238	283	333	279	233	322

TABLES 416 & 417.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1902 and 1903 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1902.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 45	− 83	− 85	− 93	−102	− 85	− 65	− 74	− 91	− 74	− 75	− 68	− 78
1 19	− 43	− 84	− 94	**− 96**	− 95	− 96	− 71	− 74	− 87	− 75	− 82	− 58	− 79
2 19	− 47	− 73	− 94	− 86	− 90	− 91	− 73	− 87	− 77	− 75	− 70	− 44	− 75
3 19	**− 50**	− 74	− 90	− 90	− 88	− 98	− 75	− 80	− 75	− 83	− 70	− 57	− 77
4 19	− 43	− 73	− 85	− 85	− 92	− 91	− 74	− 81	− 56	− 86	− 71	− 59	− 75
5 19	− 43	− 69	− 81	− 89	− 93	− 90	− 72	− 80	− 52	− 76	− 60	− 55	− 71
6 19	− 24	− 64	− 69	− 91	− 74	− 64	− 48	− 65	− 68	− 69	− 39	− 38	− 59
7 19	+ 12	− 29	− 16	− 75	− 32	+ 3	− 25	− 47	**−105**	− 43	+ 32	+ 27	− 25
8 19	+ 40	+ 32	+ 71	+ 5	+ 60	+ 98	+ 34	0	− 72	+ 54	+ 98	+ 89	+ 42
9 19	+ 72	+108	+188	+168	+159	+201	+120	+ 84	+ 78	+168	+154	+154	+138
10 19	+127	+168	+267	+259	+234	+273	+213	+175	+204	+259	**+220**	+202	+217
11 19	**+159**	**+233**	**+284**	**+285**	**+294**	**+290**	**+245**	+221	+263	**+292**	+212	**+214**	**+249**
12 19	+120	+232	+235	+239	+264	+266	+216	**+225**	**+264**	+251	+173	+161	+220
13 19	+ 52	+160	+151	+164	+215	+205	+154	+203	+213	+146	+112	+ 89	+155
14 19	+ 4	+ 92	+ 60	+ 94	+131	+100	+ 73	+137	+133	+ 78	+ 57	+ 19	+ 81
15 19	− 21	+ 29	− 13	+ 40	+ 31	− 14	+ 7	+ 66	+ 43	+ 32	+ 11	− 17	+ 16
16 19	− 20	− 14	− 53	+ 3	− 28	− 76	− 50	− 13	− 9	− 14	− 34	− 51	− 30
17 19	− 11	− 31	− 57	− 40	− 62	−115	− 71	− 49	− 35	− 51	− 70	− 64	− 55
18 19	− 20	− 55	− 69	− 76	− 92	**−116**	**− 81**	− 65	− 52	− 86	− 82	− 72	− 72
19 19	− 34	− 67	− 80	− 87	−106	−101	− 72	− 74	− 77	−104	− 78	− 77	− 80
20 19	− 35	− 75	− 85	− 90	−110	−103	− 73	− 80	− 84	−116	− 85	**− 82**	− 85
21 19	− 44	− 85	**− 97**	− 96	**−111**	−103	− 69	− 85	− 92	**−117**	**− 91**	− 73	**− 89**
22 19	− 49	**− 88**	− 96	− 84	−107	− 97	− 70	**− 88**	− 88	−115	− 82	− 70	− 86
23 19	− 50	− 83	− 86	− 89	−107	− 91	− 66	− 77	− 89	−101	− 78	− 70	− 82
Range ...	209	321	381	381	405	406	326	313	369	409	311	296	338

1903.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 56	− 86	−101	−109	− 87	− 84	− 82	− 75	− 43	−101	−112	− 58	− 83
1 19	− 45	− 89	− 97	−127	−101	− 81	− 90	− 73	− 39	− 91	−115	**− 88**	− 87
2 19	− 32	− 90	− 98	−120	−107	− 78	−101	− 71	− 40	− 87	−125	− 64	− 85
3 19	− 30	− 84	− 98	−113	−108	− 77	− 91	− 72	− 32	− 76	−100	− 69	− 79
4 19	− 12	− 77	− 91	−101	**−123**	− 84	− 84	− 62	− 37	− 72	− 79	− 76	− 75
5 19	− 4	− 69	− 86	−104	−123	− 93	− 98	− 58	− 33	−101	− 65	− 63	− 75
6 19	+ 13	− 49	− 81	− 95	−112	− 75	− 68	− 52	− 74	−100	− 38	− 54	− 66
7 19	+ 18	+ 5	− 25	− 32	− 29	− 12	− 34	− 17	**−146**	− 58	+ 18	+ 2	− 26
8 19	+ 13	+ 90	+ 82	+ 94	+101	+ 68	+ 38	+ 33	− 95	+ 46	+103	+ 64	+ 53
9 19	+ 61	+196	+185	+241	+242	+173	+130	+122	+ 28	+160	+231	+118	+157
10 19	+128	+246	+272	**+347**	+300	+255	+235	+180	+136	+232	+313	+164	+234
11 19	**+134**	**+269**	**+315**	+345	**+303**	**+288**	+266	**+213**	**+185**	**+318**	**+347**	**+189**	**+264**
12 19	+105	+230	269	+264	+270	+247	**+273**	+188	+168	+286	+255	+175	+227
13 19	+ 74	+168	+165	+194	+194	+200	+234	+162	+157	+208	+166	+129	+171
14 19	+ 28	+ 74	+ 81	+ 99	+ 98	+ 96	+150	+108	+112	+108	+ 56	+ 66	+ 90
15 19	− 6	+ 7	+ 9	+ 21	+ 6	− 3	+ 65	+ 33	+ 45	+ 18	− 20	+ 24	+ 16
16 19	− 45	− 62	− 44	− 39	− 38	− 68	− 40	− 15	+ 17	− 37	− 70	− 11	− 38
17 19	− 37	− 79	− 59	− 75	− 78	−111	− 90	− 46	+ 3	− 59	− 83	− 61	− 65
18 19	− 44	− 81	− 72	− 98	− 89	**−112**	−109	− 70	− 20	− 72	− 85	− 57	− 76
19 19	− 38	− 89	− 88	−111	−110	− 92	**−122**	− 92	− 67	−107	−102	− 58	− 89
20 19	**− 61**	−105	−106	−123	−110	− 91	−110	− 90	− 68	**−125**	−111	− 70	− 98
21 19	− 59	−106	**−118**	**−130**	−111	− 90	− 98	**− 92**	− 67	−111	**−138**	− 68	**− 99**
22 19	− 47	**−111**	−118	−122	−103	− 94	− 93	− 77	− 57	− 93	−127	− 68	− 92
23 19	− 58	− 97	−103	−109	− 84	− 81	− 83	− 75	− 44	− 96	−118	− 67	− 84
Range ...	195	380	433	477	426	400	395	305	331	443	485	277	363

TABLES 418 & 419—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each month of the years 1904 and 1905 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1904.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 58	− 63	− 157	− 128	− 122	− 100	− 116	− 83	− 81	− 106	− 99	− 77	− 99
1 19	− 79	− 51	− 143	− 132	− 129	− 94	− 110	− 92	− 80	− 95	− 91	− 75	− 97
2 19	− **82**	− 54	− 158	− 130	− 131	− 86	− 115	− 88	− 70	− 89	− 88	− 90	− 98
3 19	− 81	− 33	− 146	− 125	− 123	− 84	− 107	− 81	− 63	− 89	− 88	− 71	− 90
4 19	− 56	− 39	− 152	− 121	− 122	− 97	− 108	− 91	− 78	− 80	− 88	− 61	− 91
5 19	− 45	− 41	− 135	− 107	− 103	− 98	− 104	− 82	− 77	− 69	− 85	− 48	− 82
6 19	− 39	− 46	− 125	− 96	− 69	− 37	− 89	− 83	− 98	− 73	− 63	− 14	− 70
7 19	− 18	− 32	− 45	− 34	− 4	+ 43	− 28	− 91	− **129**	− 30	+ 15	+ 42	− 26
8 19	+ 18	+ 6	+ 89	+ 101	+ 119	+ 131	+ 50	− 34	− 68	+ 58	+ 124	+ 139	+ 61
9 19	+ 78	+ 78	+ 260	+ 267	+ 241	+ 205	+ 152	+ 119	+ 102	+ 188	+ 258	+ 216	+ 180
10 19	+ 170	+ 146	+ 380	+ 372	+ 331	+ 260	+ 257	+ 244	+ 217	+ 266	+ 337	+ **271**	+ 271
11 19	+ **230**	+ **191**	+ **448**	+ **373**	+ **343**	+ **283**	+ 319	+ 286	+ **327**	+ **332**	+ **339**	+ 257	+ **310**
12 19	+ 205	+ 185	+ 399	+ 329	+ 279	+ 266	+ **333**	+ **293**	+ 303	+ 307	+ 251	+ 184	+ 278
13 19	+ 143	+ 122	+ 260	+ 225	+ 192	+ 238	+ 307	+ 220	+ 229	+ 215	+ 131	+ 85	+ 197
14 19	+ 59	+ 61	+ 126	+ 105	+ 101	+ 110	+ 197	+ 124	+ 120	+ 114	+ 36	+ 1	+ 96
15 19	+ 1	− 6	+ 24	+ 10	+ 32	− 2	+ 73	+ 51	+ 26	+ 24	− 48	− 42	+ 12
16 19	− 55	− 26	− 43	− 63	− 40	− 86	+ 49	− 14	− 32	− 41	− 93	− 92	− 44
17 19	− 61	− 38	− 79	− 88	− 77	− 128	− 127	− 43	− 59	− 87	− 94	− **117**	− 83
18 19	− 40	− 45	− 103	− 103	− 97	− **129**	− **152**	− 66	− 85	− 97	− 88	− 71	− 89
19 19	− 58	− 47	− 119	− 116	− 112	− 121	− 151	− 86	− 82	− 106	− 105	− 72	− 98
20 19	− 56	− 58	− 124	− 130	− 125	− 123	− 141	− 101	− 88	− **148**	− 124	− 89	− 109
21 19	− 66	− **79**	− 142	− **145**	− 115	− 126	− 138	− 98	− 92	− 143	− **130**	− 103	− **115**
22 19	− 60	− 77	− **165**	− 131	− **136**	− 119	− 133	− **107**	− 79	− 144	− 111	− 88	− 113
23 19	− 54	− 57	− 163	− 145	− 129	− 100	− 130	− 97	− 71	− 117	− 107	− 79	− 104
Range ...	312	270	613	518	479	412	485	400	456	480	469	388	425

1905	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 94	− 127	− 136	− 151	− 105	− 135	− 152	− 146	− 73	− 85	− 151	− 82	− 129
1 19	− 71	− 124	− **153**	− 156	− 113	− 138	− **156**	− 138	− 88	− 99	− 124	− 81	− 120
2 19	− 42	− 33	− 133	− **161**	− 93	− 139	− 151	− 127	− **107**	− 83	− 130	− 94	− 108
3 19	− 42	− 24	− 142	− 154	− 90	− 154	− 144	− 132	− 68	− 111	− 124	− 92	− 106
4 19	− 20	− 49	− 144	− 151	− 99	− **158**	− 148	− 133	− 63	− 108	− 112	− 71	− 105
5 19	− 25	− 48	− 141	− 144	− 107	− 133	− 137	− 140	− 65	− 109	− 92	− 64	− 100
6 19	− 4	− 40	− 134	− 131	− 93	− 87	− 113	− 127	− 99	− **144**	− 41	− 37	− 85
7 19	+ 59	− 18	− 58	− 103	− 57	+ 11	− 25	− 43	− 96	− 112	+ 35	+ 29	− 32
8 19	+ 88	+ 47	+ 91	+ 32	+ 20	+ 108	+ 75	+ 105	− 12	− 28	+ 154	+ 82	+ 64
9 19	+ 96	+ 144	+ 253	+ 231	+ 124	+ 241	+ 202	+ 251	+ 131	+ 111	+ 256	+ 145	+ 182
10 19	+ 129	+ 202	+ 399	+ 350	+ 226	+ 345	+ 324	+ 323	+ 236	+ 247	+ 349	+ 215	+ 279
11 19	+ **166**	+ **262**	+ **434**	+ **393**	+ **295**	+ **390**	+ **405**	+ **350**	+ **251**	+ **348**	+ **366**	+ **255**	+ **326**
12 19	+ 145	+ 253	+ 349	+ 345	+ 277	355	+ 371	+ 335	+ 241	+ 312	+ 311	+ 198	+ 291
13 19	+ 113	+ 177	+ 253	+ 277	+ 224	+ 307	+ 330	+ 271	+ 163	+ 200	+ 188	+ 123	+ 219
14 19	+ 42	+ 104	+ 133	+ 189	+ 178	+ 188	+ 233	+ 181	+ 89	+ 105	+ 79	+ 59	+ 131
15 19	+ 11	+ 44	+ 22	+ 90	+ 111	+ 56	+ 85	+ 97	+ 29	+ 27	+ 11	+ 20	+ 50
16 19	− 7	− 11	− 50	+ 6	+ 23	− 61	− 33	+ 10	+ 4	− 32	− 47	− 48	− 21
17 19	− 42	− 39	− 75	− 44	− 57	− 121	− 99	− 82	− 20	− 31	− 78	− 70	− 63
18 19	− 63	− 37	− 89	− 90	− 115	− 154	− 137	− 128	− 36	− 25	− 93	− 56	− 86
19 19	− 57	− 74	− 115	− 102	− 121	− 156	− 140	− 137	− 65	− 49	− 115	− 69	− 100
20 19	− 83	− 122	− 152	− 120	− **128**	− 140	− 145	− 135	− 81	− 70	− 144	− 89	− 117
21 19	− 109	− 160	− 152	− 139	− 103	− 148	− 143	− 146	− 88	− 100	− 154	− 84	− 127
22 19	− 85	− **189**	− 139	− 140	− 102	− 146	− 153	− **159**	− 93	− 94	− 170	− **98**	− **131**
23 19	− **110**	− 145	− 122	− 136	− 103	− 141	− 145	− 157	− 74	− 92	− **177**	− 91	− 124
Range ...	276	451	587	554	423	548	561	509	358	462	543	353	457

TABLE 420.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean, 1894 to 1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 19	−151	**−146**	−128	− 98	− 86	− 77	− 94	− 74	− 85	− 80	−105	−127	−102
1 19	−153	−141	**−133**	−109	− 76	− 83	− 94	− 76	− 86	− 85	−106	**−132**	−104
2 19	−152	−137	−127	−104	− 76	− 89	− 92	− 77	− 84	− 86	−103	−129	−102
3 19	**−154**	−139	−128	− 99	− 80	− 87	− 92	− 78	− 84	− 82	− 97	−124	−102
4 19	−150	−141	−125	− 90	− 82	− 80	− 88	− 77	− 80	− 82	−103	−125	−100
5 19	−145	−131	−118	− 88	− 84	− 82	− 84	− 76	− 79	− 85	− 95	−121	− 97
6 19	−112	−106	− 99	− 69	− 70	− 61	− 72	− 66	− 68	− 79	− 78	−109	− 80
7 19	− 56	− 39	− 45	− 21	− 35	− 15	− 27	− 26	− 47	− 45	− 40	− 52	− 36
8 19	+ 68	+ 77	+ 54	+ 63	+ 46	+ 81	+ 59	+ 54	+ 21	+ 39	+ 49	+ 55	+ 56
9 19	+233	+223	+187	+166	+153	+180	+166	+163	+134	+156	+181	+197	+177
10 19	+373	+341	+296	+255	+231	+242	+254	+237	+227	+242	+280	+300	+271
11 19	**+398**	**+397**	**+337**	**+288**	**+257**	**+252**	**+277**	**+258**	**+266**	**+266**	**+322**	**+348**	**+302**
12 19	+374	+373	+318	+269	+231	+219	+250	+228	+246	+235	+300	+321	+277
13 19	+281	+297	+249	+210	+184	+163	+194	+162	+192	+190	+235	+261	+214
14 19	+175	+172	+157	+128	+118	+ 95	+109	+ 85	+111	+110	+126	+176	+126
15 19	+ 68	+ 56	+ 61	+ 48	+ 43	+ 21	+ 30	+ 12	+ 30	+ 28	+ 32	+ 78	+ 39
16 19	− 21	− 39	− 13	− 22	− 21	− 42	− 33	− 47	− 29	− 30	− 30	− 8	− 30
17 19	− 83	− 95	− 63	− 73	− 62	− 76	− 68	− 70	− 62	− 66	− 87	− 70	− 73
18 19	−100	−120	− 84	−100	− 94	− 93	− 91	− 88	− 81	− 84	−106	−109	− 95
19 19	−114	−135	−100	−108	−106	− 94	− 99	− 95	− 87	**− 99**	−111	−120	−104
20 19	−134	−142	−119	**−116**	**−110**	**−103**	−103	**− 96**	− 89	− 98	−118	−125	−112
21 19	−148	−142	−128	−115	−103	− 99	**−105**	− 92	**− 92**	− 98	**−119**	−127	**−113**
22 19	−151	−144	−131	−112	− 97	− 90	−105	− 88	− 89	− 91	−117	−132	−110
23 19	−144	−142	−121	−104	− 88	− 78	− 96	− 77	− 87	− 79	−112	−125	−103
Range ...	552	543	470	404	367	355	382	354	358	365	441	480	415

TABLE 421.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean 1894 to 1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 19	−141	−104	−115	− 99	− 71	− 75	− 84	− 74	− 71	− 85	− 93	−112	− 92
1 19	−141	−110	− 98	−105	− 75	− 71	− 81	− 71	− 72	− 87	− 89	−109	− 91
2 19	−137	−105	− 93	− 99	− 70	− 62	− 78	− 67	− 67	− 82	− 94	− 86	− 87
3 19	−135	−109	−101	− 97	− 56	− 67	− 84	− 60	− 71	− 76	− 85	− 89	− 86
4 19	−137	−104	− 93	− 89	− 53	− 66	− 70	− 55	− 70	− 68	− 79	− 84	− 80
5 19	−133	− 91	− 80	− 86	− 46	− 55	− 64	− 47	− 64	− 65	− 71	− 80	− 73
6 19	−103	− 60	− 66	− 64	− 32	− 49	− 46	− 36	− 50	− 51	− 60	− 61	− 56
7 19	− 43	+ 7	− 7	− 10	+ 4	− 8	+ 6	+ 5	− 3	− 6	− 11	− 11	− 6
8 19	+ 75	+125	+ 88	+ 87	+ 66	+ 54	+ 80	+ 66	+ 64	+ 67	+ 72	+ 72	+ 77
9 19	+205	+236	+190	+185	+137	+127	+156	+141	+140	+158	+180	+167	+169
10 19	+328	+310	+282	+272	+188	+196	+220	+199	+207	+226	+262	+257	+245
11 19	**+380**	**+330**	**+311**	**+311**	**+213**	**+232**	**+243**	**+211**	**+232**	**+262**	**+299**	**+305**	**+275**
12 19	+345	+275	+274	+262	+176	196	+208	+167	+195	+220	+255	+261	+234
13 19	+241	+170	+185	+165	+107	+125	+130	+101	+118	+152	+159	+176	+150
14 19	+132	+ 81	+ 94	+ 69	+ 44	+ 61	+ 52	+ 45	+ 52	+ 69	+ 66	+ 87	+ 70
15 19	+ 63	− 4	+ 12	+ 7	− 4	+ 12	+ 4	+ 4	+ 4	+ 6	− 8	+ 23	+ 9
16 19	− 19	− 66	− 50	− 33	− 34	− 29	− 29	− 27	− 31	− 45	− 58	− 33	− 38
17 19	− 61	− 88	− 65	− 55	− 39	− 48	− 51	− 43	− 46	− 63	− 79	− 56	− 58
18 19	− 74	−103	− 79	− 79	− 53	− 60	− 66	− 68	− 64	− 69	− 74	− 61	− 72
19 19	−102	−111	− 97	− 99	− 70	− 69	− 81	− 73	− 73	− 80	− 84	− 80	− 85
20 19	−122	−119	−116	−108	− 83	− 85	− 88	− 76	− 79	− 96	−100	−110	− 97
21 19	−135	**−125**	−126	**−114**	**− 89**	**− 89**	− 94	− 82	**− 84**	**−100**	**−110**	−126	**−104**
22 19	−140	−121	**−134**	−113	− 86	− 85	**− 96**	**− 84**	− 84	− 95	−107	**−129**	−104
23 19	**−145**	−108	−123	−105	− 75	− 84	− 90	− 78	− 78	− 90	− 96	−123	− 97
Range ...	525	455	445	425	302	321	339	295	316	362	409	434	379

TABLE 422.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each average month and year of the maximum sun-spot years 1894, 1895, 1905.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	−104	−129	−146	−146	−145	−152	**−155**	**−150**	− 96	−115	−132	− 88	−130
1 19	−107	−132	**−161**	**−157**	−143	−148	−132	−147	−122	−123	−108	− 89	−130
2 19	− 95	− 97	−143	−153	−140	−156	−135	−139	−112	−111	−121	− 96	−124
3 19	− 98	− 96	−144	−157	−143	−162	−130	−138	−100	−117	−129	− 84	−124
4 19	− 97	− 86	−144	−151	**−147**	−157	−132	−142	−101	−120	−127	− 76	−123
5 19	− 91	− 81	−137	−145	−135	−152	−121	−133	−104	−124	−108	− 67	−116
6 19	− 51	− 61	−128	−128	− 93	−102	− 93	−110	**−126**	−114	− 57	− 38	− 91
7 19	+ 7	− 27	− 50	− 76	− 41	+ 2	− 5	− 55	−123	− 90	+ 35	+ 29	− 33
8 19	+ 81	+ 87	+ 98	+ 52	+100	+117	+ 95	+ 65	− 27	+ 13	+154	+110	+ 79
9 19	+153	+193	+265	+245	+230	+269	+222	+207	+137	+164	+265	+177	+211
10 19	+221	+271	+399	+376	+340	+395	+336	+316	+268	+311	+351	+238	+312
11 19	**+266**	**+321**	**+434**	**+410**	**+375**	**+441**	**+387**	**+358**	**+317**	**+386**	**+378**	**+247**	**+360**
12 19	+225	+305	+377	+364	+349	+408	+361	+349	+309	+359	+299	+199	+326
13 19	+158	+219	+270	+271	+274	+326	+292	+281	+239	+225	+177	+123	+238
14 19	+ 83	+114	+143	+148	+174	+201	+185	+199	+144	+113	+ 79	+ 66	+137
15 19	+ 36	+ 42	+ 35	+ 52	+ 71	+ 56	+ 62	+ 99	+ 66	+ 27	+ 4	+ 19	+ 47
16 19	− 13	− 54	− 41	− 7	− 18	− 66	− 49	− 3	+ 9	− 26	− 56	− 45	− 31
17 19	− 42	− 75	− 87	− 51	− 69	−145	−115	− 85	− 30	− 50	− 91	− 67	− 75
18 19	− 54	− 76	−110	− 81	−105	**−180**	−137	−110	− 44	− 48	−107	− 79	− 94
19 19	− 66	− 93	−127	−108	−122	−165	−139	−119	− 80	− 83	−124	− 92	−110
20 19	− 86	−119	−148	−130	−134	−159	−147	−131	− 99	−103	−148	− 99	−125
21 19	**−112**	−135	−155	−148	−127	−165	−147	−131	−114	−123	−142	**−103**	−134
22 19	−105	−147	−159	−139	−135	−162	−154	−140	−120	**−124**	−146	− 99	**−136**
23 19	−106	**−148**	−140	−140	−139	−150	−152	−140	− 99	−123	**−147**	− 87	−131
Range ...	378	469	595	567	522	621	542	508	443	510	525	350	496

TABLE 423.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each average month and year of the minimum sun-spot years 1899 to 1902.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	− 60	− 69	−105	−101	− 89	− 82	− 83	− 65	− 75	− 78	− 74	− 74	− 79
1 19	− 54	− 77	− 97	−101	− 93	− 81	− 89	− 67	− 78	− 76	− 75	− 68	− 80
2 19	− 48	− 69	− 99	− 99	− 90	− 81	− 94	− 72	− 77	− 72	− 73	− 53	− 78
3 19	− 56	− 73	− 93	− 96	− 87	− 86	− 96	− 71	− 74	− 79	− 68	− 56	− 78
4 19	− 44	− 59	− 92	− 92	− 85	− 85	− 92	− 71	− 62	− 74	− 71	− 53	− 74
5 19	− 34	− 50	− 87	− 94	− 84	− 88	− 90	− 65	− 60	− 74	− 58	− 46	− 70
6 19	− 22	− 42	− 78	− 85	− 71	− 58	− 67	− 47	− 71	− 66	− 35	− 30	− 57
7 19	+ 14	− 25	− 29	− 57	− 27	+ 15	− 14	− 9	**− 80**	− 39	+ 36	+ 39	− 14
8 19	− 38	+ 31	+ 76	+ 47	+ 75	+ 98	+ 67	+ 60	− 25	+ 39	+113	+ 97	+ 52
9 19	+ 71	+103	+205	+194	+184	+186	+160	+143	+ 97	+143	+176	+145	+151
10 19	+125	+170	+293	+285	+260	+254	+240	+203	+196	+233	**+228**	+181	+222
11 19	**+160**	**+219**	**+310**	**+301**	**+288**	**+267**	**+269**	**+219**	**+235**	**+280**	+221	**+182**	**+246**
12 19	+147	+202	+257	+254	+248	+234	+253	+196	+228	+238	+159	+142	+213
13 19	+101	+136	+165	+188	+187	+177	+198	+141	+176	+140	+ 79	+ 89	+148
14 19	+ 57	+ 64	+ 83	+113	+110	+ 86	+111	+ 80	+100	+ 49	+ 24	+ 32	+ 76
15 19	+ 23	+ 19	+ 18	+ 40	+ 28	− 9	+ 30	+ 21	+ 30	− 5	− 13	− 8	+ 14
16 19	− 14	− 11	− 38	− 11	− 41	− 73	− 41	− 39	− 23	− 36	− 45	− 34	− 34
17 19	− 30	− 33	− 60	− 52	− 73	− 98	− 79	− 68	− 42	− 50	− 63	− 49	− 59
18 19	− 43	− 58	− 82	− 86	−102	**−108**	**−103**	− 83	− 48	− 74	− 71	− 63	− 76
19 19	− 55	− 65	− 97	−104	−113	−101	−101	− 83	− 60	− 86	− 73	− 69	− 83
20 19	− 62	− 77	−105	−116	**−113**	− 99	−102	**− 88**	− 69	− 75	− 76	− 75	− 88
21 19	− 72	− 77	−118	**−119**	−112	− 94	− 97	− 87	− 74	− 77	**− 83**	− 75	**− 90**
22 19	**− 74**	**− 79**	**−118**	−111	−102	− 91	− 95	− 83	− 76	− 72	− 80	**− 78**	− 88
23 19	− 66	− 78	−110	−101	− 95	− 87	− 85	− 67	− 71	**− 88**	− 77	− 77	− 83
Range ...	234	298	428	420	401	375	372	307	315	368	311	280	336

TABLES 424 & 425.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1894 and 1895 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1894. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+20	+12	+17	0	+21	+25	+ 16	+ 54	0	+23	−43	−28	+ 9
1 19	+43	+19	+36	+ 5	+36	+31	+ 32	+ 53	+ 1	+42	−33	0	+22
2 19	0	+17	+30	+13	+48	+33	+ 35	+ 55	+ 7	+18	+10	+30	+24
3 19	+20	+39	+41	+32	+56	+37	+ 26	+ 69	+40	+21	+33	+20	+35
4 19	+71	+51	+56	+26	+61	+46	+ 23	+ 70	+45	+13	+46	+30	+45
5 19	+79	+32	+17	+50	+36	+59	+ 33	+ 72	+45	+47	+62	+30	+47
6 19	+74	+32	+27	+38	+32	+28	+ 39	+ 72	+35	+53	+48	+30	+43
7 19	+75	+23	+21	+ 7	+60	+11	+39	+101	+28	+71	+46	+53	+45
8 19	+44	−25	+27	+28	+11	+51	+ 65	+ 95	+22	+85	+34	+54	+41
9 19	+ 5	−49	− 7	+20	−10	+18	+ 36	+ 63	−11	+55	+11	+55	+16
10 19	−37	+24	−57	−19	−18	−21	+ 17	− 18	0	+29	−34	+56	− 6
11 19	−49	−13	−40	+15	−19	−16	+ 54	− 59	+15	−42	−80	+50	−15
12 19	−64	−18	−24	+20	−40	−37	+ 57	− 72	+27	−77	−50	+43	−19
13 19	−67	−24	−12	+53	−42	−50	+ 52	− 58	+30	−75	−25	+ 9	−17
14 19	−44	+ 9	−10	+32	−32	−67	+ 55	−176	+ 6	−73	−19	−21	−28
15 19	−50	−18	−31	+27	−40	−41	− 7	−154	−11	−64	+21	−45	−34
16 19	−29	− 4	+ 4	+ 1	−25	−47	− 77	−123	−27	−70	+54	−17	−30
17 19	−38	−40	−10	−23	−33	− 6	− 76	− 39	−33	−32	+79	−24	−23
18 19	−32	−17	− 9	−32	−46	+13	−127	− 20	−72	−34	+72	−29	−27
19 19	− 1	−30	+ 9	−50	−42	−23	−117	− 21	−71	− 2	+48	−42	−28
20 19	− 3	+12	−14	−58	−32	−34	− 84	+ 10	−55	− 1	−67	−54	−31
21 19	−13	−14	−30	−62	−16	0	− 39	+ 2	−14	− 7	−92	−71	−29
22 19	− 1	− 8	−16	−70	+ 4	+ 5	− 30	0	−12	− 7	−86	−68	−24
23 19	−12	+ 2	−21	−51	+22	− 8	− 15	+ 17	− 8	+32	−46	−49	−11

1895. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+ 6	− 31	+ 1	− 1	+18	+31	+31	+18	−13	− 1	+11	+13	+ 7
1 19	+70	+ 9	+27	+ 2	− 2	+11	−11	+23	+46	+61	+11	+ 1	+21
2 19	+78	− 4	+16	−10	+ 3	+51	+22	+23	+35	+46	+36	+16	+26
3 19	+61	+ 22	+23	+21	+12	+49	+43	+31	+26	+46	+62	+13	+34
4 19	+58	+ 21	+14	+11	+42	+39	+38	+52	+39	+55	+83	+15	+39
5 19	+56	+ 11	+11	+11	+28	+44	+29	+41	+54	+51	+57	+20	+34
6 19	+40	+ 15	+20	+15	+ 3	+78	+65	+23	+65	+51	+47	+ 9	+36
7 19	−10	+ 44	− 4	+13	+ 8	+50	+11	+25	+57	+33	+31	−22	+20
8 19	−56	+ 14	−17	+56	+21	− 5	−34	+22	+38	+51	+ 9	−69	+ 2
9 19	−86	+ 15	−28	+43	+29	−37	−40	+ 4	+18	+46	−15	−94	−12
10 19	−59	+ 3	−11	+32	+14	−41	−13	− 5	− 3	+27	+20	−81	−10
11 19	−40	+ 26	− 9	+26	− 5	−89	−63	−34	−19	+12	+ 4	−47	−20
12 19	+15	+ 46	− 8	+ 6	−29	−88	−73	−44	−20	−15	+ 6	−18	−18
13 19	+29	+ 34	− 3	−33	−42	−75	−30	−52	−65	−19	+10	+23	−19
14 19	+ 4	+ 29	+ 2	−15	−12	−51	−19	−47	−68	−49	− 6	+42	−16
15 19	− 8	+ 56	−25	+18	−14	−22	−36	−45	−48	−39	− 2	+38	−11
16 19	− 5	+ 84	−35	−17	− 6	+ 9	− 6	−38	−37	−38	−25	+14	− 8
17 19	−38	+ 37	+25	−17	−13	+17	+30	−17	−48	−36	−95	−10	−14
18 19	−20	− 6	+33	−27	− 2	+15	+33	− 6	−38	−64	−77	+12	−12
19 19	−27	− 66	+29	−28	−11	+ 7	− 2	− 2	−27	−49	−74	+26	−19
20 19	−43	− 95	+ 2	−29	−25	0	−18	− 3	−21	−74	−29	+36	−25
21 19	−20	−107	−18	−11	−17	− 6	+ 8	− 3	− 8	−52	−42	+49	−19
22 19	−19	− 84	−46	−48	− 3	+ 2	+13	+23	+14	−13	−18	+15	−14
23 19	+ 6	− 77	−10	−14	− 2	+21	+34	+ 9	+10	−29	+ 8	− 5	− 4

TABLES 426 & 427.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1896 and 1897 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1896.	Month.												Year.
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	+31	+16	+43	+45	+30	0	+29	+18	+25	+25	+15	0	+23
1 19	+33	+20	+37	+83	+62	+29	+29	+21	+ 8	− 1	+47	+26	+33
2 19	+12	+27	+27	+75	+64	+40	−11	+23	+55	+31	+27	+24	+33
3 19	+54	+27	+50	+44	+70	+46	+32	+14	+72	+49	+12	+11	+40
4 19	+33	+25	+50	+55	+53	+10	+25	+24	+78	+42	+18	+ 9	+35
5 19	+37	+16	+39	+45	+57	− 6	+26	+35	+73	+38	+24	+12	+31
6 19	+31	+25	− 2	+44	+75	−12	+19	+28	+71	+40	+37	+11	+24
7 19	+ 8	+38	− 5	+23	+48	− 5	+19	+ 4	+59	+48	+27	+ 2	+22
8 19	+ 5	+44	−18	−29	+24	− 6	+28	+ 3	+61	+11	+11	− 7	+11
9 19	+34	+31	−34	−23	− 2	−22	+38	+17	− 5	−21	− 9	−28	− 2
10 19	+40	+26	−19	−39	−22	−44	+57	+37	−55	−28	−37	−39	−10
11 19	+14	+30	− 8	−45	−37	−29	+34	+31	−53	−25	−42	+ 7	−10
12 19	−18	+20	+26	−42	−23	− 2	− 9	+16	−54	−41	−38	+ 6	−13
13 19	−42	− 9	+17	−58	−35	+43	−33	− 4	−60	−28	−11	+ 5	−18
14 19	−44	−27	− 3	−59	−37	+54	−50	−21	−65	−44	− 8	+15	−24
15 19	−19	−35	−27	−43	−80	+57	−53	−21	−30	−17	+ 9	+14	−20
16 19	−21	−46	−10	−52	−57	+ 8	−60	−28	−36	+16	+21	+12	−21
17 19	−66	−47	−29	−36	−47	−13	−28	−30	−15	+14	+ 2	−14	−26
18 19	−68	−54	−20	−51	−46	−26	−11	−43	−56	−25	−21	−16	−36
19 19	−44	−75	−30	−15	−33	−45	−18	−56	−44	−44	−20	+ 1	−35
20 19	−30	−35	−31	+13	−16	−31	−24	−42	−39	−37	−22	−17	−26
21 19	−19	−26	−39	+23	−15	−11	−27	−19	−21	− 3	− 9	−17	−15
22 19	− 1	+18	−15	+16	−17	−18	−27	+ 4	+13	+ 3	+ 1	− 5	− 2
23 19	+42	−10	+16	+24	− 8	−14	+20	− 7	+12	0	−20	− 3	+ 4

1897.	Month.												Year.
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	+ 4	− 9	−49	+53	0	+15	+ 6	− 8	−10	+ 1	+24	+ 2	+ 2
1 19	+18	− 1	+ 6	+52	+18	+ 9	+26	+ 7	+35	+18	+29	+ 2	+18
2 19	+25	+ 6	+12	+54	+26	+21	+25	+25	+13	+12	+40	+ 8	+22
3 19	+38	− 6	+22	+53	+23	+40	+14	+ 3	+13	+35	+28	+22	+24
4 19	+44	− 4	+12	+53	+47	+28	+12	− 8	+15	+25	+16	+42	+23
5 19	+53	+ 6	+ 2	+51	+54	+36	+11	− 5	+16	+36	+17	+60	+28
6 19	+55	+ 7	+ 2	+49	+40	+23	+ 8	− 7	+16	+27	+15	+64	+25
7 19	+48	+28	+ 3	+26	+42	−11	− 3	− 7	+ 4	+14	−10	+87	+18
8 19	+13	+39	+ 1	−18	+22	−11	−12	−24	+10	−11	−42	+61	+ 2
9 19	− 3	+23	+ 3	−32	+12	−24	−14	−11	+23	−15	−56	+51	− 4
10 19	−32	+12	+ 1	−13	−16	−45	− 6	− 2	+15	+ 8	−55	+ 7	−10
11 19	−56	− 7	+11	−32	−41	−35	−19	+ 5	+31	+22	−39	−10	−14
12 19	−56	+15	+46	−40	−80	−15	−21	+ 5	+26	+12	−36	−28	−14
13 19	−24	+ 8	+61	−36	−49	− 7	−26	− 9	+44	+ 9	−28	−25	− 7
14 19	− 9	+ 6	+46	−31	−27	+ 8	−19	−18	+18	− 5	−11	−22	− 5
15 19	− 6	−13	+17	−71	−10	+ 8	+ 7	− 3	−37	−31	− 2	+ 7	−11
16 19	− 9	−19	−41	−61	0	−11	+15	+ 8	−52	−43	+34	−14	−16
17 19	− 9	−41	−51	−53	−12	− 8	− 4	+29	−46	−32	+42	−45	−19
18 19	−29	− 4	−40	−47	−16	−14	+ 2	+36	−40	−27	+33	−40	−15
19 19	−36	−21	+ 1	−34	− 6	− 9	+ 4	+15	−54	− 9	+ 4	−72	−18
20 19	−28	− 6	− 6	−26	− 9	− 7	− 8	− 8	−38	−17	−18	−62	−19
21 19	− 1	−22	− 4	+ 6	+ 4	− 3	− 9	−12	−18	−24	−12	−75	−14
22 19	+ 5	−10	−46	+36	−13	+12	− 1	− 6	+ 1	− 3	+25	−29	− 2
23 19	+ 1	+16	−18	+62	− 1	+ 9	+ 3	− 8	+ 3	− 9	− 7	− 7	+ 4

TABLES 428 & 429.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1898 and 1899 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1898.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−29	− 8	−11	+10	−21	+ 5	+34	−15	−22	−18	−17	−25	−10
1 19	+ 6	0	−14	− 8	+ 5	− 7	+33	−13	−34	+14	− 8	+ 8	− 1
2 19	+ 4	+ 5	+27	+19	+20	+ 4	+15	−15	−40	+15	+ 8	− 9	+ 4
3 19	+ 6	− 4	+ 3	− 1	+13	+ 7	+43	+ 7	−29	+ 4	+ 8	−40	+ 1
4 19	+13	+ 3	+31	+19	+15	+19	+34	+16	−16	+22	+ 2	−21	+11
5 19	+ 9	− 2	+ 7	+27	+18	+51	+27	+ 4	− 5	+26	− 3	+20	+15
6 19	− 5	+ 1	+49	+16	+27	+47	+26	0	+ 4	+22	+24	+21	+19
7 19	−17	+ 4	+13	+12	+19	+29	+15	−10	+44	+35	+52	+24	+18
8 19	−15	+ 9	+24	− 2	− 6	+12	+ 9	− 4	+57	+60	+45	+57	+20
9 19	+ 2	+19	+31	+15	−40	+ 6	0	+ 1	+48	+51	+37	+68	+20
10 19	+22	+41	+56	−14	−12	− 2	+ 3	− 3	+35	+53	+32	+71	+23
11 19	+26	+56	+38	− 7	0	−13	−12	+ 6	+32	+32	+54	+64	+23
12 19	+56	+72	+20	+ 7	+18	+ 2	−19	− 5	+38	+19	+57	+43	+26
13 19	+53	+28	−38	+ 7	+16	−22	−19	+ 8	− 1	− 7	+53	+27	+ 9
14 19	+49	+24	−32	− 6	+ 8	−43	−29	+26	− 7	−26	+20	+ 6	− 1
15 19	+11	+ 9	−12	−13	+17	−38	−45	+ 8	0	+13	+ 7	−25	− 6
16 19	+ 8	− 7	−12	−37	+15	−42	−52	− 5	− 4	− 5	−36	−23	−17
17 19	− 6	−66	−13	−34	− 4	−27	−47	+ 6	+16	−47	−47	−43	−26
18 19	−19	−38	+ 1	+ 5	−24	− 2	−29	− 3	+28	−75	−53	−31	−20
19 19	−28	−40	−53	−10	−17	+ 1	−11	+ 4	0	−43	−38	−25	−22
20 19	−37	−33	−47	− 6	− 9	− 5	− 5	+12	−49	−18	−31	−26	−21
21 19	−42	−32	−27	− 8	− 8	+ 7	+ 3	+ 7	−20	−40	−59	−38	−21
22 19	−27	−30	−26	− 3	−58	0	−31	− 4	−37	−25	−45	−58	−23
23 19	−30	−22	− 6	+15	+10	+ 5	+ 5	−21	−39	−58	−48	−35	−19

1899.	Month.												
Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+11	+ 2	+28	− 8	+ 4	−16	+34	− 8	− 4	+ 5	−13	+21	+ 5
1 19	−12	+ 19	− 1	− 2	+29	−16	+38	+ 7	+16	+ 9	+ 5	+22	+ 9
2 19	−37	+ 46	+17	− 3	+51	−15	+46	+14	+31	+ 6	+20	+17	+16
3 19	+ 8	+ 51	+42	+11	+40	− 6	+59	+ 8	+29	+ 1	+10	+25	+23
4 19	+17	+ 39	+34	+ 8	+14	−12	+56	+ 5	+22	− 2	+27	+21	+19
5 19	+14	+ 33	+27	+30	+30	+ 5	+33	+10	+15	+13	+26	+24	+22
6 19	+ 1	+ 34	+24	+26	+38	− 2	+27	+ 4	+10	+18	+21	+31	+19
7 19	− 1	+ 50	+25	+28	+17	−18	+13	−23	+30	+11	+20	+ 2	+13
8 19	+ 5	+ 62	−10	− 3	− 7	−20	−14	−52	+35	+18	+10	− 7	+ 1
9 19	+20	+ 79	−22	+ 6	−34	− 2	−12	−78	+65	+21	− 3	− 6	+ 3
10 19	+20	+ 54	−30	+36	−20	+14	+ 1	−45	+51	0	−20	− 4	+ 5
11 19	+ 3	+ 30	−23	+54	−15	+10	+13	+ 1	+26	−25	−11	− 1	+ 5
12 19	− 2	+ 28	−29	+42	−32	+49	−14	+39	+35	−12	+15	− 1	+10
13 19	−14	+ 7	−16	+15	−41	+30	−20	+64	+20	− 3	+29	−31	+ 3
14 19	− 4	− 26	−50	−28	−29	+23	−41	+64	− 5	− 6	+12	−26	−10
15 19	−11	− 59	−51	−33	−36	+14	−58	+36	−34	+15	+ 3	−16	−19
16 19	− 7	−106	−10	−41	− 1	+ 1	−62	+15	−37	+ 1	+ 4	−14	−21
17 19	+ 2	−118	− 6	−54	−18	+ 4	−25	+ 6	−52	−28	− 8	− 7	−25
18 19	−15	− 87	− 9	−56	−24	+ 5	− 8	− 3	−75	−31	−23	−21	−29
19 19	−18	− 60	−11	−37	−16	− 9	−18	−19	−76	−18	−29	−13	−27
20 19	− 3	− 30	+ 1	+ 2	+ 4	−14	−23	−13	−42	0	−25	− 6	−12
21 19	+25	− 22	+ 9	+ 2	+11	− 9	− 6	−14	−32	+11	−33	−22	− 7
22 19	+ 3	− 23	+31	− 1	− 5	−12	− 3	−14	−29	− 3	−21	+ 1	− 6
23 19	0	− 11	+23	+ 4	+20	−11	−10	−13	− 6	−12	−21	+19	− 1

TABLES 430 & 431.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1900 and 1901 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1900. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+27	−15	− 2	− 2	+30	+ 5	− 1	−20	+29	+12	− 5	+18	+ 6
1 19	+11	−12	+ 7	+ 9	+37	− 6	+ 2	− 8	+30	+16	+ 3	+17	+ 9
2 19	+ 4	− 5	+32	+13	+26	−10	+11	−10	+33	+24	− 3	+ 4	+10
3 19	+14	+12	+49	+ 6	+34	− 6	+10	−15	+38	+41	+ 5	+18	+17
4 19	+15	−23	+57	+ 3	+37	− 9	+ 6	−21	+24	+34	+10	+ 4	+11
5 19	+ 8	− 1	+48	− 1	+25	− 4	+11	−29	+22	+39	+ 7	+ 6	+11
6 19	+25	− 9	+52	− 6	+29	− 6	+27	−22	+24	+26	+ 5	+13	+13
7 19	+ 9	+25	+35	−12	+17	− 1	+22	+ 1	0	+14	−13	−14	+ 7
8 19	+36	+11	+14	−20	− 3	+25	− 2	+14	−21	− 5	−12	−32	0
9 19	+31	+15	0	−35	−38	+42	−24	+11	−10	−26	+ 2	−24	− 5
10 19	+30	+16	−11	− 8	−70	+45	−29	+ 6	−33	−40	− 5	−21	−10
11 19	+21	+33	0	+13	−57	+28	−29	+11	−40	−64	+ 8	+ 1	− 6
12 19	−21	+18	−18	+17	−16	+ 2	−26	+31	−34	−54	+20	− 2	− 7
13 19	−14	+22	−38	+ 5	−15	−27	−24	+64	−32	−52	+24	+ 5	− 7
14 19	−15	+33	−38	+ 4	−30	−20	+15	+42	−22	−15	+19	+10	− 1
15 19	−51	+24	−32	+15	−33	−12	+22	+23	−24	+ 2	+ 7	+12	− 4
16 19	−68	−10	−19	+ 5	−32	− 4	+27	+13	−11	+ 1	− 7	0	− 9
17 19	−40	+ 5	−33	−11	−23	− 5	+14	− 5	+ 4	+ 1	− 3	−11	− 9
18 19	−24	− 5	−26	− 2	− 7	− 9	− 4	−17	+ 4	+ 7	−13	− 2	− 8
19 19	− 1	−13	− 8	− 5	+11	−12	0	−21	+ 2	+ 4	−12	− 2	− 5
20 19	−23	−16	− 1	− 1	0	−15	− 2	−14	+ 6	+ 1	−19	0	− 7
21 19	+12	−38	− 8	+ 3	+13	− 3	−16	−13	+ 1	+10	− 9	− 3	− 4
22 19	+ 6	−36	−27	− 1	+27	+ 3	− 1	− 3	+ 8	+14	− 7	+ 1	− 1
3 19	+ 8	−24	−27	+ 5	+30	+10	− 3	− 9	+15	+ 9	+ 1	+14	+ 2

1901. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 7	−20	−15	− 7	− 8	+12	−12	−32	− 4	− 5	− 5	− 8	− 9
1 19	− 7	− 8	−23	+10	+ 2	+ 9	−11	−27	+ 7	− 9	− 3	− 6	− 5
2 19	− 3	− 3	− 3	+29	−12	+ 3	− 9	−20	+11	0	+ 3	− 7	− 1
3 19	− 1	+ 3	− 8	+21	−18	+ 1	0	−11	+18	− 4	+ 1	−12	− 1
4 19	− 7	− 4	−14	+23	−22	+ 1	+ 8	− 9	+ 4	− 5	+11	− 3	− 1
5 19	−13	+ 1	−11	+34	−14	+16	+10	−14	+ 1	−10	+ 8	− 1	+ 1
6 19	− 6	− 1	− 5	+19	+ 5	+ 5	+23	−10	+ 4	−12	+21	− 6	+ 3
7 19	+ 7	+ 3	− 1	− 2	+29	−26	+29	+ 6	− 6	− 2	+13	− 6	+ 4
8 19	+29	+20	+15	−37	+42	−58	+22	+18	−16	+11	+ 9	+ 3	+ 5
9 19	+45	+29	+22	−61	+27	−84	+18	+52	−15	+21	− 3	+17	+ 6
10 19	+36	+22	+12	−55	+14	−77	+34	+64	− 7	+ 1	+ 4	+30	+ 6
11 19	+29	+39	+15	52	−22	−48	+27	+65	+ 8	+10	+ 4	+50	+10
12 19	+24	+44	+31	−25	−20	−21	+10	+68	+12	+15	− 3	+44	+15
13 19	+ 3	+33	+21	− 6	+ 3	+ 9	+ 4	+53	+ 8	+ 1	0	+18	+12
14 19	−30	− 4	+15	− 2	+ 7	+30	+ 1	+15	+ 2	+14	− 2	− 3	+ 4
15 19	−31	−22	− 6	+16	− 5	+29	− 6	− 5	+ 5	+ 3	+ 4	−17	− 3
16 19	− 5	−18	−16	+25	+ 4	+25	−10	−22	+17	− 5	+ 6	−33	− 3
17 19	−22	− 7	− 3	+24	0	+31	−20	−34	+11	− 3	+ 3	−33	− 4
18 19	+ 3	+ 3	+ 8	+14	−10	+32	−17	−29	+ 3	0	− 6	−11	− 1
19 19	− 6	−14	+ 2	+14	− 2	+22	−20	−24	−13	−13	− 6	−21	− 7
20 19	−20	−20	−19	+15	+ 1	+29	−20	−26	−12	− 3	−11	−16	− 8
21 19	−20	−21	− 8	+11	− 3	+20	−17	−29	−19	0	− 8	− 2	− 8
22 19	− 1	−30	− 3	+ 5	+ 3	+21	−12	−20	− 5	− 7	−22	+ 7	− 5
23 19	− 7	−11	− 8	− 1	− 2	+21	−18	−27	− 4	− 6	− 6	+ 9	− 5

TABLES 432 & 433.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1902 and 1903 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1902. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	− 7	− 3	− 8	+ 7	+ 3	+12	+ 6	− 4	+15	−20	+ 8	+ 8	+ 1
1 19	− 8	+ 1	− 4	+10	+15	+24	+ 9	+ 4	+18	−15	+18	− 2	+ 6
2 19	− 3	+12	− 3	+ 7	+21	+24	− 3	+25	+18	− 7	+10	−17	+ 7
3 19	− 2	+ 3	− 1	+21	+14	+30	− 4	+ 3	+22	+13	+19	− 8	+ 9
4 19	+ 1	+13	+ 8	+22	+20	+24	− 2	− 1	+ 7	+18	+20	+ 3	+11
5 19	+15	+20	0	+18	+22	+20	− 4	+ 8	+ 7	+14	+17	+11	+12
6 19	+11	+25	+ 3	+23	+26	+ 7	− 7	− 1	+ 4	+13	+24	+1	+12
7 19	+ 2	+36	− 2	+30	+20	−13	+10	− 1	+25	+ 7	+30	+ 7	+13
8 19	+ 8	+44	+16	+37	−20	−30	+14	+12	+38	− 2	+36	− 5	+12
9 19	+ 9	+44	+31	+17	0	−51	+15	+23	+ 5	−15	+53	−17	+ 9
10 19	+ 8	+18	+40	+23	+ 7	−46	−11	+ 7	−37	−15	+11	−15	− 1
11 19	+15	− 7	+26	− 2	−33	−35	− 8	+ 9	−46	−10	+26	−27	− 8
12 19	+27	−21	+23	+ 5	−39	−31	+ 2	− 4	−43	− 7	+ 3	−22	− 9
13 19	+34	−24	− 4	−11	−46	−30	+ 9	− 8	−34	− 3	−14	− 8	−12
14 19	+33	−26	−18	−29	−42	−16	+21	−25	−34	−23	−35	+15	−15
15 19	+25	−25	−16	−40	− 6	+19	+ 8	−21	− 5	−33	−48	+15	−11
16 19	− 4	−34	−12	−48	− 3	+23	+10	− 7	+ 2	−19	−35	+15	− 9
17 19	−26	−46	−13	−40	− 5	+25	− 2	− 4	+ 9	− 6	−17	+ 2	−10
18 19	−24	−22	−13	−17	− 1	+10	−10	− 2	+ 6	+19	− 8	+12	− 4
19 19	−26	−19	−16	−15	+ 1	+ 3	−21	− 3	+16	+22	−30	+11	− 6
20 19	−36	− 9	−15	−10	− 2	+ 3	−16	−15	+11	+15	−32	+ 7	− 8
21 19	−20	+ 1	−14	− 2	− 4	+ 3	−17	− 2	+ 2	+17	−18	− 1	− 5
22 19	−22	− 1	−10	−11	+ 4	+ 8	− 6	+ 4	− 5	+21	−20	+ 3	− 3
23 19	−20	+ 9	−13	+11	+15	+17	− 1	+ 7	+ 8	+14	−14	0	+ 3

1903. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	−17	+23	− 7	+ 2	− 6	−15	− 6	+ 6	−13	−22	+ 60	−30	− 2
1 19	−25	+24	− 8	+23	+ 1	−11	+ 2	+ 5	+ 2	−13	+ 81	+15	+ 8
2 19	−27	+24	+ 1	+13	+14	−13	+ 8	+15	+10	+13	+ 82	− 2	+11
3 19	−28	+22	+ 6	+18	+22	+ 4	+ 2	+12	0	+44	+ 49	+ 7	+13
4 19	−30	+21	− 3	+24	+32	+ 8	− 4	+17	− 5	+58	+ 46	+35	+17
5 19	−24	+20	−11	+37	+41	+17	+ 9	+21	− 9	+68	+ 26	+25	+18
6 19	−33	+19	+ 3	+39	+38	+18	+14	+17	+19	+50	+ 30	+26	+20
7 19	−14	− 1	−10	+18	+ 8	+ 4	+25	− 1	+70	+48	+ 30	+26	+17
8 19	+34	−12	−13	− 6	−28	− 5	+21	0	+80	+ 1	+ 22	+40	+11
9 19	+41	−37	+10	−16	−66	−15	+11	+ 8	+77	−19	− 19	+25	0
10 19	+36	−48	+19	−25	−47	− 9	+23	+23	+70	+71	− 91	+37	+ 5
11 19	+57	−58	+19	0	− 22	−10	+32	+50	+50	+78	−103	+29	+10
12 19	+49	−51	+10	+24	−11	+13	0	+66	+39	+72	− 74	+14	+13
13 19	+28	−35	+28	+22	+10	+12	−13	+18	−11	+23	− 63	− 2	+ 1
14 19	+19	− 9	+18	+21	+22	+31	− 8	− 7	−44	−43	− 49	+ 4	− 4
15 19	+18	−14	+ 8	− 7	+26	+35	−24	−10	−40	−56	− 21	− 6	− 8
16 19	+26	+11	0	−32	+12	+20	−12	−30	−71	− 8	− 28	−25	−11
17 19	+ 2	+14	−12	−46	+ 3	+21	−11	−51	−66	−73	− 7	− 2	−19
18 19	+ 1	+ 5	−16	−35	−20	+ 1	−13	−47	−56	−93	− 10	− 8	−24
19 19	−28	+ 4	−12	−30	− 3	−23	+ 3	−34	−22	−85	− 7	−31	−22
20 19	−17	+14	− 3	−21	− 3	−38	− 4	−30	−22	−55	+ 5	−43	−18
21 19	−24	+ 9	− 6	−10	− 4	−18	−20	− 10	−21	−57	+ 25	−49	−15
22 19	−33	+20	− 5	− 5	− 2	−26	−25	−16	−13	−41	+ 18	−41	−14
23 19	−17	+20	− 6	− 2	−17	− 8	−11	+ 1	−21	+ 7	+ 12	−41	− 7

TABLES 434 & 435.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each month of the years 1904 and 1905 and for the whole years.*

Unity = 0·1γ = ·000001 C. G. S.

1904. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
H. m.													
0 19	+ 9	−28	+23	+25	+30	− 7	+ 20	−18	− 1	+24	+17	+ 6	+ 8
1 19	+16	−28	+30	+10	+32	− 9	+ 7	0	+ 3	+21	+25	+20	+11
2 19	+41	−32	+45	+16	+32	− 9	+ 4	− 1	+ 6	+28	+27	+37	+16
3 19	+51	−28	+40	+30	+35	−10	0	0	+ 9	+31	+38	+18	+18
4 19	+36	−16	+47	+18	+41	+ 2	− 3	+27	+28	+25	+41	+ 5	+21
5 19	+34	−12	+38	+12	+35	+ 8	− 5	+14	+28	+26	+56	+ 9	+20
6 19	+31	+11	+34	+ 1	+25	−12	+ 6	+26	+18	+27	+56	− 2	+18
7 19	+37	+24	+28	−15	+22	− 5	+ 6	+27	+27	+ 5	+52	+13	+18
8 19	+34	+37	− 4	−17	− 6	+20	+ 20	+31	+34	−10	+23	−13	+12
9 19	+ 5	+56	− 8	−26	−20	+35	+ 30	+ 5	+16	−33	−22	−23	+ 1
10 19	−41	+51	−35	−38	−30	+58	+ 34	−11	− 3	−21	−39	−33	− 9
11 19	−47	+59	−61	−21	−31	+65	+ 12	0	−45	−25	−41	−32	−14
12 19	−36	+42	−68	+ 6	− 5	+43	0	− 5	−34	−38	−33	−20	−12
13 19	−31	+40	−43	− 7	+12	+ 1	− 31	+21	−34	−44	−28	+ 7	−11
14 19	−10	+21	−37	− 4	+ 1	+ 7	− 34	+22	−13	−35	−10	+25	− 6
15 19	− 6	+17	−30	+ 5	−12	− 4	− 42	+20	+ 2	−13	+23	+ 4	− 3
16 19	+19	−16	−13	+ 3	−26	−20	−119	+16	+ 1	− 6	+21	+13	−11
17 19	+ 6	−34	0	− 5	−43	−23	+ 13	− 8	+17	+15	−10	+27	− 4
18 19	− 8	−34	0	−21	−59	−35	+ 24	−15	+13	− 1	−38	−27	−17
19 19	11	−29	− 9	−29	−43	−34	+ 24	−19	−10	−15	−55	−17	−21
20 19	−31	−30	−13	− 2	−18	−30	+ 8	−32	+ 3	+11	−32	−19	−15
21 19	−18	−25	− 5	+26	−16	−12	− 2	−48	−11	+ 9	−38	+ 7	−11
22 19	−31	− 9	+19	+ 9	+12	−13	+ 4	−26	−26	+17	−29	−13	− 7
23 19	−41	−37	+31	+31	+32	−17	+ 32	−21	−18	+13	+ 5	− 5	0

1905. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October	November.	December.	Year.
H. m.													
0 19	−17	+ 9	− 7	+ 6	− 5	− 1	+38	+44	+15	−39	+ 3	− 9	+ 3
1 19	+ 5	+15	+13	+11	−13	+17	+38	+49	+27	− 8	−18	−13	+10
2 19	−22	−48	+11	+22	−23	+24	+42	+41	+49	−13	−22	+14	+ 6
3 19	−20	−34	+ 4	+39	−20	+34	+31	+50	+17	+17	− 4	+18	+11
4 19	−28	−18	+ 7	+54	−12	+42	+46	+52	+ 3	+ 9	+ 1	− 4	+13
5 19	− 4	−13	+ 8	+42	− 4	+36	+44	+63	+ 7	+15	− 5	− 6	+15
6 19	−16	− 5	+34	+30	− 6	+20	+40	+86	+11	+24	+ 1	− 3	+18
7 19	−26	+21	+36	+33	+ 1	+ 7	+17	+56	−14	+38	+35	+ 4	+17
8 19	− 1	+40	+12	+22	+19	+ 6	−12	+ 6	− 7	+46	+32	+12	+15
9 19	+36	+37	+ 1	−17	+37	−17	−14	−33	+ 7	+38	+28	+25	+11
10 19	+34	+17	− 8	− 2	+54	−31	−37	−25	+17	+30	+23	+ 8	+ 7
11 19	+38	+31	−12	−21	+31	−44	−69	−25	+43	+24	+41	+ 9	+ 4
12 19	+30	+39	+24	−20	+23	−18	−67	−66	+30	+33	−17	+ 7	0
13 19	+19	+33	+15	−28	+26	−27	−77	−81	+44	+40	−30	+ 6	− 5
14 19	+32	+10	+ 4	−51	−16	−11	−53	−74	+18	+35	− 7	+20	− 8
15 19	+16	−23	−16	−45	−45	−18	− 9	−78	−16	+ 9	−25	+ 7	−20
16 19	−24	−28	− 9	−31	−25	−18	+ 4	−61	−55	− 2	−16	+21	−20
17 19	−22	−40	+ 6	−12	− 5	−10	+ 2	−27	−47	−30	+ 4	+32	−13
18 19	− 1	−56	+ 3	+15	+20	+17	− 5	− 9	−51	−49	− 6	− 1	−10
19 19	−15	−33	−35	−17	+14	+12	− 4	−14	−47	−51	− 1	− 1	−16
20 19	− 5	− 7	+ 9	−15	+17	− 6	− 1	−16	−25	−57	0	−11	−10
21 19	+ 6	+ 2	−12	−15	−13	−11	+ 7	+ 3	−34	−46	−26	−43	−15
22 19	− 8	+47	−36	− 6	−25	+11	+20	+26	−10	−52	+ 1	−36	− 6
23 19	− 6	+23	−37	+10	−24	− 4	+23	+42	− 5	−36	+ 9	−38	− 4

TABLE 436.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean (1894 to 1904).
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 19	+19	+16	+25	+10	+ 1	+ 2	+ 8	- 7	+ 8	- 4	+ 9	+16	+ 8
1 19	+25	+14	+40	+25	- 3	+12	+12	- 1	+14	+ 5	+ 8	+21	+14
2 19	+32	+22	+42	+28	+ 2	+22	+12	+ 1	+16	+ 9	+ 8	+26	+18
3 19	+43	+32	+47	+25	+ 8	+24	+13	+ 2	+15	+11	+11	+25	+21
4 19	+46	+38	+41	+24	+16	+16	+ 8	+ 2	+13	+13	+20	+31	+22
5 19	+49	+36	+39	+27	+21	+21	+ 4	+ 6	+12	+20	+16	+31	+23
6 19	+40	+42	+38	+23	+21	+18	+ 8	+ 8	+ 9	+25	+10	+30	+22
7 19	+41	+28	+25	+ 9	+20	+ 9	+ 5	+ 6	+13	+21	+10	+17	+17
8 19	+45	+17	+14	- 5	+12	-10	- 1	- 4	+14	+12	+15	+ 6	+10
9 19	+19	+ 3	+ 1	- 8	+ 5	- 9	- 9	-13	+ 2	- 6	+ 7	- 6	- 1
10 19	-10	- 2	-10	-11	+ 2	+ 6	-15	- 5	- 9	+ 6	+ 2	- 4	- 4
11 19	- 1	-31	-17	-15	+ 1	+15	-12	- 3	-19	+18	- 3	-14	- 6
12 19	- 7	-41	-19	-21	+ 7	+20	- 4	+ 4	-19	+12	+ 1	-20	- 6
13 19	- 2	-50	-24	-13	- 2	+11	- 5	+12	-20	+ 6	- 6	-24	- 8
14 19	-30	-36	-30	-12	- 8	- 3	- 2	+ 9	-21	+ 3	- 4	-31	-12
15 19	-37	-26	-29	-17	-12	-19	- 1	+ 6	- 9	- 4	- 6	-35	-14
16 19	-49	-17	-38	-17	-22	-21	- 1	+ 6	- 4	-20	-25	-31	-19
17 19	-35	- 9	-29	-16	-16	-23	- 4	+ 1	- 3	-26	- 8	-11	-15
18 19	-48	- 4	-40	-14	- 5	-27	- 7	- 2	- 2	-28	-15	- 2	-17
19 19	-53	-11	-35	-14	- 7	-30	- 5	- 4	- 3	-19	-19	- 9	-18
20 19	-43	-17	-23	-16	-11	-15	- 5	- 2	- 6	-21	-12	- 8	-16
21 19	-21	- 8	-12	- 6	- 3	- 8	- 4	- 7	- 5	-15	-11	-10	- 9
22 19	-17	- 2	- 6	+ 4	-13	-12	+ 4	- 2	- 2	-15	- 8	+ 3	- 6
23 19	- 6	+ 8	+ 4	+11	- 5	- 3	+ 7	- 5	+ 9	-11	+ 6	+ 7	+ 1

TABLE 437.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean (1894 to 1904).
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 19	- 1	- 1	+23	- 2	-19	+10	+ 7	- 8	- 4	+ 7	+ 8	-10	+ 2
1 19	+17	+30	+27	+14	0	+ 8	+ 8	- 8	- 2	+18	+14	- 1	+11
2 19	+16	+28	+25	+19	+ 8	+12	+10	- 1	- .1	+20	+25	-13	+15
3 19	+28	+38	+35	+25	- 4	+24	+24	- 2	+ 4	+22	+25	- 3	+20
4 19	+44	+40	+30	+24	+ 9	+23	+16	- 2	+11	+26	+23	- 5	+22
5 19	+44	+34	+28	+30	+ 9	+23	+18	- 3	+14	+22	+25	- 1	+22
6 19	+43	+31	+24	+29	+18	+23	+19	- 2	+16	+19	+26	+ 6	+22
7 19	+48	+12	+19	+29	+18	+19	+ 9	+ 3	+13	+15	+26	+18	+19
8 19	+36	-11	+ 7	+11	+29	+14	+ 3	+14	+16	+13	+11	+23	+13
9 19	+13	-27	- 4	+ 1	+35	+15	0	+23	+18	+ 3	- 5	+27	+ 7
10 19	-15	-17	- 9	-10	+45	+ 3	- 5	+17	+ 8	+ 4	-20	+17	0
11 19	-28	- 9	- 5	-12	+45	- 4	- 1	+25	+ 4	+ 4	-26	+22	- 1
12 19	-31	+ 5	- 7	- 8	+44	0	-11	+25	+ 1	0	-25	+19	- 1
13 19	-32	+12	-11	0	+19	- 5	- 9	+13	- 3	- 4	-16	+14	- 3
14 19	-25	+ 4	-19	+ 1	+ 7	-17	- 1	- 1	-10	-11	- 8	+16	- 7
15 19	-31	+ 3	-12	- 4	0	-20	- 6	-12	-14	-14	+ 1	- 5	-10
16 19	- 9	- 1	- 4	-15	-14	-23	-16	-12	-14	- 6	+ 3	-10	-10
17 19	-10	-20	-23	-24	-37	-28	-13	-11	-19	-15	0	-10	-18
18 19	- 8	-20	-35	-19	-36	-32	-11	0	- 6	-23	-18	-18	-19
19 19	- 2	-26	-36	-24	-38	-25	- 6	-10	-10	-30	-23	-23	-21
20 19	-19	-34	-29	-24	-32	-11	- 9	-16	-12	-21	-19	-12	-21
21 19	-36	-31	-20	-24	-39	- 7	-14	-10	- 6	-22	-12	-20	-20
22 19	-29	-27	- 1	-11	-35	- 3	- 8	-10	- 4	-18	- 8	-14	-14
23 19	-13	-17	+ 3	- 6	-32	- 1	- 3	- 5	- 4	-10	- 6	-14	- 9

TABLE 438.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each average year 1894—1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean 1894—1904.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
H. m.													
0 19	−146	−125	−122	− 98	− 79	− 76	− 89	− 74	− 78	− 83	− 99	−120	− 97
1 19	−147	−125	−116	−107	− 76	− 78	− 87	− 74	− 79	− 87	− 97	−120	− 98
2 19	−145	−122	−110	−102	− 74	− 76	− 85	− 73	− 75	− 85	− 98	−108	− 95
3 19	−144	−123	−115	− 98	− 68	− 77	− 88	− 70	− 77	− 79	− 90	−106	− 94
4 19	−144	−123	−109	− 90	− 67	− 74	− 80	− 66	− 75	− 75	− 91	−105	− 90
5 19	−140	−111	− 99	− 87	− 66	− 69	− 74	− 62	− 71	− 75	− 82	−100	− 85
6 19	−108	− 82	− 82	− 66	− 51	− 55	− 59	− 51	− 59	− 66	− 70	− 85	− 68
7 19	− 49	− 16	− 26	− 16	− 15	− 11	− 11	− 11	− 25	− 26	− 26	− 32	− 21
8 19	+ 71	+101	+ 71	+ 75	+ 55	+ 68	+ 69	+ 60	+ 42	+ 53	+ 61	+ 64	+ 66
9 19	+220	+230	+189	+175	+145	+154	+161	+152	+138	+157	+180	+182	+173
10 19	+351	+326	+289	+264	+209	+219	+238	+218	+217	+234	+271	+279	+258
11 19	+390	+364	+324	+300	+235	+242	+260	+235	+249	+264	+310	+326	+288
12 19	+360	+324	+296	+266	+204	+208	+229	+197	+220	+227	+278	+291	+255
13 19	+261	+233	+217	+188	+145	+144	+162	+131	+155	+171	+197	+219	+182
14 19	+154	+127	+126	+ 99	+ 82	+ 78	+ 80	+ 65	+ 81	+ 90	+ 96	+131	+ 98
15 19	+ 65	+ 25	+ 37	+ 28	+ 19	+ 17	+ 18	+ 9	+ 16	+ 16	+ 12	+ 50	+ 24
16 19	− 20	− 53	− 31	− 27	− 27	− 36	− 30	− 37	− 30	− 38	− 44	− 21	− 34
17 19	− 73	− 92	− 64	− 64	− 50	− 62	− 50	− 57	− 55	− 65	− 83	− 63	− 65
18 19	− 87	−112	− 82	− 90	− 74	− 76	− 79	− 78	− 72	− 76	− 89	− 86	− 83
19 19	−107	−122	− 98	−103	− 88	− 81	− 91	− 84	− 80	− 89	− 98	−100	− 95
20 19	−128	−131	−118	−111	− 97	− 93	− 95	− 86	− 85	− 98	−109	−117	−105
21 19	−141	−134	−126	−114	− 96	− 94	−100	− 87	− 89	− 99	−115	−127	−109
22 19	−145	−133	−133	−112	− 91	− 87	−101	− 85	− 86	− 92	−113	−131	−107
23 19	−144	−125	−122	−104	− 81	− 84	− 93	− 77	− 82	− 84	−104	−124	−100
Range...	537	498	457	414	332	336	361	322	338	363	425	457	397

TABLE 439.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each average year 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	1894 to 1904.	Inequality (1894—1904) calculated from the difference of 1st components.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
H. m.														
0 19	+ 9	+ 7	+ 23	+ 2	− 10	+ 5	+ 6	− 9	+ 1	− 2	+ 8	+ 3	+ 5	+ 5
1 19	+ 22	+ 21	+ 33	+ 18	− 1	+ 9	+ 9	− 5	+ 6	+ 8	+11	+10	+12	+ 10
2 19	+ 24	+ 26	+ 33	+ 22	+ 4	+ 16	+ 10	− 1	+ 7	+11	+16	+ 6	+17	+ 14
3 19	+ 35	+ 34	+ 40	+ 24	+ 1	+ 23	+ 17	− 1	+ 9	+13	+18	+11	+20	+ 17
4 19	+ 45	+ 39	+ 35	+ 23	+ 11	+ 19	+ 11	− 1	+11	+17	+21	+13	+21	+ 19
5 19	+ 47	+ 34	+ 31	+ 28	+ 15	+ 22	+ 11	+ 1	+12	+18	+20	+15	+22	+ 20
6 19	+ 43	+ 36	+ 24	+ 25	+ 19	+ 19	+ 13	+ 3	+12	+20	+18	+18	+22	+ 19
7 19	+ 45	+ 20	+ 22	+ 18	+ 18	+ 13	+ 7	+ 4	+13	+17	+18	+17	+18	+ 17
8 19	+ 41	+ 2	+ 11	+ 2	+ 20	+ 1	0	+ 5	+12	+11	+12	+15	+12	+ 14
9 19	+ 16	− 12	− 2	− 4	+ 20	+ 3	− 5	+ 6	+ 9	0	+ 1	+11	+ 3	+ 10
10 19	− 6	− 10	− 10	− 10	+ 23	+ 5	− 10	+ 6	− 1	+ 5	− 9	+ 7	− 2	+ 5
11 19	− 15	− 20	− 10	− 14	+ 23	+ 5	− 6	+ 10	− 8	+10	−14	+ 4	− 4	0
12 19	− 19	− 18	− 13	− 14	+ 26	+ 10	− 7	+ 15	− 9	+13	−12	0	− 4	− 5
13 19	− 17	− 19	− 18	− 7	+ 9	+ 3	− 7	+ 12	−12	+ 1	−11	− 5	−10	− 10
14 19	− 28	− 16	− 24	− 5	− 1	− 10	− 1	+ 4	−15	− 4	− 6	− 8	−10	− 14
15 19	− 34	− 11	− 20	− 11	− 6	− 19	− 4	− 3	−11	− 8	− 3	−20	−12	− 17
16 19	− 30	− 8	− 21	− 16	− 17	− 21	− 9	− 3	− 9	−11	−11	−20	−16	− 19
17 19	− 23	− 14	− 26	− 19	− 26	− 25	− 9	− 4	−10	−19	− 4	−13	−17	− 20
18 19	− 27	− 12	− 36	− 15	− 20	− 29	− 8	− 1	− 4	−24	−17	−10	−18	− 19
19 19	− 28	− 19	− 35	− 18	− 22	− 27	− 5	− 7	− 6	−22	−21	−16	−21	− 17
20 19	− 31	− 25	− 26	− 19	− 21	− 12	− 7	− 8	− 8	−18	−15	−10	−19	− 14
21 19	− 29	− 19	− 15	− 14	− 21	− 7	− 4	− 8	− 5	−15	−11	−15	−14	− 10
22 19	− 24	− 14	− 2	− 2	− 23	− 6	− 1	− 5	− 3	−14	− 7	− 6	−10	− 5
23 19	− 11	− 4	+ 4	+ 4	− 19	− 1	+ 2	− 5	+ 3	− 7	0	− 4	− 4	0

TABLE 440.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Horizontal Force for each average month of the period 1894—1904 and for the average year.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	− 76	− 92	− 124	− 123	− 111	− 105	− 106	− 85	− 82	− 93	− 93	− 74	− 97
1 19	− 74	− 89	− 124	− 128	− 117	− 103	− 105	− 86	− 87	− 92	− 89	− 78	− 97
2 19	− 71	− 84	− 120	− 125	− 119	− 104	− 104	− 86	− 78	− 90	− 91	− 68	− 95
3 19	− 77	− 81	− 113	− 118	− 118	− 108	− 107	− 84	− 77	− 92	− 86	− 62	− 93
4 19	− 68	− 69	− 113	− 114	− 117	− 104	− 104	− 85	− 74	− 87	− 86	− 61	− 90
5 19	− 55	− 63	− 104	− 112	− 112	− 108	− 100	− 77	− 73	− 88	− 72	− 56	− 85
6 19	− 33	− 50	− 92	− 101	− 87	− 69	− 72	− 62	− 91	− 82	− 45	− 36	− 68
7 19	+ 7	− 24	− 31	− 49	− 26	+ 9	− 12	− 33	**−106**	+ 47	+ 33	+ 27	− 21
8 19	+ 54	+ 52	+ 87	+ 73	+ 95	+ 100	+ 69	+ 40	− 43	+ 46	+ 127	+ 94	+ 66
9 19	+ 109	+ 139	+ 225	+ 229	+ 217	+ 205	+ 165	+ 142	+ 101	+ 170	+ 216	+ 154	+ 173
10 19	+ 180	+ 211	+ 324	+ 334	+ 306	+ 291	+ 258	+ 220	+ 216	+ 267	+ 281	+ 204	+ 258
11 19	**+220**	**+256**	**+359**	**+352**	**+330**	**+315**	**+295**	**+249**	**+269**	**+320**	**+286**	+ 210	**+289**
12 19	+ 190	+ 237	+ 307	+ 302	+ 292	+ 281	+ 289	+ 238	+ 258	+ 286	+ 212	+ 173	+ 256
13 19	+ 126	+ 170	+ 204	+ 219	+ 218	+ 222	+ 238	+ 186	+ 204	+ 179	+ 117	+ 107	+ 182
14 19	+ 64	+ 80	+ 107	+ 121	+ 123	+ 124	+ 147	+ 118	+ 122	+ 82	+ 38	+ 45	+ 98
15 19	+ 18	+ 21	+ 26	+ 43	+ 33	+ 20	+ 52	+ 42	+ 46	+ 10	− 21	− 1	+ 24
16 19	− 27	− 30	− 32	− 14	− 40	− 62	− 29	− 25	− 9	− 35	− 63	− 43	− 33
17 19	− 42	− 45	− 63	− 57	− 79	− 109	− 92	− 65	− 36	− 57	− 80	− 63	− 65
18 19	− 53	− 63	− 89	− 90	− 104	**−127**	− 116	− 83	− 48	− 69	− 86	− 70	− 83
19 19	− 66	− 73	− 109	− 114	− 117	− 117	**−118**	− 92	− 70	− 94	− 95	− 77	− 94
20 19	− 77	− 90	− 121	− 133	**−122**	− 117	− 118	**−100**	− 81	− 110	− 104	− 83	− 104
21 19	**− 87**	− 99	− 134	**−140**	− 120	− 116	− 113	− 97	− 90	**−114**	**−108**	**− 85**	**−109**
22 19	− 84	**−107**	**−139**	− 131	− 117	− 114	− 113	− 95	− 94	− 111	− 103	− 81	− 107
23 19	− 79	− 104	− 132	− 126	− 110	− 104	− 107	− 84	− 81	− 99	− 95	− 76	− 100
Range ...	299	363	498	492	452	442	413	349	375	434	394	295	398

TABLE 441.—*Showing the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each average month of the period 1894—1904 and for the average year.*

Unity = 0·1γ = ·000001 C. G. S.

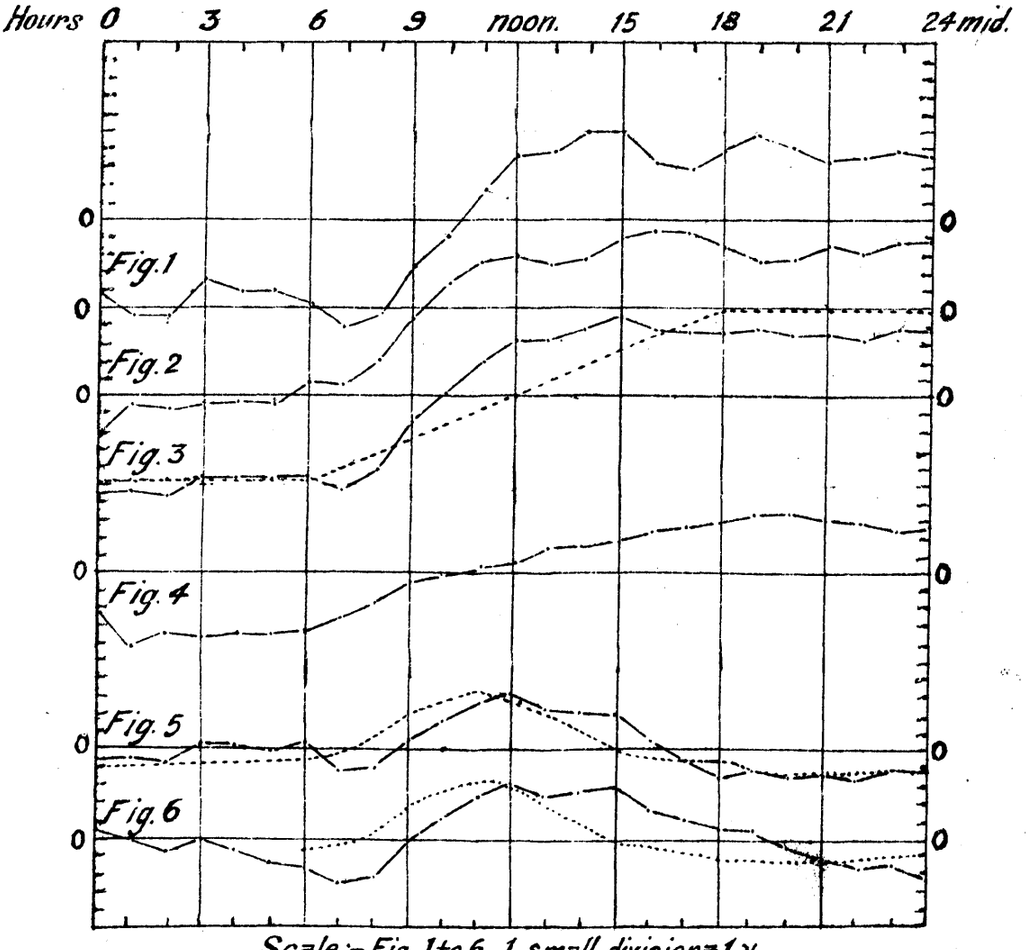
Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 19	+ 5	− 5	+ 3	+ 12	+ 11	+ 6	+ 13	0	+ 3	+ 8	+ 2	− 2	+ 5
1 19	+ 14	+ 4	+ 10	+ 18	+ 23	+ 6	+ 13	+ 8	+ 15	+ 18	+ 13	+ 10	+ 12
2 19	+ 9	+ 9	+ 19	+ 21	+ 30	+ 12	+ 13	+ 14	+ 19	+ 22	+ 22	+ 10	+ 17
3 19	+ 20	+ 13	+ 25	+ 24	+ 29	+ 18	+ 20	+ 11	+ 24	+ 30	+ 22	+ 7	+ 20
4 19	+ 23	+ 11	**+ 28**	+ 23	**+ 32**	+ 14	+ 16	**+ 16**	+ 24	+ 30	+ 28	+ 14	+ 21
5 19	**+ 25**	+ 11	+ 16	**+ 28**	+ 32	**+ 22**	+ 16	+ 15	+ 24	**+ 34**	+ 25	**+ 21**	**+ 22**
6 19	+ 20	+ 15	+ 20	+ 25	+ 32	+ 17	**+ 21**	+ 12	+ 26	+ 31	**+ 29**	+ 21	+ 22
7 19	+ 13	**+ 25**	+ 10	+ 12	+ 28	+ 2	+ 17	+ 12	**+ 32**	+ 28	+ 24	+ 15	+ 18
8 19	+ 13	+ 23	+ 3	0	+ 8	− 2	+ 10	+ 10	+ 32	+ 21	+ 12	+ 7	+ 12
9 19	+ 10	+ 21	0	− 8	− 14	**− 15**	+ 5	+ 9	+ 20	+ 8	− 2	+ 2	+ 3
10 19	+ 2	+ 20	− 2	− 11	− 17	− 15	+ 10	+ 5	+ 4	+ 2	− 21	+ 1	− 2
11 19	− 2	+ 17	− 3	− 5	**− 25**	− 16	+ 3	+ 8	− 3	− 3	− 20	+ 7	− 4
12 19	− 3	+ 17	+ 1	− 3	− 25	− 7	− 9	+ 9	− 1	− 12	− 12	+ 4	− 4
13 19	− 4	+ 7	− 2	− 5	− 20	− 11	− 12	+ 8	− 13	− 18	− 5	+ 2	− 10
14 19	− 4	+ 3	− 10	− 10	− 16	− 4	− 9	− 11	− 22	− 28	− 7	+ 4	− 10
15 19	− 12	− 8	**− 19**	− 12	− 18	+ 4	− 22	− 16	− 21	− 21	+ 1	− 1	− 12
16 19	− 10	− 15	− 16	− 24	− 11	− 3	**− 32**	**− 19**	− 24	− 17	+ 3	− 7	− 16
17 19	− 21	− 32	− 13	**− 28**	− 19	+ 1	− 14	− 14	− 20	− 22	− 4	− 14	− 17
18 19	− 21	− 25	− 9	− 25	− 24	− 1	− 14	− 14	− 27	**− 31**	− 12	− 16	− 18
19 19	− 21	**− 33**	− 9	− 21	− 16	− 11	− 15	− 17	**− 29**	− 25	− 18	− 18	**− 21**
20 19	**− 25**	− 23	− 14	− 11	− 12	− 13	− 17	− 15	− 25	− 20	**− 24**	− 19	− 19
21 19	− 13	− 27	− 18	− 3	− 7	− 3	− 13	− 13	− 17	− 17	− 24	**− 21**	− 14
22 19	− 11	− 18	− 14	− 7	− 6	− 2	− 5	− 5	− 10	− 8	− 16	− 17	− 10
23 19	− 7	− 13	− 4	+ 7	+ 6	+ 1	+ 4	− 8	− 7	− 8	− 9	− 10	− 4
Range ...	50	58	47	56	57	37	53	35	61	65	53	42	43
Sum without regard to signs.	308	395	268	343	461	206	323	269	442	462	355	250	313

472. The tabulation record at Colaba arranged from 0^h to 24^h is taken in hand first, that re-arranged from 10^h to 10^h being discussed later. With the help of table 381 two *pairs* of quiet-days were selected from each month of the years 1900 and 1901, see table 442 below, each pair containing one day with a fairly large positive aperiodic change and the other with an equally large negative change.

TABLE 442.—*List of quiet-days specially selected with large positive and negative aperiodic changes.*

Months.		January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.	
Years.	Hours from which aperiodic element is determined.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.	Dates with positive aperiodic change.	Dates with negative aperiodic change.
1900 ...	0^h to 0^h ...	4	3	6	3	5	4	3	2	8	11	1	3	3	2	6	5	1	3	6	7	4	6	18	19
		9	7	19	21	28	26	15	18	15	14	22	23	14	13	15	16	17	18	12	14	28	25	26	25
1901 ...	0^h to 0^h ...	13	10	3	1	15	17	25	23	8	9	3	2	3	1	6	8	2	1	2	1	23	26	21	20
		31	30	26	24	31	30	30	28	17	19	27	30	8	10	28	27	26	27	24	26	30	29	26	25
1900 ...	10^h to 10^h	8	7	3	2	10	11	3	2	10	9	4	2	1	2	22	23	9	7	3	2	5	4	5	4
		29	30	18	17	24	25	21	22	27	28	16	15	9	10	29	28	19	21	18	19	20	21	20	19
1901 ...	10^h to 10^h	13	10	3	1	15	17	25	23	8	9	3	2	3	1	6	8	2	1	2	1	23	26	21	20
		31	30	26	24	31	30	30	28	17	19	27	30	8	10	28	27	26	27	24	26	30	29	26	25

The dates in each pair, it will be seen, have been so selected as to be consecutive if possible, but at any rate, they are rarely further apart than 48 hours. The inequalities derived from each of these groups of 24 days in the year are shown in columns 2, 3, 5 and 6 of table 443. The differences of these inequalities, that is of those shown in columns 2 and 3, and in columns 5 and 6, appear in columns 4 and 7. These represent the difference results of the data, respectively for the year 1900 and 1901, and are charted in figures 1 and 2 below, and the average result of both the years is shown in figure 3 (*vide* column 8 of the table).



Scale :- Fig. 1 to 6, 1 small division = 1 γ.
Dotted curve Figs. 5 and 6, 1 small division = 10 γ.

TABLE 443.—*Showing the progression of the aperiodic element as derived from the selected days in 1900 and 1901.*

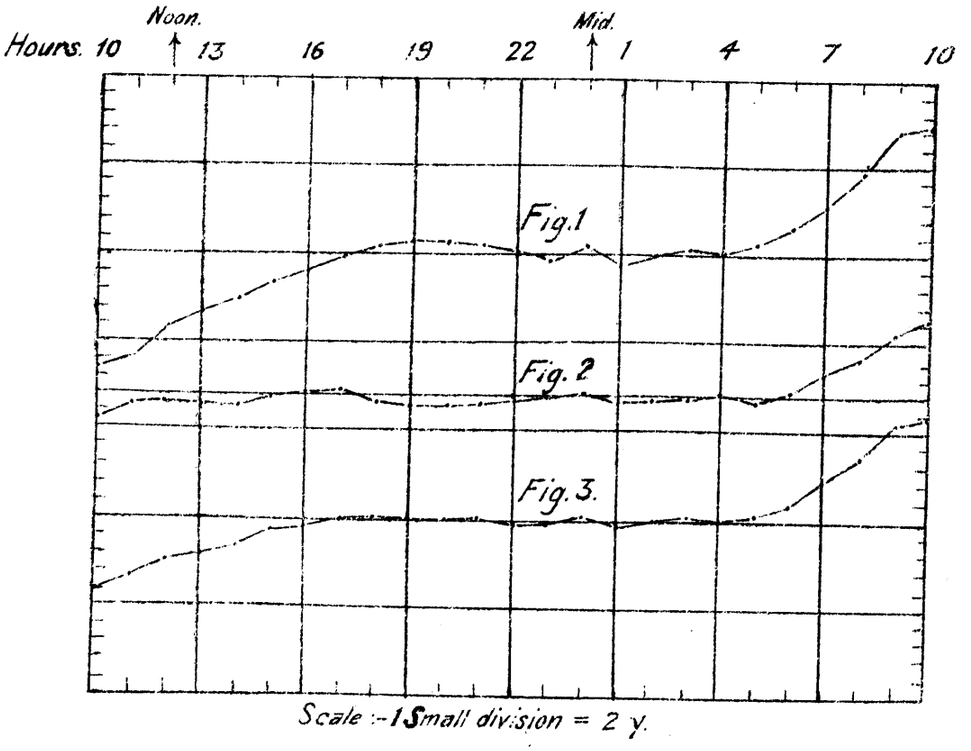
Unity = 0·1γ.

Civil Hours.	Mean diurnal inequality of H. F. for selected days in the year 1900 with a large positive aperiodic change.	Mean diurnal inequality of H. F. for selected days in the year 1900 with a large negative aperiodic change.	Difference, column 2 less column 3.	Mean diurnal inequality of H. F. for selected days in the year 1901 with a large positive aperiodic change.	Mean diurnal inequality of H. F. for selected days in the year 1901 with a large negative aperiodic change.	Difference, column 5 less column 6.	Mean of columns 4 and 7.	Aperiodic correction derived by the method of least squares by assuming a progression of the type shown in figure 3, para. 472.	Difference column 8 less column 9 or residual diurnal variation.	Aperiodic correction derived by the method of least squares on an assumption as usual of a uniform progression.	Difference, column 8 less column 11.	Average excess inequality of H. F. quiet days less all days uncorrected for progressive change.	Civil Hours.	Mean diurnal inequality of H. F. for selected days in the year 1900 with a large positive aperiodic change.	Mean diurnal inequality of H. F. for selected days in the year 1900 with a large negative aperiodic change.	Difference, column 15 less column 16.	Mean diurnal inequality of H. F. for selected days in the year 1901 with a large positive aperiodic change.	Mean diurnal inequality of H. F. for selected days in the year 1901 with a large negative aperiodic change.	Difference, column 18 less column 19.	Mean of columns 17 and 20.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
0	−117	− 75	−42	−103	− 32	− 71	−56	−49	− 7	− 59	+ 3	−24	10	+155	+292	−137	+180	+205	− 25	− 81
1	−115	− 62	−53	− 93	− 37	− 56	−54	−49	− 5	− 54	0	−40	11	+196	+317	−121	+204	+216	− 12	− 66
2	−109	− 55	−54	− 92	− 34	− 58	−56	−49	− 7	− 49	− 7	−33	12	+182	+266	− 84	+171	+182	− 11	− 47
3	−102	− 64	−38	− 89	− 34	− 55	−46	−49	+ 3	− 44	− 2	−35	13	+121	+191	− 70	+106	+122	− 16	− 43
4	− 99	− 58	−41	− 87	− 33	− 54	−47	−49	+ 2	− 39	− 8	−34	14	+ 55	+107	− 52	+ 39	+ 52	− 13	− 32
5	− 95	− 53	−42	− 81	− 27	− 54	−48	−49	+ 1	− 34	−14	−33	15	+ 3	+ 35	− 32	− 4	− 4	0	− 16
6	− 82	− 34	−48	− 67	− 23	− 44	−46	−49	+ 3	− 29	−17	−32	16	− 41	− 21	− 20	+ 42	− 46	+ 4	− 8
7	− 43	+ 18	−61	− 29	+ 14	− 43	−52	−41	−11	− 25	−27	−26	17	− 62	− 58	− 4	− 62	− 66	+ 4	0
8	+ 37	+ 90	−53	+ 42	+ 72	− 30	−41	−32	− 9	− 20	−21	−18	18	− 76	− 85	+ 9	− 79	− 73	− 6	+ 1
9	+137	+165	−28	+141	+147	− 6	−17	−24	+ 7	− 15	− 2	− 8	19	− 83	− 97	+ 14	− 88	− 77	− 11	+ 1
10	+222	+233	−11	+205	+192	+ 13	+ 1	−16	+17	− 10	+11	− 1	20	− 85	− 97	+ 12	− 90	− 80	− 10	+ 1
11	+262	+248	+14	+229	+204	+ 25	+19	− 8	+27	− 5	+24	+ 2	21	− 90	− 97	+ 7	− 90	− 84	− 6	0
12	+241	+208	+33	+196	+169	+ 27	+30	0	+30	0	+30	+ 4	22	− 97	− 98	+ 1	− 88	− 80	− 8	− 3
13	+184	+146	+38	+131	+109	+ 22	+30	+ 8	+22	+ 5	+25	+12	23	− 95	− 89	− 6	− 78	− 76	− 2	− 4
14	+110	+ 72	+48	+ 64	+ 39	+ 25	+36	+16	+20	+ 10	+26	+13	0	− 84	− 88	+ 4	− 72	− 72	0	+ 2
15	+ 52	+ 3	+49	+ 21	− 17	+ 38	+43	+24	+19	+ 15	+28	+17	1	− 88	− 77	− 11	− 75	− 67	− 8	− 9
16	− 9	− 40	+31	− 17	− 59	+ 42	+36	+32	+ 4	+ 20	+16	+22	2	− 83	− 80	− 3	− 70	− 63	− 7	− 5
17	− 41	− 70	+29	− 37	− 78	+ 41	+35	+41	− 6	+ 25	+10	+25	3	− 75	− 79	+ 4	− 65	− 59	− 6	− 1
18	− 59	− 98	+39	− 54	− 86	+ 32	+35	+49	−14	+ 29	+ 6	+28	4	− 71	− 74	+ 3	− 54	− 53	− 1	+ 1
19	− 67	−114	+47	− 63	− 90	+ 27	+37	+49	−12	+ 34	+ 3	+32	5	− 58	− 71	+ 13	− 51	− 43	− 8	+ 2
20	− 76	−116	+40	− 65	− 93	+ 28	+34	+49	−15	+ 39	− 5	+32	6	− 32	− 64	+ 32	− 29	− 33	+ 4	+ 18
21	− 84	−116	+32	− 65	− 97	+ 32	+32	+49	−17	+ 44	−12	+29	7	+ 23	− 35	+ 58	+ 24	− 2	+ 26	+ 42
22	− 84	−117	+33	− 63	− 93	+ 30	+31	+49	−18	+ 49	−18	+26	8	+104	+ 9	+ 95	+105	+ 62	+ 43	+ 69
23	− 68	−106	+38	− 53	− 89	+ 36	+37	+49	−12	+ 54	−17	+22	9	+212	+ 71	+141	+213	+142	+ 71	+106
24	− 63	− 98	+35	− 47	− 84	+ 37	+36	+49	−13	+ 59	−23	+15	10	+295	+150	+145	+288	+204	+ 84	+114
Aperiodic change.	+ 54	− 23	+77	+ 56	− 52	+108	+92	+98	− 6	+118	+26	+39	...	+140	−142	+282	+108	− 1	+109	+195

Considering that the variations dealt with are in each case practically simultaneous and that the days selected are quiet-days and thus presumably free from disturbance, the average result as also the result of each year should fairly prominently bring out the aperiodic element if it has the regular and uniform growth it is arbitrarily assumed to have. Though in the process of taking the differences the diurnal variation cuts out almost wholly, the result may nevertheless remain mixed up with a small residual diurnal variation, as even the difference in epoch of a single day when the averages of the year are made up of such scanty data as employed in the present discussion, may affect strict simultaneity of results. And even if the mean epoch is precisely the same it does not necessarily follow of course that the results should always be identically the same (see also paragraph 479). We know however that in such average results usually, the residual variation which is likely to be involved in them due to the shift of epoch of a day or two, can scarcely be larger than of the order of amplitude of 2γ or 3γ, as the actual change in the quiet-day variation from one month to the next, that is in 30 days, is in itself small in magnitude, of the order of about 5γ. In the present discussion therefore, we may take it that the uncertainty involved can scarcely to an appreciable extent mask the progression of the noncyclic element we wish to determine, especially as in the selective method adopted the magnitude of the element is purposely kept as large as possible, which in the present case is over 5γ and of opposite signs in each group of days so that the difference curve of the results of the two groups, helps to bring out the element pronouncedly accentuated to over 10γ.

473. It will be noticed that the character of the progression as shown by the three difference curves, charted above is nearly the same which, if accepted as connoting a real phenomenon, indicates that the aperiodic element—and we shall presently refer to the residual diurnal variation mixed up in the result—grows during a quiet-day much more actively during the day hours than during the night hours, and more so during the day hours before noon than after noon. It will also be readily observed from the results charted above, that between 6 a.m. and 12 noon the change is markedly large, while between 6 p.m. and 6 a.m., the night hours, little or no change is indicated thus bespeaking quiescent conditions.

474. To remove any possible doubt about the result being affected by the mode of arrangement of the hours of the day, the whole data for the years 1900 and 1901 were rederived, the quiet-day being selected and reckoned this time from 10^h to 10^h instead of from 0^h to 24^h as in the previous results. Table 442 already referred to, contains the dates of these selected days. The results of the inequalities for the years 1900 and 1901, which have in each case a large positive and a large negative aperiodic change, are shown in columns 15 and 16, and 18 and 19 of table 443. The difference curve for each year and the average result of the two years are shown in columns 17, 20 and 21 of the table, which are also charted as figures 1 to 3 below. It will readily appear that the character of all the three curves is practically the same, and indicates the same progression noted in the last paragraph, namely, an accelerated rate of growth from 10 a.m. to 6 p.m., little or no change from 6. p.m. to 6 a.m. and again an increased rate from 6 a.m. to 10 a.m.



475. That the difference curves so obtained here as also in paragraph 472 must contain a residual diurnal wave can scarcely be doubted. It is small we know but in order to have some idea as to the probable character and amplitude of this variation we can for the moment assume as correct that the progression of the aperiodic element takes place in the manner shown by the dotted line in figure 3, paragraph 472. Equating the average difference curve shown in the same figure by the method of least squares to such a progression as indicated by this dotted curve we obtain residual errors which are charted as figure 5 in the same paragraph. The fairly accordant similarity of this curve of residual errors to that of the usual diurnal wave which is charted for ready reference side by side as a dotted curve in figure 5, becomes at once strikingly apparent. And as the result can scarcely be regarded as fortuitous, it adds at any rate some evidence however slender to that already noted against the hypothesis of the uniform growth of the aperiodic element from hour to hour. It may be mentioned also that when precisely similar treatment as the above is adopted for the difference curve, but on the usual assumption that the element grows uniformly from hour to hour, the resulting curve leaves much larger residual errors (see figure 6 thick curve) and differs considerably from the character of the usual diurnal wave which is shown by the dotted curve. This indirectly negatives the initial hypothesis of an uniform growth of the element and makes it at least the less probable of the two assumptions.

476. The data for the month of June 1900 at Colaba in which all days of the month happen to be quiet, offer yet another opportunity for a simple treatment. The hourly data for the month are given in table 444, where the figures in ordinary type indicate the values in force at each hour, duly corrected for instrumental and other errors; while the figures in italics above them denote the smoothed values of force for the hours, from which by the process described below, the diurnal variation effects have been eliminated. Overlapping means of 24 hourly values indicated by the large figures in the above table, are taken and the mean of two such consecutive means, is entered in its proper place in the hourly columns. These are printed in the table in italics. Both these sets of figures have been charted in plate 89; the thin curve shows how the magnetic phenomenon actually progresses from hour to hour, while the thick curve shows the mathematical result—the smoothed progression of the secular change as derived from the treatment adopted as above, which it will be seen makes the secular change from hour to hour during the day-hours, dependent upon $\frac{1}{24}$ of the difference of the night-hours, while that of the night-hours dependent upon the secular change of the day hours.

477. A glance at the numbers in italics in table 444 shows that some of the days of the month considered from 0^h to 24^h, can be grouped in two divisions, one indicating a rise of secular force in 24 hours and the other a fall of the same. The days selected for the former group are 1, 4, 5, 12, 17 and 22, while for the latter they are 2, 15, 20, 23 and 30. The results indicating the increasing and decreasing progression of the secular change given by the two groups as also their difference, are given below :—

Unity=0·1γ.

Hours.	0	1	2	3	4	5	6	7	8	9	10	11	Noon.	13	14	15	16	17	18	19	20	21	22	23	Mid.
Increasing Secular Progression ...	−21	−21	−21	−19	−18	−18	−16	−13	−11	−9	−8	−1	+1	+2	+2	+6	+9	+11	+14	+16	+16	+19	+26	+31	+39
Decreasing Secular Progression ...	+15	+17	+19	+17	+11	+9	+7	+5	+7	+7	+5	+7	+5	+5	+3	+3	−1	−1	−7	−9	−15	−21	−27	−33	−41
Difference : Increasing less decreasing Secular Progression ...	−36	−38	−40	−36	−29	−27	−23	−18	−18	−16	−13	−8	−4	−3	−1	+3	+10	+12	+21	+25	+31	+40	+53	+64	+80

Here at any rate the diurnal wave is eliminated completely by the process initially adopted, and it will be noticed that the curves confirm in a general way at least the results in paragraph 472 though here they are derived by an altogether different mode of treatment. Between 0^h and 6^h the rise indicated is +1·3γ; between 6^h and noon it is +1·9γ; between noon and 18^h it is +2·5γ, and between 18^h and 24^h it is +5·9γ. Even the slightly greater rate of secular progress of the element from 6 a.m. to 12 noon than from 12 noon to 6 p.m. as shown in the previous results, is also exhibited by the result obtained here, as brought out by the more rapid change of the element from 6 p.m. to midnight than from midnight to 6 a.m. For, it must be remembered that in this case the secular rise during the night-hours is determined by the rate of change of the element during the day-hours and one may expect the result, if satisfactory, to give no change at all during the day-hours and a rapid rise during the night-hours. The change however from 6 a.m. to 6 p.m. here, which should be very small corresponding to night-hours in the previous result, is, it must be admitted, somewhat larger than the rate of change of the element from midnight to 6 a.m. But it is apparent at the same time that in any case on an average the rate during the night-hours is 7·2γ which is unquestionably greater than during the day-

TABLE 444.—*Hourly means of H for the month of June 1900 and their smoothed values after the elimination of the diurnal variation by taking overlapping means of 24 hourly values and reducing them to the proper epoch.*

37000 + Unity = 1γ = ·00001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Date.																									
	430	431	431	432	432	432	432	433	433	433	434	434	435	435	435	435	436	436	437	438	438	439	440	441	442
1	425	425	426	425	425	425	425	430	437	442	453	455	455	451	446	436	426	427	427	432	431	433	425	425	433
	442	442	443	443	443	443	444	444	444	444	444	443	443	443	443	443	442	442	441	440	439	438	437	435	434
2	433	433	433	432	436	436	440	448	453	465	475	478	473	465	452	440	432	431	431	432	433	431	433	435	432
	434	433	432	431	431	431	430	430	429	429	429	429	428	428	428	428	428	428	428	429	429	430	431	432	433
3	432	433	428	423	419	421	419	430	434	432	437	444	445	440	432	424	423	423	423	421	422	423	431	432	426
	433	433	434	434	434	434	434	433	433	434	434	435	435	435	435	436	436	436	436	436	436	436	436	436	436
4	426	426	427	424	423	423	429	438	447	457	460	467	466	452	439	430	423	418	417	422	426	430	426	427	429
	436	435	435	435	436	436	437	438	439	439	439	440	440	441	441	441	441	441	442	442	442	442	443	443	444
5	429	431	431	430	429	431	435	439	443	452	462	462	458	447	437	432	436	438	438	441	438	442	432	432	439
	444	444	444	445	445	445	445	445	444	443	444	444	444	444	444	444	444	444	444	444	444	445	445	445	446
6	439	438	432	438	434	433	436	444	454	466	469	470	468	456	446	441	436	439	435	436	432	433	439	441	438
	446	446	446	445	445	444	444	444	444	444	444	444	444	444	444	445	444	444	444	444	445	445	445	445	445
7	438	439	436	436	432	434	439	450	461	473	482	478	467	459	448	431	429	432	431	432	429	431	436	437	434
	445	445	446	446	447	447	448	448	449	449	449	449	449	449	449	449	449	449	448	488	447	447	446	445	445
8	434	434	435	437	439	436	440	462	473	478	483	478	473	468	459	444	440	445	443	441	439	434	432	432	435
	445	445	444	444	444	444	444	444	443	443	443	444	444	444	445	445	445	445	445	445	445	444	444	443	443
9	435	432	431	434	433	435	434	444	453	464	469	470	467	460	450	442	442	438	435	436	436	438	433	434	438
	443	443	443	443	443	443	442	442	442	442	441	442	442	441	441	441	441	441	440	440	440	441	441	441	441
10	438	441	439	438	434	432	437	445	449	451	456	463	463	459	451	441	437	435	431	432	431	430	436	438	433
	441	441	441	442	442	442	443	443	443	443	444	443	443	443	443	444	444	444	444	444	444	444	444	444	443
11	433	433	432	431	433	433	437	445	451	457	461	462	463	465	459	451	443	437	436	437	438	438	431	432	436
	443	443	442	442	442	442	442	442	442	442	442	443	443	443	443	443	444	444	444	444	444	445	446	447	448
12	436	433	432	432	433	434	442	448	451	455	458	455	451	447	450	450	442	438	440	438	437	435	436	435	440
	448	449	450	450	451	451	451	451	451	451	450	450	450	449	449	449	449	449	449	449	448	449	449	449	450
13	440	441	439	438	437	437	443	454	466	478	483	484	477	469	463	455	447	440	436	435	435	434	438	440	434
	450	450	451	451	450	450	450	450	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449	449
14	434	433	434	434	435	435	440	451	462	484	495	497	491	479	464	452	441	437	432	429	426	427	435	433	433
	449	449	449	449	448	448	448	448	449	449	449	451	451	451	451	451	451	451	451	451	450	449	448	447	446
15	433	434	435	435	434	435	441	454	468	480	494	496	493	478	462	452	441	435	435	435	434	435	430	434	437
	446	445	445	445	445	445	445	445	445	445	445	445	445	444	444	444	444	444	444	444	444	444	445	445	446
16	437	437	438	438	440	439	439	442	447	451	460	466	474	469	458	448	440	438	436	437	438	436	434	437	436
	446	446	446	446	446	446	446	446	447	447	447	447	447	448	448	448	448	449	449	449	449	449	449	449	450
17	436	435	434	435	435	436	439	443	451	462	471	476	476	468	460	454	446	441	436	437	442	443	436	436	441
	450	451	451	452	452	452	452	452	452	452	451	452	452	452	451	451	451	451	451	451	451	451	451	451	450
18	441	442	441	440	439	439	441	444	452	460	476	488	492	486	474	461	452	443	439	439	437	436	442	441	437
	450	449	449	449	449	450	450	450	450	450	450	449	449	450	450	450	450	450	450	450	451	451	451	451	451
19	437	437	436	436	437	440	444	448	454	463	471	474	475	474	469	463	459	449	441	435	436	439	435	437	440
	451	452	451	451	450	450	449	449	449	449	449	450	450	450	449	449	449	449	448	448	448	448	448	448	447
20	440	441	441	440	440	440	444	453	458	463	476	482	480	474	461	450	442	437	437	438	438	439	437	439	437
	447	447	446	446	446	446	447	447	447	447	447	447	448	448	448	448	449	449	449	449	449	449	449	449	449
21	437	434	434	434	435	437	440	451	460	463	471	468	468	465	456	449	444	441	439	440	443	446	439	439	443
	449	449	449	449	449	449	449	450	449	449	449	450	450	449	449	450	450	450	450	450	450	450	451	452	453
22	443	440	436	439	444	443	444	449	458	463	467	467	467	465	460	456	448	446	442	441	441	440	445	446	442
	453	453	454	454	454	453	453	452	452	452	452	452	451	451	451	451	450	450	449	449	448	447	446	445	444
23	442	440	440	441	444	443	445	456	470	470	492	492	482	475	467	454	441	436	434	432	435	435	441	442	435
	444	443	442	441	441	441	441	441	441	441	441	441	441	441	442	442	442	442	442	443	443	443	444	444	445
24	435	434	434	434	436	435	434	437	445	455	460	464	460	454	449	441	434	431	432	436	437	436	435	434	440
	445	445	445	446	446	446	447	447	447	447	447	447	447	447	447	447	447	447	447	447	447	446	446	446	445
25	440	440	440	438	438	438	441	447	454	464	471	470	467	464	455	446	440	441	441	439	440	440	436	438	440
	445	445	445	444	444	444	444	443	443	443	443	443	443	443	443	443	443	444	444	444	444	445	445	445	445
26	440	440	440	439	438	438	439	443	446	454	461	467	464	456	444	437	435	434	436	437	436	435	439	439	439
	445	446	447	448	449	450	450	451	451	452	453	454	454	455	456	456	456	456	456	456	456	455	455	454	454
27	439	440	441	442	441	441	444	449	456	465	470	470	471	468	470	465	455	449	446	447	451	461	435	436	456
	454	454	453	451	450	450	449	449	448	447	446	443	442	441	440	440	440	439	439	439	439	438	438	438	438
28	456	456	454	445	439	436	438	441	455	453	460	455	462	449	443	428	432	432	432	431	435	436	464	464	435
	438	438	439	439	440	440	440	441	440	440	440	441	441	441	440	440	440	440	439	439	440	440	440	440	439
29	435	437	439	434	432	432	435	436	435	438	458	459	461	461	457	452	444	437	435	431	432	433	432	433	431
	439	439	439	438	437	437	436	436	436	436	435	434	434	434	434	434	434	434	434	434	434	434	434	435	435
30	431	431	429	428	426	428	433	438	446	446	450	455	453	450	444	433	427	427	426	427	426	426	437	432	

TABLE 445.—*Hourly means of H for the month of July 1894 and their smoothed values after the elimination of the diurnal variation by taking overlapping means of 24 hourly values and reducing them to the proper epoch.*

37000 C. G. S. + Unity = 1γ = ·00001 C. G. S.

Colaba Civil Hour.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Date.																								
	424	*424*	*424*	*424*	*424*	*423*	*423*	*423*	*423*	*424*	*424*	*424*	*424*	*424*	*425*	*426*	*427*	*427*	*428*	*429*	*429*	*429*	*429*	*429*
1	416	413	409	413	413	416	406	421	429	444	457	456	460	453	442	431	420	411	413	412	410	411	415	412
	428	*427*	*427*	*426*	*425*	*424*	*423*	*422*	*422*	*422*	*421*	*421*	*421*	*420*	*418*	*415*	*413*	*411*	*408*	*406*	*405*	*404*	*404*	*403*
2	416	414	444	440	421	427	439	431	430	436	445	455	448	433	424	410	390	393	397	397	402	401	407	403
	402	*400*	*399*	*398*	*398*	*397*	*396*	*396*	*395*	*394*	*393*	*392*	*391*	*390*	*391*	*391*	*392*	*392*	*392*	*393*	*393*	*393*	*393*	*393*
3	407	400	360	391	364	374	380	391	406	426	432	427	420	410	397	388	381	376	376	379	381	382	383	382
	394	*394*	*395*	*395*	*396*	*396*	*397*	*397*	*398*	*399*	*400*	*400*	*401*	*402*	*403*	*405*	*406*	*406*	*407*	*408*	*408*	*409*	*410*	*411*
4	381	384	384	383	385	386	391	400	409	422	432	438	435	424	409	394	389	390	393	398	397	402	402	403
	412	*413*	*414*	*415*	*416*	*417*	*416*	*416*	*415*	*414*	*413*	*412*	*412*	*412*	*411*	*410*	*410*	*410*	*410*	*409*	*409*	*408*	*408*	*407*
5	403	400	405	426	407	406	402	415	425	440	453	467	460	454	440	417	400	386	383	380	376	377	378	385
	406	*406*	*406*	*406*	*406*	*406*	*407*	*408*	*409*	*410*	*411*	*412*	*413*	*413*	*414*	*415*	*415*	*416*	*417*	*418*	*419*	*421*	*423*	*425*
6	402	394	397	399	399	401	404	410	415	422	442	445	444	445	435	418	408	407	410	410	401	400	402	405
	425	*426*	*427*	*427*	*428*	*429*	*430*	*431*	*432*	*433*	*434*	*435*	*436*	*437*	*437*	*438*	*438*	*438*	*438*	*438*	*438*	*437*	*434*	*432*
7	408	410	413	417	420	420	423	435	450	468	480	477	466	457	445	437	434	428	434	437	432	428	428	426
	430	*430*	*429*	*429*	*428*	*427*	*426*	*425*	*423*	*416*	*415*	*418*	*417*	*416*	*415*	*413*	*412*	*411*	*410*	*408*	*407*	*406*	*406*	*406*
8	423	422	425	421	420	421	430	438	440	411	423	428	436	442	438	428	420	406	391	400	387	394	395	400
	406	*406*	*405*	*403*	*402*	*400*	*400*	*400*	*400*	*400*	*400*	*399*	*399*	*399*	*400*	*401*	*401*	*401*	*402*	*402*	*403*	*404*	*406*	*407*
9	395	389	392	391	392	393	398	399	406	414	421	426	431	429	403	390	373	390	395	395	388	386	394	394
	408	*409*	*410*	*412*	*413*	*414*	*415*	*416*	*416*	*417*	*416*	*416*	*419*	*420*	*420*	*420*	*420*	*421*	*421*	*421*	*421*	*421*	*422*	*422*
10	395	411	403	401	398	400	409	421	431	443	452	459	457	450	435	422	412	412	411	412	405	404	406	410
	423	*423*	*423*	*423*	*423*	*422*	*422*	*422*	*422*	*423*	*423*	*423*	*423*	*423*	*423*	*423*	*423*	*423*	*423*	*424*	*424*	*425*	*425*	*425*
11	411	411	412	405	408	409	408	418	435	454	466	470	465	451	436	417	407	405	410	414	412	410	409	409
	425	*425*	*425*	*425*	*426*	*426*	*426*	*426*	*426*	*426*	*426*	*426*	*425*	*425*	*425*	*424*	*424*	*423*	*423*	*423*	*423*	*423*	*422*	*421*
12	408	409	411	412	413	413	418	429	441	460	468	467	467	457	442	426	413	405	412	414	413	412	408	403
	420	*419*	*419*	*419*	*419*	*419*	*419*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*418*	*417*	*416*	*416*	*416*	*416*
13	396	395	406	400	402	406	413	429	436	451	450	447	443	443	433	416	414	409	406	408	407	409	411	410
	416	*417*	*417*	*419*	*419*	*420*	*420*	*420*	*420*	*420*	*420*	*420*	*420*	*420*	*421*	*421*	*422*	*422*	*422*	*422*	*423*	*424*	*425*	*425*
14	403	389	401	398	401	402	406	411	422	437	456	454	457	459	450	436	427	420	414	409	406	407	407	406
	426	*426*	*425*	*425*	*425*	*424*	*423*	*423*	*423*	*423*	*424*	*424*	*424*	*424*	*424*	*423*	*423*	*424*	*425*	*426*	*427*	*426*	*426*	*427*
15	408	408	407	409	406	409	412	418	462	462	454	469	453	445	446	429	423	410	399	406	406	410	417	406
	427	*428*	*429*	*429*	*429*	*429*	*429*	*430*	*430*	*430*	*430*	*430*	*430*	*430*	*430*	*430*	*430*	*429*	*428*	*428*	*427*	*427*	*426*	*425*
16	406	407	402	405	420	428	443	439	456	457	470	474	472	461	445	430	420	418	417	415	412	411	411	409
	423	*422*	*422*	*422*	*421*	*420*	*419*	*417*	*415*	*413*	*412*	*411*	*411*	*411*	*410*	*410*	*409*	*409*	*408*	*407*	*405*	*404*	*404*	*403*
17	407	406	402	409	409	410	421	429	444	440	444	441	434	445	439	425	406	403	359	358	373	387	391	390
	403	*404*	*403*	*401*	*400*	*399*	*399*	*400*	*400*	*399*	*399*	*399*	*398*	*397*	*397*	*397*	*397*	*397*	*397*	*397*	*396*	*395*	*394*	*393*
18	391	396	397	398	400	396	397	397	409	422	432	436	451	435	404	389	383	379	380	366	368	375	391	377
	392	*390*	*389*	*388*	*387*	*386*	*385*	*384*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*385*	*387*	*389*	*392*
19	376	375	389	395	398	397	398	407	388	400	406	403	409	397	388	368	360	348	348	374	379	379	379	378
	396	*400*	*403*	*403*	*401*	*395*	*383*	*368*	*355*	*343*	*332*	*320*	*311*	*304*	*300*	*294*	*288*	*284*	*278*	*271*	*265*	*259*	*254*	*247*
20	377	385	397	388	388	392	391	408	425	440	453	507	514	495	506	362	186	104	14	27	74	125	84	130
	239	*230*	*221*	*213*	*212*	*216*	*226*	*237*	*247*	*255*	*264*	*272*	*279*	*283*	*285*	*288*	*291*	*293*	*296*	*300*	*303*	*307*	*311*	*315*
21	184	258	292	222	272	264	248	258	281	314	310	317	307	289	260	238	247	275	292	287	292	300	308	317
	320	*324*	*328*	*333*	*338*	*341*	*344*	*346*	*348*	*350*	*352*	*353*	*354*	*355*	*356*	*357*	*358*	*359*	*360*	*361*	*361*	*360*	*359*	*358*
22	321	320	319	318	326	325	334	343	373	393	417	420	415	395	376	355	345	337	336	340	340	344	354	352
	358	*358*	*358*	*359*	*360*	*361*	*361*	*362*	*363*	*364*	*364*	*365*	*366*	*367*	*368*	*369*	*370*	*371*	*372*	*372*	*374*	*375*	*376*	*377*
23	344	349	339	339	341	348	362	352	361	372	392	401	411	406	394	380	364	354	354	357	359	363	364	366
	378	*377*	*376*	*376*	*376*	*377*	*378*	*379*	*379*	*380*	*380*	*381*	*381*	*381*	*381*	*382*	*382*	*383*	*383*	*383*	*383*	*383*	*383*	*384*
24	373	369	367	370	363	370	373	381	337	408	413	417	402	388	382	373	374	394	371	370	369	371	375	377
	384	*386*	*387*	*388*	*389*	*389*	*389*	*388*	*387*	*385*	*384*	*382*	*380*	*379*	*379*	*378*	*377*	*377*	*377*	*376*	*375*	*374*	*373*	*371*
25	377	373	380	379	376	368	376	383	397	412	425	430	428	423	417	402	387	371	362	349	334	334	331	337
	370	*368*	*367*	*366*	*365*	*365*	*365*	*365*	*366*	*368*	*369*	*370*	*371*	*372*	*372*	*373*	*373*	*373*	*373*	*373*	*374*	*375*	*375*	*375*
26	351	354	357	363	366	367	369	368	367	378	388	394	395	392	387	376	369	367	372	367	366	368	366	366
	375	*376*	*377*	*378*	*379*	*380*	*381*	*381*	*381*	*382*	*382*	*382*	*382*	*383*	*383*	*384*	*385*	*386*	*387*	*387*	*388*	*388*	*389*	*390*
27	365	364	363	365	367	369	377	385	385	389	392	403	408	408	413	404	388	385	381	378	375	373	364	373
	391	*392*	*392*	*391*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*390*	*389*	*389*	*389*	*389*	*390*	*390*	*391*
28	378	377	381	386	386	389	391	395	401	406	424	427	419	413	405	392	360	383	383	375	379	380	363	367
	391	*391*	*391*	*391*	*391*	*392*	*392*	*392*	*392*	*392*	*393*	*393*	*394*	*394*	*395*	*395*	*395*	*395*	*395*	*395*	*395*	*395*	*394*	*393*
29	382	382	379	375	381	384	389	396	406	422	432	434	415	412	405	400	393	383	383	380	375	383	384	386
	393	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*394*	*395*	*396*	*396*	*397*	*397*	*398*	*399*
30	388	388	387	386	377	378	382	389	409	411	422	427	421	410	408	405	396	387	389	380	377	376	384	382
	399	*400*	*401*	*401*	*401*	*400*	*400*	*400*	*400*	*401*	*401*	*401*	*402*	*402*	*402*	*402*	*402*	*402*	*402*	*402*	*402*	*402*	*402*	*402*
31	389	389	389	390	391	391	394	403	415	429	444	444	441	424	413	402	391	381	381	386	388	387	387	389

hours when it is only 4·47, corresponding to the reverse conditions obtaining in the previous results. The treatment of the data in table 444 is however capable of several modifications which may enable perhaps a better result to be obtained than the one indicated above.

478. It is of course unjustifiable to dogmatise when the data dealt with are so scanty. But whatever the real mode of propagation of the aperiodic element is eventually found to be, the above results at any rate create a strong suspicion that no indication of any real physical basis underlying the assumption of an uniform growth, apparently seems to exist in the Colaba data. Whenever therefore large aperiodic corrections are applicable, as is always the case in the quiet-day variations, the possible uncertainty introduced thereby in the phases of the harmonic components by these corrections should not be lost sight of. If the progression happens to be anything like that suggested in paragraph 472 (see the dotted curve in figure 3) the Fourier coefficients in the reductions must change. The p coefficients of course remain unaffected as before, but the q coefficients must alter from ·63c, ·31c, ·20c, and ·14c to 1·04c, ·31c, ·15c, and ·14c respectively for the four orders, c being the aperiodic correction. It will be seen that the change is not so much in the 2nd, 3rd or 4th component as in the 1st. If what is suggested really obtains in the phenomenon, it must change by some 3° or 12 minutes in time, the phase of the occurrence of maximum of the first component which would practically be the sole component thus appreciably affected in the average diurnal inequality of the quiet-day. Such a possibility at any rate should be taken into account when the phases of all-day and quiet-day results come to be compared as they have been in paragraph 487, where the greatest difference made out is only about 9°. And this feeling of uncertainty is by no means allayed when we find that the difference made out between the quiet-day and all-day variation, is practically also a single wave of 24 hours: (*vide* plate 88). And when at the same time we notice as for example in the average result of 11 years, that the actual difference between the all-day variation and the quiet-day variation, uncorrected for aperiodic change, gives a curve which when charted side by side as in figure 4 in paragraph 472, with the other curves discussed therein, indicates a strikingly close resemblance to each other, the suspicion grows almost into a conviction that a close relation, if not actual identity, may not improbably exist between the two phenomena.

479. The march generally of the magnetic phenomenon as registered by the Colaba magnetograph for two typical months, is shown in plate 89. It fairly succinctly represents how the phenomenon actually progresses from day to day. The record for the month of June 1900 (figure 1 in the plate) shows the growth of the phenomenon when quiet conditions prevail more or less continuously during a month; while that of July 1894 (see figure 2, also table 445) represents conditions which obtain during a typically disturbed month. The record for June 1900 shows clearly that there are quiet-days and quiet-days; that some indicate an accentuated and some a suppressed diurnal wave; some have a positive aperiodic change while others exhibit a negative change. It will also be noticed that it is quite possible to select several combinations of 5 quiet-days from the month's result, which though coincident in their mean epoch, may show different typical variations for the month. The uncertainty in the selection of the days thus shown, is possibly presented here in an accentuated form, as it would not be often or always that the field of selection of the quiet-days would be so wide as in June 1900 at Colaba. But nevertheless it is sufficient to indicate how necessary it is to avoid any hasty generalisation from any single set of selected quiet-days data.

480. For example whether the incidence and progression from month to month and year to year of an uncertain factor such as the aperiodic element derived from two hours 0^h and 24^h of a particular set of five quiet-days can be accepted as an invariable and typical measure of quiet conditions generally for an interval of 24 hours needs some consideration. We have seen that though the element on the average shows a small positive value, it very often carries a negative sign. And it becomes obvious that any arbitrary mode of selection of the days must introduce extraneous factors which may not improbably mask an otherwise specifically marked but feebly pronounced physical phenomenon, if at all the element is capable of connoting one. In table 446 in which the aperiodic changes from 0^h to 24^h of the quiet days of the Astronomer Royal are given, the average result of the 11 years shows that the character of the quiet-day interval of 24 hours, is typified by a rise of secular force by 3·9γ.* Similar result shown by the quiet-days locally selected (see table 448) indicates a secular change of 3·1γ. When the two results are considered by themselves, this small difference may not perhaps be regarded as of much significance. But when considered along with the annual and secular variations of the element exhibited in the two results both of which are irregular and by no means accordant, it appears problematical if either of them can be accepted as a reliably definite indication. One of the two results must be faulty, or what is much more probable both may be more or less vitiated.

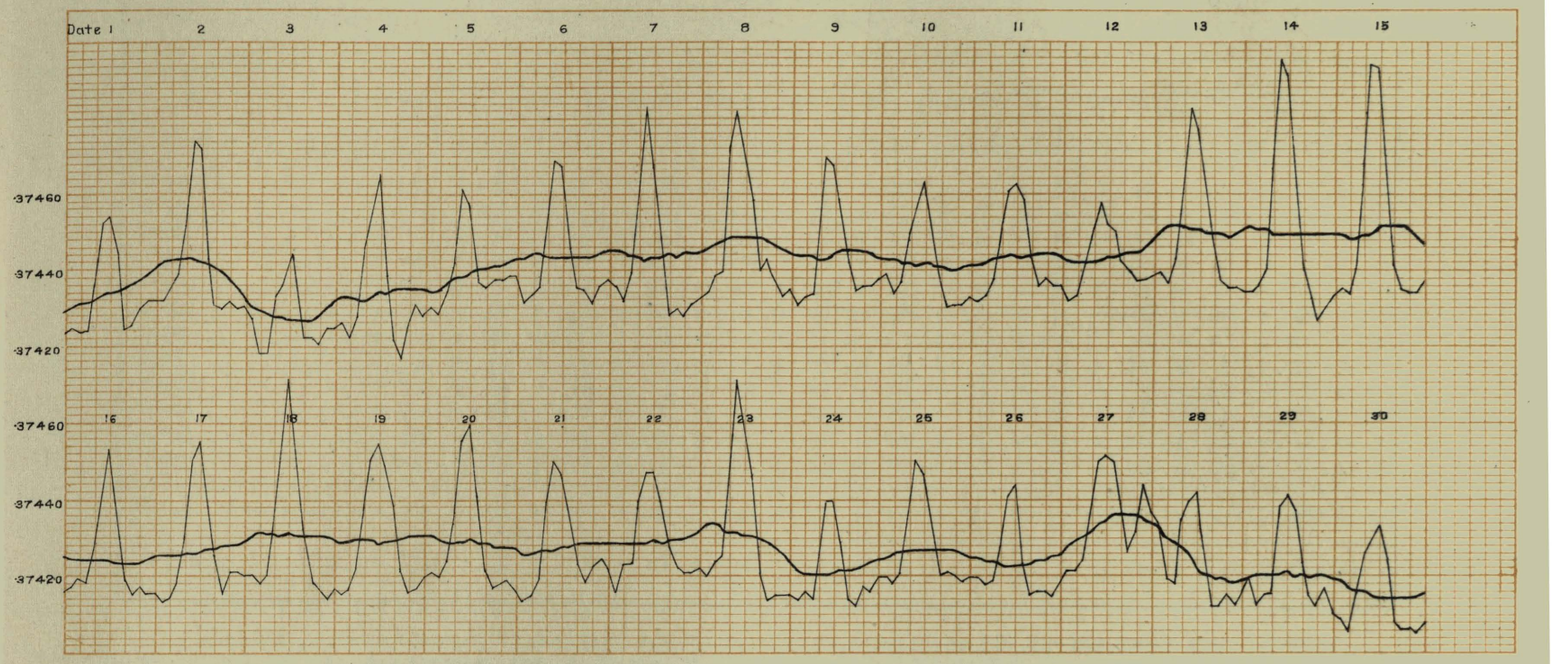
* In table 447 in the last columns are given the aperiodic elements for each year of the period 1894 to 1905 at Kew, as published in the annual reports, and it will be seen that invariably this element gives larger values at Colaba, the average at Kew being 3·0γ as against 3·9γ at Colaba.

MAGNETOGRAPH RECORD

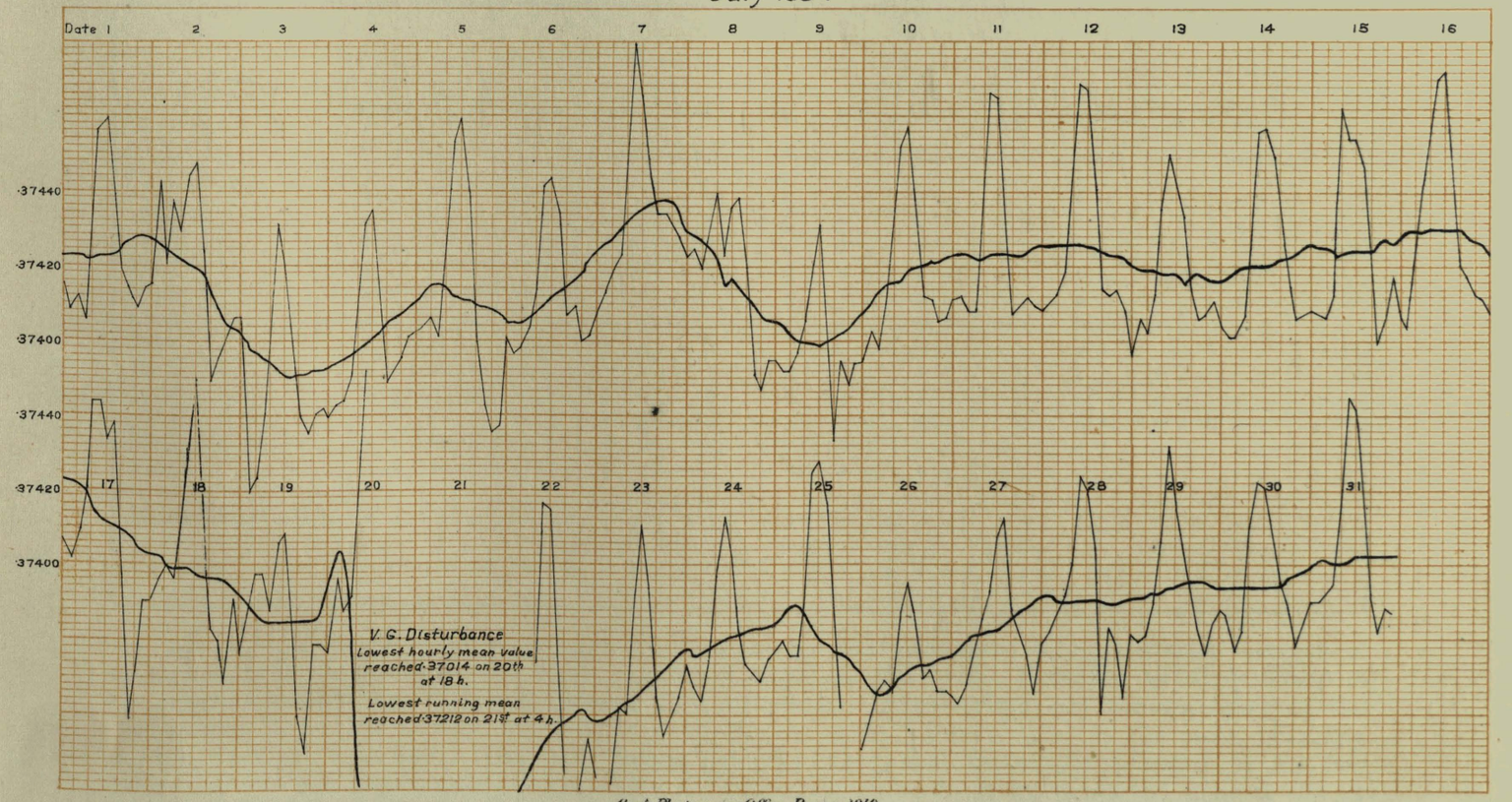
Curves showing hourly values of Horizontal Force and their running means.

June 1900

Plate 89.



July 1894



Gov.t Photozinco Office, Poona. 1910.

TABLE 446.—*Showing the average aperiodic change from 0^h to 24^h for the quiet-days selected by the Astronomer Royal as recorded at Colaba (Bombay).*

Unity = 0·1γ

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	+ 54	+ 138	+ 31	+ 26	+ 6	+ 39	+ 100	+ 7	+ 23	+ 46	+ 51	+ 33	+ 46
1895 ...	+ 12	+ 156	+ 63	+ 62	+ 124	+ 88	+ 117	+ 28	+ 30	+ 4	+ 33	+ 32	+ 63
1896 ...	+ 51	+ 38	+ 125	+ 99	+ 123	+ 21	+ 53	+ 41	+ 56	+ 51	+ 50	+ 78	+ 65
1897 ...	+ 45	+ 19	+ 32	+ 123	+ 60	+ 60	+ 54	+ 34	+ 39	+ 20	+ 20	+ 70	+ 48
1898 ...	+ 14	+ 26	+ 86	+ 46	+ 37	+ 33	+ 11	+ 35	+ 107	+ 11	+ 46	+ 22	+ 39
1899 ...	+ 21	− 31	+ 77	+ 27	+ 4	+ 27	+ 38	+ 44	− 1	+ 18	+ 26	+ 48	+ 25
1900 ...	+ 5	+ 30	+ 18	+ 54	+ 60	− 11	− 17	+ 40	+ 6	0	+ 18	+ 27	+ 19
1901 ...	− 5	+ 35	+ 11	+ 17	+ 17	+ 63	+ 24	− 5	+ 9	+ 20	+ 2	+ 49	+ 19
1902 ...	+ 23	+ 42	+ 36	+ 23	+ 23	+ 15	+ 24	+ 14	+ 14	+ 5	+ 46	+ 17	+ 24
1903 ...	+ 20	+ 30	+ 25	+ 7	+ 14	+ 34	+ 16	+ 77	+ 38	+ 15	+ 41	+ 36	+ 29
1904 ...	+ 58	+ 65	+ 25	+ 60	+ 67	+ 52	+ 65	+ 23	+ 37	+ 16	+ 38	+ 91	+ 50
1905 ...	+ 141	+ 55	+ 86	+ 23	+ 32	+ 57	+ 27	+ 63	+ 26	+ 96	+ 48	+ 6	+ 55
Means, 1894—1904	+ 27	+ 50	+ 48	+ 49	+ 49	+ 38	+ 44	+ 31	+ 33	+ 19	+ 34	+ 46	+ 39
Variation ...	− 12	+ 11	+ 9	+ 10	+ 10	− 1	+ 5	− 8	− 6	− 20	− 5	+ 7	...

TABLE 447.—*Showing the average aperiodic change from 0^h to 24^h for the quiet-days selected by the Astronomer Royal as recorded at Kew and published in the Kew reports.*

Unity = 1γ

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	+ 4	+ 12	+ 1	− 2	+ 2	0	+ 3	+ 2	+ 3	+ 7	+ 7	+ 1	+ 3·3
1895 ...	+ 5	+ 7	+ 5	+ 4	+ 1	+ 6	+ 6	− 1	+ 6	+ 5	+ 6	+ 3	+ 4·4
1896 ...	+ 2	+ 5	+ 6	+ 10	+ 7	+ 4	+ 3	+ 1	+ 5	0	0	+ 2	+ 3·8
1897 ...	+ 1	+ 2	+ 3	+ 10	+ 5	+ 3	+ 2	+ 3	+ 4	+ 3	+ 3	+ 5	+ 3·7
1898 ...	+ 3	+ 1	+ 7	+ 1	+ 2	− 1	+ 5	+ 2	+ 7	+ 2	+ 3	+ 2	+ 2·8
1899 ...	+ 3	+ 4	+ 1	+ 5	+ 1	+ 1	+ 5	+ 5	+ 1	+ 3	+ 5	+ 4	+ 3·2
1900 ...	+ 2	+ 3	+ 5	+ 4	+ 6	− 2	− 2	+ 2	0	+ 2	0	− 1	+ 1·6
1901 ...	− 1	+ 2	+ 1	+ 4	+ 1	+ 2	+ 4	+ 2	+ 3	+ 3	+ 1	+ 2	+ 2·0
1902 ...	+ 2	+ 3	+ 2	+ 4	0	+ 2	+ 2	+ 3	+ 1	+ 2	+ 4	+ 3	+ 2·3
1903 ...	0	+ 2	+ 3	+ 3	+ 2	+ 3	+ 5	+ 5	0	+ 5	+ 1	+ 6	+ 2·9
1904 ...	+ 5	+ 4	+ 1	+ 6	+ 7	+ 5	+ 4	+ 1	+ 3	+ 1	+ 3	+ 1	+ 3·4
1905 ...	+ 4	+ 4	− 1	+ 2	+ 2	+ 3	+ 2	+ 3	+ 2	+ 5	+ 1	+ 1	+ 2·3
Mean, 1894—1904.	+ 2·4	+ 4·1	+ 3·2	+ 4·5	+ 3·1	+ 2·1	+ 3·4	+ 2·3	+ 3·0	+ 3·0	+ 3·0	+ 2·5	+ 3·0
Variation ...	− 0·6	+ 1·7	+ 0·8	+ 1·5	+ 0·1	− 0·9	+ 0·4	− 0·7	0·0	0·0	0·0	− 0·5	...

481. An additional result hence is shown in table 449* where the sums of the aperiodic changes of *all* quiet-days in the month divided by the number of days are collected. Here the vitiating effects of the selective method, are obviously reduced to a minimum. In paragraph 465 the quiet-day of the Astronomer Royal has been shown to have practically the same intrinsic value as the *mean* quiet-day derived from *all* quiet-days. One may hence naturally expect that the results indicated by the two tables 446 and 449 should nearly be the same, if the aperiodic element can be depended upon to be as certain and definite an index of quiet conditions as the daily mean. It will be readily seen however that it does not appear to be the case. The secular variation of the aperiodic element shown in table 449 is of a different character, and exhibits no clear evidence of the 11-year period, though the annual variation does disclose the semi annual pulse much more effectively (see figures below page 554).

* The number of quiet-days in each month or year is not the same and the division hence of the total aperiodic change by unequal number of days in each month, may introduce a small uncertainty.

TABLE 448.—*Showing the average aperiodic change from 0^h to 24^h for the quiet-days locally selected.*

Unity = 0·1γ

Year.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	+ 38	− 51	+ 70	+ 22	+ 15	+ 6	+ 56	+ 10	+ 42	− 26	+ 69	+ 20	+ 23
1895 ...	+ 44	+ 83	+ 106	+ 90	+ 95	+ 92	+ 91	+ 50	+ 19	+ 64	+ 58	+ 10	+ 67
1896 ...	+ 65	+ 26	+ 58	+ 93	+ 10	− 1	+ 25	+ 58	− 21	+ 43	+ 9	+ 101	+ 39
1897 ...	+ 46	+ 23	− 15	+ 59	+ 62	− 12	+ 3	+ 39	+ 92	+ 5	− 36	+ 62	+ 27
1898 ...	+ 10	+ 61	+ 14	+ 6	+ 9	+ 32	− 1	+ 12	+ 115	+ 40	+ 79	+ 1	+ 31
1899 ...	+ 22	+ 15	+ 38	− 5	+ 1	+ 9	+ 45	+ 67	+ 44	+ 32	+ 5	+ 27	+ 25
1900 ...	+ 60	+ 24	− 4	+ 76	+ 62	+ 18	+ 4	+ 38	+ 14	− 18	+ 18	+ 32	+ 27
1901 ...	− 26	+ 38	+ 48	+ 14	+ 14	+ 40	+ 18	+ 76	+ 26	+ 38	+ 18	− 6	+ 25
1902 ...	+ 12	+ 10	+ 48	+ 24	0	+ 8	+ 20	+ 20	+ 16	0	− 16	+ 26	+ 14
1903 ...	+ 20	+ 40	+ 31	+ 34	+ 25	+ 44	+ 18	+ 67	+ 5	+ 66	− 6	+ 43	+ 32
1904 ...	+ 21	+ 22	+ 29	+ 61	+ 59	+ 23	+ 30	+ 51	− 16	+ 14	+ 39	+ 53	+ 32
1905 ...	+ 99	+ 60	− 25	+ 44	+ 64	− 6	+ 48	+ 115	+ 6	+ 22	+ 16	+ 25	+ 39
Means, 1894—1904.	+ 28	+ 26	+ 38	+ 43	+ 32	+ 24	+ 28	+ 44	+ 31	+ 23	+ 22	+ 34	+ 31
Variation ...	− 3	− 5	+ 7	+ 12	+ 1	− 7	− 3	+ 13	0	− 8	− 9	+ 3	...

TABLE 449.—*Showing the average aperiodic change from 0^h to 24^h for all quiet-days shown in thick type in table 450.*

Unity = 0·1γ

Year.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	+ 4	− 10	+ 35	+ 30	+ 40	+ 45	+ 50	+ 14	+ 62	− 10	+ 20	+ 30	+ 28
1895 ...	+ 44	+ 207	+ 100	+ 65	− 35	+ 47	+ 34	+ 16	+ 17	− 60	+ 23	+ 20	+ 36
1896 ...	+ 57	+ 210	+ 35	+ 40	+ 33	+ 20	+ 44	+ 84	+ 53	+ 54	+ 39	+ 34	+ 43
1897 ...	+ 28	+ 16	+ 24	+ 25	+ 55	+ 16	+ 24	− 6	− 12	+ 1	− 18	+ 39	+ 16
1898 ..	+ 13	+ 19	− 16	+ 28	+ 16	+ 25	+ 23	+ 28	+ 126	− 2	+ 28	+ 1	+ 24
1899 ...	+ 34	+ 40	+ 45	+ 32	+ 12	+ 17	+ 11	+ 31	− 17	+ 21	+ 8	+ 22	+ 22
1900 ...	+ 46	+ 33	+ 36	+ 7	+ 32	− 5	+ 7	+ 37	+ 17	+ 4	+ 14	+ 21	+ 18
1901 ...	+ 6	+ 29	+ 22	+ 33	+ 3	+ 24	+ 22	+ 28	+ 11	+ 10	+ 22	+ 11	+ 19
1902 ...	+ 27	+ 15	+ 5	+ 18	+ 6	+ 12	+ 31	+ 18	+ 21	+ 25	+ 19	+ 17	+ 18
1903 ...	+ 20	+ 32	+ 28	+ 15	+ 16	+ 14	+ 36	+ 51	+ 50	+ 40	+ 23	+ 70	+ 28
1904 ...	+ 46	− 34	+ 5	+ 33	+ 11	+ 30	+ 9	+ 23	+ 10	+ 26	+ 25	+ 38	+ 20
1905 ...	+ 45	+ 42	+ 43	+ 19	− 8	+ 37	+ 28	+ 42	+ 10	+ 33	+ 11	+ 16	+ 23
Mean, 1894—1904.	+ 27	+ 32	+ 23	+ 26	+ 17	+ 18	+ 23	+ 26	+ 24	+ 15	+ 20	+ 23	+ 23
Variation ...	+ 4	+ 9	0	+ 3	− 6	− 5	0	+ 3	+ 1	− 8	− 3	0	...

Any way the results in table 449 in which the vitiating effects due to selective methods are reduced to a minimum, can scarcely be set aside as less reliable than those in tables 446, 448 and it cannot but become obvious that selective methods do introduce sufficiently serious uncertainties in the progression of the aperiodic element to detract much from the usefulness of the result. And even then, if the aperiodic element derived from any two hours 0^h and 24^h, is to be definitely regarded along with other elements such as the range or the daily mean as one of the certain indices of the character of an interval of 24 quiet hours, it must be made certain that it is not influenced by other accidental factors. In tables 450* and 451 have been collected for the period 1894—1904 the aperiodic element of each day derived from 0^h and 24^h in the former, and from 10^h to 10^h in the latter from which have been derived the data in tables 446, 448 and 449 already referred to. In tables 452 and 453, we have the aperiodic element derived from 10^h to 10^h respectively for the Astronomer Royal's quiet-days and the locally selected days. Thus tables 446 and 452 are comparable, inasmuch as they relate to practically the same quiet-day, as in

* Figures in thick type denote quiet-days.

TABLE 450.—*Showing the aperiodic changes from 0^h to 24^h of each day of the years 1894 and 1895.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 4	+ 14	+197	+52	− 17	+33	0	+ **8**	+22	+37	+ 3	+ 5
2 ...	+ 7	− 30	+ 1	+28	+37	− 1	− 8	− 1	− 8	−11	+ 9	+ **3**
3 ...	−43	+ 4	+ 13	+ 3	+ 4	−10	− 27	+ **4**	+ **2**	+16	+ 4	+ 4
4 ...	+ 6	+ 12	− 10	+ 1	−17	+ 2	+ 21	+ 14	− **4**	− 1	− 3	+ **4**
5 ...	− 6	+ 18	+ 18	+ 5	+17	+ **9**	− 1	− 19	+ 1	−16	+ 12	−42
6 ...	+20	− 23	+ 19	− 7	− 2	+ **1**	+ 6	**0**	+ 7	+ 6	− 18	+21
7 ...	+ 8	− 4	− **10**	−12	+28	+ **8**	+ 15	− 5	−16	+ 6	+ 1	+ 7
8 ...	+ **6**	+ 8	+ **7**	+14	−27	**0**	− 28	+ 19	−20	+ 2	− 20	− 3
9 ...	+ **7**	− **13**	− 17	+ 9	− 3	−55	+ 1	− 13	+33	+ 2	+ 11	+ 2
10 ...	−21	+ **11**	+ 11	0	+ 7	+ 4	+ 15	+ 6	−13	− **1**	+ 11	+ **5**
11 ...	+24	+ 9	+ 2	+ 6	+ 2	+ 6	− **3**	− 1	− 1	+ 7	0	+**13**
12 ...	−14	− 4	+ **7**	−20	+ 3	+20	− 12	− 3	− 2	− 1	+ **3**	−25
13 ...	+11	+ 2	+ **9**	−18	+ 8	+ 6	+ 8	− 8	+**10**	+ 1	−204	+11
14 ...	− 8	+ 4	− 36	+34	−45	− 2	+ **4**	− 13	−81	− 4	+142	+ 2
15 ...	+ **8**	− 20	+ 3	− 1	− 4	+ 8	− 1	+ 3	+28	− 4	+ 28	−48
16 ...	+ **8**	− 10	− 6	0	+11	− 6	+ 1	+ 14	+18	−25	0	+24
17 ...	+ **1**	+ 37	+ 16	−93	+ 2	− 5	− 17	− **2**	+11	+11	− 4	+27
18 ...	− **7**	− 7	+ 2	+51	+ 7	+13	− 15	+ **1**	+12	+ 4	− 30	− **3**
19 ...	+10	− 13	+ 1	+16	0	−27	+ 3	+ 6	−23	+11	+ 14	+ 1
20 ...	− 5	+ **2**	+ 8	+ 3	+ 2	+20	−193	−186	− 7	− 2	+ 34	+ **5**
21 ...	−11	− 65	− 33	− 4	− 6	−28	+138	+ 95	+13	− 3	+ 12	−20
22 ...	+ 3	+ 33	− 3	+ 2	+ 5	− 4	+ 23	+ 44	−11	+ 2	+ **1**	+ 8
23 ...	− 1	+ 24	+ 16	+ **3**	− 5	+20	+ 29	+ 17	+20	− 5	− 70	+ 8
24 ...	−11	− 60	+ 3	− 1	+ **5**	+26	+ 5	− 2	0	− 9	+ 28	+ 1
25 ...	+18	− 98	+ 3	+ 3	+ **1**	− 3	− 26	0	+ 7	+ 1	+ 27	+ **4**
26 ...	−23	+ 95	+ 1	+ 3	+ **6**	− 5	+ **14**	− 3	− 4	+ 2	− 6	**0**
27 ...	+ 7	+ 50	+ **3**	− 2	0	+ 3	+ 13	+ 10	− 8	−14	+ 4	+ 6
28 ...	+ 7	−212	+ **5**	+19	−24	+ 1	+ 4	− 1	+17	+22	− 2	− **5**
29 ...	−**20**		− 7	+18	+ 8	− 7	+ 6	+ 5	+**17**	+13	− 4	− 8
30 ...	+14		− 89	− 51	− 2	+ 9	+ 1	− **1**	−52	0	+ 14	+ **6**
31 ...	+ 1		− 6		−22		+ 1	**0**		−18		+ **1**
Average variability per day.	11·0	31·5	18·1	16·0	10·5	11·4	20·6	16·3	15·6	8·3	24·0	10·4

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−30	− 50	+14	− 3	−12	− 11	− **5**	− 7	+ 6	+16	+15	+13
2 ...	− 1	−33	− 4	+ 9	+ 7	+12	− 4	− **2**	+ **6**	+10	− 5	− 3
3 ...	− 2	+**64**	− 2	− 4	−10	− 5	+ 2	+ **2**	− **6**	−**13**	+ 4	− 1
4 ...	+23	+33	− 3	+ 6	+ **7**	+10	+ 2	+ 4	−62	−10	− 7	− 2
5 ...	+ 8	−31	+ 4	−15	−18	− 5	+**17**	− 7	+20	+21	+10	+ 5
6 ...	−36	−34	+ 1	− 3	+13	+19	−48	− 6	− **2**	− 3	+ **7**	+10
7 ...	+34	+52	+ 1	+11	−19	−16	+35	+ **5**	+**11**	+20	+ 5	−59
8 ...	− 6	−28	+31	+ **5**	+21	+**15**	−**11**	+ **4**	+ **1**	−18	−16	+18
9 ...	−12	−33	−39	−25	−10	−**13**	+20	−14	+**10**	+ 9	−53	+ 6
10 ...	+11	+43	+ 3	+**19**	−26	+ **7**	**0**	−60	− **2**	+10	+ 5	+33
11 ...	− 8	− 2	+ **3**	−49	+21	−10	+14	+30	− **4**	+11	+18	−24
12 ...	+18	+ 6	+ 9	+18	+ 7	+ **9**	−27	+ 6	+ 9	−40	+25	− 1
13 ...	−13	− 6	−71	+25	− 5	+ **6**	−10	+ 7	+ **7**	−11	− 8	+10
14 ...	+**10**	− 7	+27	−10	−42	− **5**	− 3	+11	+ 3	+26	+ 9	+ 6
15 ...	+ **8**	−13	+20	−10	+41	+23	− 5	− **2**	−38	+ 5	0	− 4
16 ...	−23	−27	− 8	+ 6	+ 8	− 8	+11	+ **2**	+ 8	−15	+ 1	− **1**
17 ...	+ 8	+38	+ 8	+ 1	−**22**	−19	+ 3	+ 9	+16	0	+ 7	+ **2**
18 ...	− 1	+ 5	+ 3	− 4	− 8	+ 1	+ **7**	−25	+ 9	+ 7	+ 5	−14
19 ...	−10	− 5	− 9	+ 1	+34	+ **7**	− **2**	+19	−26	+13	− **4**	+19
20 ...	− 7	− 1	− 3	+ 7	+ **2**	+ **6**	+ 9	+12	+13	+10	+ 7	+ 2
21 ...	+ 2	+**10**	0	+ **1**	− 8	+ 6	− **3**	− 1	− 2	−15	− 1	−29
22 ...	+16	+ **5**	+ 1	+**16**	+ 7	0	+ 4	+ **6**	+ 7	+14	+ **4**	+24
23 ...	+ 6	+ **4**	+10	−51	+ 6	−11	− 7	+ 4	+ 2	−18	−39	−13
24 ...	− 3	−45	+**17**	+33	− **3**	− 8	+ 7	−18	+ **2**	+12	+12	−17
25 ...	+ **3**	+26	− 5	+11	− **1**	+**10**	+**16**	+ **7**	− 6	+ **1**	+ 5	+ 9
26 ...	+ **4**	+20	−14	−14	− **4**	+ **5**	−42	− 5	0	− 4	+ 9	+10
27 ...	+ **4**	+ 9	+ 2	+ 9	+14	+13	+ 9	+ **3**	**0**	−68	− 8	+ **5**
28 ...	**0**	−29	+12	− **2**	−20	− 7	− 2	+ **1**	− **2**	+ **2**	−11	+ 1
29 ...	−17		+ 9	**0**	+ 3	−17	+10	− 6	+ 2	+35	+ 5	+ **3**
30 ...	+ **2**		−14	+13	−17	− 2	+ 3	+19	−45	− 1	+ 8	0
31 ...	+ 7		− 2		− 5		+17	− **8**		0		+ **1**
Average variability per day.	10·7	23·5	11·3	12·7	13·6	9·3	11·5	10·1	10·9	14·1	10·4	11·1

Figures in thick type denote quiet-days.

TABLE 450.—*Showing the aperiodic changes from 0^h to 24^h of each day of the years 1896 and 1897.*

Unity = $1\gamma = \cdot00001$ C. G. S.

1896. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ **8**	+ 5	+ 22	- 5	- **3**	**0**	- 2	-16	- **4**	+ 3	+**11**	-21
2	- 8	-21	+ 5	-**17**	-98	+ **6**	- **3**	- 7	+ 2	-19	**0**	+25
3	-30	-27	- 12	- 3	-15	+ **5**	- 4	- 1	+ 2	+ 2	+ **2**	-30
4	+ 1	+30	- 11	+28	+71	-**11**	+ 4	+ 6	- 8	+11	-19	-40
5	+ 7	- 4	+ 5	-28	+25	+ 4	- 9	+ **8**	+ 1	+ **1**	+ 6	+34
6	- 6	+19	+ 13	- 6	+14	- **3**	+ 7	+12	- 5	+ **5**	-35	+15
7	+13	+ 3	- 3	+**25**	-12	+ **2**	+ 3	-19	+13	+ **1**	-37	- 9
8	- 1	-35	- 1	+ 5	+ 5	+19	-**10**	0	+ 5	-16	+42	+**10**
9	-25	+32	+ 6	-10	+ **9**	-37	+ **9**	0	0	-18	+19	- **2**
10	+17	- 6	+ 7	0	- 3	+ 8	+ **4**	- 2	- **9**	+37	- 9	+ 2
11	+26	+ 3	+ 14	+ 5	- 5	+ 2	- 8	+ 9	+11	-38	+**10**	+ 4
12	- 9	- 5	- 44	+ 7	- 1	+ **7**	- 6	- 6	- 7	-10	+ **4**	+**12**
13	-18	+24	+ 21	- **1**	+15	+ **1**	- 6	+ 4	- 4	+24	- **4**	-25
14	+17	-21	- 7	0	- 3	-16	+ 7	+ **5**	+ 5	+ 2	- 2	+ 2
15	+ 1	+ 4	+ 12	- **3**	- 3	+ 1	+ 4	**0**	+ 1	-15	- 2	-10
16	+ 5	- 2	+ 9	+ **6**	- 5	-28	+ 2	+ **2**	-24	- 3	+ 2	+18
17	-15	- 6	- **3**	-15	+ 2	+27	+ 4	+**38**	- 5	+ 8	+**25**	+13
18	+20	+ 6	+ **3**	+ 3	-30	+ 1	+ **4**	-58	-43	+**11**	-24	+ **2**
19	-32	+10	+ **8**	+ 7	+ 7	+ 8	+ **3**	+ 6	+**31**	- 5	+ 1	+ **5**
20	+ 3	+ 1	- 51	+ **9**	- 2	- **4**	+**10**	+ 9	-31	+ 5	+ 4	- **3**
21	+14	- 3	+ 40	-39	+ 4	+ **3**	- 3	-54	+25	+ 4	+ 2	+ **3**
22	- 1	- 2	+ 6	-13	+13	+ **8**	+ **1**	+32	+22	+ **8**	+ 7	+ **7**
23	+ 3	-12	+ 1	+24	-14	+ **4**	+38	+ 2	+ 7	- 5	+ **1**	-19
24	+ 3	+**21**	+ **6**	- 2	+ 5	+ **2**	-46	+ 3	-24	- 3	+ **4**	+11
25	-29	- 9	- 32	-11	+ 5	+ **5**	-23	0	+23	+ **7**	+ **8**	+ **1**
26	+33	- 3	- 13	+ 7	+ **7**	+ **4**	+**11**	+ 4	+ **8**	+ **2**	**0**	- **1**
27	- **9**	- 9	+ 8	+16	-**11**	-20	- 8	+**10**	- **2**	- **1**	- 5	+ 3
28	+**18**	+14	+ 6	-17	+**15**	+ **3**	+21	- **4**	+**10**	+ **5**	- **6**	- 4
29	+ 8	-40	+ 1	+ 1	+ **7**	+11	+ **6**	+22	- 8	+ 2	+ **5**	+ 3
30	-31		+ 7	+ **9**	- 7	- 7	-16	-25	+ **3**	-30	- **6**	0
31	+ 5		+ 5		- **1**		+**13**	+ 4		+**15**		+ 1
Average variability per day.	13·4	13·0	12·3	10·7	13·5	8·6	9·5	11·9	11·4	10·2	10·1	10·8

1897 Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	- 2	+ 4	+ 8	- 1	+**13**	+ 6	+ **4**	-18	-**17**	- 4	+ 1	- 17
2	-160	+ **7**	- 7	- 5	-23	0	+ **5**	+21	+**16**	+ 4	+ 3	+ 10
3	+104	-46	- 27	+11	+15	-17	- 4	+ 2	-13	- 5	- 5	- **4**
4	+ 18	+21	- 22	0	+ 5	+14	- **4**	+ **7**	-10	+ 2	+11	+ 9
5	+ **13**	+ 4	+ 23	- 1	+ 3	+ 3	- **1**	+ **1**	+ 2	- 4	-14	- 7
6	+ **6**	+ 9	+ **14**	-18	-14	+ **6**	+10	+ **3**	+13	- **1**	- 1	- **3**
7	+ **13**	-24	+ 13	+14	+ **7**	- **9**	- 8	+ **4**	+ **5**	+ **4**	- **5**	+ **7**
8	- **6**	+20	- 22	+12	+ 7	+ **6**	- 4	- **5**	- **4**	+ **5**	+12	+ **3**
9	+ **4**	+ 7	+ 9	- 4	+ **4**	+ **5**	+ **9**	- 7	- **1**	+10	0	+ 8
10	+ 10	- 7	+ 10	-17	+11	+ **5**	+ 8	+ 9	+ 9	-27	+ **2**	- 31
11	- 30	+12	- 2	+**14**	-21	- 9	-19	- 3	-26	+ 5	- 2	- 74
12	+ 2	- 5	+ 8	+ **6**	+ **9**	+11	+ **7**	+ **1**	+18	+11	- **1**	+ 50
13	- 9	+ 3	- 3	-**10**	- 8	- 3	- **1**	-**16**	+ 3	- **8**	- **3**	+ **12**
14	+ 23	- 9	+ 1	- 5	- 7	- 6	-19	+ **5**	- 8	+ **7**	-12	+ 10
15	- 2	+ 4	+ 5	+ **6**	- 5	+ **5**	+ 6	+10	- 5	- 4	+ 8	+ 48
16	- 4	+ **4**	+ **3**	+10	+ **4**	- 19	+ 9	+ 1	+ 9	+12	+ 2	- 37
17	+ 3	- **7**	- **12**	-19	-63	-20	- **3**	- **6**	+ 5	- 7	-20	- 10
18	+ **5**	+ **9**	+ **8**	- 6	+61	+11	+ **6**	-**21**	+ 5	-27	- 4	+ 2
19	+ **2**	+ **5**	+ **1**	+10	+10	+ 6	+ **9**	+17	- 7	+14	+17	+ 15
20	+ **5**	- **6**	0	-52	-19	+ 4	-**13**	- 4	+ **1**	+ **6**	-20	-114
21	+ **1**	- 7	- **2**	+28	-12	+ 1	+**15**	**0**	+10	+ 7	+27	+ 71
22	**0**	- **1**	+ 2	+24	+ 2	- 3	-33	+ **8**	-11	- 3	- 4	+ 21
23	- **2**	- 4	- 25	- 6	+ 4	+ **1**	+13	+ **2**	-12	- 4	+ 9	- 3
24	- **8**	+ 3	+ 9	-45	+ 2	+ **9**	+10	- **1**	- 5	+ 5	-29	+ 11
25	- **9**	+ 3	+ 9	+31	- **2**	- **8**	- 6	+ 2	+12	+ 1	+38	- 11
26	+ **15**	-23	+ **5**	+15	+**12**	+13	+ **8**	- **3**	+ **1**	-**12**	-13	+ **9**
27	+ 1	- 9	- 6	- 8	+ **5**	-14	-**10**	- 3	- 3	+ 1	+ 5	+ **3**
28	- 8	+23	+ 12	+ 4	+ **6**	+15	+ **4**	+ **7**	+18	-14	- **2**	+ 8
29	- 9		- 35	- **5**	- **3**	- **5**	+ **3**	+ **3**	- **7**	+20	+12	- 25
30	- 15		+ 9	+ **4**	-34	+ **3**	+ 1	- 6	- **5**	-17	- 5	+ 18
31	+ 24		- 5		+19		-17	+ 7		+12		- 33
Average variability per day.	16·5	10·2	10·2	13·0	13·2	7·9	8·7	6·5	8·7	8·5	9·6	22·1

Figures in thick type denote quiet-days.

TABLE 450.—*Showing the aperiodic changes from 0^h to 24^h of each day of the years 1898 and 1899.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+20	+ 6	**+ 3**	**+ 3**	- 9	+ 2	+ 4	**- 1**	- 27	+ 9	+ 5	**- 4**
2 ...	+13	**- 6**	- 31	**+ 4**	- 2	- 3	**0**	0	+ 5	+10	+ 8	**+ 5**
3 ...	**+ 5**	**- 8**	+ 12	**+ 3**	+ 1	+ 3	+ 5	- 5	- 33	**+ 1**	- 4	- 3
4 ...	**0**	+13	+ 12	-34	-21	**+ 6**	**0**	-14	+ 20	**+ 7**	**- 3**	**- 5**
5 ...	**- 1**	-13	- 19	+23	+ 9	**+ 3**	- 8	+ 9	- 10	- 6	**+ 4**	+ 5
6 ...	**+ 6**	-11	+ 3	-14	+ 2	**- 4**	+ 8	-10	**+ 16**	+ 9	**+ 6**	+15
7 ...	**0**	**+11**	+ 12	-24	**+ 7**	-25	+ 2	+12	**+ 13**	-21	- 6	-26
8 ...	**+ 1**	**+ 4**	- 4	+14	**- 1**	+24	- 7	**+11**	- 15	**+ 8**	+13	+17
9 ...	**- 2**	**+ 3**	+ 8	+14	**+ 1**	- 2	+ 1	**- 5**	-138	**+ 3**	**-19**	-11
10 ...	-31	**+ 6**	- 22	**+ 1**	+ 3	- 5	**+ 1**	**- 2**	+ 57	**- 9**	**+ 6**	**+ 2**
11 ...	+15	-57	- 22	**- 4**	-25	+12	**+12**	+ 1	+ 18	**+ 8**	**- 6**	+ 9
12 ...	+ 8	+38	+ 21	-56	+11	0	**- 4**	-12	**+ 20**	+ 1	+10	+ 3
13 ...	+ 4	+ 1	+ 17	+46	+ 7	**0**	- 7	- 1	+ 19	**-14**	**- 5**	+ 8
14 ...	+ 3	-22	**- 3**	+ 1	+ 7	**+ 3**	**+ 1**	**+12**	- 35	**- 3**	**+10**	-16
15 ...	-22	+13	-119	+ 6	- 6	- 6	**+ 1**	**+ 5**	+ 27	+28	- 5	-14
16 ...	**- 7**	**+ 3**	+ 38	+12	+ 9	0	**+ 1**	-42	**+ 20**	-10	+ 5	+ 4
17 ...	+ 5	- 9	+ 38	-11	- 2	**+ 9**	**+ 4**	+ 5	+ 22	**+ 2**	-19	- 7
18 ...	- 1	+ 10	- 4	+10	+ 3	**+ 1**	**+ 3**	+11	- 23	**+ 1**	- 5	+ 9
19 ...	+11	+ 8	+ 28	**0**	+ 3	- 5	- 1	+ 6	0	**+ 3**	**+22**	-25
20 ...	+13	-11	- 9	**+ 1**	0	+ 3	-33	+ 1	**+ 5**	-24	- 1	+23
21 ...	-18	-10	+ 14	**+ 4**	**+ 2**	**+ 2**	+31	+ 3	**- 3**	+ 8	-24	+ 5
22 ...	+ 8	+11	**0**	**0**	**0**	+18	+ 1	- 6	**+ 22**	+ 8	-22	+ 1
23 ...	**+ 5**	**+10**	+ 1	- 4	**- 1**	-27	- 4	+ 2	- 12	**- 7**	**+22**	**+ 1**
24 ...	**+ 5**	**- 4**	+ 2	+ 9	**- 3**	+12	-12	**+ 3**	- 24	**- 3**	**+10**	**- 4**
25 ...	- 6	**+ 4**	**- 4**	-12	**+ 8**	-13	- 1	**+ 3**	+ 12	- 3	**+ 6**	**+ 3**
26 ...	- 3	**+ 1**	+ 7	**+ 4**	0	-20	+ 4	-17	**+ 8**	- 2	-17	**+ 5**
27 ...	+ 3	**+ 3**	- 2	**+16**	+ 2	+10	+14	+12	+ 3	- 1	- 1	+ 4
28 ...	- 7	**- 1**	+ 1	- 20	- 20	+12	-13	- 3	- 44	-29	+22	- 9
29 ...	- 2		**- 4**	**+ 2**	+ 1	+ 2	**+ 6**	+ 9	+ 19	+17	0	**- 4**
30 ...	+15		- 6	+ 1	-16	- 9	+15	**- 1**	+ 6	+26	+ 2	**+ 2**
31 ...	**- 2**		+ 1		+10		- 9	+19		-13		+ 7
Average variability per day.	7·8	10·6	15·1	11·8	6·2	8·0	6·9	7·8	22·5	9·5	9·6	8·3

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	**+ 3**	- 1	+ 6	+ 9	-25	+ 3	+18	**+ 6**	-10	**- 2**	**+ 2**	- 2
2 ...	**+ 3**	**- 1**	**+ 4**	- 3	+10	- 3	+42	+ 3	+ 2	**+ 7**	**- 1**	+ 3
3 ...	-13	**+ 9**	-23	- 2	+25	- 2	-38	- 6	+ 6	**- 3**	0	+18
4 ...	+ 4	**+ 5**	**+17**	- 5	-24	+ 6	+27	-17	- 1	- 8	-16	-17
5 ...	- 3	**0**	**+ 5**	+ 4	-11	**- 3**	-16	+10	**+ 1**	+13	+ 5	**1**
6 ...	+ 2	+14	+ 8	+ 8	+19	**+ 5**	-11	- 6	**0**	- 3	**+ 4**	**+11**
7 ...	**+12**	- 6	-23	-14	+ 8	**- 2**	+12	0	**- 5**	- 7	**+ 7**	-11
8 ...	**0**	**-10**	+19	+ 4	+ 4	**+ 7**	+ 4	- 3	+ 8	**+ 7**	**+ 1**	- 9
9 ...	**+ 6**	- 2	- 5	+ 1	- 8	**- 8**	+10	+ 6	- 1	**0**	**+ 2**	**+ 8**
10 ...	-12	**+ 8**	+10	- 6	+ 6	**- 5**	-10	**- 8**	-11	**+ 2**	**+ 1**	**+ 5**
11 ...	**+ 2**	**+14**	-22	- 9	- 6	**+ 1**	+ 4	**+ 6**	+ 4	**+ 4**	- 3	**+ 3**
12 ...	- 3	-86	+ 8	+ 7	+ 2	**+ 6**	- 6	**+ 5**	**- 2**	**- 1**	- 5	**- 4**
13 ...	**- 2**	+35	-10	**+ 4**	**+11**	-10	**+ 1**	- 8	**+ 1**	**+ 3**	**- 1**	**0**
14 ...	**+ 8**	**+ 7**	**+ 6**	**+ 8**	**- 3**	**+ 4**	**+ 3**	**+ 2**	**+ 9**	**0**	**+ 6**	**+ 2**
15 ...	**+ 6**	**+ 7**	**+ 8**	**- 5**	-11	**+ 4**	**+ 9**	**+ 6**	**- 7**	**-31**	**+ 3**	**+ 3**
16 ...	**+ 7**	**- 7**	**- 5**	**+ 2**	-20	**+ 1**	**- 3**	**- 2**	**- 3**	**+19**	**0**	**+ 3**
17 ...	-19	**+19**	**+ 3**	-11	**+ 3**	**+ 7**	**+ 6**	**+ 3**	**- 1**	**- 6**	**+ 3**	**- 8**
18 ...	-24	**- 5**	**+ 2**	-41	**+11**	-14	**- 3**	**- 4**	**-11**	**0**	**+12**	**-22**
19 ...	**+23**	**+ 3**	**+ 2**	**+18**	**+ 4**	**+ 8**	**+ 2**	**+16**	**+15**	**+ 9**	**-23**	**+13**
20 ...	**- 6**	**- 2**	**+ 3**	**+ 3**	**+ 4**	**+ 1**	**0**	**-29**	**- 6**	**- 4**	**+ 9**	**+14**
21 ...	**+ 3**	**-11**	**-31**	**+ 2**	**- 3**	**+ 5**	**- 5**	**- 3**	**- 9**	**+11**	**- 8**	**-16**
22 ...	**+ 3**	**+17**	**-19**	**+10**	**- 7**	**+ 5**	**+ 3**	**+ 2**	**+19**	**- 7**	**-15**	**+ 4**
23 ...	**-13**	**+ 4**	**+ 2**	**- 6**	**+23**	**- 5**	**- 4**	**+ 6**	**- 1**	**- 4**	**+17**	**0**
24 ...	**+11**	**-15**	**+ 4**	**+16**	**- 8**	**- 1**	**+ 5**	**0**	**+ 5**	**+ 6**	**- 4**	**+ 5**
25 ...	**- 6**	**-11**	**+ 7**	**-14**	**- 1**	**+ 2**	**- 9**	**+ 1**	**+14**	**-19**	**+ 3**	**0**
26 ...	**+ 3**	**+ 7**	**- 4**	**+10**	**0**	**+ 1**	**- 3**	**+ 6**	**-47**	**+ 4**	**+ 1**	**+ 2**
27 ...	**+ 9**	**+ 6**	**+15**	**- 2**	**-10**	**-21**	**+ 8**	**+ 5**	**+11**	**+ 2**	**+ 5**	**- 5**
28 ...	**-16**	**- 5**	**- 1**	**0**	**+ 4**	**+35**	**0**	**+ 1**	**+ 2**	**+ 5**	**- 5**	**+ 6**
29 ...	**-15**		**+11**	**0**	**+ 3**	**-36**	**+ 2**	**+ 2**	**- 2**	**+ 6**	**- 8**	**- 4**
30 ...	**+ 5**		**+ 5**	**- 7**	**+ 3**	**-33**	**- 3**	**-14**	**+ 5**	**+ 3**	**+ 3**	**+ 1**
31 ...	**+ 6**		**- 8**		**- 9**		**+ 6**	**+ 4**		**- 7**		**- 7**
Average variability per day.	8·0	11·3	9·5	7·7	9·2	8·1	8·8	6·1	7·3	6·5	5·8	6·7

Figures in thick type denote quiet-days.

TABLE 450.—*Showing the aperiodic changes from 0^h to 24^h of each day of the years 1900 and 1901.*

Unity = 1γ = ·00001 C. G. S.

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 3	+14	- 6	- 3	-36	+ 8	+ 4	- 9	0	0	- 6	+ 5
2	+ 5	- 2	- 5	+ 2	+23	- 1	- 4	+ 5	- 1	+ 2	+ 8	-14
3	+ 4	- 4	+ 2	+11	+ 5	- 6	+11	- 1	- 4	+ 4	- 1	+ 3
4	+ 3	+11	+ 4	+ 3	- 3	+ 3	0	0	+ 8	- 9	+ 3	+ 3
5	-39	-25	+ 5	-25	-90	+ 9	+ 5	- 1	-11	- 3	+ 3	- 1
6	+22	+ 6	+ 10	+ 8	+43	- 1	- 4	+ 5	+ 1	+ 5	- 5	+ 4
7	+ 3	+ 6	- 10	+ 2	+21	- 6	+ 2	- 2	+ 5	- 4	+ 5	-10
8	+ 1	+ 9	- 55	-11	+ 1	+ 2	- 3	-11	+ 8	+ 2	- 1	+ 2
9	+15	-16	+ 1	0	+ 9	+ 2	+ 4	+ 3	- 4	- 1	- 3	+14
10	-18	+11	+ 26	+ 2	+ 5	- 6	- 4	+ 9	-12	+11	+ 5	-16
11	+14	- 9	+ 5	+ 2	+ 4	+ 4	+ 1	+ 9	+ 8	- 7	+ 1	+15
12	-12	0	+ 4	- 7	+ 7	+ 3	- 6	- 9	+ 2	+ 4	- 7	-10
13	+ 6	+ 6	-101	- 4	-13	- 6	+ 8	- 1	+ 6	- 1	- 3	+ 3
14	-12	-15	+ 70	+13	+ 5	- 1	- 5	- 6	-11	- 2	- 9	- 1
15	+19	0	+ 8	+ 5	+ 2	+ 2	+ 1	+12	- 4	+ 1	+13	+ 5
16	-17	+ 3	+ 6	- 4	+ 1	0	- 2	- 1	0	+ 4	+ 3	- 2
17	+ 1	+ 3	+ 14	+10	0	+ 5	+ 7	+ 2	+ 9	- 5	+ 1	- 1
18	+ 7	+ 8	+ 8	-20	+15	- 5	-11	+15	- 4	0	- 4	+ 6
19	+40	+ 2	- 3	+11	-17	+ 4	+ 4	+12	- 2	- 1	- 3	0
20	-60	+ 2	+ 4	+ 2	+ 5	- 5	- 5	- 8	+ 4	- 7	+ 6	- 2
21	+15	-12	- 4	- 8	+ 5	+ 6	+ 2	+ 5	- 2	+10	- 6	+ 7
22	+12	+ 9	- 1	+ 5	- 7	- 2	+ 3	0	+ 4	-11	+ 2	- 5
23	- 5	+ 6	+ 4	- 4	- 5	- 7	+ 8	- 1	- 4	+10	+ 8	- 2
24	+ 1	-16	0	- 9	+ 8	+ 5	-12	+ 8	0	+ 1	-16	+ 4
25	- 1	+ 6	+ 2	+18	+ 1	+ 1	-11	-13	- 4	-38	0	-14
26	+ 5	+ 5	0	- 6	- 7	- 2	+ 6	+ 6	+ 6	+19	+ 7	+15
27	-10	0	0	- 7	+ 3	+18	- 1	- 6	+ 2	- 2	+ 5	-22
28	- 2	0	+ 3	+ 2	+ 6	-19	- 2	+ 1	-10	+ 2	+ 1	+ 2
29	+15		- 7	+13	- 4	- 5	+ 6	+ 1	0	0	- 7	+ 5
30	- 4		+ 10	- 6	- 5	- 3	+ 3	+ 4	0	+ 2	+ 6	- 3
31	-13		- 9		- 2		+ 6	+ 3		+ 3		+ 1
Average variability per day.	12·4	7·4	12·5	7·4	11·5	4·9	4·9	5·5	4·5	5·5	4·9	6·4

1901. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+18	+ 8	+ 1	-10	- 1	- 3	+ 1	- 9	- 7	+ 1	- 3	+24
2	- 9	-26	0	+ 8	+ 1	-18	+ 4	+ 9	+ 4	+ 2	+ 5	-43
3	- 9	+16	- 5	0	- 3	+ 8	+ 3	- 1	- 2	- 2	+11	+ 8
4	+18	+ 6	+ 2	+ 4	+ 1	- 2	- 1	-16	- 3	+ 8	-36	+ 2
5	-18	+ 3	+ 2	+ 7	- 2	+ 5	- 7	+ 4	+ 3	- 5	+27	-17
6	+ 1	0	0	+ 2	+ 6	+10	+ 2	+11	- 1	0	-12	+18
7	+ 5	+ 4	-11	-19	- 1	-15	+ 1	+ 9	+ 1	- 2	+ 1	0
8	0	- 2	+ 5	+ 7	- 2	- 3	+ 9	-25	+ 5	+ 6	+ 2	+ 2
9	+ 5	+ 3	- 7	+ 4	- 6	+ 6	- 5	+11	+ 4	-17	- 2	+ 3
10	-11	- 2	+13	+ 3	-22	- 1	- 4	- 2	-30	+ 4	+ 1	- 4
11	0	+ 7	- 6	- 2	+11	- 4	+15	+ 1	+ 1	- 2	- 6	+ 5
12	+ 2	-16	+ 1	0	+ 3	+ 7	-36	+ 2	+ 6	+ 4	+ 5	0
13	+ 2	0	-22	+ 5	+ 3	- 2	+15	+ 2	+ 1	- 1	+ 8	- 1
14	+ 6	+ 2	+10	-30	+ 1	- 8	+ 8	-39	+ 4	0	0	- 2
15	+ 3	+ 9	+10	+15	- 7	-10	- 1	+24	+ 6	+ 6	- 3	+ 3
16	+ 1	+ 3	+ 2	+ 5	+ 8	+ 5	- 7	- 8	+ 8	- 6	+ 4	0
17	- 2	- 2	- 5	- 4	+ 6	+ 5	- 4	+ 6	-16	+ 1	- 6	- 2
18	+ 1	- 5	- 8	+10	+ 2	+ 3	+12	- 1	+ 2	+ 1	- 2	+ 4
19	+ 2	-23	- 2	- 1	-11	+10	- 4	+ 5	+ 2	+ 4	-14	- 2
20	- 1	+12	- 4	- 2	+ 4	+ 8	- 4	- 6	+ 2	+ 2	+11	- 2
21	- 6	+ 9	+17	- 2	- 1	-11	+ 4	+ 6	0	- 9	+ 2	+ 1
22	-27	-17	-13	+ 1	+ 2	- 3	-12	- 5	+ 3	+ 3	+ 2	- 1
23	+11	+18	+12	-20	+ 2	- 1	+14	+ 5	- 6	+ 2	+ 5	+ 2
24	+ 2	- 5	-99	+ 7	+ 3	- 1	+ 6	+ 1	+ 1	+ 2	- 2	+ 2
25	+ 3	- 6	+63	+15	-10	+ 4	- 4	+10	+ 3	-23	+ 4	- 2
26	+ 1	+10	+11	0	+ 4	- 2	+ 6	- 7	+ 5	+12	0	+3
27	+ 3	+ 3	+ 6	- 7	- 5	+10	- 8	- 9	- 5	+ 7	+ 2	- 9
28	+ 7	- 3	+ 1	- 2	0	- 1	+ 5	+ 2	- 3	- 1	- 8	-27
29	- 6		+ 5	- 1	+ 3	- 1	- 5	+ 6	- 3	- 2	+ 3	+17
30	- 6		- 5	+ 5	+ 2	-10	+ 2	- 2	+ 3	+ 1	+ 4	+ 1
31	+ 1		+ 1		+12		+ 8	+ 5		+ 4		+ 4
Average variability per day.	6·0	7·9	11·3	6·6	4·7	5·9	7·0	8·0	4·7	4·5	6·4	6·8

Figures in thick type denote quiet-days.

TABLE 450.—*Showing the aperiodic changes from 0^h to 24^h of each day of the years 1902 and 1903.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 8	− 3	− 6	−10	− 4	+ 1	+ 7	− 2	+12	+1	+43	+ 2
2	+ 1	+ 2	− 1	+ 1	0	+ 3	+ 1	+ 1	−17	+17	0	+ 7
3	− 1	− 8	+ 2	− 1	+ 3	+ 2	+ 9	+ 7	+12	−10	+12	− 4
4	+ 2	+ 9	0	− 7	−12	− 2	− 9	−12	− 2	+ 1	+ 4	− 4
5	− 5	−14	+ 7	+ 6	+11	+ 5	+ 2	+ 4	+ 1	− 1	+ 2	+ 8
6	+ 2	+15	− 8	− 2	− 4	−10	+ 4	+ 5	+ 5	+ 3	+ 1	− 8
7	+ 3	−38	+ 6	+ 3	+ 1	+ 4	+ 3	− 5	− 5	+ 2	− 1	+ 8
8	− 7	+20	− 14	+ 1	−14	− 3	− 2	+ 1	− 1	− 2	+ 4	− 1
9	− 4	0	+ 2	− 2	−19	+11	− 1	+ 8	+ 6	+ 1	0	− 4
10	+ 1	+ 9	− 1	+ 5	+19	+ 1	− 9	− 4	− 8	0	+ 2	+ 3
11	+ 2	+ 2	+ 16	−46	+ 3	−10	−10	−10	− 3	−27	+ 2	− 2
12	+ 6	− 3	− 19	+15	+ 7	− 4	− 7	− 2	−13	+24	− 1	− 2
13	− 1	− 3	+ 1	+12	+ 9	+ 2	− 3	+ 5	+16	+ 2	− 7	− 2
14	+ 1	+ 3	+ 2	− 4	−12	+ 2	+ 5	0	+ 3	− 6	+ 2	+ 5
15	−15	+ 4	+ 9	+ 6	+ 4	+ 8	+ 9	+ 2	+ 2	− 3	0	− 1
16	−20	−14	− 14	0	− 2	− 8	−12	0	− 2	+ 4	+ 1	− 2
17	+16	+ 7	+ 11	+ 5	− 1	+ 4	+ 2	− 4	− 6	+ 5	− 2	+ 1
18	0	+ 5	− 7	− 3	+ 1	+ 2	+ 2	− 2	− 1	− 6	+ 5	+ 4
19	+ 8	0	+ 3	+ 2	+ 9	− 2	− 4	+ 4	−10	− 3	− 5	− 4
20	+ 1	+ 6	− 4	−13	−14	− 1	+ 8	− 1	+ 3	+ 8	− 2	+ 3
21	+ 5	−19	0	+ 4	+ 5	+ 4	− 4	−19	− 1	− 3	− 3	+ 5
22	0	+ 7	0	− 3	+ 2	−13	+ 6	− 4	+ 8	− 3	− 4	− 1
23	− 3	+ 1	− 2	+ 8	0	+ 6	+ 1	+10	−18	+ 8	− 5	−23
24	−11	+ 1	− 11	− 1	+ 5	+ 8	− 7	0	+11	−25	−34	+ 7
25	+ 8	− 7	+ 10	+ 2	− 6	− 5	−18	+10	− 2	+ 1	+36	+ 4
26	− 7	+ 1	− 9	+ 4	− 5	− 6	+ 4	− 5	+ 1	+ 5	−12	+ 6
27	+ 8	+ 2	+ 5	− 2	+ 6	+ 1	0	+ 4	+ 6	−11	+18	− 4
28	+ 2	+ 9	+ 1	0	+ 2	+ 6	+ 6	+ 3	− 5	+16	+ 3	− 2
29	− 2		0	+ 2	− 5	− 7	+ 1	− 2	+ 7	− 4	+ 2	+ 3
30	+ 8		− 5	− 3	− 6	− 8	− 2	+ 7	−17	− 1	− 5	+ 7
31	− 1		+ 13		0		+ 7	−10		−59		0
Average variability per day.	5·1	7·6	6·1	5·8	6·2	5·0	5·3	4·9	6·8	8·5	7·3	4·4

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 1	+ 7	− 4	0	− 6	−25	+ 4	− 4	+ 1	+ 7	+188	+ 2
2	+ 2	+ 3	− 7	− 4	+ 4	+13	+ 5	+ 9	+ 1	− 9	+ 18	− 21
3	− 1	− 2	+ 2	+ 3	+ 2	+ 1	+ 1	+ 5	+ 5	+ 13	+ 26	− 2
4	−10	+ 3	+ 8	+11	+ 3	+ 3	+ 6	0	− 6	+ 8	+ 3	0
5	+ 2	− 6	− 2	−16	−12	− 1	+ 2	−14	− 4	+ 4	0	+ 7
6	+ 1	+ 4	− 1	−71	−14	+ 4	−11	+ 2	+ 5	− 6	+ 3	+ 4
7	+ 2	+ 5	− 5	+33	+14	+ 1	− 2	+10	− 1	− 16	+ 12	0
8	− 1	− 2	− 8	+35	− 2	+ 7	+11	− 2	− 3	0	− 4	+ 6
9	+ 8	−17	+ 6	−11	− 1	0	− 8	− 7	0	+ 7	+ 10	+ 7
10	− 3	+ 5	+ 1	+ 1	+ 6	− 3	−18	+ 9	+ 8	+ 3	− 18	+ 4
11	−13	− 2	+ 3	+ 2	+ 3	− 2	+14	−10	− 4	− 2	+ 7	− 6
12	+13	+ 4	+ 8	− 2	− 2	− 5	0	+ 4	−11	− 75	+ 5	+ 6
13	+ 1	+ 3	− 12	+ 4	+ 2	+ 9	+ 8	+ 3	+10	+ 29	+ 3	−152
14	− 1	+ 2	+ 3	+ 3	− 5	− 3	0	− 9	− 3	+ 4	− 3	+100
15	− 4	− 3	+ 3	−16	− 1	−12	− 5	+ 1	+ 3	+ 18	+ 6	+ 15
16	− 2	0	− 4	+20	+ 4	+23	+ 6	+ 2	+ 6	− 3	− 22	+ 12
17	0	− 3	+ 4	−13	− 6	−14	− 5	+ 3	+ 2	+ 15	+ 12	+ 12
18	− 3	+ 2	+ 7	+11	+ 5	− 7	+ 4	− 2	− 8	+ 1	+ 19	+ 3
19	+ 7	+ 7	− 6	+ 2	− 2	− 5	− 8	+ 7	−19	− 1	− 20	+ 12
20	+ 1	+ 1	− 1	− 3	+ 9	+ 9	+ 2	− 3	+ 1	+ 4	+ 6	− 29
21	− 8	− 7	− 2	+ 1	− 2	− 2	+ 3	− 9	+ 1	+ 4	+ 13	+ 15
22	+13	−14	+ 5	+ 6	− 4	−11	+ 2	−17	+ 5	− 16	− 13	− 2
23	− 8	+ 3	− 6	− 5	−18	+ 9	− 6	+ 1	− 2	+ 9	+ 4	+ 9
24	+ 1	+ 6	− 1	− 3	+11	− 5	+15	+11	0	− 3	+ 4	+ 5
25	+ 4	0	+ 3	+ 6	+ 5	+ 3	+ 5	− 1	− 1	+ 14	+ 4	+ 10
26	+ 3	− 1	− 3	− 8	− 5	+ 4	−27	−27	+ 4	− 34	+ 8	0
27	−17	+ 1	− 2	− 1	+ 2	+ 6	+ 8	+23	+30	+ 20	− 3	− 7
28	+ 3	+ 3	+ 5	− 3	− 4	−21	− 4	− 5	−14	+ 5	+ 13	0
29	+ 8		− 17	0	+ 5	− 7	+ 1	+14	−22	− 1	− 16	+ 8
30	−10		+ 19	+ 6	+ 4	+12	+ 1	− 1	+ 4	− 4	− 2	− 35
31	+ 5		− 11		− 3		+ 2	+ 3		− 281		+ 9
Average variability per day.	5·0	4·1	5·5	10·0	5·4	7·6	6·3	7·0	6·1	19·9	1·55	16·1

Figures in thick type denote quiet-days

TABLE 450.—*Showing the aperiodic changes from 0h to 24h of each day of the years 1904 and 1905.*

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	- 9	+17	+ 2	-19	- 6	+ 9	+15	+ 6	- 1	- 3	+ 1	-18
2 ...	+ 7	-12	+ 5	- 9	+ 5	- 8	- 7	-10	+ 9	- 3	+ 1	+16
3 ...	- 6	- 3	-14	-10	- 6	+ 2	-10	-12	-11	- 2	+ 7	-23
4 ...	+ 6	+ 1	+ 3	+12	+ 8	+ 1	+12	0	+ 8	+ 9	-36	+ 5
5 ...	+ 6	- 4	+ 5	+ 4	+ 8	+ 6	- 7	+ 8	-20	-15	+ 6	- 7
6 ...	+ 4	+10	+ 2	+ 3	- 1	- 3	+ 7	+ 9	+13	+20	+19	+13
7 ...	+ 1	-19	+ 1	-22	- 2	-11	-28	- 4	+12	-30	0	+ 3
8 ...	+12	+13	+ 2	+ 4	+ 7	+ 6	+ 3	+ 3	- 2	+ 2	+ 2	+ 1
9 ...	- 3	0	0	+ 7	- 1	+ 8	+11	+12	-14	0	+ 3	-12
10 ...	+26	+ 2	+ 4	+19	0	+ 6	- 9	- 6	+ 7	+13	+ 2	+ 9
11 ...	-50	- 3	+ 2	-16	- 7	-14	+ 8	+ 1	-12	+ 2	+ 6	- 4
12 ...	+21	+ 6	+ 2	+ 8	- 7	+ 1	+ 1	+ 4	+11	- 6	- 3	+14
13 ...	- 6	- 7	- 3	- 2	-43	+10	+19	- 8	+ 7	+ 1	+ 2	+ 2
14 ...	+ 6	+ 6	+ 3	+ 1	+18	+ 2	-22	- 2	+ 1	- 9	+ 4	-15
15 ...	+ 2	+ 6	0	+ 6	+12	-38	+ 2	+ 4	- 1	+10	+ 3	+ 2
16 ...	-49	-17	- 2	+ 4	+13	-14	+ 5	-11	- 9	+ 1	-24	+ 9
17 ...	+33	+11	+ 4	- 5	- 6	+18	- 9	+ 1	+10	+ 2	- 8	- 5
18 ...	+12	- 4	- 7	-27	+ 3	+ 2	+ 5	+ 2	- 1	+ 6	+11	-15
19 ...	+ 9	+12	+ 8	- 5	- 4	+ 6	+10	+ 2	0	- 1	+ 1	+17
20 ...	- 6	- 8	-13	+20	+ 3	+10	+ 4	+16	+ 2	+ 9	+ 7	0
21 ...	+ 7	+ 6	+ 7	+ 5	- 1	-11	- 7	-15	- 4	-52	+ 3	-10
22 ...	-31	- 4	+ 8	-10	+ 5	+13	+ 2	- 4	+ 7	+19	- 4	+ 8
23 ...	+20	- 2	- 6	+15	+ 6	+11	- 1	- 1	- 5	+10	+ 2	+ 6
24 ...	+ 2	+10	0	- 3	-16	- 5	+ 1	+ 2	+ 9	+ 6	+ 4	- 1
25 ...	+12	- 4	+ 9	0	+10	- 2	+ 2	+ 2	-39	+ 7	-42	+14
26 ...	- 2	+ 3	-24	-13	+ 4	+17	- 5	- 1	+ 4	- 3	- 3	-18
27 ...	+ 4	+ 2	+ 7	+ 7	+10	-23	- 7	+ 9	+ 9	+ 2	+30	+ 1
28 ...	-67	- 2	+ 1	+ 2	-45	- 4	+ 5	0	+ 4	- 9	+ 9	+ 7
29 ...	+31	-15	+ 2	+ 6	+21	+ 6	+ 2	-10	+11	+ 3	+ 9	-14
30 ...	+ 7		- 1	-15	+ 8	+ 6	- 8	-33	- 4	- 9	+ 6	+ 3
31 ...	+ 3		+ 6		- 3		+ 1	+25		+ 6		+ 8
Average variability per day.	14·8	7·2	4·9	9·3	9·3	9·1	7·6	7·2	8·2	8·7	8·6	9·0

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	- 5	+14	-35	-58	-17	- 2	+10	+18	- 6	- 3	+ 5	+ 1
2 ...	- 3	-19	-61	+ 7	+12	+ 7	+ 2	-74	+ 2	+ 9	+ 6	-10
3 ...	+ 7	-81	+35	+18	+ 4	- 5	+ 8	+18	-45	+ 3	- 5	+14
4 ...	-13	+60	+21	- 3	- 1	-10	+ 7	+10	+22	0	- 44	-63
5 ...	-53	- 8	+23	-21	- 5	-15	- 8	+ 9	+ 9	+ 7	+ 17	+42
6 ...	+30	+24	- 5	+20	+ 9	+16	-21	+ 2	+ 8	-40	+ 12	+ 6
7 ...	+15	+ 4	-34	+10	- 6	0	+ 8	- 8	- 5	+11	+ 17	+ 3
8 ...	+ 6	- 5	+24	- 6	0	+17	- 1	- 5	+13	+ 1	- 10	- 3
9 ...	+12	+10	-10	+ 1	+ 3	-15	+ 1	+11	+ 3	+13	- 4	+19
10 ...	- 7	- 2	+15	- 2	+ 1	-20	+ 4	+11	-10	+ 3	+ 10	- 5
11 ...	-38	+ 8	+ 2	0	- 3	+ 7	+ 2	-17	+ 4	- 2	+ 3	+ 2
12 ...	+18	-10	0	- 6	- 2	+ 3	+ 3	+21	+ 7	- 5	-130	+ 2
13 ...	+15	+ 2	0	+12	+ 5	+ 9	+ 1	-15	- 1	-19	+ 77	-39
14 ...	-28	+ 2	+10	+28	- 2	+ 5	- 4	0	+ 2	+23	+ 34	+19
15 ...	+22	+ 1	-32	-26	+ 2	-11	+ 4	- 2	+ 3	+ 8	-115	+ 5
16 ...	+ 8	- 1	+16	+ 2	+ 8	+ 8	+ 3	+ 1	0	- 8	+ 84	+ 8
17 ...	-29	+ 5	+12	+ 1	-15	+ 1	+ 1	+ 6	+ 3	- 7	- 3	- 8
18 ...	+20	- 4	+ 8	+ 3	+19	+ 3	+ 5	+ 6	- 1	+ 3	+ 15	0
19 ...	-11	+ 3	-15	0	-23	+ 5	- 5	+ 2	-35	+ 2	+ 13	+ 5
20 ...	+21	- 1	+ 5	- 8	0	+ 2	- 2	- 7	+ 9	+11	- 3	-21
21 ...	- 6	- 3	+ 2	0	+ 2	- 2	- 5	0	+ 5	-26	- 6	+16
22 ...	-24	+11	+ 9	- 2	+ 4	-34	0	+17	+ 9	+13	+ 10	+ 8
23 ...	+29	-29	- 6	+ 6	+10	- 5	+ 9	-12	+ 1	0	- 19	0
24 ...	+10	+23	+ 2	+ 6	- 7	+21	-27	- 3	+ 2	+ 3	+ 14	+ 3
25 ...	- 9	- 2	- 2	+14	- 6	+ 4	+10	- 2	+ 6	-13	+ 12	- 6
26 ...	- 1	-12	+ 3	-32	-12	+ 4	+11	+11	-12	+ 2	- 22	+ 5
27 ...	+ 8	- 4	-24	0	+19	+ 2	+ 4	- 1	-14	+ 7	+ 9	+ 4
28 ...	- 2	+32	+24	+11	- 1	+ 6	-10	-18	+ 7	-44	+ 3	-22
29 ...	-18		+11	- 5	- 6	- 4	+ 5	+ 3	+ 2	+28	+ 9	+ 3
30 ...	+18		- 8	- 1	- 5	-15	+ 1	- 7	+ 4	+12	+ 15	+ 3
31 ...	-12		+ 4		0		+ 8	+12		0		+15
Average variability per day.	16·1	13·6	14·8	10·3	6·7	8·6	6·1	10·6	8·3	10·5	24·2	11·6

Figures in thick type denote quiet-days.

TABLE 451.—*Showing the aperiodic changes from 10ʰ to 10ʰ of each day of the years 1894 and 1895.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 6	+25	+ 95	+ 26	−18	+ 14	− 11	+ 1	− 6	+ 1	0	+ 7
2 ...	−32	−33	− 5	+ 25	+20	− 27	− 14	+ 6	− 1	+13	+ 28	− 3
3 ...	+ 6	+16	+ 19	+ 5	+ 9	− 17	− 1	+ 20	+ 32	+14	− 2	− 6
4 ...	+23	+ 5	− 10	− 9	− 4	+ 26	+ 21	− 9	− 31	−10	+ 3	+20
5 ...	+ 2	0	+ 34	− 21	−17	− 13	− 10	− 22	+ 6	− 2	+ 1	−38
6 ...	−10	−34	− 12	+ 10	+44	+ 37	+ 38	+ 15	+ 12	− 1	− 16	+ 5
7 ...	+10	+41	+ 15	− 19	−39	− 14	− 57	− 5	− 34	+10	− 11	+ 8
8 ...	+18	−21	− 50	+ 24	+ 5	+ 35	− 2	+ 2	+ 18	− 9	− 8	−10
9 ...	+ 3	−10	+ 28	+ 20	+16	−150	+ 31	+ 1	− 12	− 9	+ 17	+ 2
10 ...	−30	+16	+ 7	− 23	+15	+ 58	+ 13	− 7	− 39	+15	− 12	+14
11 ...	+ 2	+ 7	+ 6	+ 26	−24	+ 20	+ 2	− 5	+ 42	− 5	+ 21	+ 1
12 ...	+ 4	−19	+ 29	−108	−11	+ 18	− 17	+ 14	− 6	+17	+ 2	− 6
13 ...	+10	+20	+ 8	+ 52	−34	+ 6	+ 5	− 29	+ 32	−33	−128	−21
14 ...	+13	− 2	− 32	+ 32	+ 2	− 2	0	− 10	−172	+12	+ 83	+15
15 ...	+10	−12	− 44	0	− 9	+ 6	+ 16	− 6	+102	−26	− 29	−28
16 ...	+ 1	+ 7	+ 21	+ 11	+13	+ 42	− 27	+ 29	+ 43	−22	+ 10	+22
17 ...	+ 2	+23	− 18	−116	+10	− 45	− 13	+ 3	+ 17	+16	+ 10	+ 9
18 ...	+ 8	+16	+ 15	+ 54	+23	+ 1	− 25	+ 16	− 63	+ 6	+ 9	+24
19 ...	− 5	−27	+ 17	+ 25	−27	+ 1	+ 47	−278	− 15	− 7	− 25	−30
20 ...	+13	− 58	+ 19	− 3	− 1	+ 32	−123	+152	+ 18	+19	+ 51	+ 8
21 ...	+ 5	−12	−100	− 1	+21	− 52	+ 87	+ 38	+ 29	− 1	+ 3	− 7
22 ...	− 7	−42	+49	+ 7	− 1	− 15	− 25	+ 31	− 7	+13	+ 3	− 4
23 ...	−29	−52	+ 33	+ 8	−18	+ 14	+ 21	− 30	− 6	− 4	− 40	+ 7
24 ...	+10	+91	+ 5	+ 4	+ 8	+ 9	+ 11	+ 14	+ 5	+20	+ 13	−15
25 ...	−19	−38	− 17	− 4	− 2	+ 27	− 35	+ 5	− 12	−51	+ 14	+28
26 ...	− 6	+37	− 8	+ 11	+ 8	− 5	+ 2	− 2	+ 41	+29	+ 13	− 1
27 ...	− 8	+23	+ 23	− 3	+17	− 10	+ 32	+ 20	− 33	+ 3	− 26	+25
28 ...	+11	−82	+ 2	+ 12	−31	− 2	+ 8	0	+ 31	−19	+ 4	−44
29 ...	− 2		+ 14	0	− 4	+ 7	− 10	+ 15	+ 29	+ 4	+ 1	+14
30 ...	− 6		−202	− 11	−10	− 8	+ 22	+ 12	− 31	+12	+ 10	+ 3
31 ...	+15		+132		+23		+ 5	− 4		−10		0
Average variability per day.	10·5	27·5	34·5	22·3	15·6	23·8	23·6	25·8	30·8	13·0	19·8	13·7

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−64	−34	−20	+12	−24	+ 4	−36	− 7	+22	+26	+ 10	+15
2 ...	+26	− 1	− 6	+ 5	− 8	−16	+29	+ 2	+23	+33	− 12	− 4
3 ...	+26	− 4	− 5	−11	+ 1	−48	0	− 5	−18	−18	− 10	+23
4 ...	+ 8	+49	+24	+29	+15	+40	− 1	+35	−84	−21	+ 14	− 7
5 ...	− 6	−46	−22	−38	−36	+22	−32	−20	+40	+31	+ 4	+10
6 ...	− 6	+12	− 2	+13	+10	−47	+35	− 5	− 8	−12	− 1	+ 5
7 ...	− 7	−13	+28	+ 3	− 3	+44	+ 8	− 5	+ 6	− 9	+ 37	−21
8 ...	+25	+22	−53	+10	+18	− 4	−16	− 3	+ 8	+ 3	− 49	−31
9 ...	−49	−60	+24	−16	− 5	+ 3	+31	−26	−10	+11	− 12	+ 9
10 ...	+45	+56	+10	+20	−35	0	−37	−28	+35	+23	− 27	−16
11 ...	− 1	+ 3	+11	−62	+40	− 5	+44	− 2	−11	− 6	+ 23	+ 7
12 ...	+14	+15	+27	+34	−20	+22	−70	+30	− 2	−76	− 6	+ 4
13 ...	− 7	−31	−88	− 4	+17	− 3	+38	+ 1	+31	+25	+ 10	+13
14 ...	−14	− 7	+ 2	+13	−33	+ 9	0	− 2	−45	+36	+ 23	+11
15 ...	+ 9	−19	+25	− 4	+33	+36	+13	− 4	−17	−14	− 18	−14
16 ...	−47	− 9	−27	−24	− 3	−43	−16	+23	+ 1	− 9	+ 29	+15
17 ...	+16	+23	+ 4	+23	− 1	−17	−10	+ 7	+12	−14	− 1	− 3
18 ...	−14	+ 5	+15	+ 1	+ 3	+33	+22	−23	+ 4	+33	− 6	− 3
19 ...	+ 7	+17	+12	−15	−13	−29	+ 3	+38	+ 8	+ 8	+ 17	+11
20 ...	+ 2	−24	+ 2	+17	+17	+30	− 9	−10	− 1	+ 2	− 6	− 2
21 ...	+ 4	+24	− 8	+ 2	− 9	+12	−18	0	+ 5	− 5	− 13	−18
22 ...	+13	+19	− 1	+52	+ 6	−30	+18	+ 3	+13	− 8	+ 41	− 6
23 ...	+10	−18	+ 8	−51	+ 4	− 3	−18	+10	− 9	+ 7	−111	−12
24 ...	− 5	−37	+49	−18	− 3	0	+31	−25	−18	+15	+ 38	− 2
25 ...	+30	+49	−32	+17	+13	+19	− 3	−12	+12	+13	+ 24	+ 3
26 ...	−18	+14	− 7	−54	+ 7	+ 5	− 5	+20	+13	−23	+ 20	− 3
27 ...	+45	−42	− 4	+56	−23	−15	−24	−11	0	−21	− 32	+24
28 ...	−32	+49	− 3	−11	+17	−17	+12	+ 8	+22	−26	− 12	+12
29 ...	− 6		+17	+16	−31	− 4	− 9	−13	−93	+34	+ 18	−14
30 ...	−16		−15	+14	+11	+ 7	+15	+14	+ 6	−21	− 8	+11
31 ...	+23		− 7		− 8		+10	− 8		+19		+ 3
Average variability per day.	19·2	25·1	18·0	21·5	15·1	18·9	19·8	12·9	19·2	19·4	21·1	10·7

TABLE 451.—*Showing the aperiodic changes from 10^h to 10^h of each day of the years 1896 and 1897.*

Unity = 1γ = ·00001 C. G. S.

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	0	− 7	+32	+26	− 4	+22	−20	−49	+12	−10	+ 1	−11
2	− 5	+13	+17	−24	−108	+ 3	+28	+18	+ 3	0	+ 7	+25
3	−35	−20	−19	−20	+51	−21	−26	+ 8	+ 1	−11	− 7	−65
4	− 5	−12	−74	−15	+ 5	− 1	+ 1	+ 6	− 9	+19	+ 9	+14
5	+10	+19	+59	+26	+38	− 1	+ 2	+23	+ 8	− 7	−35	+ 7
6	− 3	− 1	−36	+ 5	−25	+ 7	+19	−74	+13	+12	+10	+ 6
7	+ 3	+ 4	+22	+18	+34	− 1	−20	+45	+ 5	− 4	−55	+ 1
8	+25	− 4	+21	−26	− 8	+ 8	− 4	− 9	+21	−13	+17	+ 8
9	−24	+15	+13	+24	− 4	−37	+10	+ 2	−13	−11	+ 9	+ 5
10	+ 2	− 4	+ 5	+ 5	+ 6	+37	+15	+12	0	+17	+11	−19
11	− 4	+30	−18	+ 2	−21	−13	−42	−14	− 4	−25	+19	+20
12	+26	−14	+16	+ 5	+19	+13	+ 8	+20	−52	−48	− 8	+11
13	− 8	+ 5	−34	+17	+ 4	0	+27	+ 7	+38	+30	+ 8	−46
14	+10	−14	0	−29	−28	−42	−23	+11	+21	+22	−25	+18
15	−10	+10	+15	− 6	+33	+51	+30	−25	−35	− 8	+42	+ 2
16	+37	−16	+14	+26	−17	−33	−22	+15	+ 2	− 1	−15	+ 9
17	−53	+ 8	− 1	−38	−69	−11	+ 8	−33	−41	+15	+10	+16
18	+10	+ 1	+ 6	+15	− 9	− 6	+ 4	+23	+ 4	+19	−29	0
19	− 7	− 2	+11	+ 7	+42	+26	+ 3	+16	−28	−11	+12	0
20	+ 8	+16	− 9	−10	+11	− 3	− 7	−83	+19	− 1	+21	+ 2
21	−19	−27	+12	−34	−27	0	+ 7	+55	+30	+ 1	− 9	+ 2
22	+13	+14	− 7	−23	+34	+ 1	− 5	−13	− 4	− 3	− 3	− 2
23	− 9	+26	+ 6	+29	−24	+26	+19	+19	+17	+16	+22	+ 1
24	+12	+ 3	+12	−13	+11	− 8	+ 7	−25	−11	+ 2	−13	−10
25	− 9	− 2	−75	−17	+ 5	+ 1	−45	+19	+25	+10	+ 3	+ 3
26	+11	−19	−24	+27	− 2	−29	+50	− 8	−15	−30	− 6	+ 4
27	+ 6	−23	+30	+34	+14	+ 9	−41	− 7	+ 2	+17	− 9	−20
28	+19	+ 5	+ 3	− 8	+25	+11	+21	+18	+25	+11	− 3	+14
29	−10	−13	+18	+ 2	−10	− 2	− 7	+ 9	−28	+ 8	− 3	−23
30	−11		+27	+10	−30	− 2	+10	− 9	+24	−55	+ 8	+30
31	−15		−29		+14		− 6	−15		+24		− 7
Average variability per day.	13·5	12·0	21·5	18·0	23·6	14·2	17·3	22·3	17·0	14·9	14·3	12·9

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	−20	+ 4	− 5	−67	− 2	+18	+11	− 2	−31	− 1	−22	−10
2	−13	+14	+ 6	+86	− 7	−14	0	+37	+19	− 6	+14	+11
3	+ 6	−52	−20	−14	− 8	−17	−15	+ 9	+11	+ 8	+12	− 1
4	+14	+ 8	−14	+ 7	+18	+28	− 1	−13	−13	+14	+17	− 3
5	+20	+11	+15	−50	−13	+ 4	+ 4	+ 8	−11	−13	−29	+11
6	+ 4	− 1	+29	+19	+ 5	− 9	− 4	+ 8	+ 4	− 5	+24	−13
7	− 7	−14	−38	+10	+ 7	+16	+13	+ 2	+ 5	− 1	−13	+21
8	+11	− 1	− 3	0	− 8	− 6	−15	+12	− 7	+16	− 6	− 5
9	−15	+ 6	+20	+ 6	+ 7	− 7	+15	−27	+ 7	+11	− 4	−15
10	+ 3	+ 6	− 2	− 6	− 4	− 1	+ 9	+ 2	−10	−41	+18	−74
11	−44	− 1	+ 7	+ 3	− 2	+17	−25	+28	−33	− 1	+ 3	+31
12	+ 4	+ 3	−19	− 4	+19	+ 5	− 2	−46	+20	+ 3	0	− 1
13	+26	−28	+15	−29	−20	−19	+ 4	− 3	+ 5	+11	+11	+19
14	− 8	+17	+ 6	+19	−32	+ 9	− 3	+ 6	− 9	+21	−38	− 3
15	+ 2	+ 7	+10	+15	+23	−13	0	+ 6	+20	−31	+12	+ 8
16	+ 5	+ 3	+ 4	−51	− 6	−34	+ 2	+ 2	+ 4	+18	− 5	+ 6
17	+22	+ 8	− 2	+42	− 9	+ 3	+19	0	+11	−30	−23	−17
18	+ 4	− 7	+ 5	−11	+ 8	+ 6	− 4	+15	− 9	+12	+ 2	+20
19	− 6	+18	− 9	+42	−13	+12	− 9	−13	− 9	+10	+20	+15
20	− 4	−18	+ 5	−75	+ 6	+14	− 2	− 7	− 3	+15	−15	−58
21	+17	+ 8	+ 9	+24	−32	− 7	−33	+10	+ 5	+17	−11	+ 4
22	− 4	+ 7	−26	+40	+11	+ 3	+31	+13	−22	+ 8	+33	+ 8
23	− 6	− 3	+ 4	−79	+ 9	− 4	− 9	−23	+ 9	−22	+ 8	+18
24	−18	+13	+ 4	+24	+ 8	− 1	+17	− 5	− 2	− 2	−20	−19
25	+ 4	−10	− 2	+ 1	+ 7	+15	− 8	+12	+ 2	+ 7	+ 3	+12
26	− 6	−30	+30	+ 9	+12	− 3	+13	−27	+31	− 2	+ 6	+ 9
27	+18	−17	−16	+19	+ 4	0	−13	+19	− 4	0	−19	+12
28	+14	+32	− 8	+10	− 4	− 2	+10	+18	− 3	−24	+14	−35
29	−10		−13	−18	−17	+ 7	− 5	−14	−12	−18	+ 7	+10
30	−14		+ 5	+15	−18	+ 3	−71	0	− 2	+20	+ 5	− 2
31	+16		− 6		+10		+27	+28		+ 4		− 6
Average variability per day.	11·8	12·4	11·5	26·5	11·3	9·9	12·7	13·3	11·1	12·6	13·8	15·4

TABLE 451.—*Showing the aperiodic changes from 10h to 10h of each day of the years 1898 and 1899.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 5	+29	+10	+12	−32	−16	+ 7	+ 9	− 1	+22	+15	+14
2 ...	+ 7	− 25	− 3	+11	+21	+15	+ 9	− 36	− 65	+22	−16	−12
3 ...	+ 4	+17	+ 2	−19	−25	+11	−14	+ 11	+ 35	−30	−16	− 8
4 ...	+10	− 9	0	+ 2	− 2	+ 7	− 7	+ 28	+ 1	+23	+16	+14
5 ...	− 6	−14	− 3	+ 5	+35	− 8	− 6	− 8	− 10	−11	+ 3	+15
6 ...	+ 1	− 6	+ 3	−17	−19	+76	− 8	− 3	+ 35	+ 7	+ 7	−25
7 ...	+20	+30	+ 3	−27	− 6	−93	+14	− 10	0	−24	− 4	−11
8 ...	+ 6	−12	−10	+28	+10	+18	+ 9	+ 12	− 8	+13	−10	+ 7
9 ...	0	+ 9	+42	+ 5	+11	+33	+ 3	+ 23	−146	0	−10	−20
10 ...	− 9	− 8	−20	+ 4	+27	−46	+ 9	− 16	+ 37	− 8	+14	0
11 ...	−18	−28	−42	+ 6	−43	− 3	−19	− 16	+ 29	+15	+21	+34
12 ...	− 7	− 4	+23	−44	+ 5	+ 7	+14	+ 9	+ 50	+12	0	−16
13 ...	+13	+18	+ 6	+28	+20	−14	−26	− 6	− 17	−28	−10	− 1
14 ...	+ 1	−21	−58	+ 3	− 4	+50	+16	+ 11	+ 3	+18	−13	−12
15 ...	+ 4	+14	−66	− 8	−21	−24	− 7	+ 28	+ 41	−16	+28	+ 5
16 ...	−20	− 1	+45	+18	− 5	+11	+17	−110	− 17	+ 2	− 6	−10
17 ...	−11	+ 7	+53	−22	+23	−11	− 7	+ 70	+ 3	− 7	−17	+ 8
18 ...	+ 3	− 8	−24	+33	+10	+25	+11	− 8	− 10	+18	− 3	− 7
19 ...	+ 6	+40	+13	−22	− 3	−22	−33	+ 7	+ 21	+12	+15	+14
20 ...	−13	−14	+ 9	+25	−24	+13	+20	− 6	− 8	−36	−11	−15
21 ...	+27	−27	+11	− 5	+39	− 9	−21	0	+ 14	− 3	−31	− 6
22 ...	− 4	+12	−12	− 6	−13	− 2	+19	− 5	− 6	− 6	− 3	+ 1
23 ...	+14	+11	+ 4	+ 3	+ 4	− 3	−11	+ 11	+ 4	+13	+11	+14
24 ...	+ 9	−14	−12	− 4	− 7	+ 9	+14	− 7	− 18	+10	+13	+18
25 ...	− 2	+19	+21	+ 7	+ 4	− 5	−10	+ 15	+ 14	−41	− 1	− 4
26 ...	− 9	− 2	+ 9	−21	− 5	−39	+23	− 3	+ 6	+19	+14	+ 4
27 ...	− 1	− 1	0	+21	−27	+36	−29	+ 17	− 35	+18	−13	+14
28 ...	−19	−10	− 5	+ 6	+11	−13	+14	− 46	− 1	−18	+ 7	0
29 ...	+ 7		− 9	− 2	−22	−13	− 3	+ 1	+ 2	− 8	0	− 6
30 ...	+ 4		− 6	−17	− 7	+21	+11	+ 6	+ 12	− 1	+ 3	− 7
31 ...	− 3		− 2		+19		−24	+ 23		+30		+ 3
Average variability per day.	8·5	14·6	17·0	14·4	16·3	21·8	14·0	18·1	21·6	15·8	11·0	10·5

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 1	+11	− 2	− 8	−50	− 8	−23	+20	+ 9	−10	+11	+12
2 ...	−21	−22	+28	−17	+44	+ 1	+ 9	−14	−18	+ 2	− 6	−26
3 ...	− 8	+ 8	−13	− 1	−76	0	−41	−34	− 1	+ 9	−10	+17
4 ...	+ 1	+15	+ 5	−10	+39	+ 2	+63	+22	+ 8	−10	−21	− 1
5 ...	+ 5	+12	+18	− 4	− 9	+ 8	0	+ 2	−25	− 6	+17	+14
6 ...	− 5	+12	−18	+19	+43	+16	+12	+ 4	+13	+21	− 1	−21
7 ...	+20	−21	−12	−13	− 1	−10	−19	−44	+20	−10	+ 9	− 6
8 ...	−19	− 8	+18	+16	+11	+29	+ 7	+40	− 2	+ 2	−10	−11
9 ...	+29	+21	+ 3	−28	− 2	−22	+26	−10	− 1	+ 9	+15	+ 4
10 ...	−17	+ 3	−46	+15	+ 7	+17	−29	− 2	+ 2	− 7	+ 3	+12
11 ...	+17	−36	+31	− 3	−28	−38	− 8	− 2	+16	−13	−16	+ 9
12 ...	−18	−24	−15	− 6	+10	−14	+ 5	+33	−24	+12	+ 4	−30
13 ...	+18	+24	+17	+17	− 6	+14	+10	−26	0	− 3	− 2	+17
14 ...	+ 5	−10	+ 9	− 8	+38	+ 4	+ 4	+ 9	+ 8	+15	+15	+ 2
15 ...	−12	+ 1	−19	0	−77	+ 4	+20	− 6	−18	−33	−10	+ 5
16 ...	+15	+18	+26	− 7	+ 7	− 5	−22	− 7	+ 8	− 6	+10	− 4
17 ...	− 3	− 4	− 7	− 8	+21	+17	+ 2	+12	− 6	+ 6	+ 6	− 3
18 ...	−13	+24	− 7	−27	+5	+18	−10	+ 9	+ 1	− 4	+14	+22
19 ...	− 5	− 2	+ 2	−15	−10	−25	+13	− 9	+25	+22	−26	−31
20 ...	−25	−26	+10	+28	+ 8	− 4	+ 7	−33	−10	+ 3	− 4	+ 8
21 ...	+27	+ 4	−47	−11	0	+26	−12	+11	+ 4	+ 2	+ 6	− 9
22 ...	−26	+18	+ 2	+17	− 2	+17	+ 6	+12	− 4	−31	−18	+13
23 ...	+17	−47	−24	− 1	+47	−35	−10	− 4	− 1	+ 8	− 8	− 7
24 ...	+ 2	+13	+18	−20	−38	− 3	+17	+ 7	+14	+ 9	− 3	+ 6
25 ...	− 3	+15	+ 6	+31	+22	+14	−11	− 5	−33	−16	+14	− 9
26 ...	+ 4	+15	+16	− 3	−15	+48	−14	− 4	−21	+10	− 1	+23
27 ...	+24	+12	+ 7	+ 3	+ 1	−60	+ 8	+16	+13	+ 4	+12	−33
28 ...	−53	−20	+ 3	+16	+ 6	−40	+12	+ 3	+ 1	− 8	− 8	− 7
29 ...	+ 8		+14	−32	− 7	−19	−14	−39	+ 9	+20	− 7	+14
30 ...	+ 8		− 9	+17	+31	+40	+13	−14	+14	+ 6	+ 7	− 2
31 ...	0		+25		−45		− 4	+31		− 7		+23
Average variability per day.	13·8	15·9	15·4	13·4	22·8	18·6	14·5	15·6	11·0	10·5	9·8	12·9

TABLE 451.—*Showing the aperiodic changes from 10^h to 10^h of each day of the years 1900 and 1901.*

Unity = 1γ = ·00001 C. G. S.

1900. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 7	+14	+ 8	0	+15	+22	+ 5	+ 9	-13	+ 8	+ 7	+ 1
2 ...	- 5	- 6	- 2	-11	+23	-38	-14	- 2	0	-10	+ 2	-11
3 ...	+ 7	+15	+ 3	+12	+10	+22	+20	+18	+ 3	+20	+ 7	+11
4 ...	+ 3	-45	+ 3	-22	-14	+ 1	-11	-11	+10	-47	- 2	-13
5 ...	-35	+16	+ 2	+ 8	-56	+ 7	+10	- 1	- 2	+30	+11	+11
6 ...	- 3	+ 1	- 10	+ 1	- 2	+12	+12	+ 9	+ 9	+ 6	-15	+12
7 ...	- 2	+16	+ 4	-11	+38	0	- 7	- 7	-26	- 6	+18	-24
8 ...	+11	+ 4	- 51	- 5	+26	-14	-13	-12	+11	+ 7	-19	+10
9 ...	+11	-39	- 1	- 1	-18	-14	+13	+ 8	+25	-13	+ 6	- 7
10 ...	- 9	+21	+ 28	- 5	+20	+ 6	-24	+10	-46	+ 9	- 1	- 6
11 ...	0	+ 3	- 9	+17	-27	- 4	+49	+12	+19	+19	+ 2	- 3
12 ...	+ 3	+21	- 19	+ 2	+18	+26	-25	- 9	+ 6	- 5	- 8	+12
13 ...	-11	+ 7	- 13	- 7	- 3	+11	- 1	-13	+ 6	- 5	- 6	+ 2
14 ...	+13	- 6	+ 17	+28	- 5	- 3	+23	+17	-12	- 3	+16	+ 1
15 ...	- 3	-33	+ 21	- 3	+ 8	-33	-14	- 7	-16	- 1	-18	- 2
16 ...	- 8	+25	+ 2	+ 6	+ 6	+11	-17	+ 2	+14	+ 7	0	- 2
17 ...	+ 7	- 3	+ 4	-24	- 3	+ 4	+12	- 6	-18	+ 1	+ 3	- 6
18 ...	- 5	+14	+ 1	-10	- 8	- 4	0	- 6	+21	+10	-12	+10
19 ...	-16	+12	+ 16	+10	+ 5	+ 5	+ 2	- 9	+13	-10	+14	-22
20 ...	-42	-21	0	- 7	+15	- 5	-10	+17	- 2	-22	+17	+22
21 ...	+83	-11	- 3	+21	-37	- 4	- 6	- 5	-13	+13	-15	- 4
22 ...	-32	+ 6	+ 1	-16	+35	+24	+ 9	0	- 4	- 9	+10	- 5
23 ...	+20	- 3	- 12	-18	-13	-31	+21	-17	+ 6	+22	0	+20
24 ...	- 7	- 1	+ 17	0	+18	+11	-45	+22	+ 5	-18	-13	-15
25 ...	+11	- 8	- 11	+23	-42	-10	+11	+ 5	- 1	-20	-11	-11
26 ...	-28	+24	- 6	- 2	+31	+10	+ 8	- 8	+15	+ 9	+ 6	+15
27 ...	+13	-17	+ 28	0	+14	- 8	+ 9	-14	-40	-14	+ 4	-25
28 ...	- 6	- 2	+ 6	- 4	-14	- 3	-13	- 4	- 3	+18	+19	+ 2
29 ...	+17		- 15	+ 3	- 4	- 7	- 3	+ 7	+24	+ 9	-15	+ 3
30 ...	- 6		- 11	-56	-19	+14	+ 5	+14	- 9	- 9	+ 1	- 4
31 ...	- 5		+ 4		+13		-14	- 3		- 4		- 1
Average variability per day.	13·8	14·1	10·6	11·1	18·1	12·1	13·7	9·2	13·1	12·4	9·3	9·5

1901. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	Decembe r.
1 ...	- 3	+11	- 7	-15	+19	-15	- 9	+18	+21	+16	- 4	+11
2 ...	+14	-15	+ 4	+ 8	- 8	+13	+19	- 7	-13	+ 1	- 4	- 31
3 ...	- 2	+ 8	0	- 8	-24	+ 4	+19	- 1	-15	0	-40	+15
4 ...	+27	- 9	- 1	- 2	+13	- 4	-35	-32	+ 6	- 7	+17	+ 2
5 ...	-29	+10	+ 7	+22	+15	+ 4	+17	+14	+16	- 2	+ 1	-12
6 ...	+ 6	-12	- 2	+ 1	- 1	-19	- 1	+32	-10	+ 9	+ 1	+23
7 ...	+ 1	+15	- 4	-17	-14	+12	- 8	-25	- 5	-14	+11	- 6
8 ...	+11	-16	- 4	-19	+23	-24	+15	+ 1	+ 6	- 8	+ 1	+12
9 ...	-17	+16	- 2	+ 9	-28	+ 9	+ 5	+ 3	+15	+ 5	- 1	-17
10 ...	+ 3	-11	- 2	+12	-30	+ 2	- 3	-10	-51	+ 7	- 7	- 3
11 ...	- 8	+23	- 8	+ 1	+16	- 1	-28	+ 8	+ 7	+ 2	+11	+29
12 ...	- 4	-13	- 6	- 7	-12	+13	+ 4	- 4	+25	+ 5	- 2	-20
13 ...	+13	- 4	+ 8	+ 2	+ 9	-28	+21	+42	- 2	- 7	+ 3	+15
14 ...	+ 3	+10	+ 10	- 9	+21	+15	- 7	-45	+ 4	+13	-13	-15
15 ...	- 1	+ 2	+ 18	- 2	-22	-18	- 1	-19	+16	- 2	+ 9	+ 6
16 ...	+ 1	+22	- 22	- 3	+15	+23	-10	+17	- 6	- 9	- 4	- 2
17 ...	+ 3	-19	- 2	- 1	+12	0	- 6	+ 6	-25	+ 2	+ 1	- 3
18 ...	+ 1	+13	- 13	+ 6	-19	+ 5	+17	-11	+30	+12	+16	-17
19 ...	+16	-25	+ 21	+12	-18	+ 2	+ 6	+36	-15	-14	-24	+10
20 ...	-11	-14	- 19	- 5	- 3	+ 3	- 3	-25	+ 4	+ 3	+ 5	- 9
21 ...	+ 3	+20	+ 19	- 8	+17	-15	- 1	- 5	-16	- 5	- 1	+ 8
22 ...	-10	+15	- 3	-19	+20	+15	0	+ 7	+24	- 1	- 1	+ 2
23 ...	-11	-24	+ 7	-19	-21	-14	+22	+10	- 6	- 3	+13	+10
24 ...	+ 4	- 2	- 51	+31	- 9	+11	- 5	-19	- 6	+21	- 1	- 3
25 ...	+ 2	- 6	+ 6	- 4	+22	-16	- 4	+ 8	+ 1	-37	-11	+ 2
26 ...	- 8	+21	+ 26	+13	- 6	+25	-14	-17	+ 8	+11	+12	+ 5
27 ...	+ 8	- 4	- 9	-21	+ 8	+ 4	- 3	+ 4	- 7	+13	- 1	- 4
28 ...	+ 3	+ 5	+ 4	-10	- 7	+ 1	+ 6	+27	+ 4	- 3	- 9	-37
29 ...	- 6		- 20	+31	- 5	-24	- 6	-27	+ 1	- 2	- 5	+11
30 ...	0		+ 18	-10	+20	- 2	+13	+12	-15	+ 1	+ 4	+ 4
31 ...	+ 5		+ 24		-10		-15	-16		+18		- 9
Average variability per day.	7·5	13·0	11·2	10·9	15·1	11·4	10·4	16·4	12·7	8·2	7·8	11·4

TABLE 451.—*Showing the aperiodic changes from 10h to 10h of each day of the years 1902 and 1903.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 4	+ 2	− 8	−19	−15	+11	+ 9	+13	+17	+ 8	+13	+ 1
2 ...	+10	+ 3	+ 2	+ 5	+ 5	−15	+12	− 5	−22	+ 8	+23	+ 4
3 ...	−12	−19	− 4	− 4	+10	+10	−13	+ 1	0	−13	0	+ 1
4 ...	+14	+25	+ 12	− 1	+ 4	+ 5	− 3	+ 1	− 1	0	0	−12
5 ...	+ 4	−23	− 13	+ 5	− 9	− 8	+12	−15	+15	+10	+11	+ 7
6 ...	−18	+ 6	0	− 1	0	− 9	+15	+24	+13	+17	−10	−12
7 ...	+19	−17	+ 5	+27	− 8	+24	− 3	− 8	−15	−21	− 6	+ 4
8 ...	+ 1	− 1	− 9	− 7	+31	−31	−12	−14	+11	+ 9	+ 8	+ 1
9 ...	− 6	+13	+ 12	− 6	−53	+26	− 3	+13	− 9	−17	− 1	+ 7
10 ...	− 5	+ 8	+ 12	−70	+42	− 2	+ 8	−30	− 9	− 6	− 1	− 5
11 ...	− 2	+ 8	− 26	+28	−13	− 1	− 5	+22	+ 4	+ 9	+12	+ 3
12 ...	+ 6	+ 3	+ 22	+ 4	+11	−14	−15	− 7	−13	+ 2	0	+13
13 ...	+14	− 6	− 19	− 1	− 2	+14	+30	+ 2	+20	+ 1	+11	−19
14 ...	−14	−16	+ 23	+17	−20	−12	−11	− 2	−11	+ 7	− 6	+ 1
15 ...	−32	+15	− 14	+ 3	+14	−18	−14	+12	+10	− 3	− 2	+12
16 ...	+ 7	− 9	− 17	− 1	+ 6	+21	+ 5	− 7	−25	+17	− 2	−18
17 ...	+12	+ 6	+ 16	− 8	− 4	− 9	+21	− 3	+16	+ 7	+ 1	+14
18 ...	−11	−12	− 1	− 4	− 3	+24	−16	+ 2	+35	−35	+ 3	− 3
19 ...	+18	+ 5	+ 15	+23	0	−30	+ 9	+ 4	−17	+14	− 5	− 6
20 ...	− 9	− 4	+ 4	−23	+ 1	+22	− 6	+19	−21	− 7	− 9	+ 5
21 ...	+13	+ 9	− 10	0	−11	−16	−11	−54	− 2	+ 8	−13	− 3
22 ...	− 9	− 2	− 3	+13	+ 1	− 3	+12	+ 3	− 1	− 9	+22	−14
23 ...	+31	+ 5	+ 24	−16	+20	+10	−28	+21	+16	+ 1	−51	+ 2
24 ...	−12	+ 1	− 39	+ 1	−14	− 5	+ 7	+ 6	− 2	−18	+12	− 1
25 ...	+36	−17	+ 16	+24	+ 3	+ 5	+10	0	+10	+ 4	− 7	0
26 ...	−41	+ 1	− 19	−24	− 8	+ 1	+ 6	+ 2	−22	+ 7	+25	− 1
27 ...	+18	+13	+ 12	+11	+16	+ 1	− 9	+ 2	+14	+ 8	+ 6	+ 1
28 ...	−17	+ 6	+ 8	+10	0	0	+ 7	+13	+ 8	− 2	− 5	+ 8
29 ...	+10		− 13	− 2	−25	−27	−19	−19	− 7	+ 2	+19	− 2
30 ...	− 9		+ 3	−14	+ 5	+ 3	+18	+12	−14	−28	− 8	+12
31 ...	+ 4		+ 4		+ 4		− 6	−17		−21		− 8
Average variability per day	13·5	9·1	12·4	12·4	11·5	12·6	11·5	11·4	12·7	10·3	9·7	6·5

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 9	+19	− 8	−15	0	−37	− 1	+15	−4	− 5	+118	− 32
2 ...	− 2	−11	− 17	− 4	+ 8	+ 2	−14	− 2	+ 8	− 22	+ 24	+ 17
3 ...	+15	− 8	+ 15	+ 3	+ 3	− 3	+18	+25	−10	+ 16	+ 18	+ 14
4 ...	+ 2	+ 9	+ 2	+12	−28	+23	−15	−59	+14	+ 10	− 4	− 12
5 ...	−40	−15	− 7	−83	+12	+ 4	− 8	+47	− 7	− 3	+ 26	+ 1
6 ...	+ 6	+10	− 12	+ 1	−15	− 3	+16	− 5	− 2	+ 6	+ 15	+ 5
7 ...	+11	−11	− 7	+45	+ 8	− 8	− 6	+ 2	+19	− 34	− 28	− 3
8 ...	− 1	− 8	− 8	+19	+ 2	− 5	+ 7	−16	−25	+ 15	+ 8	− 2
9 ...	− 1	+23	+ 29	−18	+ 7	− 4	+ 8	− 9	+23	+ 27	− 9	+ 5
10 ...	− 9	−29	− 8	+14	−11	+ 6	−31	+43	−20	− 10	− 5	− 11
11 ...	+ 1	+22	+ 13	+11	+10	+10	+ 9	−25	− 3	− 5	+ 14	+ 12
12 ...	+ 5	+20	− 10	+ 7	− 9	+17	+26	−14	−20	− 62	− 7	+ 14
13 ...	+13	+ 4	− 7	−14	− 2	+17	+17	+29	+ 4	− 9	+ 10	− 87
14 ...	−14	−19	+ 17	+23	− 6	−26	−29	−12	+12	+ 31	− 5	+ 23
15 ...	+23	+17	− 3	−16	+ 9	− 7	− 3	0	−18	+ 19	+ 18	+ 23
16 ...	−28	−30	− 11	− 6	+ 7	+ 5	+ 3	−12	+16	+ 1	− 36	− 2
17 ...	+12	+ 5	+ 14	+10	+ 1	−37	+18	+15	+29	− 12	+ 10	+ 30
18 ...	0	+18	− 2	−32	+ 1	+34	−16	−16	−24	+ 22	− 45	− 3
19 ...	−13	−11	+ 8	+22	−17	−13	+ 8	+22	−24	+ 11	+ 49	+ 19
20 ...	+ 6	+11	− 3	0	+18	+ 5	+ 6	−17	− 3	+ 3	− 5	− 36
21 ...	− 6	−35	+ 6	+10	+ 2	−12	− 9	−56	+26	− 10	+ 7	+ 17
22 ...	− 4	+25	− 7	−18	−33	− 1	− 3	+50	−12	− 1	+ 8	− 4
23 ...	+15	− 4	+ 16	+19	+14	+ 5	+ 1	− 7	− 7	− 15	+ 1	+ 1
24 ...	− 1	− 1	− 11	+ 9	− 3	+ 4	+29	+ 7	+ 2	+ 8	+ 9	+ 10
25 ...	+ 7	+ 9	− 3	+20	+11	+ 7	− 9	+18	0	− 17	− 11	+ 16
26 ...	−31	+ 3	− 12	−50	−18	+ 8	−35	−30	+10	+ 3	+ 13	− 21
27 ...	+29	+ 4	+ 12	+16	+ 7	+13	+ 8	− 1	+ 9	+ 15	+ 11	− 7
28 ...	− 5	+ 2	+ 1	+11	− 1	−33	−25	+23	− 2	− 2	− 40	+ 7
29 ...	+14		− 5	−24	+ 6	−34	+10	+ 6	−16	+ 13	+ 13	+ 47
30 ...	− 8		− 3	+ 3	− 8	+42	+10	−24	−27	− 5	+ 8	−131
31 ...	− 9		+ 2		+24		−16	+17		−206		+ 53
Average variability per day.	11·0	13·7	9·0	17·8	9·7	14·2	13·4	20·1	13·2	19·9	19·2	21·5

TABLE 451.—*Showing the aperiodic changes from 10h to 10h of each day of the years 1904 and 1905.*

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+27	- 6	+ 15	-64	+ 5	0	-26	-19	+ 9	- 2	- 8	- 5
2 ...	- 8	+ 5	+ 6	+32	+ 3	+ 4	0	- 1	+ 1	+15	+17	+12
3 ...	-17	+19	- 31	+10	+ 4	+ 9	+ 5	-20	+15	- 5	+ 1	-10
4 ...	+21	-26	- 1	+ 3	+ 7	+ 5	-12	- 1	+ 4	- 5	-26	0
5 ...	-13	+ 8	- 9	+21	+ 7	+41	+18	+31	-46	-14	-23	+ 3
6 ...	+25	+ 4	+ 13	-28	+ 8	-62	-45	+13	+18	+ 1	+41	+11
7 ...	- 3	- 5	+ 8	- 1	- 7	- 6	+22	- 3	- 2	+ 5	+22	-10
8 ...	- 5	-12	0	+ 7	+ 5	+18	-10	- 4	+ 8	-18	-16	+35
9 ...	-24	-14	+ 4	+11	+ 19	+ 2	- 5	+10	- 8	+19	+ 4	-40
10 ...	- 9	+15	+ 17	-10	- 36	+ 3	- 6	-20	+ 8	+16	-10	+22
11 ...	+ 5	+10	- 22	- 3	+ 29	+ 6	+36	+27	- 7	- 2	+16	- 5
12 ...	+14	+ 6	+ 23	+11	-106	-10	- 1	-13	- 6	+10	- 9	0
13 ...	0	+ 5	- 8	+ 8	+ 15	+24	-24	- 5	+ 8	-26	+12	+ 5
14 ...	+17	- 3	+ 1	0	+ 37	+ 7	+19	- 9	+ 3	+ 1	-10	-28
15 ...	-22	+12	+ 6	-10	+ 23	-95	- 7	- 3	+24	+ 5	-53	+24
16 ...	+11	- 7	- 5	-11	- 3	+49	+11	-13	-31	+13	+15	-16
17 ...	+ 9	- 2	+ 19	+ 9	+ 14	- 6	+27	+16	-13	+15	+ 8	+ 9
18 ...	+17	- 7	- 7	-75	- 26	+29	-20	-21	+ 2	- 9	+ 6	+ 9
19 ...	+ 5	+11	- 5	+36	- 6	-11	+25	+23	+ 9	+ 4	+ 5	-19
20 ...	- 4	-11	- 13	+38	+ 5	-13	-18	+17	+23	-11	+18	+ 8
21 ...	-36	+12	+ 6	0	+ 16	+32	-15	-24	- 4	-56	+10	-17
22 ...	+20	+ 2	+ 16	+ 1	- 7	- 4	+18	-28	- 9	+34	-14	+26
23 ...	-23	- 2	- 8	+21	- 2	- 8	-16	+12	-17	+ 7	- 3	- 6
24 ...	+18	+19	- 21	- 8	- 10	+ 6	+ 2	+12	-30	+17	+11	+ 4
25 ...	+ 6	-21	+ 4	-28	0	+ 3	+15	+24	+ 6	+14	-20	-11
26 ...	-15	+ 4	- 16	+ 7	+ 19	- 3	-42	-20	+18	-16	+ 5	-10
27 ...	+18	+ 5	+ 21	+ 9	- 29	-24	+35	+20	+ 7	- 6	- 1	+11
28 ...	-45	+ 2	+ 13	+ 2	- 3	+21	- 3	0	+12	-19	+17	+ 1
29 ...	+33	- 9	- 18	- 3	- 1	- 1	- 3	-20	+26	+13	- 4	- 9
30 ...	+ 4		+ 16	-25	+ 22	+27	-20	-34	-40	-11	-14	-10
31 ...	+ 1		- 18		- 6		+19	+26		+16		+18
Average variability per day.	15·3	9·1	11·9	16·4	15·5	17·6	16·9	15·8	13·8	13·1	14·0	12·7

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	-14	-25	+ 4	-81	-23	- 3	+23	-13	- 28	+17	+21	+ 18
2 ...	- 6	0	- 49	+35	+17	+33	-11	-49	+ 52	-20	- 3	- 21
3 ...	+27	-30	- 1	+25	+ 3	+39	+19	0	- 27	+21	-14	+ 24
4 ...	-28	+23	+ 54	+ 6	+ 1	-19	-12	+34	- 4	+ 7	-58	- 48
5 ...	-10	+ 8	- 5	-15	- 6	-36	- 4	+ 4	- 14	-45	+37	+ 16
6 ...	+ 1	+ 8	- 19	+ 2	+15	+ 6	-40	-22	+ 29	+12	+25	+ 14
7 ...	+25	- 1	+ 3	+ 1	-15	+19	+26	+ 6	- 14	- 2	- 9	0
8 ...	- 8	+ 5	+ 9	+22	+ 1	-11	0	+23	+ 16	- 9	+18	+ 12
9 ...	+ 2	- 8	- 1	- 3	+11	-17	-10	+ 3	+ 11	+25	0	+ 14
10 ...	+19	+25	+ 18	0	-22	0	+27	- 8	- 21	- 7	-16	- 10
11 ...	-11	- 4	- 5	+ 6	+39	- 3	- 5	+23	+ 21	+ 7	+11	+ 38
12 ...	-17	-16	- 10	-10	-20	+16	+15	+ 1	- 7	+10	-56	-105
13 ...	+ 3	-16	- 1	- 7	- 3	+ 6	-13	-19	0	-12	+37	+ 38
14 ...	-23	+21	- 21	- 1	-16	+ 2	+ 9	-13	+ 1	+ 3	-20	+ 9
15 ...	+ 3	-13	+ 12	+ 4	+10	- 8	+11	+15	- 1	+ 8	-97	+ 10
16 ...	0	- 6	- 5	-10	+ 6	+20	-12	+ 8	+ 11	- 7	+67	- 7
17 ...	+20	+11	+ 22	+ 6	- 9	-12	- 5	+ 1	+ 11	-12	+16	- 2
18 ...	- 8	+ 8	+ 27	- 2	-11	+23	-10	+ 5	-105	+ 6	+23	- 6
19 ...	+10	+25	- 21	+15	+ 1	-26	+18	- 6	+ 19	+23	+18	0
20 ...	+11	- 4	- 5	-26	+ 4	- 7	-18	+ 4	+ 25	-21	- 9	- 25
21 ...	+11	-11	+ 4	+20	+ 1	- 4	- 2	- 8	+ 30	0	-21	+ 23
22 ...	-13	-11	+ 19	-13	+41	-27	- 7	+ 3	- 18	+ 6	+20	- 6
23 ...	+11	+17	- 29	+13	-49	+21	+22	-20	+ 8	+ 7	-14	+ 18
24 ...	-14	+ 7	- 3	- 3	+ 6	+ 8	-21	+ 3	+ 8	-14	+26	+ 1
25 ...	-20	-11	+ 8	+ 3	+ 8	- 6	+ 1	+ 7	- 16	-15	-17	- 8
26 ...	+14	- 7	+ 9	+13	+ 3	+ 6	+14	- 2	- 26	+12	- 6	+ 19
27 ...	+14	- 9	- 8	-24	- 1	- 1	-35	+25	+ 22	+45	+11	+ 1
28 ...	-27	+18	+ 33	+15	-27	+26	+27	-26	+ 33	-83	- 9	- 4
29 ...	- 6		- 29	- 3	+23	-16	+ 1	-17	- 18	+29	+18	- 23
30 ...	+14		+ 13	-13	- 3	-13	0	- 7	- 1	+ 5	-13	+22
31 ...	+17		- 20		- 1		+15	+12		+ 9		- 9
Average variability per day.	13·1	12·4	15·1	13·2	12·8	13·5	14·0	12·5	19·9	16·1	23·7	17·8

the former case the day is reckoned from 0^h to 0^h and in the latter from 10^h to 10^h of Colaba civil time; that is in the former case the day is 5 hours earlier while in the latter it is 5 hours later than the actual day at Greenwich selected as quiet by the Astronomer Royal. While tables 448 and 453 similarly give the respective aperiodic elements from 0^h to 0^h and 10^h to 10^h of the locally selected quiet-days and are thus comparable to each other also. The aperiodic element is hence derived in both cases for an interval of 24 quiet hours and it will be seen that even on the average, the values are by no means accordant. The mean value on the average of 11 years for the Astronomer Royal's days from 0^h to 0^h is $+3{\cdot}9\gamma$ while that from 10^h to 10^h is $+4{\cdot}5\gamma$; while the mean values for the locally selected days respectively for the same are $+3{\cdot}1\gamma$ and $+3{\cdot}9\gamma$. These results indicate greater fluctuations in the element during the day hours than during the night hours of a quiet interval of 24 hours.*

TABLE 452.—*Showing the average aperiodic change (10^h to 10^h) for the quiet-days selected by the Astronomer Royal.*

Unity = $0{\cdot}1\gamma$

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	+ 26	+ 46	+ 146	+ 86	− 2	− 34	− 74	+ 36	+ 172	+ 8	+ 24	+ 146	+ 48
1895 ...	+ 88	+ 200	+ 222	+ 170	− 34	+ 86	+ 78	− 32	+ 128	+ 50	+ 126	+ 18	+ 92
1896 ...	− 44	+ 100	+ 26	+ 30	− 6	+ 34	+ 86	+ 112	+ 116	+ 14	− 56	+ 18	+ 36
1897 ...	− 54	+ 6	+ 60	+ 80	+ 16	− 12	+ 78	+ 52	+ 30	+ 82	− 12	0	+ 27
1898 ...	+ 96	+ 146	− 4	+ 8	+ 76	− 58	+ 78	+ 96	+ 210	+ 136	+ 14	+ 88	+ 74
1899 ...	+ 88	+ 44	+ 74	+ 32	+ 18	+ 170	+ 52	+ 44	+ 12	+ 54	+ 30	+ 2	+ 52
1900 ...	+ 36	+ 74	+ 48	+ 22	− 108	− 4	+ 46	+ 48	− 50	− 70	− 2	+ 52	+ 8
1901 ...	+ 56	+ 64	− 60	− 38	+ 112	− 8	+ 74	+ 136	+ 18	+ 94	+ 18	+ 68	+ 44
1902 ...	− 20	+ 52	+ 86	+ 94	+ 68	− 78	+ 92	+ 16	− 84	− 52	+ 66	− 16	+ 19
1903 ...	+ 104	− 36	+ 24	+ 58	− 54	+ 76	+ 92	+ 140	+ 54	+ 32	+ 16	+ 98	+ 50
1904 ...	− 8	+ 82	+ 54	− 18	− 54	+ 32	+ 126	+ 86	+ 118	+ 52	+ 28	− 10	+ 41
1905 ...	+ 48	+ 80	+ 146	+ 8	+ 130	+ 34	− 44	+ 32	+ 74	+ 94	− 10	+ 104	+ 58
Mean, 1894—1904 .	+ 33	+ 71	+ 61	+ 48	+ 3	+ 19	+ 66	+ 67	+ 66	+ 36	+ 23	+ 42	+ 45
Annual Variation...	− 12	+ 26	+ 16	+ 3	− 42	− 26	+ 21	+ 22	+ 21	− 9	− 22	− 3	...

TABLE 453.—*Showing the average aperiodic change (10^h to 10^h) for the quiet-days locally selected.*

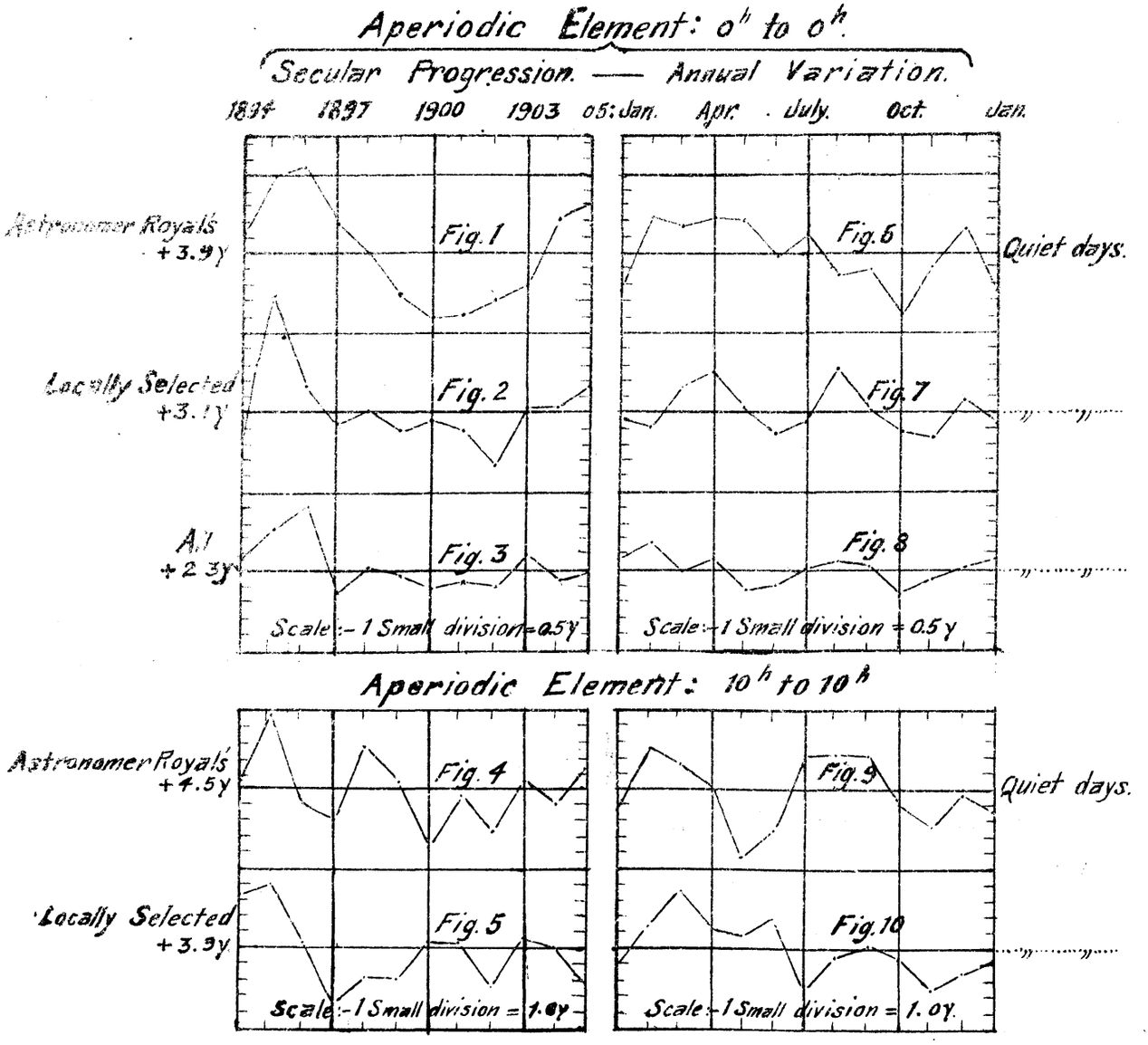
Unity = $0{\cdot}1\gamma$

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November	December.	
1894 ...	+ 60	− 24	+ 210	+ 60	+ 112	+ 55	− 54	+ 68	+ 254	+ 78	+ 63	− 1	+ 73
1895 ...	− 6	+ 66	+ 161	+ 202	+ 8	+ 166	+ 46	+ 61	+ 60	+ 18	+ 127	+ 37	+ 79
1896 ...	+ 186	+ 12	+ 103	+ 152	− 107	+ 5	+ 71	+ 36	− 70	+ 31	+ 21	+ 67	+ 42
1897 ...	− 10	+ 23	+ 49	− 41	+ 69	− 10	− 16	− 75	+ 4	+ 85	+ 35	− 56	+ 5
1898 ...	+ 53	+ 97	+ 88	− 68	+ 54	+ 17	− 128	+ 86	− 50	+ 26	+ 81	− 6	+ 21
1899 ...	+ 14	+ 144	+ 68	+ 24	− 92	+ 40	+ 66	+ 82	− 88	+ 14	− 10	− 22	+ 20
1900 ...	+ 10	+ 54	+ 22	+ 92	+ 48	+ 142	+ 6	+ 34	+ 84	+ 12	− 4	+ 20	+ 43
1901 ...	+ 74	+ 134	− 24	+ 24	+ 188	− 30	+ 8	+ 38	+ 40	+ 68	− 24	+ 14	+ 42
1902 ...	− 84	+ 16	+ 46	+ 50	+ 52	+ 60	+ 88	+ 14	+ 10	− 22	− 4	− 18	+ 17
1903 ...	+ 42	− 54	+ 36	+ 22	+ 106	+ 66	+ 92	+ 78	+ 90	+ 68	− 124	+ 120	+ 45
1904 ...	− 20	+ 102	+ 50	+ 42	+ 70	+ 132	− 38	− 48	+ 106	− 24	− 2	+ 114	+ 40
1905 ...	− 34	− 50	+ 108	− 18	− 32	− 4	+ 34	− 10	+ 50	+ 40	+ 82	+ 42	+ 17
Mean, 1894—1904 .	+ 29	+ 52	+ 74	+ 51	+ 46	+ 58	+ 13	+ 34	+ 40	+ 32	+ 14	+ 24	+ 39
Annual Variation...	− 10	+ 13	+ 35	+ 12	+ 7	+ 19	− 26	− 5	+ 1	− 7	− 25	− 15	...

* A reference to the last row in table 262 will show that when dealing with the pure secular effects incident on each hourly ordinate as a disturbance effect, 11 hour shows the greatest, while 7 hour the least effect. The night hours show intermediate conditions of disturbances.

Thus the difficulty of the acceptance of the element determined from any particular hour, as a specific indicator of a physical phenomenon connected generally with a duration of 24 quiet-hours, can best be realised from the above results in the Colaba data.

The secular and seasonal variations of this element, derived from the 5 quiet-days of the Astronomer Royal, from the 5 quiet-days selected locally and from *all* quiet-days in the month, are charted below for ready reference, from which what has been advanced above in regard to the uncertainty of results can be readily seen at a glance. The results derived in one set are from 0^h to 0^h and in the other from 10^h to 10^h. The point to be noted is that the whole data relate to quiet-days in each case.



482. Having incidentally referred to some of the points connected with the quiet-day variations, their comparison in detail with the all-day data, which may now be taken in hand, shows that the average quiet-day variation is just appreciably smaller in range than the all-day variation (*vide* tables 257 and 440). These obviously connote conditions prevailing in the periodic part of the variation, which however eliminates the aperiodic contribution which is of as much importance in the magnetic elements as the former.

483. The ranges of all individual days hence for a period of 16 years, 1890 to 1905, have been especially extracted, see table 454, for comparison with the ranges similarly derived from quiet-days alone. In tables 455, 456 and 457 are collected respectively the average daily range of each month derived from every day of the month, which gives us (1) the non-periodic range of all-days, (2) the non-periodic range derived from all quiet-days referred to in paragraph 465, and (3) the non-periodic range of the Astronomer Royal's five selected quiet-days.

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1890 and 1891 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1890. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	27	48	62	100	37	24	51	74	67	39	49	39
2 ...	41	42	56	47	37	25	37	52	77	47	28	39
3 ...	61	70	40	41	51	25	31	64	38	77	33	31
4 ...	19	30	55	42	84	30	28	49	49	57	52	35
5 ...	39	44	53	52	83	27	44	31	47	96	34	60
6 ...	53	48	48	48	35	69	65	50	51	44	43	25
7 ...	20	49	69	59	33	52	75	52	45	45	60	37
8 ...	26	49	64	51	38	40	61	45	26	92	85	56
9 ...	19	43	41	49	55	50	56	53	32	61	58	55
10 ...	42	45	47	38	81	48	49	38	36	100	47	34
11 ...	33	31	72	58	84	55	70	40	39	47	53	40
12 ...	56	45	64	59	44	45	52	53	83	67	77	43
13 ...	57	39	51	57	29	36	33	35	42	50	94	38
14 ...	39	36	42	52	31	42	54	38	31	53	49	27
15 ...	54	55	56	32	30	44	32	68	46	79	62	59
16 ...	28	41	71	32	48	48	59	31	48	45	58	31
17 ...	31	38	54	57	23	57	68	31	31	45	52	42
18 ...	47	50	48	56	38	38	40	14	48	76	50	23
19 ...	31	50	24	56	55	49	52	45	66	61	48	44
20 ...	41	52	41	53	52	35	31	43	49	40	32	46
21 ...	50	50	49	37	56	65	49	39	71	49	53	30
22 ...	34	54	65	40	33	58	62	26	42	45	48	54
23 ...	69	46	38	40	45	42	45	37	31	49	49	25
24 ...	29	40	54	54	50	37	34	35	32	103	32	43
25 ...	28	42	53	64	42	52	29	36	110	43	39	58
26 ...	23	34	50	47	24	35	30	33	41	62	58	42
27 ...	26	66	55	54	41	48	33	35	51	84	34	29
28 ...	30	47	29	50	54	58	29	43	63	50	41	54
29 ...	47		29	63	36	32	43	59	50	58	38	35
30 ...	25		50	43	34	39	44	72	29	53	51	56
31 ...	19		49		33		40	43		51		30

1891. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	26	97	56	52	56	45	58	38	43	67	58	43
2 ...	49	42	180	39	69	56	41	93	56	58	64	60
3 ...	23	51	96	38	79	45	86	74	53	59	47	41
4 ...	33	28	84	47	58	59	43	34	53	42	61	49
5 ...	37	74	69	46	39	70	44	33	40	64	62	52
6 ...	31	34	40	52	123	47	99	46	48	61	54	67
7 ...	37	44	33	104	46	42	72	70	43	83	39	147
8 ...	20	38	39	131	62	36	41	71	75	78	87	45
9 ...	24	109	59	60	54	41	55	69	102	41	80	105
10 ...	38	38	49	56	43	49	65	72	63	68	93	44
11 ...	48	58	58	48	54	43	43	96	95	62	52	41
12 ...	67	68	89	69	43	40	46	60	33	113	54	27
13 ...	38	42	64	31	95	59	69	53	52	42	58	37
14 ...	74	77	46	51	106	166	96	48	59	60	95	37
15 ...	32	110	52	48	250	34	44	62	94	54	56	42
16 ...	132	39	65	65	121	66	60	80	45	56	64	52
17 ...	26	53	55	186	39	39	130	33	62	50	91	39
18 ...	57	55	66	70	45	78	52	34	35	66	56	37
19 ...	51	47	71	52	45	47	53	69	45	63	55	83
20 ...	14	40	41	111	37	48	56	62	67	47	138	69
21 ...	16	46	56	64	40	47	60	54	72	42	105	66
22 ...	21	31	54	52	52	42	60	57	44	51	64	59
23 ...	42	45	83	64	42	62	61	36	112	83	49	56
24 ...	81	64	51	64	63	56	119	37	36	85	50	44
25 ...	29	50	67	64	47	66	74	51	59	48	51	51
26 ...	58	100	71	54	40	59	72	60	88	78	42	48
27 ...	35	33	63	47	85	64	42	27	63	55	48	27
28 ...	42	44	61	51	152	54	57	44	137	64	48	47
29 ...	32		59	58	64	43	60	75	45	59	60	83
30 ...	52		74	55	47	55	63	38	59	84	59	179
31 ...	35		52		47		53	43		82		42

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1892 and 1893 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1892. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	67	66	92	83	152	59	60	61	44	41	63	83
2 ...	54	57	56	80	70	124	70	68	55	87	83	37
3 ...	68	49	70	57	62	131	75	108	33	59	110	61
4 ...	87	61	92	53	68	75	44	110	47	62	186	157
5 ...	99	40	53	54	123	55	54	74	50	104	68	72
6 ...	38	43	216	76	51	71	88	79	65	45	62	62
7 ...	16	46	89	80	68	66	51	54	30	57	51	46
8 ...	29	57	64	60	108	75	57	86	48	63	60	62
9 ...	20	67	64	122	76	73	93	47	46	80	50	52
10 ...	32	68	71	75	53	57	52	70	58	114	68	37
11 ...	44	94	112	57	66	52	56	69	93	101	56	29
12 ...	43	61	144	65	74	60	213	308	53	141	32	52
13 ...	52	573	69	63	69	56	90	131	80	51	45	42
14 ...	56	106	55	56	76	64	125	55	69	58	103	49
15 ...	35	89	76	96	52	79	63	62	77	113	68	50
16 ...	88	46	47	59	40	73	232	52	98	109	43	54
17 ...	98	59	47	75	169	81	110	60	43	96	130	46
18 ...	66	78	67	55	313	59	91	50	42	137	57	29
19 ...	62	81	69	47	129	37	56	56	112	69	67	88
20 ...	76	81	70	55	73	53	40	69	126	70	64	41
21 ...	45	57	91	72	74	64	35	49	164	85	73	58
22 ...	59	41	69	62	122	61	74	66	70	69	76	24
23 ...	63	62	79	126	55	55	34	57	31	68	56	119
24 ...	66	102	116	59	49	100	58	103	32	75	143	35
25 ...	38	58	68	105	66	66	79	77	45	53	58	37
26 ...	38	122	76	182	69	67	128	52	89	85	42	45
27 ...	50	80	60	52	61	366	94	48	58	67	45	57
28 ...	63	31	74	65	65	73	107	44	89	61	51	44
29 ...	251	55	40	114	72	52	107	45	39	81	27	81
30 ...	60		53	49	72	70	92	57	56	68	49	60
31 ...	43		81		58		46	77		63		36

1893. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	71	62	114	76	66	70	47	76	63	62	129	37
2 ...	58	97	60	78	65	95	47	59	24	113	133	42
3 ...	81	106	86	70	84	50	66	67	41	72	80	59
4 ...	81	106	77	85	69	95	77	65	72	59	37	56
5 ...	120	58	60	104	103	70	90	88	76	123	56	142
6 ...	76	61	59	78	84	82	85	145	44	66	61	60
7 ...	41	53	81	80	104	65	69	88	53	84	54	36
8 ...	70	34	55	86	91	62	76	58	71	53	80	58
9 ...	79	55	61	59	103	101	77	45	37	66	89	52
10 ...	53	35	50	85	51	64	76	60	87	133	85	49
11 ...	29	47	58	65	75	81	62	70	95	49	62	58
12 ...	56	63	123	104	37	63	71	125	87	52	82	26
13 ...	25	112	88	83	54	70	59	60	95	94	51	44
14 ...	45	141	105	66	77	94	159	61	93	73	53	35
15 ...	39	104	83	74	92	118	97	75	51	58	54	54
16 ...	51	53	64	68	62	61	72	67	39	49	76	73
17 ...	42	103	83	76	70	71	67	74	75	67	35	54
18 ...	63	78	65	59	113	111	76	313	58	48	53	66
19 ...	72	69	80	64	80	63	66	58	59	50	56	56
20 ...	55	71	69	68	76	46	65	48	59	64	63	83
21 ...	87	60	66	84	68	72	128	43	49	59	75	46
22 ...	82	65	70	82	70	61	70	82	51	68	96	50
23 ...	32	49	69	84	62	87	67	57	60	80	59	63
24 ...	45	86	90	88	68	95	56	67	44	136	79	155
25 ...	55	62	151	66	93	64	46	49	64	130	73	99
26 ...	57	63	183	144	55	76	39	52	183	90	55	64
27 ...	46	50	97	60	64	87	71	54	38	95	100	69
28 ...	57	67	86	67	58	128	66	48	64	87	64	58
29 ...	110		82	47	65	93	70	60	103	80	85	39
30 ...	66		70	60	107	56	53	76	162	60	39	49
31 ...	40		77		63		43	64		79		43

TABLE 454.—*Showing the diurnal ranges for each day (10h to 10h) of the years 1894 and 1895 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	35	51	83	66	116	61	50	66	52	54	44	51
2 ...	40	97	77	69	50	67	96	64	52	72	47	48
3 ...	83	54	53	86	64	69	56	77	58	71	76	45
4 ...	65	48	81	83	95	59	52	67	83	100	67	37
5 ...	71	57	64	82	70	61	92	86	58	96	79	92
6 ...	61	71	87	121	74	61	69	64	64	79	74	44
7 ...	31	57	59	74	90	80	69	79	69	76	57	38
8 ...	36	72	111	45	69	59	55	62	67	85	92	54
9 ...	42	64	43	65	57	160	70	64	50	73	56	51
10 ...	62	36	66	84	81	97	54	62	72	55	53	54
11 ...	57	56	67	63	81	58	66	81	43	84	58	39
12 ...	47	67	60	129	61	59	72	60	58	59	71	54
13 ...	24	38	78	71	65	63	61	87	56	81	302	63
14 ...	44	66	124	65	47	61	56	75	241	57	128	52
15 ...	44	83	92	68	53	59	70	53	86	70	72	104
16 ...	46	71	53	54	50	77	72	31	65	110	54	72
17 ...	46	62	65	219	67	133	87	61	68	45	90	36
18 ...	60	82	49	79	75	78	85	57	103	53	127	45
19 ...	62	125	41	51	73	110	92	184	105	49	103	72
20 ...	47	94	55	59	45	93	500	453	91	37	55	27
21 ...	93	140	131	63	70	159	154	68	59	58	48	66
22 ...	86	146	71	56	94	76	85	66	103	50	57	52
23 ...	82	126	70	56	69	55	58	55	43	74	129	32
24 ...	59	79	73	69	48	41	49	46	54	74	104	36
25 ...	54	316	90	63	52	64	99	53	58	86	56	24
26 ...	96	55	63	59	54	70	32	47	53	58	66	39
27 ...	49	48	46	76	61	67	49	38	80	75	67	41
28 ...	42	274	66	62	102	81	67	58	37	58	62	72
29 ..	48		70	112	79	74	59	52	46	59	62	39
30 ...	57		243	110	64	74	53	62	155	57	51	49
31 ...	45		119		106		63	63		81		59

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	105	101	95	84	88	72	85	69	35	63	52	35
2 ...	40	117	63	59	66	81	51	53	56	62	85	55
3 ...	51	38	65	65	65	72	56	54	81	74	52	61
4 ...	43	45	62	60	47	40	57	47	133	95	52	78
5 ...	43	80	78	111	88	59	42	75	70	76	68	58
6 ...	92	77	72	50	34	67	119	66	58	67	48	60
7 ...	40	69	61	64	79	47	60	57	47	44	57	176
8 ...	37	56	104	55	66	66	64	54	47	54	135	95
9 ...	101	119	64	84	69	81	52	85	42	47	128	49
10 ...	42	59	70	66	151	73	67	95	42	37	104	36
11 ...	75	58	65	173	59	67	49	46	84	51	68	30
12 ...	56	60	70	60	61	59	105	40	58	123	46	27
13 ...	56	78	158	69	48	66	51	53	56	99	44	29
14 ...	43	81	99	55	105	66	87	40	83	66	54	38
15 ...	32	73	49	95	50	68	73	37	66	96	80	55
16 ...	76	85	62	80	62	98	70	37	57	47	56	34
17 ...	38	41	54	43	75	84	56	47	47	111	59	52
18 ...	48	30	37	83	91	73	57	97	38	39	51	48
19 ...	38	50	66	73	50	78	72	70	78	57	48	48
20 ...	26	72	72	51	59	57	65	66	63	62	53	51
21 ...	22	42	70	68	63	65	49	49	46	59	49	93
22 ...	28	47	69	65	67	98	53	45	58	49	62	54
23 ...	34	52	55	154	52	110	58	58	62	70	147	43
24 ...	43	197	78	73	50	86	43	65	58	60	77	77
25 ...	47	74	112	54	63	60	63	35	39	67	56	35
26 ...	53	49	110	78	71	74	93	40	53	108	65	23
27 ...	64	59	99	59	69	60	66	49	50	157	81	23
28 ...	85	94	75	63	114	57	38	44	60	96	56	37
29 ...	88		37	59	93	54	54	49	94	80	53	42
30 ...	55		98	59	81	67	52	40	65	70	52	35
31 ...	34		71		81		42	56		66		47

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1896 and 1897 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	32	51	58	54	72	45	45	80	28	76	53	54
2 ...	58	68	72	90	253	55	39	47	29	53	50	41
3 ...	91	73	83	95	170	66	62	54	47	56	49	107
4 ...	70	60	156	41	59	37	47	57	52	45	71	96
5 ...	38	42	54	67	63	46	65	46	41	52	78	48
6 ...	41	33	70	67	60	37	73	87	50	38	114	51
7 ...	43	20	47	46	73	43	56	40	50	55	132	53
8 ...	44	52	44	83	75	52	48	58	61	66	65	36
9 ...	114	33	66	62	52	99	43	34	65	84	41	56
10 ...	50	40	60	62	57	60	35	45	75	79	60	46
11 ...	33	56	50	63	82	63	86	40	69	114	41	27
12 ...	39	78	129	66	79	47	45	47	74	152	44	26
13 ...	77	51	82	64	53	51	47	43	36	34	43	145
14 ...	80	125	56	78	68	82	64	50	43	47	52	32
15 ...	62	71	43	67	51	65	46	56	69	56	60	36
16 ...	76	57	41	61	79	129	69	32	65	70	60	31
17 ...	91	57	60	95	104	51	38	48	73	49	39	33
18 ...	48	46	50	60	49	56	43	54	172	67	80	38
19 ...	120	58	63	53	77	37	43	56	45	86	44	30
20 ...	68	40	135	53	62	49	44	60	78	63	59	42
21 ...	52	60	70	80	64	46	28	84	35	50	58	31
22 ...	31	29	73	74	54	37	40	72	54	50	39	26
23 ...	54	65	58	64	61	43	38	51	40	65	52	58
24 ...	28	58	59	64	30	52	71	51	106	70	57	45
25 ...	58	67	120	48	35	47	120	43	39	56	38	34
26 ...	20	79	77	36	42	68	67	39	52	67	39	43
27 ...	54	80	45	66	36	39	104	24	34	45	50	57
28 ...	37	81	64	79	61	45	34	27	34	58	32	34
29 ...	53	108	57	72	64	50	48	43	76	63	25	44
30 ...	103		60	63	59	44	74	44	37	117	30	21
31 ...	71		103		28		61	43		43		34

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	57	56	66	86	51	37	34	64	65	56	83	63
2 ...	222	58	56	104	74	38	41	34	34	47	35	41
3 ...	89	108	79	77	43	62	55	56	66	42	45	47
4 ...	44	50	85	86	41	47	48	48	97	38	50	46
5 ...	51	41	52	91	53	40	33	42	67	53	64	44
6 ...	55	64	54	78	59	43	33	34	41	53	65	58
7 ...	57	65	72	67	45	51	41	44	49	46	61	44
8 ...	65	38	79	48	51	50	56	50	55	32	43	57
9 ...	53	30	59	51	40	44	36	60	45	41	47	47
10 ...	39	46	62	93	55	20	46	38	51	81	46	74
11 ...	94	43	54	46	51	44	71	42	83	38	50	141
12 ...	62	45	52	46	53	38	31	66	19	47	61	68
13 ...	35	40	39	59	62	41	41	62	30	29	55	34
14 ...	35	41	50	48	87	37	82	23	98	49	84	38
15 ...	49	32	43	42	42	48	47	43	34	69	38	50
16 ...	29	29	50	69	42	81	50	32	41	28	47	31
17 ...	42	39	68	44	119	47	39	46	53	42	82	47
18 ...	46	43	58	61	37	26	53	52	49	52	31	43
19 ...	47	36	56	79	52	31	43	60	48	45	38	45
20 ...	38	52	52	235	43	55	48	53	28	35	73	265
21 ...	31	44	56	44	93	43	57	43	53	41	22	38
22 ...	55	56	69	52	44	51	44	43	42	70	39	27
23 ...	55	71	61	122	26	36	48	53	33	80	46	39
24 ...	58	86	60	56	31	33	38	25	51	50	68	39
25 ...	39	78	49	37	36	51	54	28	32	69	30	21
26 ...	28	78	66	36	41	57	40	45	43	68	35	36
27 ...	42	71	77	32	44	56	58	26	62	60	42	28
28 ...	51	38	65	51	48	35	40	51	42	65	18	39
29 ...	102		86	77	55	40	42	49	51	54	37	70
30 ...	76		58	52	93	41	61	32	46	41	31	47
31 ...	68		64		27		72	66		36		93

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1898 and 1899 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	28	36	34	37	73	48	41	31	51	43	50	37
2 ...	22	65	107	44	32	33	49	55	80	53	55	58
3 ...	20	50	52	44	61	44	66	43	42	65	43	62
4 ...	17	37	49	67	49	37	47	42	30	38	34	52
5 ...	33	59	79	44	44	44	34	63	46	49	32	51
6 ...	20	42	78	69	56	96	41	46	30	30	33	54
7 ...	30	37	54	111	44	150	33	31	33	64	59	56
8 ...	37	64	64	31	37	42	58	29	60	33	36	25
9 ...	45	44	57	49	45	70	55	40	309	51	56	37
10 ...	78	41	101	46	62	86	46	58	111	49	29	29
11 ...	85	135	148	51	100	27	57	44	37	33	65	35
12 ...	33	48	54	115	41	23	39	43	46	51	54	31
13 ...	29	31	55	39	59	35	68	63	42	75	55	32
14 ...	25	83	72	92	50	59	31	27	70	56	37	75
15 ...	47	49	190	58	68	79	38	29	48	60	52	40
16 ...	67	62	61	45	35	46	34	123	50	37	57	64
17 ...	39	53	62	52	36	45	42	72	43	38	89	38
18 ...	29	35	74	75	44	49	34	44	35	27	71	26
19 ...	36	56	56	55	49	63	56	35	34	42	41	49
20 ...	34	68	45	43	49	48	50	41	45	101	51	37
21 ...	31	79	54	52	46	53	42	27	38	45	70	18
22 ...	36	48	49	49	60	46	42	48	37	55	88	11
23 ...	34	31	42	63	45	61	49	45	66	31	34	25
24 ...	37	50	60	56	55	42	57	43	79	40	30	38
25 ...	61	35	44	46	41	55	68	20	39	107	39	40
26 ...	63	48	64	53	43	76	39	54	36	32	61	29
27 ...	54	39	64	41	51	51	60	44	35	47	83	50
28 ...	46	53	62	58	45	47	40	70	54	77	27	64
29 ...	30		58	58	46	51	38	19	59	81	51	59
30 ...	38		58	63	48	41	38	21	31	51	34	49
31 ...	24		35		33		46	27		52		38

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	43	35	38	76	82	36	63	52	44	40	43	45
2 ...	33	40	31	75	74	52	45	50	46	34	46	72
3 ...	29	19	77	51	79	33	57	75	27	42	52	44
4 ...	30	19	44	67	60	23	61	47	33	53	71	36
5 ...	18	24	43	51	96	31	46	53	40	39	36	50
6 ...	37	39	79	38	30	41	50	57	14	41	47	42
7 ...	18	49	55	68	61	46	59	47	34	56	32	43
8 ...	32	32	35	46	49	55	40	41	51	40	44	55
9 ...	21	29	49	70	54	67	51	46	40	41	28	33
10 ...	41	35	74	59	54	57	88	33	57	44	40	20
11 ...	37	40	36	63	65	74	41	35	36	41	54	39
12 ...	42	205	55	60	39	35	53	40	58	28	40	45
13 ...	37	39	55	46	37	31	44	77	28	31	46	24
14 ...	38	45	55	64	52	44	46	43	22	34	38	18
15 ...	50	35	58	45	108	34	50	44	80	112	51	26
16 ...	52	33	49	49	35	43	61	35	32	33	32	24
17 ...	70	34	59	57	46	38	43	38	53	37	55	25
18 ...	60	36	53	110	34	53	48	50	64	37	44	52
19 ...	35	42	38	57	37	63	33	38	47	29	72	69
20 ...	53	56	42	45	65	40	36	99	54	38	39	39
21 ...	16	50	80	42	43	38	51	63	53	34	41	48
22 ...	34	32	82	26	44	54	35	42	44	56	91	33
23 ...	49	78	101	51	71	87	40	43	42	69	36	51
24 ...	23	30	33	38	70	40	31	40	28	44	21	25
25 ...	22	39	51	46	42	38	85	48	63	45	25	43
26 ...	32	66	47	50	82	72	47	34	84	31	33	42
27 ...	46	49	48	45	61	112	50	34	26	43	30	56
28 ...	99	73	68	45	49	61	45	49	26	40	37	39
29 ...	59		51	68	51	56	48	79	47	37	41	30
30 ...	29		58	43	67	78	38	41	35	44	53	24
31 ...	32		55		111		41	25		44		31

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1900 and 1901 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ= ·00001 C. G. S.

1900. Date.	Month. January.	February.	March.	April.	May	June.	July.	August.	September.	October.	November.	December.	1901. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	42	18	54	46	43	39	41	33	36	38	44	36	1 ...	9	36	48	73	45	50	37	37	28	27	44	38
2 ...	46	34	52	48	39	59	54	43	35	41	42	55	2 ...	25	104	35	63	55	39	30	38	36	38	42	69
3 ...	34	32	39	33	41	36	32	41	35	30	48	30	3 ...	34	41	49	65	51	44	41	51	43	50	45	25
4 ...	46	79	37	44	54	50	44	57	36	72	40	36	4 ...	40	36	46	53	31	51	54	47	23	45	52	25
5 ...	137	38	39	38	223	34	28	39	52	19	42	36	5 ...	69	35	40	48	43	39	31	20	23	34	35	45
6 ...	27	28	46	54	28	41	50	35	48	43	47	40	6 ...	30	40	47	63	54	40	45	43	31	36	21	35
7 ...	24	29	37	36	36	53	49	45	49	37	41	81	7 ...	32	26	56	75	57	36	32	39	25	49	35	39
8 ...	33	41	128	36	53	52	49	61	24	33	47	33	8 ...	26	38	45	57	48	44	24	55	11	45	35	42
9 ...	16	56	49	42	51	38	28	30	42	41	35	34	9 ...	47	24	53	33	63	24	52	40	31	47	57	54
10 ...	48	16	32	45	47	33	53	37	69	34	35	52	10 ...	31	31	39	39	94	24	54	31	81	31	37	26
11 ...	30	52	34	33	45	32	57	40	29	38	32	32	11 ...	27	31	44	62	30	33	47	25	24	40	47	42
12 ...	40	35	30	49	32	43	72	54	27	50	47	28	12 ...	23	78	29	51	37	24	41	26	49	35	36	50
13 ...	35	53	169	59	44	51	45	55	48	52	46	27	13 ...	21	43	45	48	18	41	44	42	33	65	32	34
14 ...	25	67	44	51	32	70	51	44	43	40	50	30	14 ...	21	33	39	70	42	35	44	127	31	35	31	44
15 ...	62	76	40	53	32	62	74	58	51	44	41	28	15 ...	23	31	51	48	58	51	43	49	24	39	26	27
16 ...	38	34	53	56	31	40	56	39	27	47	21	26	16 ...	22	41	57	52	34	36	40	39	57	46	31	30
17 ...	35	58	40	62	39	40	45	46	37	44	22	27	17 ...	20	53	39	40	47	39	59	35	45	35	27	32
18 ...	36	39	41	58	39	57	54	44	29	46	36	25	18 ...	31	51	60	34	48	36	45	38	36	36	37	26
19 ...	83	48	41	35	43	40	56	37	36	57	32	27	19 ...	33	85	51	39	36	30	43	41	44	41	68	17
20 ...	48	67	53	46	37	48	70	35	41	65	43	24	20 ...	45	53	57	51	30	48	51	66	28	28	34	26
21 ...	110	52	52	48	44	35	49	44	45	31	52	31	21 ...	57	44	38	58	25	54	43	38	46	36	29	16
22 ...	50	30	56	51	43	31	36	46	31	42	45	22	22 ...	85	61	60	57	37	39	48	34	26	32	25	18
23 ...	35	37	47	53	49	60	46	38	25	34	36	32	23 ...	59	67	51	46	51	49	47	34	45	31	31	24
24 ...	25	64	36	26	36	33	68	34	38	41	51	39	24 ...	36	40	151	40	45	35	55	47	42	33	35	35
25 ...	40	44	53	23	50	33	45	63	40	83	39	41	25 ...	38	37	44	37	43	37	68	30	36	77	34	31
26 ...	54	40	43	46	35	33	42	51	41	47	27	26	26 ...	36	36	46	30	43	35	46	33	32	29	28	30
27 ...	44	57	48	51	40	35	48	50	58	40	39	65	27 ...	49	39	55	53	39	42	40	27	46	39	33	49
28 ...	32	40	56	41	51	34	55	34	43	30	32	25	28 ...	24	38	43	30	50	49	26	39	42	48	38	101
29 ...	26		70	44	40	35	49	36	33	39	56	29	29 ...	27		57	42	39	48	46	45	45	32	25	28
30 ...	28		63	84	48	30	33	38	45	55	30	27	30 ...	41		38	50	43	40	36	32	56	35	25	30
31 ...	45		45		21		35	39		43		24	31 ...	34		51		56		38	42		40	·	23

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1902 and 1903 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	16	43	44	54	39	43	27	27	23	32	26	37
2 ...	18	33	37	32	23	44	31	44	57	35	44	43
3 ...	25	50	34	46	34	30	33	37	40	41	39	39
4 ...	17	37	33	41	49	37	40	45	18	37	39	41
5 ...	21	52	35	33	43	50	22	43	28	27	35	30
6 ...	30	27	37	40	33	46	43	31	32	47	42	38
7 ...	16	64	29	44	33	40	55	43	49	51	37	21
8 ...	31	36	55	65	36	55	51	44	34	29	28	25
9 ...	36	31	38	68	98	36	28	38	30	51	32	56
10 ...	27	25	42	72	55	44	45	45	47	30	32	40
11 ...	19	39	59	121	52	45	46	27	22	57	26	33
12 ...	16	48	41	36	42	49	56	37	46	34	39	37
13 ...	27	43	60	32	45	45	35	24	19	35	62	53
14 ...	36	35	41	35	53	50	49	28	36	33	58	27
15 ...	57	35	55	42	30	36	48	26	28	47	49	32
16 ...	26	52	51	43	42	31	31	42	45	37	49	44
17 ...	18	34	41	40	53	30	38	34	25	53	41	27
18 ...	20	36	41	33	43	35	53	36	44	65	41	36
19 ...	12	20	44	34	36	49	33	39	72	37	55	40
20 ...	21	38	57	123	38	38	41	36	57	44	46	32
21 ...	17	44	73	37	39	42	39	85	38	34	36	27
22 ...	21	36	51	46	27	41	24	26	37	41	54	37
23 ...	36	32	57	45	39	37	50	22	34	38	65	43
24 ...	75	44	105	32	43	43	40	40	31	60	71	31
25 ...	54	47	57	36	38	49	44	28	40	47	47	25
26 ...	86	30	60	53	40	52	40	37	42	41	41	21
27 ...	39	31	36	29	31	45	42	52	23	54	32	19
28 ...	43	29	49	43	45	40	30	40	36	46	34	23
29 ...	41		60	44	61	52	37	50	44	41	33	26
30 ...	31		46	60	33	32	22	30	45	60	50	25
31 ...	31		46		40		40	56		95		35

1903. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	26	36	59	50	53	110	46	48	49	51	106	49
2 ...	27	41	52	49	49	36	47	34	38	64	60	58
3 ...	31	34	33	38	58	40	36	44	37	28	57	42
4 ...	51	23	45	39	67	42	41	62	37	41	50	64
5 ...	64	38	65	76	60	45	41	40	72	48	49	52
6 ...	14	19	49	189	72	42	37	56	35	52	73	42
7 ...	16	22	64	45	40	38	53	30	46	56	73	68
8 ...	40	42	44	42	42	31	37	39	60	44	41	41
9 ...	27	35	33	59	47	23	48	26	38	48	51	45
10 ...	33	35	49	44	47	19	78	39	59	62	60	31
11 ...	28	30	46	44	35	27	29	66	39	61	48	27
12 ...	25	38	64	55	43	51	50	57	45	131	59	29
13 ...	30	52	57	60	46	59	52	43	25	49	42	232
14 ...	34	56	36	56	33	71	65	78	21	49	43	31
15 ...	30	45	57	99	37	60	49	51	42	41	44	41
16 ...	59	49	48	49	40	56	34	52	21	46	75	20
17 ...	26	38	33	67	55	52	51	26	29	37	35	40
18 ...	44	31	45	80	50	37	58	49	61	32	65	35
19 ...	42	39	50	37	46	50	56	30	72	43	41	46
20 ...	22	24	56	45	32	39	51	51	59	52	47	97
21 ...	30	47	57	50	47	42	54	63	39	44	31	41
22 ...	17	47	57	47	48	41	40	75	48	62	64	38
23 ...	24	46	58	40	47	32	43	56	84	42	71	35
24 ...	39	32	67	54	50	48	44	36	52	42	55	29
25 ...	26	45	55	74	46	44	68	40	37	47	56	33
26 ...	38	43	52	93	46	46	97	131	30	56	34	38
27 ...	38	43	41	44	32	46	59	26	29	46	43	40
28 ...	43	54	48	57	35	79	72	45	39	45	60	20
29 ...	33		68	65	40	85	31	40	74	51	23	78
30 ...	56		54	54	44	60	30	72	36	50	37	135
31 ...	45		62		41		39	29		722		54

TABLE 454.—*Showing the diurnal ranges for each day (10^h to 10^h) of the years 1904 and 1905 derived from hourly tabulations of H. F. Magnetograms.*

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	46	48	44	153	53	37	63	44	37	54	58	48
2 ...	48	47	53	67	45	41	41	70	42	37	73	49
3 ...	39	38	72	53	52	48	43	93	49	53	49	64
4 ...	30	48	56	57	55	47	52	66	59	32	137	42
5 ...	56	46	47	52	54	56	42	35	85	40	72	52
6 ...	25	55	31	68	61	112	111	53	37	46	41	41
7 ...	50	51	42	65	65	49	43	72	56	73	61	48
8 ...	41	53	42	55	58	35	57	54	44	64	70	59
9 ...	40	45	45	61	57	43	38	45	47	31	50	104
10 ...	50	12	51	62	73	36	33	55	36	41	47	50
11 ...	18	26	92	61	42	55	44	43	64	52	35	53
12 ...	18	25	64	51	132	56	58	60	48	54	48	40
13 ...	17	46	67	61	87	51	57	60	27	82	47	33
14 ...	24	51	56	56	46	61	100	43	39	47	52	49
15 ...	26	50	57	67	56	145	54	51	46	44	44	46
16 ...	79	60	69	41	51	126	45	53	83	43	51	67
17 ...	37	54	56	45	76	62	72	42	49	46	44	35
18 ...	32	37	81	147	69	66	83	40	38	56	59	48
19 ...	42	24	64	89	54	63	62	28	17	42	33	48
20 ...	48	36	90	48	38	57	85	38	34	49	35	30
21 ...	64	27	55	56	37	64	66	61	45	137	45	58
22 ...	44	46	58	55	60	39	50	43	59	41	68	41
23 ...	37	46	78	60	57	48	59	26	46	33	37	37
24 ...	25	50	59	73	58	50	48	23	64	44	38	34
25 ...	42	60	45	71	29	58	45	28	76	60	147	34
26 ...	27	35	83	54	40	56	60	57	32	63	77	47
27 ...	27	35	41	46	60	85	56	28	42	69	56	20
28 ...	119	41	56	50	70	48	60	48	41	80	40	41
29 ...	56	62	80	58	52	49	55	65	61	33	49	40
30 ...	49		56	66	32	62	58	74	67	53	44	28
31 ...	38		65		53		43	35		55		23

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	34	36	74	137	67	44	44	48	42	76	52	36
2 ...	18	78	195	67	47	48	64	136	53	63	66	74
3 ...	38	146	44	49	55	78	45	46	170	33	58	48
4 ...	54	51	64	61	49	113	51	42	68	54	99	124
5 ...	92	68	101	90	51	115	54	53	57	75	36	27
6 ...	42	35	66	60	43	34	99	46	32	98	59	37
7 ...	42	49	109	42	61	52	33	66	57	52	55	42
8 ...	38	43	64	53	45	62	66	60	52	56	59	42
9 ...	27	54	69	73	46	92	59	50	56	40	73	49
10 ...	44	49	65	71	54	122	42	47	73	53	64	56
11 ...	77	48	67	64	60	73	62	71	45	51	47	71
12 ...	58	70	62	82	84	34	49	68	57	55	251	105
13 ...	39	32	55	56	57	46	64	78	53	91	102	56
14 ...	67	55	75	46	46	48	59	57	40	52	70	42
15 ...	12	47	57	52	29	70	67	42	43	44	212	41
16 ...	27	35	63	47	35	52	73	89	55	56	130	46
17 ...	60	22	48	44	69	65	67	63	47	59	52	44
18 ...	54	29	62	45	43	61	48	47	123	52	53	37
19 ...	42	48	83	79	42	73	49	65	59	54	59	29
20 ...	36	64	72	61	45	42	59	52	31	63	71	78
21 ...	43	79	60	63	46	42	57	62	31	63	77	16
22 ...	109	54	56	60	55	78	41	50	51	53	57	29
23 ...	50	77	78	54	77	85	51	48	24	56	79	16
24 ...	43	66	51	49	37	47	88	54	35	51	62	31
25 ...	41	80	52	45	33	47	48	50	49	59	57	40
26 ...	42	92	55	65	67	49	43	40	63	46	61	39
27 ...	30	55	80	85	67	48	54	44	62	69	75	44
28 ...	49	26	56	49	60	44	55	101	48	160	54	67
29 ...	41		92	72	45	60	44	81	64	34	51	63
30 ...	19		67	74	50	58	51	47	67	48	48	39
31 ...	51		66		55		40	35		44		50

The results show that the quiet-day range in any case, as must be expected, is decidedly smaller than the all-day range. The difference on the average of 11 years in all quiet-day result is about 8γ, which increases to about 15γ in 1894, the year of maximum spot, and diminishes to about 4γ in 1901, the year of minimum disturbance. The corresponding figures for the Astronomer Royal's quiet-days are 7γ, 14γ and 5γ respectively.

TABLE 455.—*Showing the mean monthly and annual values of the non-periodic diurnal range for all days in the month.*

Unity = 0·1γ

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1890 ...	369	459	509	510	457	435	460	440	490	603	502	406	470
1891 ...	420	558	646	644	691	554	637	555	628	634	647	587	600
1892 ...	615	838	784	751	856	791	830	756	647	785	695	563	743
1893 ...	608	718	826	770	751	784	714	759	699	774	705	605	726
1894 ...	553	906	791	786	704	776	836	787	743	690	803	512	741
1895 ...	528	715	755	738	716	703	630	554	609	727	679	524	656
1896 ...	593	600	713	659	702	546	558	502	577	654	552	470	594
1897 ...	585	528	612	691	529	441	479	455	503	502	489	568	532
1898 ...	390	527	672	569	500	550	465	445	572	521	505	421	511
1899 ...	392	466	548	552	596	511	493	484	436	432	440	395	479
1900 ...	443	451	525	465	467	426	489	435	399	438	400	345	440
1901 ...	353	455	505	502	450	398	436	417	374	398	360	360	417
1902 ...	311	383	488	487	424	423	392	385	375	446	427	337	406
1903 ...	342	387	517	601	462	484	496	495	452	724	531	527	501
1904 ...	418	434	600	649	572	608	576	495	491	534	570	455	533
1905 ...	458	567	712	633	522	628	557	593	570	600	764	490	591
Mean, 1894—1904.	446	532	611	609	557	533	532	496	503	551	523	447	528

TABLE 456.—*Showing the mean monthly and annual values of the non-periodic diurnal range for all quiet-days given in table 381.*

Unity = 0·1γ

Years.	Month.												Year.	Excess over the corresponding mean of all days.
	January.	February	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1890 ...	290	424	476	493	393	420	385	439	371	481	417	370	412	− 58
1891 ...	323	414	522	510	523	487	541	465	493	553	587	429	477	− 123
1892 ...	494	...	730	630	633	618	548	559	441	662	538	441	572	− 171
1893 ...	478	595	664	736	686	708	676	582	576	603	612	506	626	− 100
1894 ...	464	572	700	675	628	679	577	601	657	667	544	466	589	− 152
1895 ...	586	440	...	641	579	670	571	505	529	641	526	430	556	− 100
1896 ...	343	367	568	652	549	468	457	419	496	536	435	380	483	− 111
1897 ...	467	431	562	551	431	401	452	447	468	438	461	408	452	− 80
1898 ...	292	458	532	499	459	456	432	372	360	468	423	411	432	− 79
1899 ...	317	288	474	458	456	456	448	410	357	375	385	335	403	− 76
1900 ...	308	370	425	450	407	434	482	420	388	411	385	312	406	− 34
1901 ...	294	373	465	467	432	386	422	361	342	358	326	296	379	− 38
1902 ...	273	361	472	390	397	417	364	372	336	387	380	322	372	− 34
1903 ...	325	393	489	516	426	434	446	422	355	473	442	354	421	− 80
1904 ...	330	370	570	542	511	526	527	429	411	462	472	395	470	− 63
1905 ...	267	481	602	560	460	515	524	526	434	510	594	380	490	− 101
Mean, 1894-1904.	364	402	526	531	480	484	471	433	427	474	434	374	451	− 77

TABLE 457.—*Showing the mean monthly and annual values of the non-periodic diurnal range for the quiet-days selected by the Astronomer Royal derived from table 454.*

Unity = 0·1γ

Years.	Month.												Year.	Excess over the corresponding mean of all days.
	January.	February.	March.	April.	May.	June.	July	August.	September.	October.	November.	December.		
1894 ...	487	584	672	625	699	681	550	604	631	660	645	360	600	−141
1895 ...	527	584	747	613	545	681	590	515	512	516	534	546	576	− 80
1896 ...	433	471	610	602	642	483	411	423	558	520	480	324	496	− 98
1897 ...	483	452	595	580	461	385	413	472	426	481	431	452	469	− 63
1898 ...	293	442	544	504	492	473	506	318	386	455	442	369	435	− 76
1899 ...	355	347	507	473	475	485	483	447	430	392	389	274	421	− 58
1900 ...	310	364	456	393	450	372	496	358	420	461	345	338	397	− 43
1901 ...	292	352	443	513	401	403	373	353	303	393	312	307	370	− 47
1902 ...	217	365	403	421	418	428	382	352	389	433	360	322	374	− 32
1903 ...	253	390	440	520	442	420	441	341	317	486	532	308	407	− 94
1904 ...	340	280	624	542	489	441	522	420	488	494	489	420	462	− 71
1905 ...	307	490	592	551	457	560	570	496	405	437	559	428	488	−103
Mean, 1894·1904.	363	421	549	526	501	477	470	418	442	481	451	365	455	− 73

484. It will be seen from Chapter XIII that when the ranges in table 454 are treated by the method indicated by Galton to find the median or the day of greatest frequency of a particular value of the range, the average result for the 11 years, 1894—1904, shows that the median range is less by about 4γ than the mean all-day range. This difference, as against that of 8γ between the quiet-day and all-day mean noted above, indicates the relation which the all-day mean bears to the median, and to the average of the particular set of quiet-days. We shall recur to this subject fully in Chapter XIII.

485. The result at any rate is in accordance with the general inference arrived at previously, namely, that quiet conditions are almost always associated with variations of smaller amplitudes, while the disturbances are clearly characterised by larger fluctuations. This appears thus to be true on the average whether the element progresses in its diurnal, annual or secular march.

486. A general summary of the average variations of the years (*vide* tables 438 and 41 to 52, plates 82, 83) shows that while the maximum remains constant in its occurrence at 11 a.m., both in the quiet and all-day variations, the minimum, which is always unsteady, is less so in the former than in the latter. The excursions on either side of this hour of minimum (21 hours) are, it will be noticed, slightly larger in all-days.

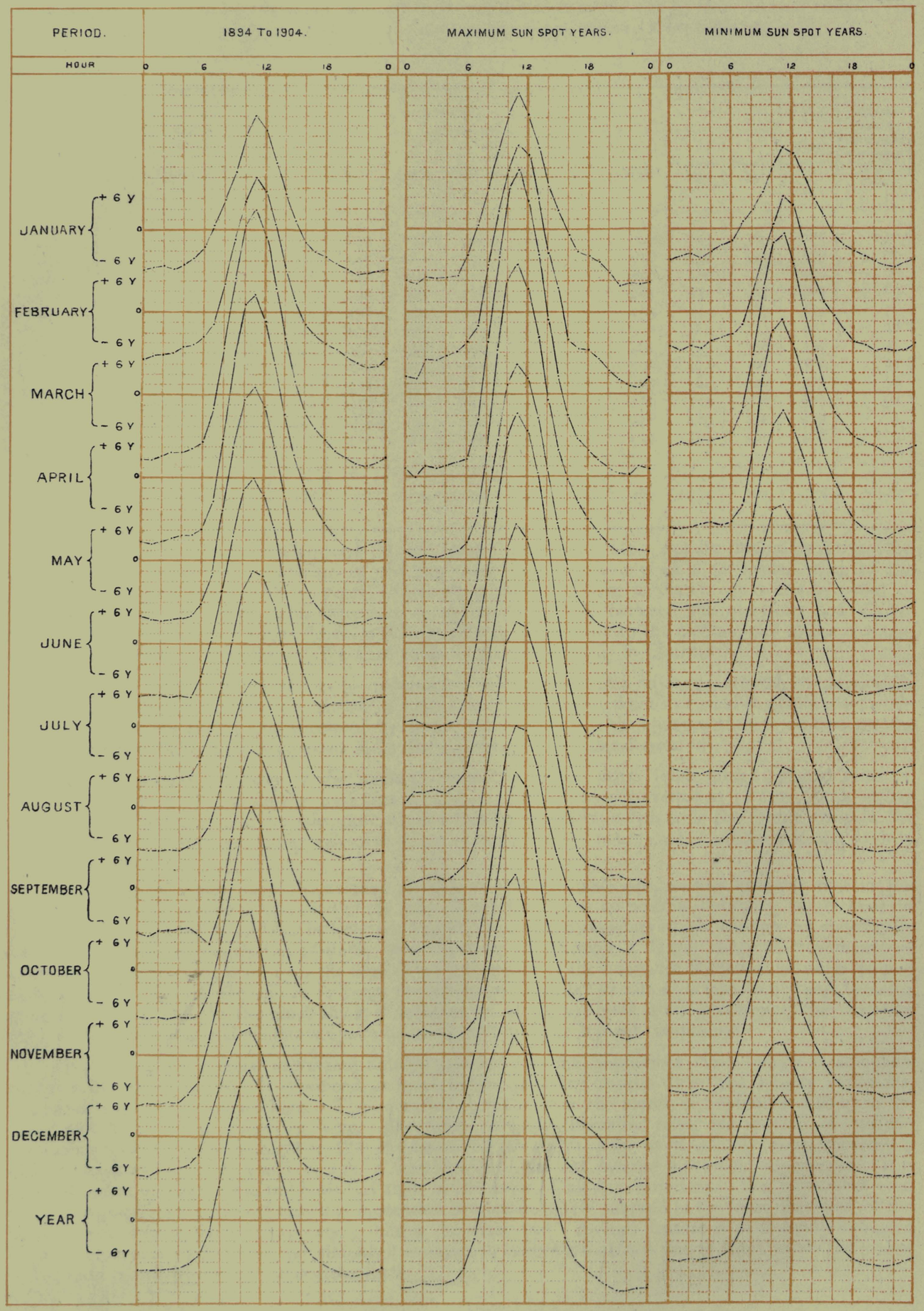
Examining the variations of the average months as shown in table 440, we find however that in the quiet-day, there is a steady progression of the hour of minimum from 22 hour in February to 18 hour in June and back steadily to 22 hour in February again, a succession of events which, though not specifically different in character from that of all-days, does show by comparison a larger range of movement, as in the all-day results (see table 257) the time of the occurrence of the minimum fluctuates between 20 and 22 hours only. On the average of 11 years the minimum in all-day variations occurs somewhere between 20 and 21 hours, while in the quiet-day it is incident at about 21 hour, thus prolonging the duration between the maximum and minimum epoch by about half an hour in quiet conditions.

487. There is a peculiar movement notably prominent in the September curve which is somehow absent in all other months. It is noticed as much in the quiet-day results as in the all-day variations, and needs a passing reference here. The accession to minimum in the month of September falls as in the other months as usual about 22 hour. The force normally thereafter rises, but instead of steadily continuing to do so from the night to the day-hours till about 11 a.m. as it usually does, receives a sudden check and about 6, 7 and 8 a.m. a specifically significant reverse movement supervenes. It is curiously more emphasised in the quiet-day than in the average all-day variations. We have also seen (*vide* paragraph 347, plate 13) how this movement is more definitely marked in the least disturbed of the three 11-year cycles, that of 1894—1904, than in the other two. As this feature is persistently indicated in this month of the year alone, presumably it is easier to conceive that it is due to some terrestrial cause rather than to one which lies outside the earth.

COLABA OBSERVATORY.

Horizontal Force Diurnal Inequality (Magnetograph)
(Quiet Days)

Plate 82.



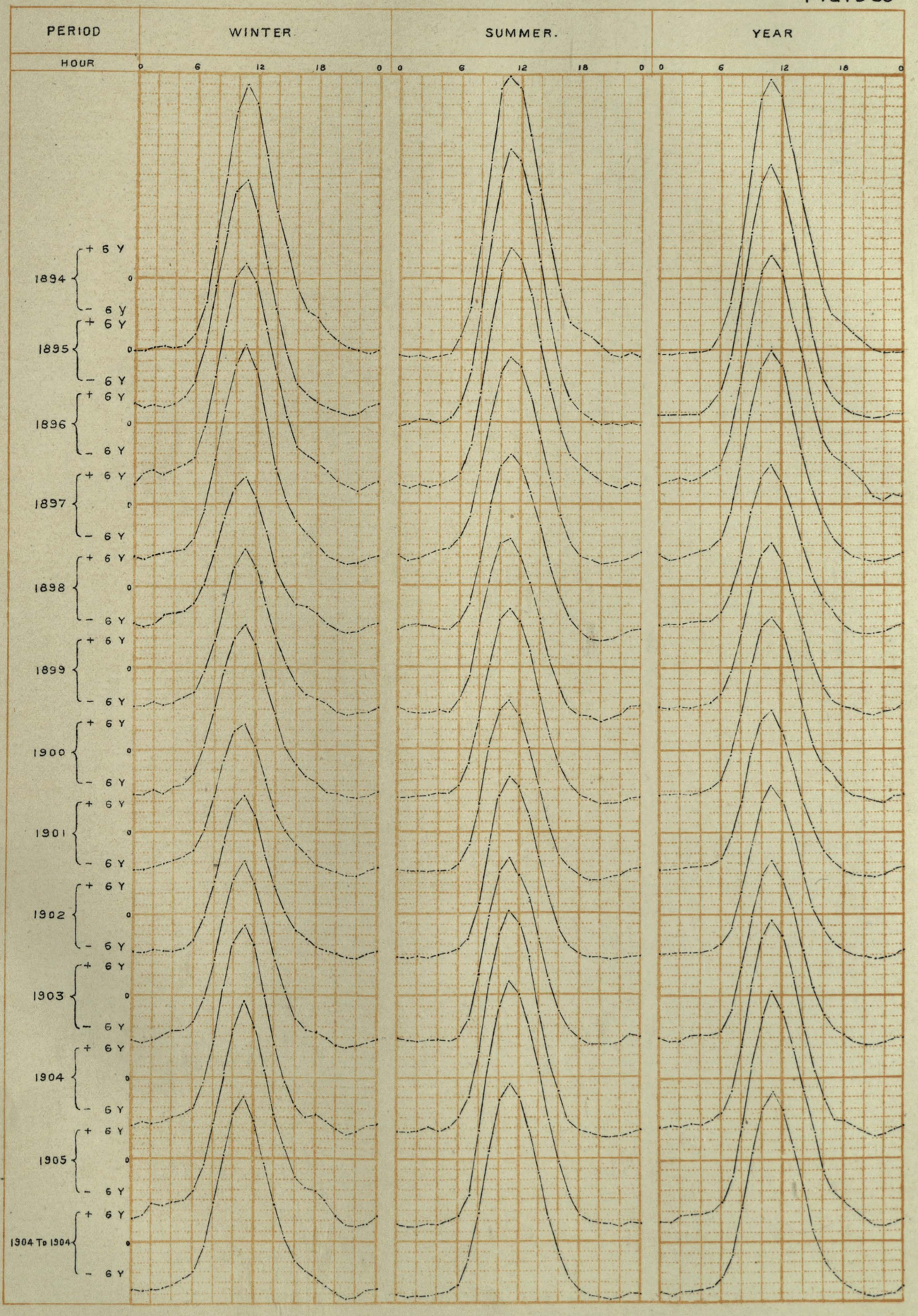
Gov^t Photozinco: Office, Poona. 1910.

COLABA OBSERVATORY

Horizontal Force Diurnal Inequality (Magnetograph)

(Quiet Days)

Plate 83



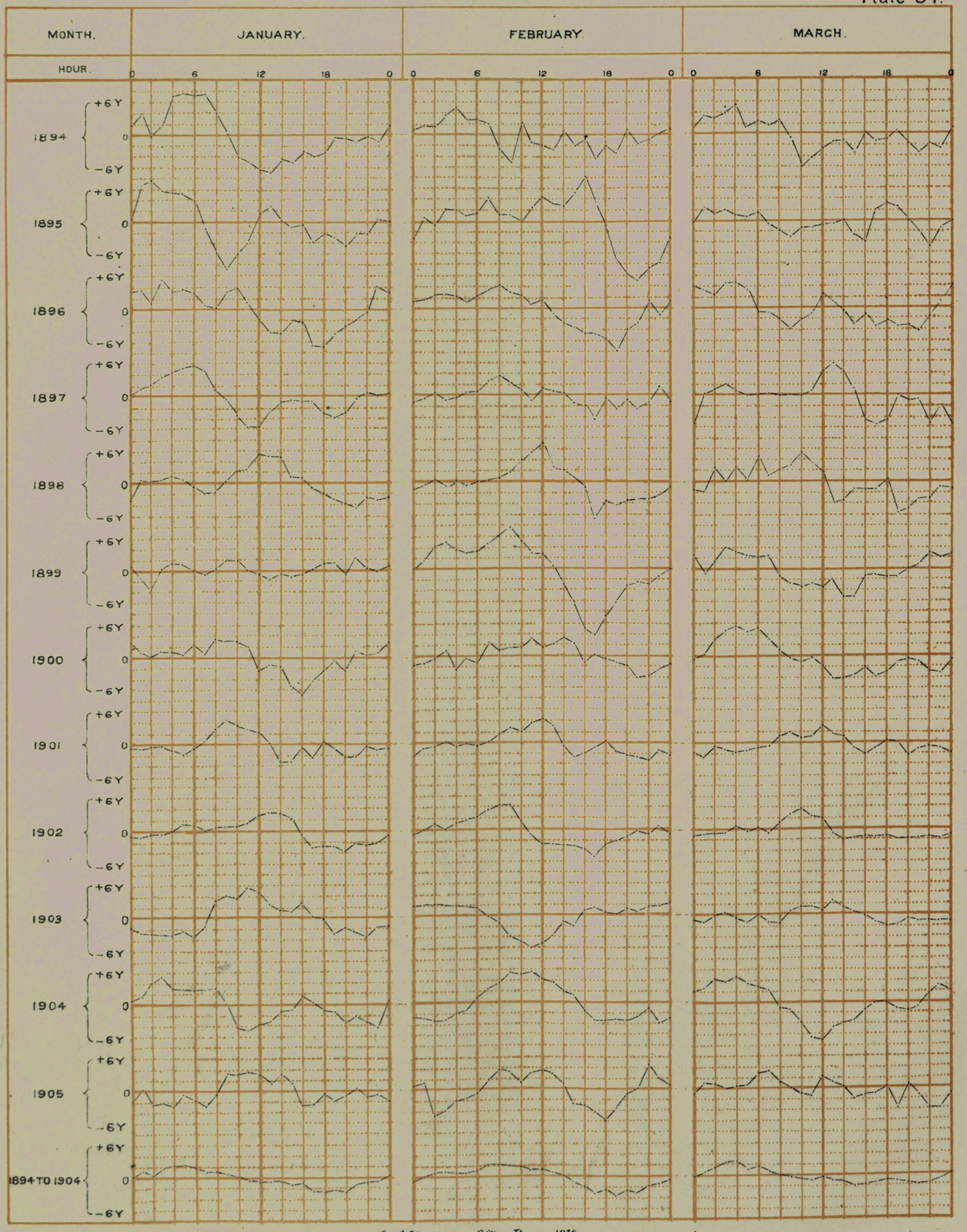
Govt Photozinco: Office, Poona 1910.

COLABA OBSERVATORY

Excess Diurnal Inequality of Horizontal Force (Magnetograph)

(All days less Quiet days)

Plate 84.



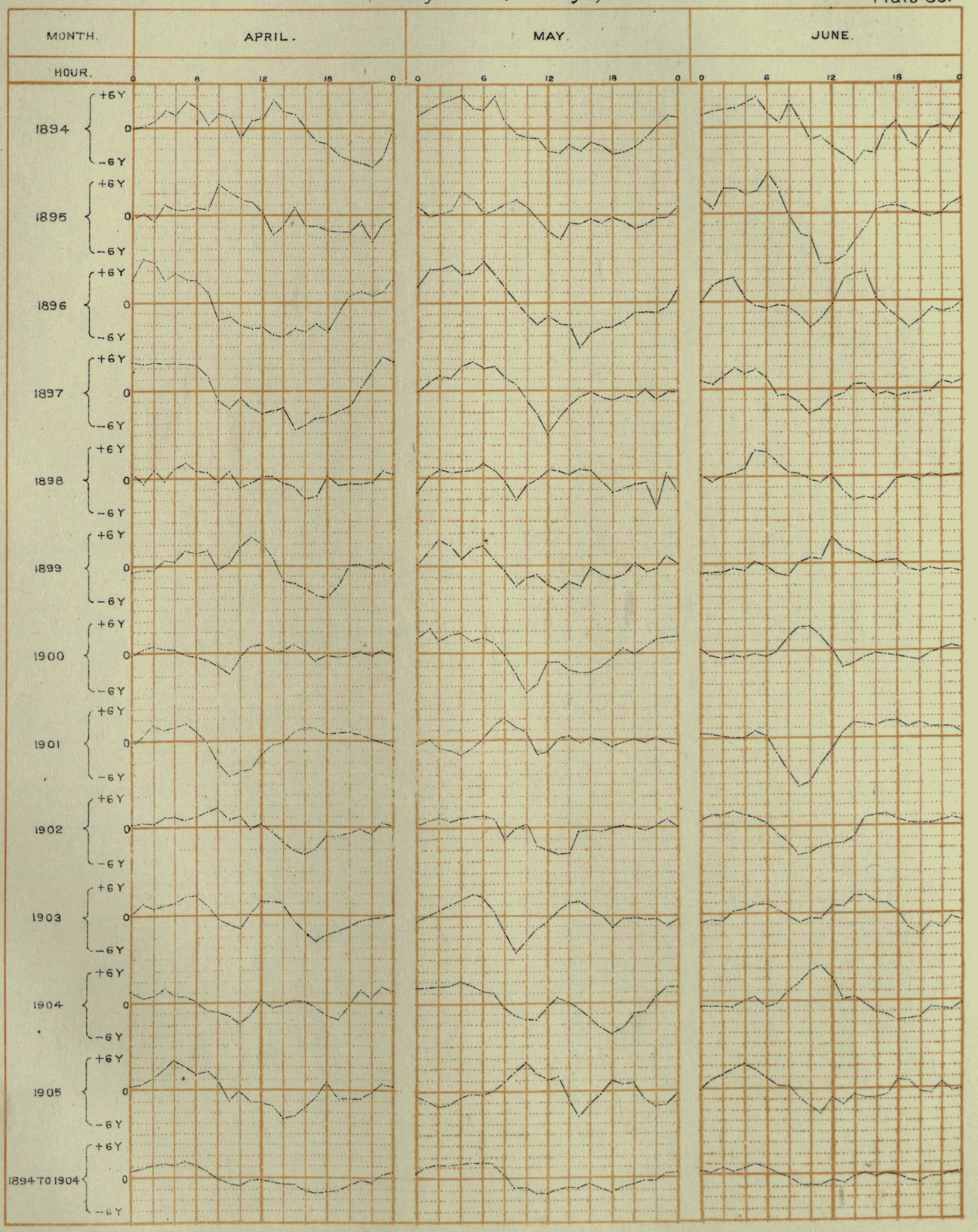
Govt Photozinco. Office, Poona. 1910

COLABA OBSERVATORY

Excess Diurnal Inequality of Horizontal Force (Magnetograph)

(All days less Quiet days)

Plate 85.



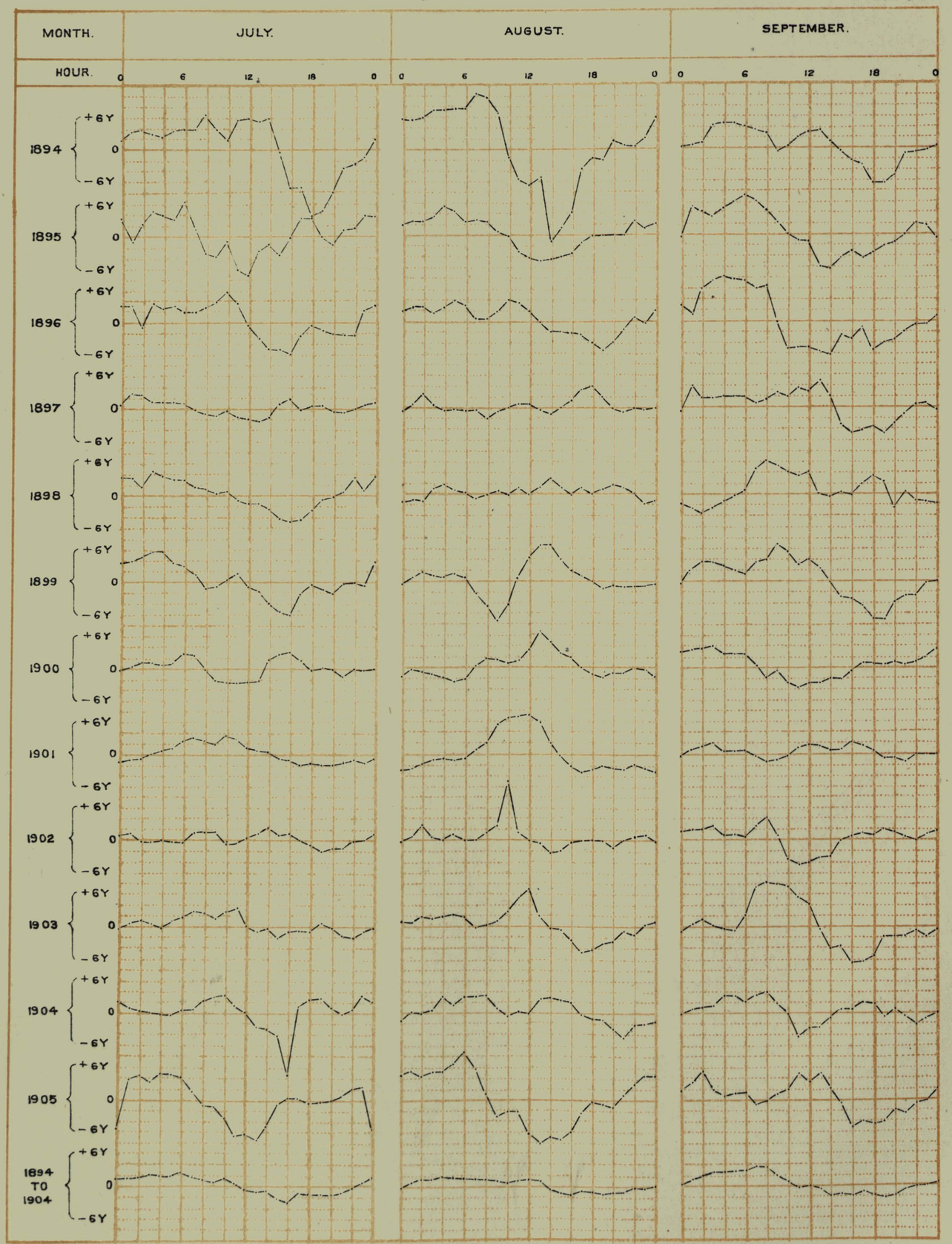
Govt Photozinco: Office Poona, 1910

COLABA OBSERVATORY

Excess Diurnal Inequality of Horizontal Force (Magnetograph)

(All days less Quiet days)

Plate 86.



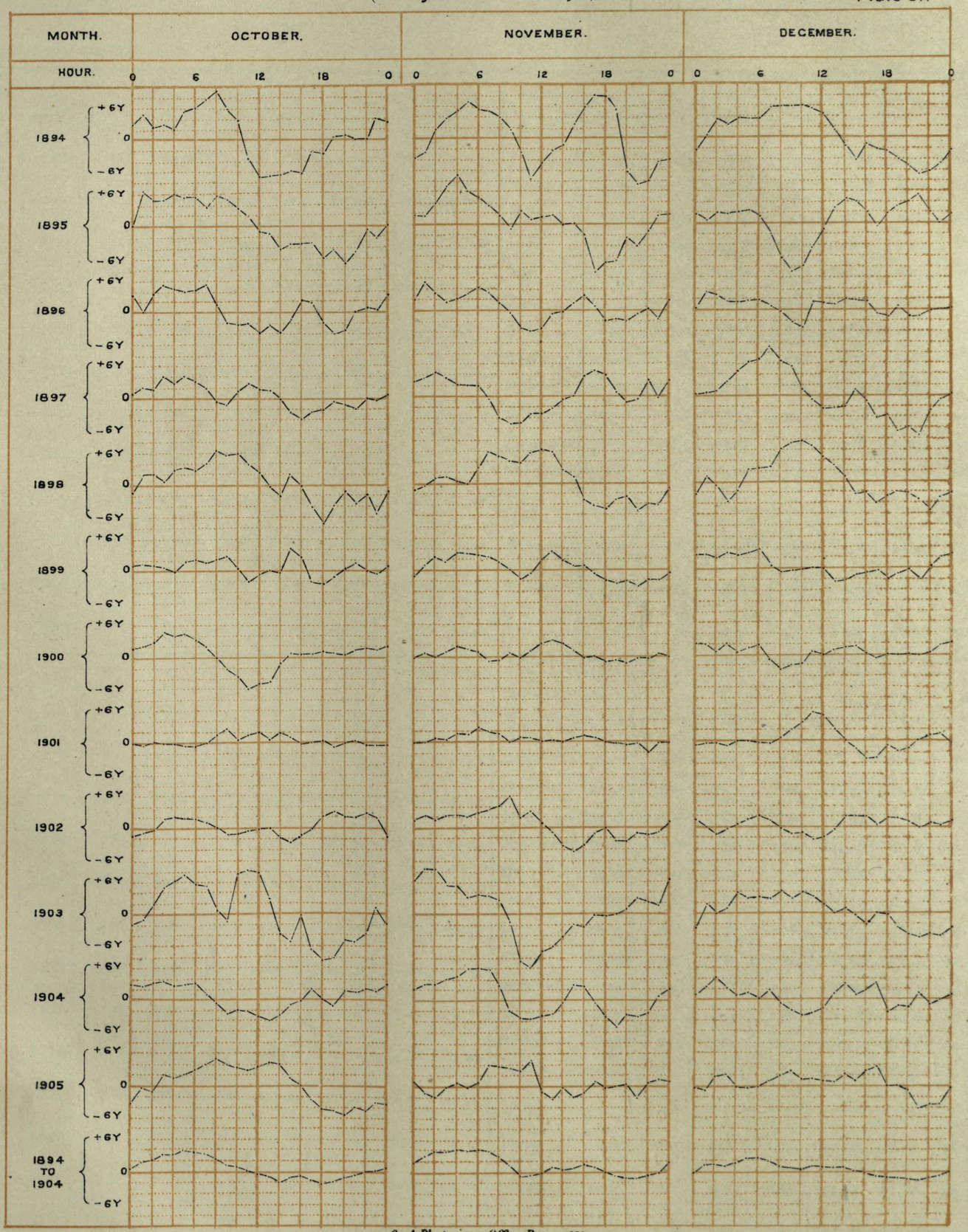
Govt. Photozinco: Office, Poona, 1910.

COLABA OBSERVATORY

Excess Diurnal Inequality of Horizontal Force (Magnetograph)

(All days less Quiet days)

Plate 87.



Govt. Photozinco. Office, Poona, 1910.

TABLE 458.—*Showing the values of the p, q co-efficients (reckoned from $0^h\ 19^m$) and of the Amplitude* P *and the first maximum* μ *(reckoned from $0^h\ 0^m$) for the first four orders of the Harmonic Components of the Diurnal Inequality of Horizontal Force for each average year and the average months given in tables 438 and 440.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	−22·50	+2·28	+10·48	−4·26	−2·98	+3·49	+0·15	−1·21
1895 ...	−20·21	+4·54	+ 9·93	−4·85	−2·46	+3·02	+0·12	−0·78
1896 ...	−18·60	+3·07	+ 8·57	−3·44	−2·46	+2·97	+0·34	−0·82
1897 ...	−16·53	+3·51	+ 7·91	−3·41	−1·98	+2·48	+0·22	−1·14
1898 ...	−12·90	+3·17	+ 6·37	−2·41	−1·46	+2·13	+0·06	−0·94
1899 ...	−13·10	+3·37	+ 6·53	−3·08	−1·47	+2·25	+0·02	−0·71
1900 ...	−14·40	+3·30	+ 6·81	−3·20	−1·64	+2·48	+0·18	−0·92
1901 ...	−12·36	+3·47	+ 6·26	−3·14	−1·51	+2·32	−0·6	−1·02
1902 ...	−13·09	+2·62	+ 6·87	−2·74	−2·07	+2·25	+0·28	−0·96
1903 ...	−14·08	+3·10	+ 7·39	−2·99	−2·09	+2·34	+0·14	−1·02
1904 ...	−16·41	+3·81	+ 8·52	−3·62	−2·75	+2·82	+0·46	−0·99
1905 ...	−18·52	+2·80	+ 8·61	−2·92	−2·50	+2·77	+0·07	−0·90

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	−11·73	+2·64	+5·04	−2·47	−1·50	+1·76	+0·82	−0·59
February...	−14·09	+2·76	+6·29	−2·43	−2·48	+2·37	+0·70	−0·77
March ...	−19·56	+3·81	+8·92	−4·44	−2·37	+4·03	+0·01	−1·50
April ...	−19·97	+3·16	+9·38	−3·97	−2·02	+3·84	−0·32	−1·93
May ...	−18·77	+3·69	+9·39	−4·48	−1·87	+2·74	−0·27	−0·92
June ...	−17·76	+4·86	+9·41	−4·52	−2·06	+1·92	−0·21	+0·08
July ...	−17·70	+3·30	+9·27	−2·72	−2·25	+1·11	−0·04	−0·06
August ...	−14·43	+2·38	+7·69	−2·10	−2·01	+1·48	+0·09	−0·65
September .	−13·94	−0·15	+8·44	−0·64	−3·88	+2·45	+0·73	−1·85
October ...	−15·99	+3·01	+8·55	−3·33	−2·75	+3·67	+0·82	−1·70
November .	−14·58	+5·91	+6·25	−5·75	−0·88	+3·53	−0·08	−0·97
December .	−11·51	+4·31	+4·91	−3·68	−0·87	+2·13	−0·16	−0·51
Winter ...	−14·58	+3·74	+6·66	−3·68	−1·81	+2·91	+0·35	−1·01
Summer ...	−17·09	+2·87	+8·93	−3·07	−2·35	+2·26	0·0	−0·89
Year ...	−15·83	+3·29	+7·78	−3·37	−2·08	+2·61	+0·18	−0·95

Years.	P_1	P_2	P_3	P_4	μ_1	μ	μ	μ
					° ′	° ′	° ′	° ′
1894 ...	22·62	11·31	4·59	1·22	**178 58**	173 41	48 15	74 1
1895 ...	20·71	11·05	3·90	0·79	172 5	171 44	47 48	74 26
1896 ...	18·85	9·23	3·86	0·89	175 23	173 49	47 58	77 53
1897 ...	16·90	8·61	3·17	1·16	172 46	173 5	47 37	74 59
1898 ...	13·28	6·81	2·58	0·94	170 57	174 23	46 14	73 10
1899 ...	13·53	7·22	2·69	0·71	170 19	172 7	45 48	72 39
1900 ...	14·77	7·52	2·97	0·94	171 51	172 10	45 55	75 1
1901 ...	12·84	7·00	2·77	1·02	**169 4**	171 26	45 46	71 25
1902 ...	13·35	7·40	3·06	1·00	173 26	173 52	48 57	76 19
1903 ...	14·42	7·97	3·14	1·03	172 20	173 44	48 40	74 12
1904 ...	16·85	9·26	3·94	1·09	171 41	173 14	49 31	78 29
1905 ...	18·73	9·09	3·73	0·90	176 9	175 23	48 46	73 22

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	12·02	5·61	2·31	1·01	172 4	171 41	48 14	85 49
February...	14·36	6·74	3·43	1·04	173 40	174 11	50 11	82 49
March ...	19·93	9·96	4·67	1·49	173 44	171 31	44 54	72 21
April ...	20·22	10·18	4·34	1·96	175 45	173 17	44 0	69 54
May ...	19·13	10·40	3·32	0·96	173 38	172 0	46 11	68 10
June ...	18·41	10·44	2·82	0·22	169 27	171 55	50 25	44 32
July ...	18·00	9·66	2·51	0·07	174 11	176 34	56 0	63 50
August ...	14·63	7·97	2·50	0·66	175 23	177 7	52 38	74 13
September.	13·94	8·46	4·59	1·99	185 22	182 35	54 0	77 38
October ...	16·27	9·18	4·59	1·89	174 5	174 6	47 2	78 41
November .	15·73	8·49	3·64	0·97	162 41	163 26	39 25	71 4
December .	12·29	6·14	2·30	0·53	164 13	166 19	42 9	67 54
Winter ...	15·05	7·61	3·43	1·07	170 22	170 17	45 23	77 2
Summer ...	17·33	9·44	3·26	0·89	175 13	175 16	50 7	72 15
Year ...	16·17	8·48	3·34	0·97	173 1	173 2	47 36	74 56

488. Proceeding to the consideration of the Fourier co-efficients of the average variations, which are collected in table 458, it will be seen that there is apparently no difference in the amplitudes of the four components in either the yearly or the average monthly results when compared with similar all-day results, which can be regarded as specifically significant in this smoothed periodic phenomenon. The phase co-efficients however show a definite divergence which being well marked in the first component needs examination, the difference in the other components being small enough to be neglected. In the yearly results the maximum epoch of the first component invariably occurs earlier in all-days than in quiet-days; in the year 1894 this early incidence amounts to as much as 40 minutes in time, which is reduced to about 4 minutes in 1901. Similarly also in the results of the average months, is this early incidence in all-days fully maintained. The greatest interval of 47 minutes occurs in September and the least, about 11 minutes, in June. In the average condition of 11 years, the maximum of the first component falls earlier by 28 minutes in the all-day result than in that of the quiet-day.

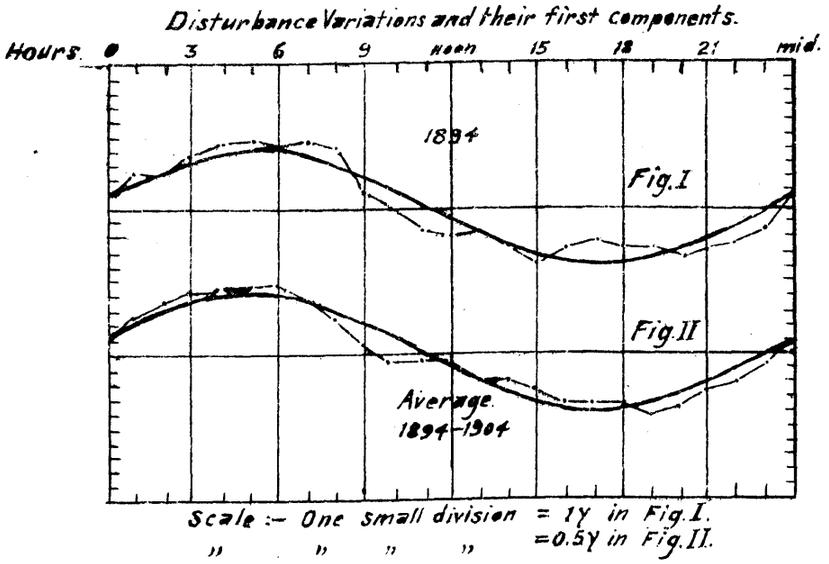
489. From the above results one is inclined to infer that the real intrinsic difference in the periodic variations derived from either the quiet or the all-day results in the Colaba record, consists *merely* in the shift of the phase of the first component alone, as no other appreciably large difference effects in other components are noted. There are undoubtedly other very small fluctuations in the co-efficients of the higher orders, but considering that here as well as in the other results which follow, we can deal only with the broad and definitely marked features of the Colaba data, the minor features must be regarded at least in the present discussion as of no material importance. On the whole therefore it may be taken that the quiet-day variation does not differ from the all-day variation in the average results except in the one single respect noted above. The curve due to this difference is a typical variation whose dominant feature is a single wave of the first order (*vide* plate 88) to which reference has already been made elsewhere.

Take for example the average results of 11 years in which the amplitudes of the first component respectively of the quiet-day and of the all-day variations are 16·17γ and 16·23γ, the corresponding phase angles* being 173° and 166°. It will be seen that it is immaterial if in either case 16·17γ or 16·23γ is adopted as the value of the amplitude, as the result is not dependent on this small difference; but it is principally the change of phase which is the real factor responsible for the disturbance. Even by inspection it becomes apparent, as the amplitudes are nearly the same in magnitude and the difference lies only in the phase factor, that the resultant difference harmonic curve (of the same order) must differ in phase by about a quarter of wave length, that is, by about 6 hours, and its amplitude must be roughly equal to 16·17γ × tan 7° or about 2γ.

490. We can however readily compute the single Fourier wave which is the disturbing cause of this shift of phase from 173° to 166° in the first component, from the formulæ

$$16{\cdot}23\gamma \cos 166^\circ - 16{\cdot}17\gamma \cos 173^\circ = A' \cos \mu'$$
$$\text{and } 16{\cdot}23\gamma \sin 166^\circ - 16{\cdot}17\gamma \sin 173^\circ = A' \sin \mu'$$

The co-efficients of the resultant curve are $A' = 1{\cdot}96\gamma$ and $\mu' = 80^\circ\ 55'$. The same result can of course be derived directly by analysing the disturbance curve itself, but the point worth noting is that this simple harmonic curve of the first order practically measures the *whole* difference, that is the all-day variation less the quiet-day variation. (See table 439, columns 14 and 15; also figure II below.)



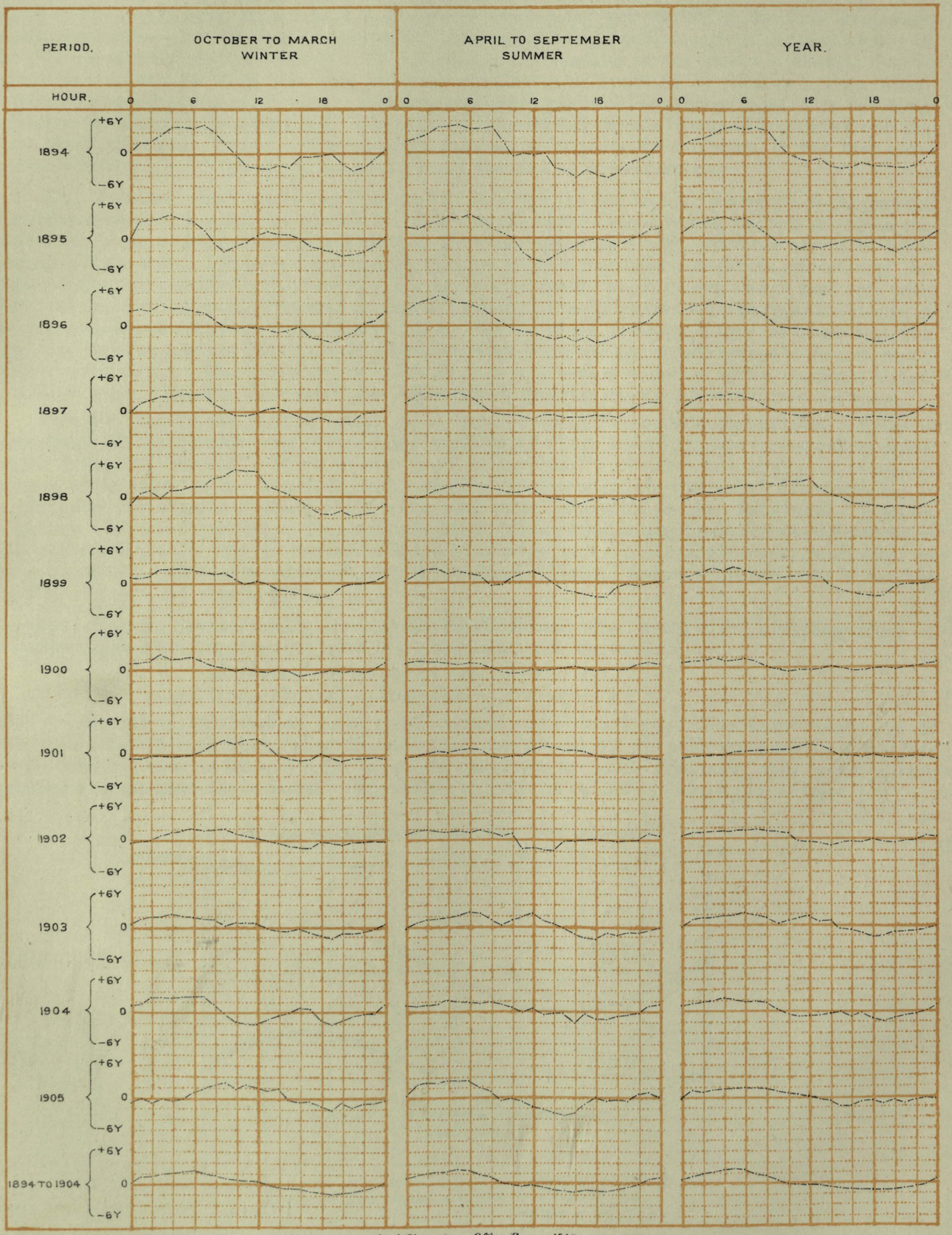
* It is this difference of 7° in phase which has been referred to in paragraph 478. The reference to 9° is for the year 1894.

COLABA OBSERVATORY

Excess Diurnal Inequality of Horizontal Force (Magnetograph)

(All days less Quiet days)

Plate 88.

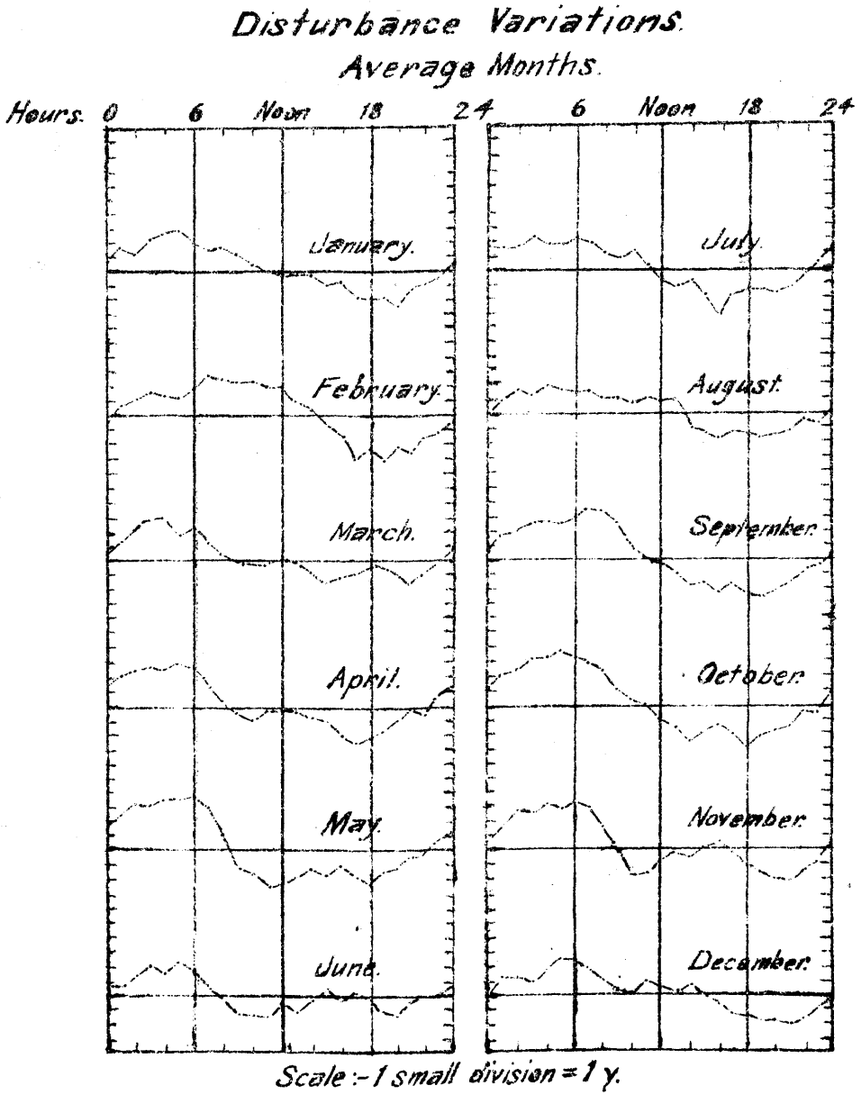


Govt Photozinco. Office, Poona. 1910

491. If similarly the curve of disturbance variation of the year 1894 shown in column 2 of the above table is examined (*vide* figure I above) here too the first component practically makes up for the whole disturbance variation. The computed co-efficients are $A'' = 3{\cdot}93\gamma$; $\mu'' = 79°$. The coincidence of the phase angle in both the average result and that of the year 1894, is notable: *vide* figures I and II above. The analysis of the disturbance curve (shown in figure 12, second set, plate 73, to which reference is already made, in Chapter X) shows that the first component in that curve is also the dominant component, its amplitude being equal to about 28γ, while the other components are less than 2γ in amplitude. The phase angle indicated there is 99° 31′. The resemblance between the two is unmistakable so far except in regard to the magnitude of the amplitude which of course, we know, must differ for obvious reasons.

492. These excess variations for each year of the period 1894—1905 (*vide* table 439), which are charted in plate 88, when examined in their secular progression, show that the effects of the storms and disturbances which differentiate the all-day variations from those of the quiet-day, are subject to the influence, as might be expected, of the 11-year period disturbance, which attains its maximum effect about the years of sun-spot maximum and almost vanishes about the epoch of minimum spot such as the year 1901.

In their seasonal march however (*vide* table 441, plates 84 to 87, and also figures below which are charted for ready reference) as shown by the curves of the average months which are not so regular as the average curves of each year, they apparently do not show any appreciably large fluctuations from



month to month, though when the range or summed ranges shown in table 441 in the two last rows are examined, the existence of the semi-annual pulse affecting the equinoctial and solsticial months is fairly clearly indicated.

TABLE 424A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1894.

Unity = 0·1γ

1894. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 11	+ 3	+ 8	− 9	+ 12	+ 16	+ 7	+ 45	− 9	+ 14	− 52	− 37	223
1 19	+ 21	− 3	+ 14	− 17	+ 14	+ 9	+ 10	+ 31	− 21	+ 20	− 55	− 22	237
2 19	− 24	− 7	+ 6	− 11	+ 24	+ 9	+ 11	+ 31	− 17	− 6	− 14	+ 6	166
3 19	− 15	+ 4	+ 6	− 3	+ 21	+ 2	− 9	+ 34	+ 5	− 14	− 2	− 15	130
4 19	+ 26	+ 6	+ 11	− 19	+ 16	+ 1	− 22	+ 25	0	− 32	+ 1	− 15	174
5 19	+ 32	− 15	− 30	+ 3	− 11	+ 12	− 14	+ 25	− 2	0	+ 15	− 17	176
6 19	+ 31	− 11	− 16	− 5	− 11	− 15	− 4	+ 29	− 8	+ 10	+ 5	− 13	158
7 19	+ 30	− 22	− 24	− 38	+ 15	− 34	− 6	+ 56	− 17	+ 26	+ 1	+ 8	277
8 19	+ 3	− 66	− 14	− 13	− 30	+ 10	+ 24	+ 54	− 19	+ 44	− 7	+ 13	297
9 19	− 11	− 65	− 23	+ 4	− 26	+ 2	+ 20	− 47	− 27	+ 39	− 5	+ 39	308
10 19	− 31	+ 30	− 51	− 13	− 12	− 15	+ 23	− 12	+ 6	+ 35	− 28	+ 62	318
11 19	− 34	+ 2	− 25	+ 30	− 4	− 1	+ 69	− 44	+ 30	− 27	− 65	+ 65	396
12 19	− 45	+ 1	− 5	+ 39	− 21	− 18	+ 76	− 53	+ 46	− 58	− 31	+ 62	455
13 19	− 50	− 7	+ 5	+ 70	− 25	− 33	+ 69	− 41	+ 47	− 58	− 8	+ 26	439
14 19	− 16	+ 37	+ 18	+ 60	− 4	− 39	+ 83	− 148	+ 34	− 45	+ 9	+ 7	500
15 19	− 16	+ 16	+ 3	+ 61	− 6	− 7	+ 27	− 120	+ 23	− 30	+ 55	− 11	375
16 19	+ 1	+ 26	+ 34	+ 31	+ 5	− 17	− 47	− 93	+ 3	− 40	+ 84	+ 13	394
17 19	− 15	− 17	+ 13	0	− 10	+ 17	− 53	− 16	− 10	− 9	+ 102	− 1	263
18 19	− 5	+ 10	+ 18	− 5	− 19	+ 40	− 100	+ 7	− 45	− 7	+ 99	− 2	357
19 19	+ 27	− 2	+ 37	− 22	− 14	+ 5	− 89	+ 7	− 43	+ 26	+ 76	− 14	362
20 19	+ 28	+ 43	+ 17	− 27	− 1	− 3	− 53	+ 41	− 24	+ 30	− 36	− 23	326
21 19	+ 16	+ 15	− 1	− 33	+ 13	+ 29	− 10	+ 31	+ 15	+ 22	− 63	− 42	290
22 19	+ 23	+ 16	+ 8	− 46	+ 28	+ 29	− 6	+ 24	+ 12	+ 17	− 62	− 44	315
23 19	− 1	+ 13	− 10	− 40	+ 33	+ 3	− 4	+ 28	+ 3	+ 43	− 35	− 38	251
Sum without regard to signs.	512	437	397	599	375	366	836	1,042	466	652	910	595	7,187

TABLE 425A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1895.

Unity = 0·1γ

1895. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	− 1	− 38	− 6	− 8	+ 11	+ 24	+ 24	+ 11	− 20	− 8	+ 4	+ 6	161
1 19	+ 49	− 12	+ 6	− 19	− 23	− 10	− 32	+ 2	+ 25	+ 40	− 10	− 20	248
2 19	+ 52	− 30	− 10	− 36	− 23	+ 25	− 4	− 3	+ 9	+ 20	+ 10	− 10	232
3 19	+ 27	− 12	− 11	− 13	− 22	+ 15	+ 9	− 3	− 8	+ 12	+ 28	− 21	181
4 19	+ 19	− 18	− 25	− 28	+ 3	0	− 1	+ 13	0	+ 16	+ 44	− 24	191
5 19	+ 22	− 23	− 23	− 23	− 6	+ 10	− 5	+ 7	+ 20	+ 17	+ 23	− 14	193
6 19	+ 4	− 21	− 16	− 21	− 33	+ 42	+ 29	− 13	+ 29	+ 15	+ 11	− 27	261
7 19	− 30	+ 24	− 24	− 7	− 12	+ 30	− 9	+ 5	+ 37	+ 13	+ 11	− 42	244
8 19	− 58	+ 12	− 19	+ 54	+ 19	− 7	− 36	+ 20	+ 36	+ 49	+ 7	− 71	388
9 19	− 74	+ 27	− 16	+ 55	+ 41	− 25	− 28	+ 16	+ 30	+ 58	− 3	− 82	455
10 19	− 49	+ 13	− 1	+ 42	+ 24	− 31	− 3	+ 5	+ 7	+ 37	+ 30	− 71	313
11 19	− 20	+ 46	+ 11	+ 46	+ 15	− 69	− 43	− 14	+ 1	+ 32	+ 24	− 27	348
12 19	+ 33	+ 64	+ 10	+ 24	− 11	− 70	− 55	− 26	− 2	+ 3	+ 24	0	322
13 19	+ 48	+ 53	+ 16	− 14	− 23	− 56	− 11	− 33	− 46	0	+ 29	+ 42	371
14 19	+ 20	+ 45	+ 18	+ 1	+ 4	− 35	− 3	− 31	− 52	− 33	+ 10	+ 58	310
15 19	+ 3	+ 67	+ 14	+ 29	− 3	− 11	− 25	− 34	− 37	− 28	+ 9	+ 49	309
16 19	+ 3	+ 92	− 27	− 9	+ 2	+ 17	+ 2	− 30	− 29	− 30	− 17	+ 22	280
17 19	− 24	+ 51	+ 39	− 3	+ 1	+ 31	+ 44	− 3	− 34	− 22	− 81	+ 4	337
18 19	− 8	+ 6	+ 45	− 15	+ 10	+ 27	+ 45	+ 6	− 26	− 52	− 65	+ 24	329
19 19	− 8	− 47	+ 48	− 9	+ 8	+ 26	+ 17	+ 17	− 8	− 30	− 55	+ 45	318
20 19	− 18	− 70	+ 27	− 4	0	+ 25	+ 7	+ 22	+ 4	− 49	− 4	+ 61	291
21 19	− 1	− 88	+ 1	+ 8	+ 2	+ 13	+ 27	+ 16	+ 11	− 33	− 23	+ 68	291
22 19	− 5	− 70	− 32	− 34	+ 11	+ 16	+ 27	+ 37	+ 28	+ 1	− 4	+ 29	294
23 19	+ 10	− 73	− 6	− 10	+ 2	+ 25	+ 38	+ 13	+ 14	− 25	+ 12	− 1	229
Sum without regard to signs.	586	1,002	451	512	309	640	524	380	513	623	538	818	6,896

TABLE 426A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1896.

Unity = 0·1γ

1896. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 8	− 7	+ 20	+ 22	+ 7	− 23	+ 6	− 5	+ 2	+ 2	− 8	− 23	133
1 19	0	− 13	+ 4	+ 50	+ 29	− 4	− 4	− 12	− 25	− 34	+ 14	− 7	196
2 19	− 21	− 6	− 6	+ 42	+ 31	+ 7	− 44	− 10	+ 22	− 2	− 6	− 9	206
3 19	+ 14	− 13	+ 10	+ 4	+ 30	+ 6	− 8	− 26	+ 32	+ 9	− 28	− 29	209
4 19	− 2	− 10	+ 15	+ 20	+ 18	− 25	− 10	− 11	+ 43	+ 7	− 17	− 26	204
5 19	+ 6	− 15	+ 8	+ 14	+ 26	− 37	− 5	+ 4	+ 42	+ 7	− 7	− 19	190
6 19	+ 7	+ 1	− 26	+ 20	+ 51	− 36	− 5	+ 4	+ 47	+ 16	+ 13	− 13	239
7 19	− 14	+ 16	− 27	+ 1	+ 26	− 27	− 3	− 18	+ 37	+ 26	+ 5	− 20	220
8 19	− 6	+ 33	− 29	− 40	+ 13	− 17	+ 17	− 8	+ 50	0	0	− 18	231
9 19	+ 36	+ 33	− 32	− 21	0	− 20	+ 40	+ 19	− 3	− 19	− 7	− 26	256
10 19	+ 50	+ 36	− 9	− 29	− 12	− 34	+ 67	+ 47	− 45	− 18	− 27	− 29	403
11 19	+ 24	+ 40	+ 2	− 35	− 27	− 19	+ 44	+ 41	− 43	− 15	− 32	+ 17	339
12 19	− 5	+ 33	+ 39	− 29	− 10	+ 11	+ 4	+ 29	− 41	− 28	− 25	+ 19	273
13 19	− 24	+ 9	+ 35	− 40	− 17	+ 61	− 15	+ 14	− 42	− 10	+ 7	+ 23	297
14 19	− 20	− 3	+ 21	− 35	− 13	+ 78	− 26	+ 3	− 41	− 20	+ 16	+ 39	315
15 19	+ 1	− 15	− 7	− 23	− 60	+ 77	− 33	− 1	− 10	+ 3	+ 29	+ 34	293
16 19	0	− 25	+ 11	− 31	− 36	+ 29	− 39	− 7	− 15	+ 37	+ 42	+ 33	305
17 19	− 40	− 21	− 3	− 10	− 21	+ 13	− 2	− 4	+ 11	+ 40	+ 28	+ 12	205
18 19	− 32	− 18	+ 16	− 15	− 10	+ 10	+ 25	− 7	− 20	+ 11	+ 15	+ 20	199
19 19	− 9	− 40	+ 5	+ 20	+ 2	− 10	+ 17	− 21	− 9	− 9	+ 15	+ 36	193
20 19	− 4	− 9	− 5	+ 39	+ 10	− 5	+ 2	− 16	− 13	− 11	+ 4	+ 9	127
21 19	− 4	− 11	− 24	+ 38	0	+ 4	− 12	− 4	− 6	+ 12	+ 6	− 2	123
22 19	+ 1	+ 20	− 13	+ 18	− 15	− 16	− 25	+ 6	+ 15	+ 5	+ 3	− 3	140
23 19	+ 38	− 14	+ 12	+ 20	− 12	− 18	+ 16	− 11	+ 8	− 4	− 24	− 7	184
Sum without regard to signs.	366	441	379	616	476	587	469	328	622	345	378	473	5,480

TABLE 427A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1897.

Unity = 0·1γ

1897. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 2	− 11	− 51	+ 51	− 2	+ 13	+ 4	− 10	− 12	− 1	+ 22	0	179
1 19	0	− 19	− 12	+ 34	0	− 9	+ 8	− 11	+ 17	0	+ 11	− 16	137
2 19	+ 3	− 16	− 10	+ 32	+ 4	− 1	+ 3	+ 3	− 9	− 10	+ 18	− 14	123
3 19	+ 14	− 30	− 2	+ 29	− 1	+ 16	− 10	− 21	− 11	+ 11	+ 4	− 2	151
4 19	+ 21	− 27	− 11	+ 30	+ 24	+ 5	− 11	− 31	− 8	+ 2	− 7	+ 19	196
5 19	+ 25	− 22	− 26	+ 23	+ 26	+ 8	− 17	− 33	− 12	+ 8	− 11	+ 32	243
6 19	+ 30	− 18	− 23	+ 24	+ 15	− 2	− 17	− 32	− 9	+ 2	− 10	+ 39	221
7 19	+ 30	+ 10	− 15	+ 8	+ 24	− 29	− 21	− 25	− 14	− 4	− 28	+ 69	277
8 19	+ 11	+ 37	− 1	− 20	+ 20	− 13	− 14	− 26	+ 8	− 13	− 44	+ 59	266
9 19	+ 1	+ 27	+ 7	− 28	+ 16	− 20	− 10	− 7	+ 27	− 11	− 52	+ 55	261
10 19	− 22	+ 22	+ 11	− 3	− 6	− 35	+ 4	+ 8	+ 25	+ 18	− 45	+ 17	216
11 19	− 42	+ 7	+ 25	− 18	− 27	− 21	− 5	+ 19	+ 45	+ 36	− 25	+ 4	274
12 19	− 42	+ 29	+ 60	− 26	− 66	− 1	− 7	+ 19	+ 40	+ 26	− 22	− 14	352
13 19	− 17	+ 15	+ 68	− 29	− 42	0	− 19	− 2	+ 51	+ 16	− 21	− 18	298
14 19	− 4	+ 11	+ 51	− 26	− 22	+ 13	− 14	− 13	+ 23	0	− 6	− 17	200
15 19	+ 5	− 2	+ 28	− 60	+ 1	+ 19	+ 18	+ 8	− 26	− 20	+ 9	+ 18	214
16 19	+ 7	− 3	− 25	− 45	+ 16	+ 5	+ 31	+ 24	− 36	− 27	+ 50	+ 2	271
17 19	+ 10	− 22	− 32	− 34	+ 7	+ 11	+ 15	+ 48	− 27	− 13	+ 61	− 26	306
18 19	− 14	+ 11	− 25	− 32	− 1	+ 1	+ 17	+ 51	− 25	− 12	+ 48	− 25	262
19 19	− 18	− 3	+ 19	− 16	+ 12	+ 9	+ 22	+ 33	− 36	+ 9	+ 22	− 54	253
20 19	− 9	+ 13	+ 13	− 7	+ 10	+ 12	+ 11	+ 11	− 19	+ 2	+ 1	− 43	151
21 19	+ 13	− 8	+ 10	+ 20	+ 18	+ 11	+ 5	+ 2	− 4	− 10	+ 2	− 61	164
22 19	+ 7	− 8	− 44	+ 38	− 11	+ 14	+ 1	− 4	+ 3	− 1	+ 27	− 27	185
23 19	− 3	+ 12	− 22	+ 58	− 5	+ 5	− 1	− 12	− 1	− 13	− 11	− 11	154
Sum without regard to signs.	350	383	591	691	376	273	285	453	488	265	557	642	5,354

TABLE 428A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1898.

Unity = 0·1γ

1898. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	−19	+ 2	− 1	+20	−11	+15	+44	− 5	−12	− 8	− 7	−15	159
1 19	+ 7	+ 1	−13	− 7	+ 6	− 6	+34	−12	−33	+15	− 7	+ 9	150
2 19	0	+ 1	+23	+15	+16	0	+11	−19	−44	+11	+ 4	−13	157
3 19	+ 5	− 5	+ 2	− 2	+12	+ 6	+42	+ 6	−30	+ 3	+ 7	−41	161
4 19	+ 2	− 8	+20	+ 8	+ 4	+ 8	+23	+ 5	−27	+11	− 9	−32	157
5 19	− 6	−17	− 8	+12	+ 3	+36	+12	−11	−20	+11	−18	+ 5	159
6 19	−24	−18	+30	− 3	+ 8	+28	+ 7	−19	−15	+ 3	+ 5	+ 2	162
7 19	−35	−14	− 5	− 6	+ 1	+11	− 3	−28	+26	+17	+34	+ 6	186
8 19	−35	−11	+ 4	−22	+26	− 8	−11	−24	+37	+40	+25	+37	280
9 19	−18	− 1	+11	− 5	−60	−14	−20	−19	+28	+31	+17	+48	272
10 19	− 1	+18	+33	−37	−35	−25	−20	−26	+12	+30	+ 9	+48	294
11 19	+ 3	+33	+15	−30	−23	−36	−35	−17	+ 9	+ 9	+31	+41	282
12 19	+30	+46	− 6	−19	− 8	−24	−45	−31	+12	− 7	+31	+17	276
13 19	+44	+19	−47	− 2	+ 7	−31	−28	− 1	−10	−16	+44	+18	267
14 19	+50	+25	−31	− 5	+ 9	−42	−28	+27	− 6	−25	+21	+ 7	276
15 19	+17	+15	− 6	− 7	+23	−32	−39	+14	+ 6	+19	+13	−19	210
16 19	+25	+10	+ 5	−20	+32	−25	−35	+12	+13	+12	−19	− 6	214
17 19	+20	−40	+13	− 8	+22	− 1	−21	+32	+42	−21	−21	−17	258
18 19	+ 1	−18	+21	+25	− 4	+18	− 9	+17	+48	−55	−33	−11	260
19 19	− 6	−18	−31	+12	+ 5	+23	+11	+26	+22	−21	−16	− 3	194
20 19	−16	−12	−26	+15	+12	+16	+16	+33	−28	+ 3	−10	− 5	192
21 19	−21	−11	− 6	+13	+13	+28	+24	+28	+ 1	−19	−38	−17	219
22 19	− 4	− 7	− 3	+20	−35	+23	+54	+19	−14	− 2	−22	−35	238
23 19	−11	− 3	+13	+34	+29	+24	+24	− 2	−20	−39	−29	−16	244
Sum without regard to signs.	400	353	373	347	404	480	596	433	515	428	470	468	5,267

TABLE 429A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1899.

Unity = 0·1γ

1899. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 6	− 3	+23	−13	− 1	−21	+29	−13	− 9	0	−18	+16	152
1 19	−21	+10	−10	−11	+20	−25	+29	− 2	+ 7	0	− 4	+13	152
2 19	−53	+30	+ 1	−19	+35	−31	+30	− 2	+15	−10	+ 4	+ 1	231
3 19	−15	+28	+19	−12	+17	−29	+36	−15	+ 6	−22	−13	+ 2	214
4 19	− 2	+20	+15	−11	− 5	−31	+37	−14	+ 3	−21	+ 8	+ 2	169
5 19	− 8	+11	+ 5	+ 8	+ 8	−17	+11	−12	− 7	− 9	+ 4	+ 2	102
6 19	−18	+15	+ 5	+ 7	+19	−21	+ 8	−15	− 9	− 1	+ 2	+12	132
7 19	−14	+37	+12	+15	+ 4	−31	0	−36	+17	− 2	+ 7	−11	186
8 19	+ 4	+61	−11	− 4	− 8	−21	−15	−53	+34	+17	+ 9	− 8	245
9 19	+17	+76	−25	+ 3	−37	− 5	−15	−81	+62	+18	− 6	− 9	354
10 19	+15	+49	−35	+31	−25	+ 9	− 4	−50	+46	− 5	−25	− 9	303
11 19	− 2	+25	−28	+49	−20	+ 5	+ 8	− 4	+21	−30	−16	− 6	214
12 19	−12	+18	−39	+32	−42	+39	−24	+29	+25	−22	+ 5	−11	298
13 19	−17	+ 4	−19	+12	−44	+27	−23	+61	+17	− 6	+26	−34	290
14 19	+ 6	−16	−40	−18	−19	+33	−31	+74	+ 5	+ 4	+22	−16	284
15 19	+ 8	−40	−32	−14	−17	+33	−39	+55	−15	+34	+22	+ 3	312
16 19	+14	−85	+11	−20	+20	+22	−41	+36	−16	+22	+25	+ 7	319
17 19	+27	−93	+19	−29	+ 7	+29	0	+31	−27	− 3	+17	+18	300
18 19	+14	−58	+20	−27	+ 5	+34	+21	+26	−46	− 2	+ 6	+ 8	267
19 19	+ 9	−33	+16	−10	+11	+18	+ 9	+ 8	−49	+ 9	− 2	+14	188
20 19	+ 9	−18	+13	+14	+16	− 2	−11	− 1	−30	+12	−13	+ 6	145
21 19	+32	−15	+16	+ 9	+18	− 2	+ 1	− 7	−25	+18	−26	−15	184
22 19	+ 9	−17	+37	+ 5	+ 1	− 6	+ 3	− 8	−23	+ 3	−15	+ 7	134
23 19	+ 1	−10	+24	+ 5	+21	−10	− 9	−12	− 5	−11	−20	+20	148
Sum without regard to signs.	333	772	475	378	420	501	434	645	519	281	315	250	5,323

TABLE 430A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1900.

Unity = 0·1γ

1900. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+21	−21	− 8	− 8	+24	− 1	− 7	−26	+23	+ 6	−11	+12	168
1 19	+ 2	−21	− 2	0	+28	−15	− 7	−17	+21	+ 7	− 6	+ 8	134
2 19	− 6	−15	+22	+ 3	+16	−20	+ 1	−20	+23	+14	−13	− 6	159
3 19	− 3	− 5	+32	−11	+17	−23	− 7	−32	+21	+24	−12	+ 1	188
4 19	+ 4	−34	+46	− 8	+26	−20	− 5	−32	+13	+23	− 1	− 7	219
5 19	− 3	−12	+37	−12	+14	−15	0	−40	+11	+28	− 4	− 5	181
6 19	+12	−22	+39	−19	+16	−19	+14	−35	+11	+13	− 8	0	208
7 19	+ 2	+18	+28	−19	+10	− 8	+15	− 6	− 7	+ 7	−20	−21	161
8 19	+36	+11	+14	−20	− 3	+25	− 2	+14	−21	− 5	−12	−32	195
9 19	+36	+20	+ 5	−30	−33	+47	−19	+16	− 5	−21	+ 7	−19	258
10 19	+40	+26	− 1	+ 2	−60	+55	−19	+16	−23	−30	+ 5	−11	288
11 19	+27	+39	+ 6	+19	−51	+34	−23	+17	−34	−58	+14	+ 7	329
12 19	−14	+25	−11	+24	− 9	+9	−19	+38	−27	−47	+27	+ 5	255
13 19	− 7	+29	−31	+12	− 8	−20	−17	+71	−25	−45	+31	+12	308
14 19	−14	+34	−37	+ 5	−29	−19	+16	+43	−21	−14	+20	+11	263
15 19	−47	+28	−28	+19	−29	− 8	+26	+27	−20	+ 6	+11	+16	265
16 19	−59	− 1	−10	+14	−23	+ 5	+36	+22	− 2	+10	+ 2	+ 9	193
17 19	−31	+14	−24	− 2	−14	+ 4	+23	+ 4	+13	+10	+ 6	− 2	147
18 19	−16	+ 3	−18	+ 6	+ 1	− 1	+ 4	− 9	+12	+15	− 5	+ 6	96
19 19	+ 4	− 8	− 3	0	+16	− 7	+ 5	−16	+ 7	+ 9	− 7	+ 3	85
20 19	−16	− 9	+ 6	+ 6	+ 7	− 8	+ 5	− 7	+13	+ 8	−12	+ 7	104
21 19	+16	−34	− 4	+ 7	+17	+ 1	−12	− 9	+ 5	+14	− 5	+ 1	125
22 19	+ 7	−35	−26	0	+28	+ 4	0	− 2	+ 9	+15	− 6	+ 2	134
23 19	+ 6	−26	−29	+ 3	+28	+ 8	− 5	−11	+13	+ 7	− 1	+12	149
Sum without regard to signs.	429	490	467	249	507	376	287	530	380	436	246	215	4,612

TABLE 431A.—*Disturbance Inequalities: Monthly excess inequalities of H (all-days less quiet-days) corrected for the average annual excess inequality.*

1901.

Unity = 0·1γ

1901. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 2	−11	− 6	+ 2	+ 1	+21	− 3	−23	+ 5	+ 4	+ 4	+ 1	83
1 19	− 2	− 3	−18	+15	+ 7	+14	− 6	−22	+12	− 4	+ 2	− 1	106
2 19	− 2	− 2	− 2	+30	−11	+ 4	− 8	−19	+12	+ 1	+ 4	− 6	101
3 19	0	+ 4	− 7	+22	−17	+ 2	+ 1	−10	+19	− 3	+ 2	−11	98
4 19	− 6	− 3	−13	+24	−21	+ 2	+ 9	− 8	+ 5	− 4	+12	− 2	109
5 19	−14	0	−12	+33	−15	+15	+ 9	−15	0	−11	+ 7	− 2	133
6 19	− 9	− 4	− 8	+16	+ 2	+ 2	+20	−13	+ 1	−15	+18	− 9	117
7 19	+ 3	− 1	− 5	− 6	+25	−30	+25	+ 2	−10	− 6	+ 9	−10	132
8 19	+24	+15	+10	−42	+37	−63	+17	+13	−21	+ 6	+ 4	− 2	254
9 19	+39	+23	+16	−67	+21	−90	+12	+46	−21	+15	− 9	+11	370
10 19	+30	+16	+ 6	−61	+ 8	−83	+28	+58	−13	− 5	− 2	+24	334
11 19	+19	+29	+ 5	−62	−32	−58	+17	+55	− 2	0	− 6	+40	325
12 19	+ 9	+29	+16	−40	−35	−36	− 5	+53	− 3	0	−18	+29	273
13 19	− 9	+21	+ 9	−18	− 9	− 3	− 8	+41	− 4	−11	−12	+ 6	151
14 19	−34	− 8	+11	− 6	+ 3	+26	− 3	+11	− 2	+10	− 6	− 7	127
15 19	−28	−19	− 3	+19	− 2	+32	− 3	− 2	+ 8	+ 6	+ 7	−14	143
16 19	− 2	−15	−13	+28	+ 7	+28	− 7	−19	+20	− 2	+ 9	−30	180
17 19	−18	− 3	+ 1	+28	+ 4	+35	−16	−30	+15	+ 1	+ 7	−29	187
18 19	+ 4	+ 4	+ 9	+15	− 9	+33	−16	−28	+ 4	+ 1	− 5	−10	138
19 19	+ 1	− 7	+ 9	+21	+ 5	+29	−13	−17	− 6	− 6	+ 1	−14	129
20 19	−12	−12	−11	+23	+ 9	+37	−12	−18	− 4	+ 5	− 3	− 8	154
21 19	−12	−13	0	+19	+ 5	+28	− 9	−21	−11	+ 8	0	+ 6	132
22 19	+ 4	−25	+ 2	+10	+ 8	+26	− 7	−15	0	− 2	−17	+12	128
23 19	− 2	− 6	− 3	+ 4	+ 3	+26	−13	−22	+ 1	− 1	− 1	+14	96
Sum without regard to signs.	285	273	195	611	296	723	267	561	199	127	165	298	4,000

TABLE 432A.—*Disturbance Inequalities: Monthly excess inequalities (all-days less quiet-days) corrected for the average annual excess inequality.*

1902.

Unity = 0·1γ

1902. Bombay Civil Time.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	- 8	- 4	- 9	+ 6	+ 2	+11	+ 5	- 5	+14	-21	+ 7	+ 7	99
1 19	-14	- 5	-10	+ 4	+ 9	+18	+ 3	- 2	+12	-21	+12	- 8	118
2 19	-10	+ 5	-10	0	+14	+17	-10	+18	+11	-14	+ 3	-24	136
3 19	-11	- 6	-10	+12	+ 5	+21	-13	- 6	+13	+ 4	+10	-17	128
4 19	-10	+ 2	- 3	+11	+ 9	+13	-13	-12	- 4	+ 7	+ 9	- 8	101
5 19	+ 3	+ 8	-12	+ 6	+10	+ 8	-16	- 4	- 5	+ 2	+ 5	- 1	80
6 19	- 1	+13	- 9	+11	+14	- 5	-19	-13	- 8	+ 1	+12	+ 7	113
7 19	-11	+23	-15	+17	+ 7	-26	- 3	-14	+12	- 6	+17	- 6	157
8 19	- 4	+32	+ 4	+25	-32	-42	+ 2	0	+26	-14	+24	-17	222
9 19	0	+35	+22	+ 8	- 9	-60	+ 6	+14	- 4	-24	+44	-26	252
10 19	+ 9	+19	+41	+24	+ 8	-45	-10	+ 8	-36	-14	+12	-14	240
11 19	+23	+ 1	+34	+ 6	-25	-27	0	+17	-38	- 2	+34	-19	226
12 19	+36	-12	+32	+14	-30	-22	+11	+ 5	-34	+ 2	+12	-13	223
13 19	+46	-12	+ 8	+ 1	-34	-18	+21	+ 4	-22	+ 9	- 2	+ 4	181
14 19	+48	-11	- 3	-14	-27	- 1	+36	-10	-19	- 8	-20	+30	227
15 19	+36	-14	- 5	-29	+ 5	+30	+19	-10	+ 6	-22	-37	+26	239
16 19	+ 5	-25	- 3	-39	+ 6	+32	+19	+ 2	+11	-10	-26	+24	202
17 19	-16	-36	- 3	-30	+ 5	+35	+ 8	+ 6	+19	+ 4	- 7	+12	181
18 19	-20	-18	- 9	-13	+ 3	+14	- 6	+ 2	+10	+23	- 4	+16	138
19 19	-20	-13	-10	- 9	+ 7	+ 9	-15	+ 3	+22	+28	-24	+17	177
20 19	-28	- 1	- 7	- 2	+ 6	+11	- 8	- 7	+19	+23	-24	+15	151
21 19	-15	+ 6	- 9	+ 3	+ 1	+ 8	-12	+ 3	+ 7	+22	-13	+ 4	103
22 19	-19	+ 2	- 7	- 8	+ 7	+11	- 3	+ 7	- 2	+24	-17	+ 6	113
23 19	-23	+ 6	-16	+ 8	+12	+14	- 4	+ 4	+ 5	+11	-17	- 3	123
Sum without regard to signs.	416	309	291	300	287	498	262	176	359	316	392	324	3,930

TABLE 433A.—*Disturbance Inequalities: Monthly excess inequalities (all-days less quiet-days) corrected for the average annual excess inequality.*

1903.

Unity = 0·1γ

1903. Bombay Civil Time.	January.	February.	March	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	-15	+25	- 5	+ 4	- 4	-13	- 4	+ 8	-11	-20	+ 62	-28	199
1 19	-33	+16	-16	+15	- 7	-19	- 6	- 3	- 6	-21	+ 73	+ 7	222
2 19	-38	+13	-10	+ 2	+ 3	-24	- 3	+ 4	- 1	+ 2	+ 71	-13	184
3 19	-41	+ 9	- 7	+ 5	+ 9	- 9	-11	- 1	-13	+31	+ 36	- 6	178
4 19	-47	+ 4	-20	+ 7	+15	- 9	-21	0	-22	+41	+ 29	+18	233
5 19	-42	+ 2	-29	+19	+23	- 1	- 9	+ 3	-27	+50	+ 8	+ 7	220
6 19	-53	- 1	-17	+19	+18	- 2	- 6	- 3	- 1	+30	+ 10	+ 6	166
7 19	-31	-18	-27	+ 1	- 9	-13	+ 8	-18	+53	+31	+ 13	+ 9	231
8 19	+23	-23	-24	-17	-39	-16	+10	-11	+69	-10	+ 11	+29	282
9 19	+41	-37	+10	-16	-66	-15	+11	+ 8	+77	-19	- 19	+25	344
10 19	+31	-53	+14	-30	-52	-14	+18	+18	+65	+66	- 96	+32	489
11 19	+47	-68	+ 9	-10	-32	-20	+22	+40	+40	+68	-113	+19	488
12 19	+36	-64	- 3	+11	-24	0	-13	+53	+26	+59	- 87	+ 1	377
13 19	+27	-36	+27	+21	+ 9	+11	-14	+17	-12	+22	- 64	- 3	263
14 19	+23	- 5	+22	+25	+26	+35	- 4	- 3	-40	-39	- 45	+ 8	275
15 19	+26	- 6	+16	+ 1	+34	+43	-16	- 2	-32	-48	- 13	+ 2	239
16 19	+37	+22	+11	-21	+23	+31	-11	-19	-60	+ 3	- 17	-14	269
17 19	+21	+33	+ 7	-27	+22	+40	+ 8	-32	-47	-54	+ 12	+17	320
18 19	+25	+29	+ 8	-11	+ 4	+25	+11	-23	-32	-69	+ 14	+16	267
19 19	- 6	+26	+10	- 8	+19	- 1	+25	-12	0	-63	+ 15	- 9	194
20 19	+ 1	+32	+15	- 3	+15	-20	+14	-12	- 4	-37	+ 23	-25	201
21 19	- 9	+24	+ 9	+ 5	+11	- 3	- 5	+ 5	- 6	-42	+ 40	-34	193
22 19	-19	+34	+ 9	+ 9	+12	-12	-11	- 2	+ 1	-27	- 32	-27	195
23 19	-10	+27	+ 1	+ 5	-10	- 1	- 4	+ 8	-14	+14	+ 19	-34	147
Sum without regard to signs.	682	607	326	292	486	377	265	305	659	866	922	389	6,176

TABLE 434A.—*Disturbance Inequalities: Monthly excess inequalities (all-days less quiet-days) corrected for the average annual excess inequality.*

1904.

Unity = 0·1γ

1904. Bombay Civil Time.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
H. m.													
0 19	+ 1	−36	+15	+17	+22	−15	+ 12	−26	− 9	+16	+ 9	− 2	180
1 19	+ 5	−39	+19	− 1	+21	−20	− 4	−11	− 8	+10	+14	+ 9	161
2 19	+25	−48	+29	0	+16	−25	− 12	−17	−10	+12	+11	+21	226
3 19	+33	−46	+22	+12	+17	−28	− 18	−18	− 9	+13	+20	0	236
4 19	+15	−37	+26	− 3	+20	−19	− 24	+ 6	+ 7	+ 4	+20	−16	197
5 19	+14	−32	+18	− 8	+15	−12	− 25	− 6	+ 8	+ 6	+36	−11	191
6 19	+13	− 7	+16	−17	+ 7	−30	− 12	+ 8	0	+ 9	+38	−20	177
7 19	+19	+ 6	+10	−33	+ 4	−23	− 12	+ 9	+ 9	−13	+34	− 5	177
8 19	+22	+25	−16	−29	−18	+ 8	+ 8	+19	+22	−22	+11	−25	225
9 19	+ 4	+55	− 9	−27	−21	+34	+ 29	+ 4	+15	−34	−23	−24	279
10 19	−32	+60	−26	−29	−21	+67	+ 43	− 2	+ 6	−12	−30	−24	352
11 19	−33	+73	−47	− 7	−17	+79	+ 26	+14	−31	−11	−27	−18	383
12 19	−24	+54	−56	+18	+ 7	+55	+ 12	+ 7	−22	−26	−21	− 8	310
13 19	−20	+51	−32	+ 4	−23	+12	− 20	+32	−23	−33	−17	+18	285
14 19	− 4	+27	−31	+ 2	+ 7	+13	− 28	+28	− 7	−29	− 4	+31	211
15 19	− 3	+20	−27	+ 8	− 9	− 1	− 39	+23	+ 5	−10	+26	+ 7	178
16 19	+30	− 5	− 2	+14	−15	− 9	−108	+27	+12	+ 5	+32	+24	283
17 19	+10	−30	+ 4	− 1	−39	−19	+ 17	− 4	+21	+19	− 6	+31	201
18 19	+ 9	−17	+17	− 4	−42	−18	+ 41	+ 2	+30	+16	−21	−10	227
19 19	+10	− 8	+12	− 8	−22	−13	+ 45	+ 2	+11	+ 6	−34	+ 4	175
20 19	−16	−15	+ 2	+13	− 3	−15	+ 23	−17	+18	+26	−17	− 4	169
21 19	− 7	−14	+ 6	+37	− 5	− 1	+ 9	−37	0	+20	−27	+18	181
22 19	−24	− 2	+26	+16	+19	− 6	+ 11	−19	−19	+24	−22	− 6	194
23 19	−41	−37	+31	+31	+32	−17	+ 32	−21	−18	+13	+ 5	− 5	283
Sum without regard to signs.	414	744	499	339	422	539	610	359	320	389	505	341	5,481

TABLE 435A.—*Disturbance Inequalities: Monthly excess inequalities (all-days less quiet-days) corrected for the average annual excess inequality.*

1905.

Unity = 0·1γ

1905. Bombay Civil Time.	Month. January	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to sgns.
H. m.													
0 19	−20	+ 6	−10	+ 3	− 8	− 4	+35	+41	+12	−42	0	−12	193
1 19	− 5	+ 5	+ 3	+ 1	−23	+ 7	+28	+39	+17	−18	−28	−23	197
2 19	−28	−54	+ 5	+16	−29	+18	+36	+35	+43	−19	−28	+ 8	319
3 19	−31	−45	− 7	+28	−31	+23	+20	+39	+ 6	+ 6	−15	+ 7	258
4 19	−41	−31	− 6	+41	−25	+29	+33	+39	−10	− 4	−12	−17	288
5 19	−19	−28	− 7	+27	−19	+21	+29	+48	− 8	0	−20	−21	247
6 19	−34	−23	+16	+12	−24	+ 2	+22	+68	− 7	+ 6	−17	−21	252
7 19	−43	+ 4	+19	+16	−16	−10	0	+39	−31	+21	+18	−13	230
8 19	−16	+25	− 3	+ 7	+ 4	− 9	−27	− 9	−22	+31	+17	− 3	173
9 19	+25	+26	−10	−28	+26	−28	−25	−44	− 4	+27	+17	+14	274
10 19	+27	+10	−15	− 9	+47	−38	−44	− 32	+10	+23	+16	+ 1	272
11 19	+34	+27	− 16	−25	+27	−48	−73	− 29	+39	+20	+37	+ 5	380
12 19	+30	+39	+24	−20	+23	−18	−67	−66	+30	+33	−17	+ 7	374
13 19	+24	+38	+20	−23	+31	−22	−72	−76	+49	+45	−25	+11	436
14 19	+40	+18	+12	−43	− 8	− 3	−45	−66	+26	+43	+ 1	+28	333
15 19	+36	− 3	+ 4	−25	−25	+ 2	+11	−58	+ 4	+29	− 5	+27	229
16 19	− 4	− 8	+11	−11	− 5	+ 2	+24	−41	−35	+18	+ 4	+41	204
17 19	− 9	−27	+ 7	+ 1	+ 8	+ 3	+15	−14	−34	−17	+17	+45	197
18 19	+ 9	−46	+13	+25	+30	+27	+ 5	+ 1	−41	−39	+ 4	+ 9	249
19 19	+ 1	−17	−19	− 1	+30	+28	+12	+ 2	−31	−35	+15	+15	206
20 19	+ 5	+ 3	+19	− 5	+27	+ 4	+ 9	− 6	−15	−47	+10	− 1	151
21 19	+21	+17	+ 3	0	+ 2	+ 4	+22	+18	−19	−31	−11	−28	176
22 19	− 2	+53	−30	0	−19	+17	+26	+32	− 4	−46	+ 7	−30	266
23 19	− 2	+27	−33	+14	−20	0	+27	+46	− 1	−32	+13	−34	249
Sum without regard to signs.	506	580	312	381	507	367	707	888	498	632	354	421	6,153

The Fourier co-efficients P_1 and P_2 also indicate this typical seasonal variation, individually fairly well (see table below) :—

TABLE 459.—*Showing the amplitude* P *and the first maximum* μ *for the first two orders of the harmonic components of the excess Diurnal Inequality of Horizontal Force (all-days less quiet-days) for each average year and the average months given in tables 439—441.*

Unity = 1γ = ·00001 C. G. S.

Years.	P_1	P_2	μ_1	μ_2	Months, 1894 to 1904.	P_1	P_2	μ_1	μ
			° ′	° ′				° ′	° ′
1894	3·95	1·04	80 32	80 21	January	1·98	0·50	88 5	47 28
1895	2·52	1·45	64 43	64 0	February	2·51	0·58	117 14	10 13
1896	3·25	0·87	64 29	39 42	March	1·70	0·63	76 57	55 13
1897	2·04	0·79	66 3	56 19	April	2·17	0·62	64 17	36 53
1898	2·39	0·37	126 47	0 8	May	2·71	1·00	55 18	67 47
1899	2·01	0·58	83 50	18 2	June	1·01	0·96	44 7	62 5
1900	1·00	0·43	55 1	55 8	July	1·99	0·14	75 24	174 14
1901	0·79	0·21	156 53	4 45	August	1·56	0·30	95 29	16 44
1902	1·18	0·37	69 42	104 13	September	2·85	0·15	86 41	90 57
1903	1·79	0·49	101 29	33 52	October	2·96	0·46	77 14	72 41
1904	1·66	0·68	70 58	61 54	November	1·80	1·50	77 56	64 29
1905	1·64	0·12	89 30	135 1	December	1·56	0·66	106 12	48 53
.....	...	...	.....	.....	Year	1·99	0·47	80 14	55 17

The difference curves, derived from all-day variation less the quiet-day variation for each month of the period 1894—1905, corrected for the average annual disturbance curves shown in table 439, are given in tables 424A to 435A. It will be noticed that here the effect of each heavy storm whenever incident can be clearly discerned in the monthly excesses, which however disappears in the smoothed average result of the whole year. These monthly excesses which denote irregular disturbances from which the periodic part is thus eliminated, will be taken up for examination and discussion later.

493. Accepting the inference drawn from the above discussion, we may take it as correct that the disturbance effect due to storms, etc., in the average result of the year is purely a phase disturbance which affects mainly, if not solely, the first component of the quiet-day variation and induces an *early* culmination to maximum in that component. The variation thus modified constitutes then the all-day variation.

494. Examining now the secular progression of the harmonic co-efficients of the quiet-day variations from year to year, the phase angles μ (*vide* table 458) of the first component curiously show a *later* culmination to maximum in the year of maximum sun-spots 1894 when the magnetic as also the solar activity is greatest, and an *earlier* culmination during the minimum spot years like 1900 and 1901 when the activity is at its lowest ebb. In the year 1901, the first component of the quiet-day variation indicates its time of maximum epoch at $11{\cdot}3^h$, which is retarded to $11{\cdot}9^h$ or nearly 12 noon in the year 1894. Whatever hence this secular disturbing force or forces which thus affect the phase co-efficients may be, it is clear that the shift in phase in quiet-days, is exactly opposite, in direction to that indicated by the disturbance variation noted in the previous paragraph. And it will be seen later that this opposite effect in the shift of the phase in the secular march is also noted to be equally effective in the all-day results to which reference will be made in due course.

495. When we come thus to compare the variations in the quiet-day results, for the minimum spot years denoting quieter conditions, with those of the maximum spot years associated with disturbed secular conditions, we find that we have to deal with two prominently marked features, namely the later shift of the maximum phase, and the large increase in the total amplitudes of the variations. The former however, curiously like the phase disturbance in paragraph 490, is mainly restricted to the first component (see table 458), the secular changes in the phase angle μ of the other three components being very small, while the effect on the amplitudes, which is appreciably large, appears to influence all the components almost equally.

Of these two effects on the quiet-day variations, due to the secular disturbing forces, the less emphasised one which affects the phase, may hence by analogy be regarded as a minor or secondary factor, though its incidence may be considered as independent of the principal factor, and the latter may hence be supposed to affect the inequalities in the simplest manner possible so as to make the sole difference in the variations of the years of sun-spot maximum and sun-spot minimum, one of amplitude alone. The consideration thus of the two effects independently of each other offers, as is fully justified later by the results, a convenient method of analysing and examining the phenomenon effectively. The two factors may or may not be due to the same origin or be subject to the 11-year period. In the discussion which follows however, it is assumed in the first instance, that these causes though independently considered, are both subject to the 11-year period disturbance. Later we shall see that this assumption in the case of the former factor is open to doubt and is in all probability incorrect (*vide* paragraph 504).

496. In column 2, table 460, are given the ranges of the average quiet-day diurnal inequalities of each year; in column 4 appear the summed ranges or the average range derived from the 24 ordinates of the day; in column 6 are collected the values of the single ordinate at 11 hour; and in columns 8, 10, 12, and 14 are given the values of the amplitudes P_1, P_2, P_3, and P_4 respectively of the first four components of the inequalities. In the adjacent odd columns 3, 5, 7, 9, 11, 13, and 15 are entered the factors or ratios which the number in each even column representing the annual value of the range, the summed range, the ordinate at 11 hour, or the amplitude of each of the four components, bears to its own average corresponding value of 11 years. Such average values are shown in the last row of the same table:—

TABLE 460.—*Showing data and co-efficients for the derivation of theoretical inequalities for each year from the average diurnal inequality of the whole period of eleven years of the quiet-days selected by the Astronomer Royal.*

Unity = 1γ = ·00001 C. G. S.

Year.	Range of average diurnal inequality for the year.	Ratio; column 2 ÷ average range of the period of 11 years.	Average values of summed ranges for the year.	Ratio; column 4 ÷ average summed range of the period 1894—1904.	Ordinate at 11^h of the mean diurnal inequality for the year.	Ratio; column 6 ÷ average ordinate at 11^h of the inequality for the period 1894—1904.	Values of amplitude P_1 of average diurnal inequality for the year.	Ratio; column 8 ÷ values of amplitude P_1 of average inequality for the period 1894—1904.	Values of amplitude P_2 of average diurnal inequality for the year.	Ratio; column 10 ÷ values of amplitude P_2 of average inequality for the period 1894—1904.	Values of amplitude P_3 of average diurnal inequality for the year	Ratio; column 12 ÷ values of amplitude P_3 of average inequality for the period 1894—1904.	Values of amplitude P_4 of average diurnal inequality for the year.	Ratio; column 14 ÷ values of amplitude P_4 of average inequality for the period 1894—1904.	Factors for each year derived by the method of least squares.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1894 ...	53·7	1·35	374	1·39	+39·0	1·35	22·62	1·40	11·31	1·38	4·59	1·38	1·22	1·26	1·38
1895 ...	49·8	1·25	346	1·29	+36·4	1·26	20·71	1·28	11·05	1·30	3·90	1·17	0·79	·81	1·28
1896 ...	45·7	1·15	310	1·15	+32·4	1·12	18·85	1·16	9·23	1·09	3·86	1·16	0·89	·92	1·15
1897 ...	41·4	1·04	278	1·03	+30·0	1·04	16·90	1·04	8·61	1·02	3·17	·95	1·16	1·20	1·05
1898 ...	33·2	·84	219	·81	+23·5	·82	13·28	·82	6·81	·80	2·58	·77	0·94	·97	·82
1899 ...	33·6	·85	225	·84	+24·2	·84	13·53	·84	7·22	·85	2·69	·81	0·71	·73	·84
1900 ...	36·1	·91	243	·90	+26·0	·90	14·77	·91	7·52	·89	2·97	·89	0·94	·97	·91
1901 ...	32·2	·81	214	·80	+23·5	·82	12·84	·79	7·00	·83	2·77	·83	1·02	1·05	·80
1902 ...	33·8	·85	224	·83	+24·9	·86	13·35	·82	7·40	·87	3·06	·92	1·00	1·03	·84
1903 ...	36·3	·91	243	·90	+26·4	·92	14·42	·89	7·97	·94	3·14	·94	1·03	1·06	·90
1904 ...	42·5	1·07	281	1·05	+31·0	1·08	16·85	1·04	9·26	1·09	3·94	1·18	1·09	1·12	1·06
1905 ...	45·7	1·15	309	1·15	+32·6	1·13	18·73	1·16	9·09	1·07	3·73	1·12	0·90	·93	1·14
Average, 1894-1904.	39·7	...	269	...	+28·8	...	16·17	...	8·48	...	3·34	...	0·97	...	...

TABLE 461.—*Showing the computed Diurnal Variation of Horizontal Force obtained by multiplying the average diurnal variation of eleven years by the values of factors for each year.*

Unity = 0·1γ

Bombay Civil Time.	Years.										
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.
H. m.											
0 19	−135	−124	−112	−100	− 79	− 81	− 87	− 78	− 81	− 87	−102
1 19	−135	−124	−112	−100	− 79	− 81	− 87	− 78	− 81	− 87	−102
2 19	−132	−122	−109	− 98	− 77	− 80	− 85	− 76	− 79	− 85	−100
3 19	−129	−119	−107	− 96	− 75	− 78	− 84	− 74	− 77	− 84	− 98
4 19	−125	−115	−103	− 93	− 73	− 76	− 81	− 72	− 75	− 81	− 94
5 19	−118	−109	− 98	− 88	− 69	− 71	− 76	− 68	− 71	− 76	− 89
6 19	− 95	− 87	− 78	− 70	− 55	− 57	− 61	− 54	− 56	− 61	− 71
7 19	− 29	− 27	− 24	− 22	− 17	− 18	− 19	− 17	− 17	− 19	− 22
8 19	+ 92	+ 84	+ 76	+ 68	+ 53	+ 55	+ 59	+ 53	+ 55	+ 59	+ 69
9 19	+240	+221	+199	+178	+140	+145	+156	+138	+144	+156	+182
10 19	+359	+330	+297	+266	+209	+217	+232	+206	+214	+232	+271
11 19	+402	+370	+332	+298	+234	+243	+260	+231	+240	+260	+303
12 19	+356	+328	+294	+264	+207	+215	+230	+205	+212	+230	+269
13 19	+252	+233	+209	+187	+147	+153	+164	+146	+151	+164	+191
14 19	+136	+125	+113	+101	+ 79	+ 82	+ 88	+ 78	+ 81	+ 88	+103
15 19	+ 33	+ 31	+ 28	+ 25	+ 19	+ 20	+ 22	+ 19	+ 20	+ 22	+ 25
16 19	− 46	− 42	− 38	− 34	− 27	− 28	− 30	− 26	− 27	− 30	− 35
17 19	− 90	− 83	− 75	− 67	− 53	− 55	− 58	− 52	− 54	− 58	− 68
18 19	−115	−106	− 95	− 85	− 67	− 70	− 75	− 66	− 69	− 75	− 87
19 19	−131	−120	−108	− 97	− 76	− 79	− 85	− 75	− 78	− 85	− 99
20 19	−145	−133	−120	−107	− 84	− 87	− 94	− 83	− 86	− 94	−109
21 19	−152	−140	−125	−112	− 88	− 92	− 98	− 87	− 90	− 98	−114
22 19	−149	−137	−123	−110	− 87	− 90	− 96	− 86	− 89	− 96	−112
23 19	−139	−128	−115	−103	− 81	− 84	− 90	− 80	− 83	− 90	−105
Adopted factors for conversion ...	1·39	1·28	1·15	1·03	0·81	0·84	0·90	0·80	0·83	0·90	1·05

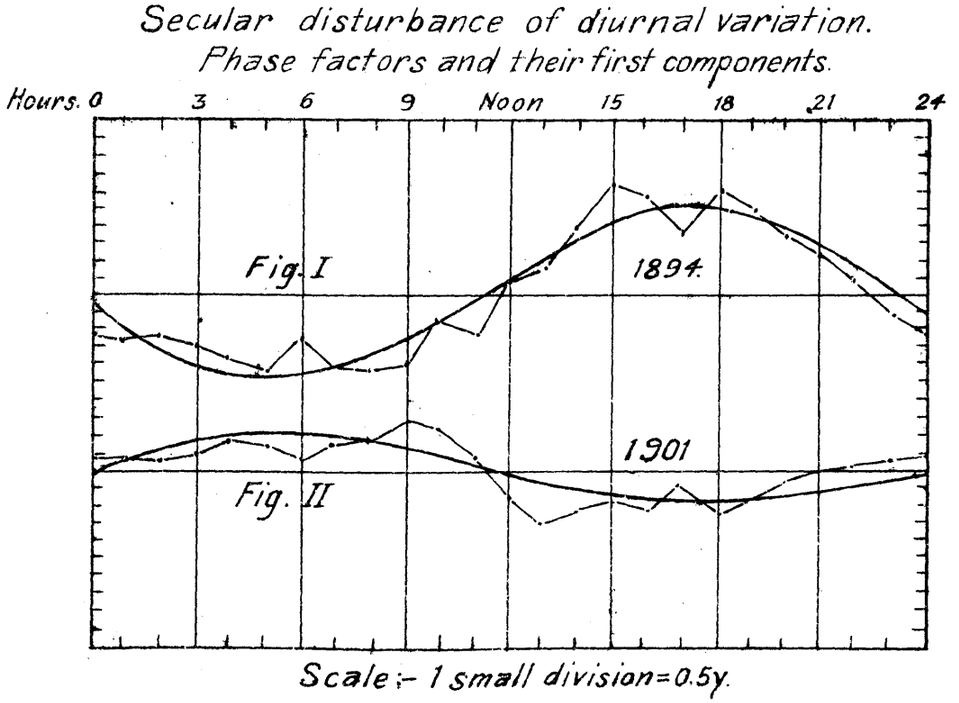
TABLE 462.—*Showing the difference between the Diurnal Inequalities of Horizontal Force for each year given in table 438 and the computed inequalities in table 461.*

Unity = 0·1γ

Bombay Civil Time.	Years.											Average diurnal inequality for 11 years.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	
H. m.												
0 19	− 11	− 1	− 10	+ 2	0	+ 5	− 2	+ 4	+ 3	+ 4	+ 3	− 97
1 19	− 12	− 1	− 4	− 7	+ 3	+ 3	0	+ 4	+ 2	0	+ 5	− 97
2 19	− 13	0	− 1	− 4	+ 3	+ 4	0	+ 3	+ 4	0	+ 2	− 95
3 19	− 15	− 4	− 8	− 2	+ 7	+ 1	− 4	+ 4	0	+ 5	+ 8	− 93
4 19	− 19	− 8	− 6	+ 3	+ 6	+ 2	+ 1	+ 6	0	+ 6	+ 3	− 90
5 19	− 22	− 2	− 1	+ 1	+ 3	+ 2	+ 2	+ 6	0	+ 1	+ 7	− 85
6 19	− 13	+ 5	− 4	+ 4	+ 4	+ 2	+ 2	+ 3	− 3	− 5	+ 1	− 68
7 19	− 20	+ 11	− 2	+ 6	+ 2	+ 7	+ 8	+ 6	− 8	− 7	− 4	− 21
8 19	− 21	+ 17	− 5	+ 7	+ 2	+ 13	+ 10	+ 7	− 13	− 6	− 8	+ 66
9 19	− 20	+ 9	− 10	− 3	+ 5	+ 9	+ 5	+ 14	− 6	+ 1	− 2	+173
10 19	− 8	− 4	− 8	− 2	0	+ 2	+ 6	+ 12	+ 3	+ 2	0	+258
11 19	− 12	− 6	− 8	+ 2	+ 1	− 1	0	+ 4	+ 9	+ 4	+ 7	+289
12 19	+ 4	− 4	+ 2	+ 2	− 3	− 7	− 1	− 8	+ 8	− 3	+ 9	+256
13 19	+ 9	0	+ 8	+ 1	− 2	− 9	− 2	− 15	+ 4	+ 7	+ 6	+182
14 19	+ 18	+ 2	+ 13	− 2	+ 3	− 4	− 8	− 13	0	+ 2	− 7	+ 98
15 19	+ 32	− 6	+ 9	+ 3	0	− 3	− 4	− 10	− 4	− 6	− 13	+ 24
16 19	+ 26	− 11	+ 7	+ 7	0	− 8	0	− 11	− 3	− 8	− 9	− 33
17 19	+ 17	− 9	+ 11	+ 3	+ 3	− 7	+ 8	− 5	− 1	− 7	− 15	− 65
18 19	+ 28	− 6	+ 13	− 5	− 7	− 6	− 4	− 12	− 3	− 1	− 2	− 83
19 19	+ 24	− 2	+ 10	− 6	− 12	− 2	− 6	− 9	− 2	− 4	+ 1	− 94
20 19	+ 17	+ 2	+ 2	− 4	− 13	− 6	− 1	− 3	+ 1	− 4	0	−104
21 19	+ 11	+ 6	− 1	− 2	− 8	− 2	− 2	0	+ 1	− 1	− 1	−109
22 19	+ 4	+ 4	− 10	− 2	− 4	+ 3	− 5	+ 1	+ 3	+ 4	− 1	−107
23 19	− 5	+ 3	− 7	− 1	0	0	− 3	+ 3	+ 1	+ 6	+ 1	−100

497. The question to be principally considered here is in what way should suitable factors be selected so as to be appropriate, if possible, for the purpose of correctly deriving the theoretical variation for each year from the single average diurnal variation of the whole period of 11 years, on the supposition that the principal secular effect acts solely on the amplitudes alone in the simple manner as explained in the last paragraph. On examining the factors in the above table it will be noticed that the ratios indicated in all the odd columns are practically the same and any one of the series may indifferently be used for the derivation of the theoretical variations without any appreciably large differences. By taking hence the average diurnal variation of the 11-year period and multiplying it by the co-efficient or factor for any particular year according to its position in the 11-year period, one may derive the theoretical variations sought. Preferably the summed range ratios in column 5 have been used for this purpose and the theoretical variations so derived are given in table 461. The differences of these variations from the original inequalities shown in table 438 are given in table 462.

498. It will be seen from the last table that these excess curves practically represent the curves of departure of the 24 hourly ordinates from the law of uniform secular expansion or contraction of the average 11-year inequalities, indicated by the adopted co-efficients. If all hourly ordinates conformed to this law, the excess curve would be obviously a straight line. The derivation of the correct factors in view of the various uncertainties is, of course, important, but at best an approximation only is possible which, if correct enough, would enable us to remove from the inequalities fairly fully, if not completely, that part of the inequality which obeyed the law of the diurnal variation as laid down by the average (normal) diurnal inequality of 11 years. Such correlated factors could also be obtained in the usual way by the method of least squares and these are also computed and collected in column 16 of table 460, which show that the adopted factors are fairly representative. It will be seen that after the removal of the theoretical inequalities from the observed variations, the residual curves which now represent the phase disturbance factor become simple, present a striking family resemblance to each other and, for obvious reasons, have a 11-year fluctuation. The difference curve for the year 1894 (see column 2, table 462) is charted below in figure I in thin curve for ready reference.



Now instead of dealing with the whole curve of the quiet-day variation, as we have done in the last paragraph, we could apply the same treatment to the first component alone of the variation. The observed co-efficients of the first component are $P_1 = 22{\cdot}62\gamma$ and $\mu_1 = 179°$ (see table 458). As the adopted factor (see table 460) is 1·39 for the year 1894, the computed co-efficients from those of the average of 11 years which are $P_1 = 16{\cdot}17\gamma$ and $\mu = 173°$ may be derived. These would hence be $P_1 = 16{\cdot}17 \times 1{\cdot}39\gamma$ and $\mu_1 = 173°$. The difference curve obtained from these observed and computed co-efficients hence would be given by the formulæ :—

$$22{\cdot}62 \cos 179° - 22{\cdot}48 \cos 173° = A' \cos \mu'$$
$$22{\cdot}62 \sin 179° - 22{\cdot}48 \sin 173° = A' \sin \mu'$$

which when solved give the value of $A' = 2{\cdot}37\gamma$ and $\mu' = 263°$, and the curve so derived constitutes the difference curve we seek. This simple harmonic curve is charted as thick curve in figure I above, and it will be noted at once that this curve of the first component almost entirely* makes up for the whole difference curve. It will thus be seen that the shift in phase from 179° to 173° is the real disturbance factor, and as the change in the amplitude is inappreciable, as remarked in paragraph 489, it indicates a phase difference of the resultant curve by about a quarter of a wave length. Why the difference curve of P_1 derived from its observed and computed coefficients almost makes up for the similarly derived difference of the whole curve is apparent from table 458 where it will be seen that the secular change in the phase angles μ of the other components is practically nil.

499. In figure 2 charted above, the curves similarly derived for the year 1901, the year of minimum disturbance, have been indicated (see column 9, table 462), the co-efficients of the harmonic curve being $A' = 0{\cdot}95\gamma$ and $\mu'' = 90°$. Here, too, though the residual errors are comparably significant, the two curves are in close agreement. The phase of the whole movement of the first component is however, it will be noted, almost reversed by 180° when compared with the condition of the year 1894.

All such difference curves of the 12 years from 1894 to 1905 with the first component differences in 1894 and 1901 are charted in plate 90, figures 34 to 44. These constitute the conditions so far obtaining in quiet-days.

500. When we take up for examination and similar analysis the data of all-days from 1872 to 1905 we find that they too tell the same tale, though all-day variations we know are not free as the quiet-days are from disturbance effects. At any rate it will be seen, *vide* table 275A, that even here the second, third and fourth components do not show any appreciably large secular change in their phase angles, so markedly shown by the first component. In the years of minimum spots, 1899, 1887 and 1877, the phase angles μ are respectively 162°, 159° and 165° while in the maximum spot-years, 1893, 1883 and 1872, they are 173°, 169° and 170°.

The factors or coefficients for all-days derived on the assumption made as in paragraph 496, that the real secular change is confined only to an uniform and regular increment or decrement in the amplitudes of the inequalities are given in table 463. The theoretical curves are shown in table 464, while the differences of the theoretical from the observed original inequalities appear in table 465. The results are all charted in figures 1 to 33 in plate 90 in thin curve, while over them in thick curve appear wherever they are significant the corresponding difference curve obtained from the first component with its original and shifted phases. It will be seen that if we omit the intermediate years of transition from the maximum spot epoch to the minimum and *vice versa*, we have only about 18 years in which we are likely to get significantly large results. Out of these some 14 years distinctly show this character curve of disturbance. This indicates that that part of the secular disturbance which is assumed to affect the phase of the first component independently of the action on the amplitudes is traceable in its working not in a few isolated years here and there, but with a fair persistence in all the variations whether they are derived from quiet or all-days throughout the period of 33 years.

501. We have seen that the storms the effects of which differentiate an all-day variation from the quite-day variation merely produce by the incident disturbance variation, the maximum phase of which is about 6 hours or a quarter of a wave length in advance of that of the diurnal inequality, a phase disturbance principally of the first component accelerating the culmination of its maximum epoch to an earlier hour in the day. On the other hand the cause or causes which influence the secular disturbance, produce in the diurnal inequality, be it from all-day or quiet-day, not only a change of amplitude but also a shift in phase which is opposite in direction to the former, that is to a later hour in the day. Apparently hence any direct connection of the storm effects with the secular phase disturbing force becomes obscure and difficult to understand.

502. Digressing for a moment in regard to some plausible explanation, it may be noted that the principal part of the secular disturbing forces, which is assumed to affect the inequalities in a simple manner so as to make the change in them solely one of increase or decrease of amplitude, can be readily explained as a result of some kind of greater ionising power in the solar radiation as suggested by Schuster, which may vary with the general condition of the sun or of the solar system dependent upon the periodic progression of the 11-year disturbance, and this may proceed independently whether spot may form or not. And the visible and apparently aperiodic manifestations of perhaps the same phenomenon in the sun as indicated by the spots and also associated, as they now and again are, on the earth by the magnetic storms, may or may not necessarily be simultaneous or always agree in their progression if the critical conditions under which the spots are generated in the sun, and the magnetic storms started on the earth, are finally determined in each case by local conditions in the sun and on the earth, which may have no direct relation with each other.

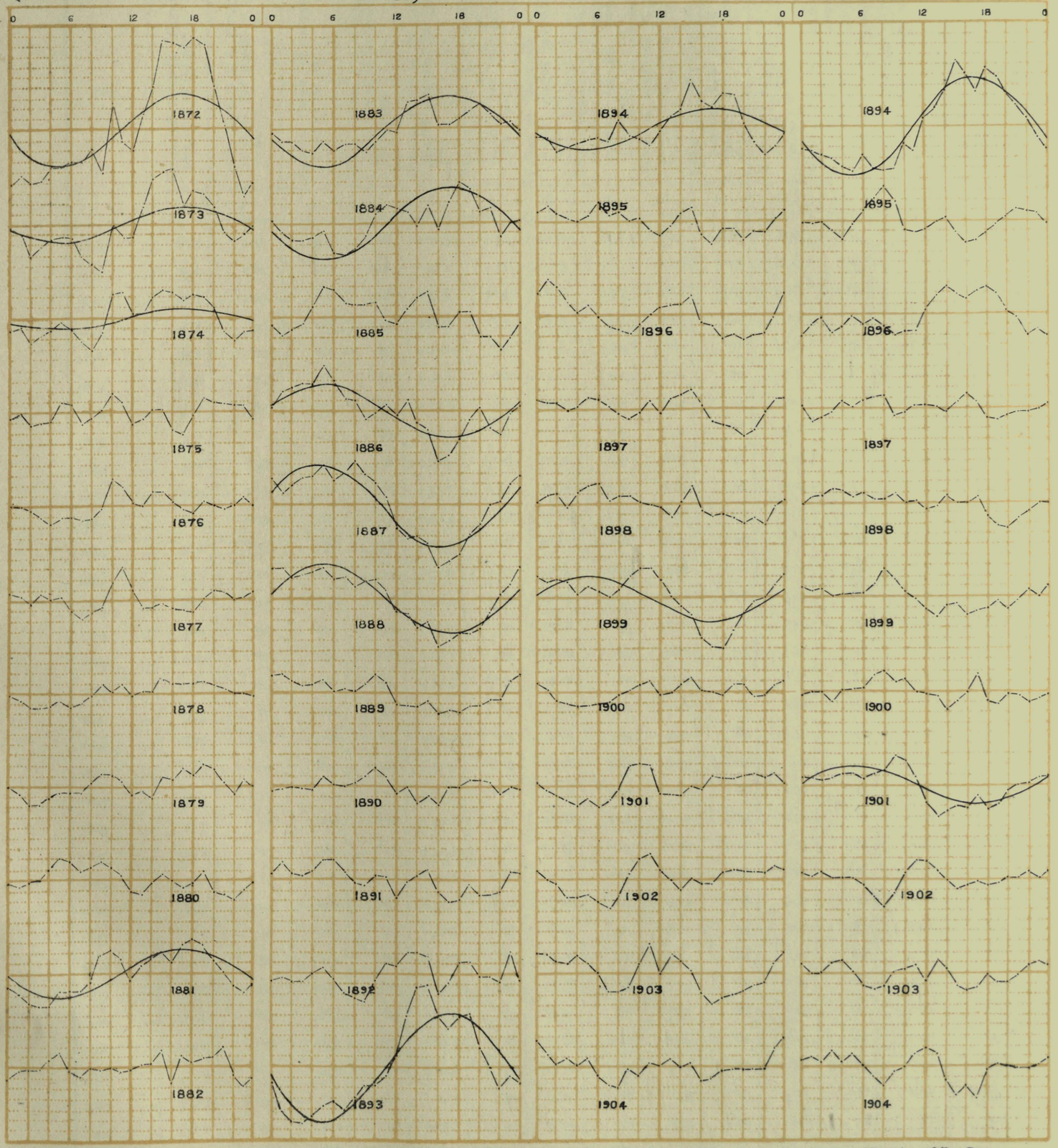
* The residual errors are here fairly small but during minimum spot-years when the disturbances are almost nil the errors become comparably large and significant, see figure 2.

COLABA OBSERVATORY

Diurnal Variation of H.

Secular Phase Disturbance and the First component.

Plate 90.



Scale: One small division = 0·5 Y.

Govt. Photozinco. Office, Poona, 1910.

TABLE 463.—*Showing data and factors for the derivation of the theoretical inequalities for each year from the average diurnal inequality of the whole period of 33 years.*

Unity = 1γ = ·00001 C. G. S.

Year.	Range of average diurnal inequality for the year.	Ratio; column 2 ÷ average range of the period of 33 years.	Average values of summed ranges for the year.	Ratio; column 4 ÷ average summed range of the period 1872—1904.	Ordinate at 11h of the mean diurnal inequality for the year.	Ratio; column 6 ÷ average ordinate at 11h of the inequality for the period 1872—1904.	Values of amptitude P_1 of average diurnal inequality for the year.	Ratio; column 8 ÷ values of amptitude P_1 of average inequality for the period 1872—1904.	Values of amptitude P_2 of average diurnal inequality for the year.	Ratio; column 10 ÷ values of amptitude P_2 of average inequality for the period 1872—1904.	Values of amptitude P_3 of average diurnal inequality for the year.	Ratio: column 12 ÷ values of amptitude P_3 of average inequality for the period 1872—1904.	Values of amptitude P_4 of average diurnal inequality for the year.	Ratio; column 14 ÷ values of amptitude P_4 of average inequality for the period 1872—1904.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1872 ...	67·5	1·55	444	1·56	+46·5	1·52	27·25	1·56	11·27	1·31	5·41	1·55	1·00	1·06
1873 ...	54·2	1·24	357	1·26	+37·5	1·23	21·73	1·24	10·02	1·17	4·00	1·14	1·04	1·10
1874 ...	48·1	1·10	308	1·08	+33·6	1·09	18·91	1·08	8·83	1·03	3·94	1·13	1·17	1·23
1875 ...	40·7	·93	268	·94	+29·0	·95	16·25	·93	8·10	·94	3·23	·92	0·82	·86
1876 ...	39·2	·90	254	·89	+27·6	·90	15·41	·88	7·80	·91	3·02	·86	0·88	·93
1877 ...	36·6	·84	233	·82	+26·4	·86	14·15	·81	7·30	·85	3·15	·90	0·92	·97
1878 ...	35·7	·82	234	·82	+25·3	·83	14·32	·82	6·97	·81	2·80	·80	0·76	·80
1879 ...	37·7	·86	247	·87	+26·7	·87	15·16	·87	7·39	·86	3·08	·88	0·86	·91
1880 ...	43·2	·99	279	·98	+29·9	·98	17·37	·99	8·03	·94	3·43	·98	0·94	·99
1881 ...	49·9	1·14	330	1·16	+35·2	1·15	20·38	1·16	9·70	1·13	4·25	1·21	1·12	1·18
1882 ...	47·4	1·09	314	1·11	+33·4	1·09	19·41	1·11	9·32	1·09	4·10	1·17	0·96	1·01
1883 ...	50·2	1·15	336	1·18	+35·7	1·17	20·51	1·17	10·27	1·20	3·97	1·13	0·86	·91
1884 ...	52·3	1·20	338	1·19	+37·0	1·21	20·74	1·19	10·35	1·21	4·73	1·35	1·39	1·46
1885 ...	48·8	1·12	322	1·13	+33·4	1·09	20·14	1·15	9·03	1·05	3·77	1·08	0·98	1·03
1886 ...	40·0	·92	254	·89	+27·6	·90	15·78	·90	7·78	·91	3·48	·99	0·64	·67
1887 ...	37·9	·87	244	·86	+26·1	·85	14·89	·85	7·80	·91	2·88	·82	0·78	·82
1888 ...	36·7	·84	230	·81	+24·9	·81	14·12	·81	7·45	·87	2·80	·80	0·91	·96
1889 ...	35·5	·81	226	·80	+24·7	·81	13·90	·79	7·18	·84	2·86	·82	0·88	·93
1890 ...	36·6	·84	238	·84	+26·0	·85	14·74	·84	7·31	·85	3·21	·92	0·84	·88
1891 ...	45·7	1·05	294	1·04	+31·6	1·03	18·16	1·04	8·92	1·04	3·45	·99	0·97	1·02
1892 ...	53·3	1·22	348	1·23	+37·5	1·23	21·29	1·22	10·69	1·25	4·39	1·25	1·27	1·34
1893 ...	57·7	1·32	393	1·38	+40·2	1·31	24·10	1·38	11·20	1·31	4·36	1·25	1·05	1·11
1894 ...	54·4	1·25	360	1·27	+37·4	1·22	22·30	1·27	10·24	1·19	4·33	1·24	0·96	1·01
1895 ...	50·0	1·15	326	1·15	+34·4	1·12	20·13	1·15	9·89	1·15	3·77	1·08	0·92	·97
1896 ...	45·7	1·05	292	1·03	+31·3	1·02	17·96	1·03	9·17	1·07	3·59	1·03	0·91	·96
1897 ...	41·8	·96	267	·94	+28·6	·93	16·47	·94	8·15	·95	2·90	·83	1·01	1·06
1898 ...	37·6	·86	243	·86	+25·8	·84	15·08	·86	7·17	·84	2·87	·82	0·80	·84
1899 ...	35·6	·82	227	·80	+24·7	·81	13·78	·79	7·64	·89	2·79	·80	0·73	·77
1900 ...	35·9	·82	235	·83	+25·4	·83	14·37	·82	7·32	·85	2·84	·81	0·74	78
1901 ...	34·1	·78	224	·79	+24·6	·80	13·62	·78	7·17	·84	2·93	·84	0·96	1·01
1902 ...	33·6	·77	218	·77	+24·2	·79	13·19	·75	7·14	·83	2·98	·85	0·97	1·02
1903 ...	39·3	·90	247	·87	+27·5	·90	15·10	·86	7·99	·93	3·14	·90	0·94	·99
1904 ...	42·2	·97	273	·96	+29·6	·97	16·62	·95	8·74	1·02	3·48	·99	1·01	1·06
Average, 1872—1904.	43·6	...	284	...	+30·6	...	17·47	...	8·58	...	3·50	...	0·95	...

TABLE 464.—*Showing the computed Diurnal Inequalities of Horizontal Force obtained by multiplying the average diurnal inequality of 33 years by the values of factors for each year.*

Unity = 0·1γ

Bombay Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Adopted factors for conversion.
Years.																									
1872 ...	−164	−150	−135	−122	−113	−107	− 76	+2	+133	+293	+423	+470	+422	+293	+144	+ 11	− 76	−129	−163	−188	−198	−200	−191	−178	1·55
1873 ...	−134	−122	−110	−100	− 92	− 87	− 62	+1	+108	+238	+344	+382	+343	+238	+117	+ 9	− 62	−105	−132	−152	−161	−163	−155	−145	1·26
1874 ...	−113	−104	− 93	− 85	− 78	− 74	− 52	+1	+ 92	+202	+292	+324	+291	+202	+100	+ 7	− 52	− 89	−112	−129	−137	−138	−132	−123	1·07
1875 ...	−100	− 91	− 82	− 74	− 69	− 65	− 46	+1	+ 81	+178	+257	+285	+256	+178	+ 87	+ 7	− 46	− 78	− 99	−114	−120	−121	−116	−108	0·94
1876 ...	− 93	− 85	− 77	− 70	− 64	− 61	− 43	+1	+ 76	+166	+240	+267	+239	+166	+ 82	+ 6	− 43	− 73	− 92	−106	−113	−114	−108	−101	0·88
1877 ...	− 87	− 80	− 71	− 65	− 60	− 57	− 40	+1	+ 71	+155	+224	+248	+223	+155	+ 76	+ 6	− 40	− 68	− 86	− 99	−105	−106	−101	− 94	0·82
1878 ...	− 87	− 80	− 71	− 65	− 60	− 57	− 40	+1	+ 71	+155	+224	+248	+223	+155	+ 76	+ 6	− 40	− 68	− 86	− 99	−105	−106	−101	− 94	0·82
1879 ...	− 92	− 84	− 76	− 69	− 64	− 60	− 43	+1	+ 75	+164	+238	+264	+237	+164	+ 81	+ 6	− 43	− 72	− 91	−105	−111	−112	−107	−100	0·87
1880 ...	−104	− 95	− 85	− 77	− 72	− 68	− 48	+1	+ 84	+185	+268	+297	+267	+185	+ 91	+ 7	− 48	− 81	−103	−119	−125	−126	−121	−113	0·98
1881 ...	−121	−111	− 99	− 90	− 83	− 79	− 56	+1	+ 98	+215	+311	+345	+310	+215	+106	+ 8	− 56	− 95	−120	−138	−146	−147	−140	−131	1·14
1882 ...	−118	−108	− 97	− 88	− 81	− 77	− 54	+1	+ 95	+210	+303	+336	+302	+210	+103	+ 8	− 54	− 92	−117	−134	−142	−143	−137	−128	1·11
1883 ...	−125	−114	−103	− 93	− 86	− 81	− 58	+1	+101	+223	+322	+358	+321	+223	+110	+ 8	− 58	− 98	−124	−143	−151	−152	−145	−136	1·18
1884 ...	−126	−115	−104	− 94	− 87	− 82	− 58	+1	+102	+225	+325	+361	+324	+225	+111	+ 8	− 58	− 99	−125	−144	−152	−154	−146	−137	1·19
1885 ...	−118	−108	− 97	− 88	− 81	− 77	− 54	+1	+ 95	+210	+303	+336	+302	+210	+103	+ 8	− 54	− 92	−117	−134	−142	−143	−137	−128	1·11
1886 ...	− 95	− 87	− 78	− 71	− 66	− 62	− 44	+1	+ 77	+170	+246	+273	+245	+170	+ 84	+ 6	− 44	− 75	− 94	−109	−115	−116	−111	−103	0·90
1887 ...	− 90	− 82	− 74	− 67	− 62	− 59	− 42	+1	+ 73	+161	+232	+258	+231	+161	+ 79	+ 6	− 42	− 71	− 89	−103	−109	−110	−105	− 98	0·85
1888 ...	− 86	− 79	− 70	− 64	− 59	− 56	− 40	+1	+ 70	+153	+221	+245	+220	+153	+ 75	+ 6	− 40	− 67	− 85	− 98	−104	−104	−100	− 93	0·81
1889 ...	− 85	− 78	− 70	− 63	− 58	− 55	− 39	+1	+ 69	+151	+218	+242	+218	+151	+ 74	+ 6	− 39	− 66	− 84	− 97	−102	−103	− 98	− 92	0·80
1890 ...	− 89	− 81	− 73	− 66	− 61	− 58	− 41	+1	+ 72	+159	+229	+255	+228	+159	+ 78	+ 6	− 41	− 70	− 88	−102	−108	−108	−103	− 97	0·84
1891 ...	−110	−101	− 90	− 82	− 76	− 72	− 51	+1	+ 89	+197	+284	+315	+283	+197	+ 97	+ 7	− 51	− 86	−109	−126	−133	−134	−128	−120	1·04
1892 ...	−129	−118	−106	− 96	− 89	− 84	− 60	+1	+105	+231	+333	+370	+332	+231	+113	+ 9	− 60	−101	−128	−148	−156	−157	−150	−140	1·22
1893 ...	−142	−130	−117	−106	− 98	− 92	− 66	+1	+115	+253	+366	+406	+364	+253	+125	+ 9	− 66	−111	−141	−162	−172	−173	−165	−154	1·34
1894 ...	−134	−122	−110	−100	− 92	− 87	− 62	+1	+108	+238	+344	+382	+343	+238	+117	+ 9	− 62	−105	−132	−152	−161	−163	−155	−145	1·26
1895 ...	−122	−112	−100	− 91	− 84	− 79	− 56	+1	+ 99	+217	+314	+348	+313	+217	+107	+ 8	− 56	− 95	−121	−139	−147	−148	−141	−132	1·15
1896 ...	−109	−100	− 90	− 81	− 75	− 71	− 50	+1	+ 89	+195	+281	+312	+280	+195	+ 96	+ 7	− 50	− 85	−108	−125	−132	−133	−127	−118	1·03
1897 ...	− 99	− 90	− 81	− 73	− 68	− 64	− 46	+1	+ 80	+176	+254	+282	+253	+176	+ 86	+ 7	− 46	− 77	− 98	−113	−119	−120	−114	−107	0·93
1898 ...	− 90	− 82	− 74	− 67	− 62	− 59	− 42	+1	+ 73	+161	+232	+258	+231	+161	+ 79	+ 6	− 42	− 71	− 89	−103	−109	−110	−105	− 98	0·85
1899 ...	− 82	− 75	− 67	− 61	− 56	− 53	− 38	+1	+ 66	+146	+210	+233	+209	+146	+ 72	+ 5	− 38	− 64	− 81	− 93	− 99	− 99	− 95	− 89	0·77
1900 ...	− 87	− 80	− 71	− 65	− 60	− 57	− 40	+1	+ 71	+155	+224	+248	+223	+155	+ 76	+ 6	− 40	− 68	− 86	− 99	−105	−106	−101	− 94	0·82
1901 ...	− 83	− 76	− 68	− 62	− 57	− 54	− 38	+1	+ 67	+147	+213	+236	+212	+147	+ 73	+ 5	− 38	− 65	− 82	− 94	−100	−101	− 96	− 90	0·78
1902 ...	− 81	− 74	− 66	− 60	− 55	− 52	− 37	+1	+ 65	+144	+207	+230	+207	+144	+ 71	+ 5	− 37	− 63	− 80	− 92	− 97	− 98	− 93	− 87	0·76
1903 ...	− 91	− 83	− 75	− 68	− 63	− 59	− 42	+1	+ 74	+163	+235	+261	+234	+163	+ 80	+ 6	− 42	− 71	− 90	−104	−110	−111	−106	− 99	0·86
1904 ...	−103	− 94	− 84	− 77	− 71	− 67	− 48	+1	+ 83	+183	+265	+294	+264	+183	+ 90	+ 7	− 48	− 81	−102	−117	−124	−125	−119	−112	0·97
Average inequality, 1872—1904.	−106	− 97	− 87	− 79	− 73	− 69	− 49	+1	+ 86	+189	+273	+303	+272	+189	+ 93	+ 7	− 49	− 83	−105	−121	−128	−129	−123	−115	...

TABLE 465.—*Showing the difference between the Diurnal Inequalities of Horizontal Force for each year and the computed inequalities in table 464.*

Unity = 0·1γ

Bombay Civil hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.																								
1872 ...	−26	−22	−25	−24	−18	−18	−15	−15	− 9	−21	+12	− 5	−11	+ 7	+21	+43	+42	+40	+44	+42	+21	+ 1	−17	−32
1873 ...	− 1	− 5	−15	−11	− 8	− 6	− 7	−15	−19	−23	0	− 7	− 7	+ 9	+22	+26	+27	+ 9	+16	+14	+ 8	− 4	− 8	− 5
1874 ...	− 6	− 4	−12	− 8	− 6	− 2	− 5	−12	−16	− 7	+11	+12	+ 2	+ 2	+10	+13	+12	+ 8	+11	+10	+ 5	− 7	−11	− 7
1875 ...	− 3	− 1	− 7	− 5	− 4	+ 5	+ 4	− 6	− 3	+ 1	+ 9	+ 5	− 6	− 3	+ 1	+ 1	− 8	−11	− 2	+ 7	+ 5	+ 4	+ 3	+ 3
1876 ...	+ 1	0	− 2	− 5	− 8	− 5	− 5	− 7	− 6	− 1	+13	+ 9	+ 2	− 1	+ 7	+ 7	+ 2	− 2	− 3	+ 2	0	− 2	0	+ 4
1877 ...	+ 3	+ 2	− 1	+ 3	+ 1	+ 2	− 5	− 8	− 6	− 3	+ 8	+16	+ 5	− 4	− 4	− 2	− 4	− 5	− 6	+ 1	+ 5	+ 4	0	+ 1
1878 ...	− 1	− 3	− 7	− 7	− 6	− 3	− 7	− 4	− 1	+ 5	+ 1	+ 5	− 1	+ 1	+ 1	+ 7	+ 5	+ 5	+ 5	+ 6	+ 4	+ 2	0	0
1879 ...	0	− 3	− 9	− 9	− 6	− 3	− 3	− 3	+ 2	+ 7	+ 6	+ 3	− 3	− 2	− 5	+ 5	+ 3	+ 8	+ 6	+11	+ 8	+ 2	− 3	+ 3
1880 ...	− 2	− 3	− 2	0	+ 5	+10	+ 8	+ 4	+ 6	+ 8	+ 6	+ 2	− 5	− 7	− 2	+ 3	− 1	− 3	− 2	+ 5	− 5	− 7	− 9	− 4
1881 ...	− 6	− 9	−13	−15	−15	− 8	− 8	− 8	− 4	+ 9	+12	+ 7	− 3	+ 3	+ 7	+10	+ 5	+14	+17	+14	+ 6	0	− 6	− 9
1882 ...	− 6	− 2	− 1	− 1	+ 3	+ 7	− 2	− 4	0	− 1	0	− 2	− 1	+ 1	+ 1	+ 8	− 8	+ 5	+ 2	+ 4	+ 4	+10	− 3	− 9
1883 ...	− 1	− 5	− 5	−10	−12	− 5	−10	− 7	− 7	−11	− 6	− 1	− 2	+13	+14	+17	+ 2	+ 2	+ 5	+ 8	+12	+ 7	+ 2	+ 3
1884 ...	+ 2	− 5	− 8	− 8	− 7	− 3	−14	−15	−12	− 6	+ 4	+ 9	+ 7	+ 5	− 2	+ 8	− 3	+10	+19	+16	+ 5	+ 7	− 7	0
1885 ...	− 3	− 8	− 6	− 3	+ 5	+15	+13	+ 7	+ 6	+ 6	+ 7	− 2	− 3	+ 3	+ 8	+12	− 5	− 5	+ 2	+ 2	−10	−10	−17	−11
1886 ...	+ 2	+10	+12	+13	+13	+22	+15	+ 6	+ 5	− 4	− 1	+ 3	− 2	+ 5	− 6	− 9	−24	−22	−14	− 5	+ 1	− 8	−12	− 2
1887 ...	+13	+ 6	+10	+13	+14	+19	+12	+16	+22	+15	+11	+ 3	−11	−16	−15	−18	−30	−27	−23	−14	− 9	0	+ 2	+10
1888 ...	+15	+15	+11	+12	+13	+15	+10	+11	+ 6	+ 9	+10	+ 4	− 6	− 7	−14	−11	−23	−20	−17	−17	−14	− 7	+ 2	+ 7
1889 ...	+ 8	+ 9	+ 6	+ 3	+ 4	+ 7	+ 1	+ 2	+ 1	+ 4	+ 8	+ 5	− 5	− 6	− 7	− 3	−11	− 8	− 9	− 6	− 6	− 3	− 3	+ 6
1890 ...	− 2	− 1	0	− 1	− 2	+ 5	+ 1	0	+ 2	+ 5	+ 9	+ 5	− 3	0	− 8	− 4	− 9	0	0	+ 3	+ 3	+ 2	− 3	0
1891 ...	+ 3	+ 8	+ 3	+ 2	+ 5	+ 9	+ 9	+ 4	− 2	− 3	+ 2	+ 1	− 8	− 1	+ 2	+ 6	− 5	−10	− 9	− 2	− 7	− 7	− 5	+ 4
1892 ...	− 3	− 2	− 4	− 4	0	+ 3	− 3	− 9	−11	−13	− 3	+ 5	+ 4	+11	+11	+ 9	− 9	− 4	+ 6	+ 6	− 1	− 1	− 4	+11
1893 ...	− 8	−21	−26	−27	−23	−18	−17	−21	−15	− 9	− 9	− 4	+ 6	+25	+38	+40	+25	+19	+25	+26	+10	0	−10	− 4
1894 ...	− 3	− 4	−11	− 9	− 7	− 5	− 4	− 6	+ 4	− 3	− 6	− 8	− 2	+ 6	+ 9	+23	+13	+10	+17	+16	+ 2	− 7	−13	− 9
1895 ...	+ 5	+ 8	+ 4	+ 2	+ 1	+ 3	+10	+ 3	+ 5	+ 1	+ 2	− 4	− 7	− 2	+ 4	+ 7	− 6	−11	− 3	− 3	− 9	− 5	− 6	+ 2
1896 ...	+11	+18	+14	+ 7	+ 2	+ 5	− 1	− 5	− 7	− 8	− 1	+ 1	+ 3	+ 4	+ 5	+ 9	− 3	− 5	−11	− 9	−12	−10	− 9	− 1
1897 ...	+ 5	+ 3	+ 3	0	+ 2	+ 6	+ 5	+ 2	− 2	− 4	− 1	+ 4	− 2	+ 5	+ 7	+ 9	+ 2	− 7	− 8	− 9	−13	−10	− 2	+ 5
1898 ...	+ 2	+ 5	+ 6	+ 1	+ 6	+ 9	+10	+ 2	+ 4	+ 4	+ 1	0	− 2	− 7	+ 1	+ 8	− 3	− 6	− 5	− 7	− 9	− 7	−10	− 2
1899 ...	+12	+ 8	+ 9	+ 8	+ 2	+ 6	+ 3	+ 1	+ 4	+11	+14	+14	+ 9	+ 1	− 4	− 8	−19	−24	−25	−16	− 8	− 2	0	+ 6
1900 ...	+ 5	+ 2	− 3	− 5	− 7	− 6	− 5	− 4	− 1	+ 2	+ 3	+ 6	− 1	0	+ 3	+ 7	+ 1	0	− 2	+ 3	+ 3	− 2	− 1	+ 3
1901 ...	+ 2	− 2	− 4	− 7	− 9	− 6	−10	− 7	− 2	+10	+11	+10	− 3	− 3	− 4	0	− 2	+ 4	+ 3	+ 3	+ 5	+ 6	+ 4	+ 7
1902 ...	+ 5	+ 1	− 2	− 8	− 8	− 7	−10	−13	− 8	+ 3	+10	+12	+ 5	0	− 5	+ 1	− 2	− 2	+ 3	+ 5	+ 4	+ 4	+ 3	+ 7
1903 ...	+10	+ 9	+ 6	+ 5	+ 8	+ 5	− 1	− 8	− 8	− 7	+ 4	+14	0	+ 9	+ 6	+ 2	− 8	−14	−12	−10	− 8	− 6	− 4	+ 4
1904 ...	+13	+ 7	+ 2	+ 4	+ 1	+ 4	− 3	− 8	−10	− 1	− 3	+ 2	+ 1	+ 3	0	+ 2	− 7	− 6	− 2	− 1	− 1	− 1	− 1	+ 8

503. Recurring however to the phase disturbance factors we have seen that the first component is the one principally affected in both the results which are in themselves similar (*vide* paragraphs 490 and 498). And as the phase factor in the first result, that is in the all-day less quiet-day variations, is clearly shown to be associated with storms and disturbances, one may be inclined to suspect at first sight that the other secular phase factor is possibly also connected with the same cause; and the opposite effects in the phase angles, which for the year 1894 is 79° and 263°, may be conceived to be the result in some way of the secondary or induced effects of the primary disturbance. Such an explanation is however obviously problematical.

504. The phenomenon is capable of being interpreted in a more satisfactory way in another manner, which brings us to the doubt expressed in regard to the correctness of the assumption made in paragraph 495. In the consideration of the question in that paragraph, it is assumed, as must be clear from the treatment adopted there, that this minor secular phase factor is subject along with the primary factor to the 11-year disturbance. This supposition may be incorrect and, as we shall presently see, the origin of this phase factor may not after all have any connection with the 11-year period disturbance. A little consideration will show that whatever be the cause, if it does not vary with the 11-year period our attempt in paragraph 496 to derive the theoretical inequalities by multiplying the average diurnal variation (of 11-years) by factors which are graded for each of the 11-years is certain to over-reduce the inequalities and to introduce a fictitious 11-year period in the residual curves of phase disturbance, though of course the absolute phase angle itself will not alter.

In connection with this view, it may be of interest to mention here in passing that the average diurnal variation of vapour pressure at Bombay derived from the thermograph registers for the period 1873—1896 (*vide* table below, as also the observatory publication of the years 1898-1899, Appendix C, table 8) has so striking a resemblance in its run and phase to this nearly constant secular phase disturbance curve in the magnetic diurnal variation that it is difficult for one to pass by the coincidence without considering the possibilities of a direct or indirect relation between the two. The co-efficients

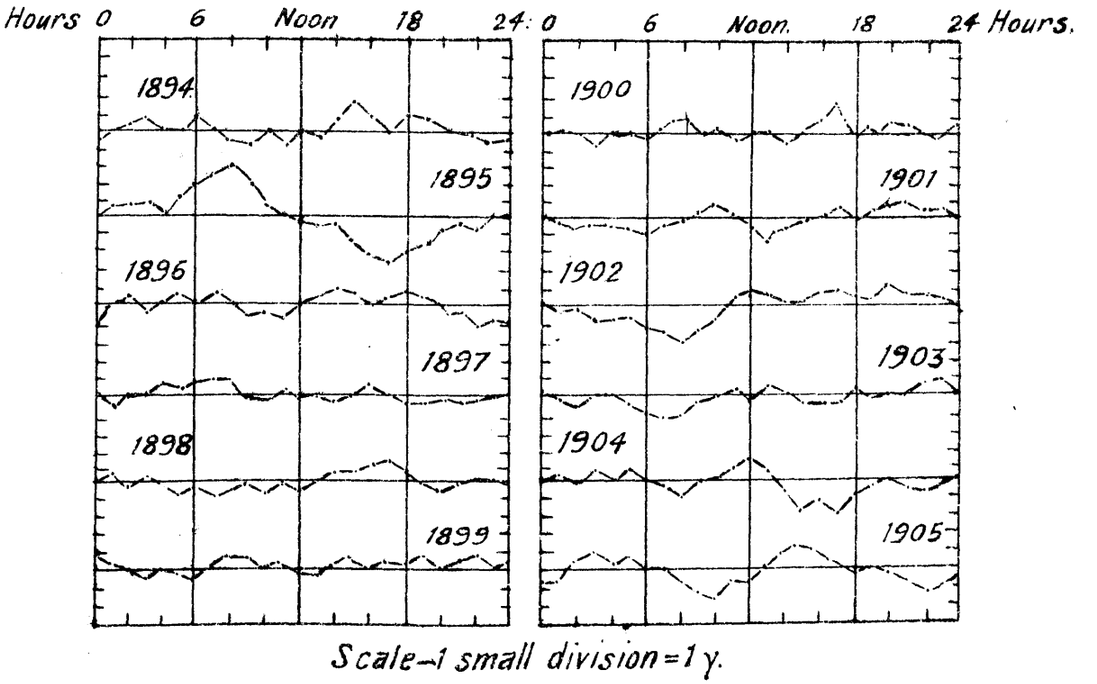
Hours.	0	1	2	3	4	5	6	7	8	9	10	11	Noon.	13	14	15	16	17	18	19	20	21	22	23
Diurnal Variation of Vapour Pressure, 1873—1896 ...	Unity = ·001 inch.																							
	− 2	− 6	− 9	− 15	− 20	− 25	− 26	− 21	− 13	− 8	− 1	− 1	+1	+7	+16	+20	+23	+20	+16	+15	+16	+11	+4	−1
Phase Factor Magnetic Curve, 1894 ...	Unity = 0·1γ.																							
	− 11	− 12	− 13	− 15	− 19	− 22	− 22	− 20	− 21	− 20	− 8	− 12	+4	+9	+18	+32	+26	+17	+28	+24	+17	+11	+4	−5

of the harmonic components of the average vapour pressure diurnal wave at Colaba are $P_1 = \cdot 0203$ inch, $\mu_1 = 258°$. The values of P_2, P_3, P_4 are less than $\frac{1}{10}$th of the amplitude of the first component, and may safely be neglected in the present discussion. The coefficients of the magnetic phase disturbance curve (*vide* paragraph below) are $P_1 = 5 \cdot 3\gamma$; $\mu_1 = 263°$. The other components are here also negligibly small. Hence it will be seen that the phase angles of the only significant component in each, which is the 24-hour wave, agree with each other to within 5° or about 20 minutes in time. Further examination however of this supposed relation will be taken up in Chapter XIV.

505. Any way if the existence of such relation whether it is with the vapour pressure or some other meteorological factor or combination of factors, terrestrial or cosmical, which does not vary appreciably with the 11-year period, be accepted as probable in the magnetic variation, it will be readily seen if the assumption made is at all in the right direction, that when this constant curve of phase disturbance is taken away from the magnetic inequalities, the variations so corrected must obey the simple law already referred to, namely, that they should in their secular progression, bear to each other the simple relation of an uniform increase or decrease of the amplitude. And this they appear to do when so modified. From the results in paragraph 498 it will be seen that as the values of the amplitudes of the phase disturbance curves for the years 1894 and 1901 are already available, the co-efficients of the single phase disturbing curve which would satisfy our requirements as not to wax, wane, and reverse in the 11 years considered, are readily derivable by mere inspection. The amplitude of the inequality for the year 1894 is $2 \cdot 37\gamma$. Taking 1·39 as the factor of reduction for that year, and as obviously the factor of the average conditions of 11 years is unity, the amplitude of the curve we wish to secure would be $\frac{2 \cdot 37\gamma}{1 \cdot 39 - 1 \cdot 00} = 6 \cdot 1\gamma$ nearly. Such values can be derived from each of the 11 years considered, and all these of course should be very nearly the same. That for 1901 works out as $4 \cdot 6\gamma$. Though during

the minimum spot and more so in the intermediate years the conditions would not be favourable, the average co-efficients for the curve have been computed from the years 1894 and 1901 where the amplitudes are significantly large. The adopted values are $A_1 = 5{\cdot}3\gamma$, $\mu_1 = 263°$.

506. If now this curve whether it is induced by some terrestrial (meteorological) cause as we shall inquire into later, or some other unknown cosmical cause, is taken away from the magnetic inequalities (shown in table 438) of each of the 11 years considered, we obtain a series of variations corrected so to say for phase disturbance due to the unknown cause which does not vary with the 11-year period. These curves are shown in table 466 and it becomes apparent from their run that they are all simplified and very nearly obey the law of uniform expansion and contraction of the amplitude. The same corrected 11 inequalities may be derived directly from the single average diurnal magnetic inequality of 11 years by taking away from it in the first instance the phase disturbance curve (see column 1, table 466), and then multiplying it by the adopted factors of reduction for each year referred to in paragraph 496. The results obtained (*vide* table 467), it will be seen, are practically the same by both these methods, the differences between the two sets of results being fairly small (*vide* table 468) and of the same order as the residual errors noted in the curves in paragraphs 490 and 498. It must have been noticed that when really small variations of the type shown in table 462 which show the 11-year period and reverse in phase while passing from the maximum spot to minimum spot epoch, have to be otherwise modified and explained, and if in the subsequent treatment the residuals are also of the order shown in table 468* the result can scarcely be accepted as either convincing or satisfactory. Considering, however, (1) that in the treatment all other components except the first are neglected, (2) that out of the 11 annual residuals in table 468, that of 1895 alone is unsatisfactory while the rest of the curves all show small and irregular residuals as will be readily seen from figures charted below, and (3) that from the original inequalities of H of about 54γ in range, the phase factor variation of a range of about 10γ is taken away and the residuals lie all within 2γ the result is not entirely disappointing. It must also be remembered that the phase disturbance factor presumably ascribed to some terrestrial or other cause or causes if not influenced appreciably by the 11-year law may, in all probability, be subject to some



other short period and irregular movements from year to year; and as this factor is assumed in the treatment to be constant in effect from one year to the next throughout the period, the irregularities noted above in the figures, may not improbably be due partly at least to some such cause.

507. The above results which have been derived from quiet-day variations are, it must be noted, equally effectively derivable from all-day data also. If therefore the rough attempt † thus made to remove from the inequalities whether of quiet-days or all-days, the complex feature of phase disturbance involved in their secular progression, is at all in the right direction of solution and enables us

* The sums of the square residuals however are much less than those given by variations in table 462.

† An attempt to treat the Kew inequalities from 1894 to 1904 roughly as above, so far gives similar results as at Colaba; and considering that the variation of H at Kew is opposite in run to that at Colaba, the phase factor shows the same relative connection to the diurnal variation at each place.

TALBLE 466.—*Diurnal Inequality of Horizontal Force for each year in table 438 corrected for the constant secular phase disturbance inequality in column 1.*

Unity = 0·1γ

Constant Secular phase disturbance inequality.	Bombay Civil Time.	Years.												Mean 1894—1904.
		1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	H. m.													
− 7	0 19	−153	−132	−129	−105	− 86	− 83	− 96	− 81	− 85	− 90	−106	−127	−104
−20	1 19	−167	−145	−136	−127	− 96	− 98	−107	− 94	− 99	−107	−117	−140	−118
−32	2 19	−177	−154	−142	−134	−106	−108	−117	−105	−107	−117	−130	−140	−127
−42	3 19	−186	−165	−157	−140	−110	−119	−130	−112	−119	−121	−132	−148	−136
−49	4 19	−193	−172	−158	−139	−116	−123	−129	−115	−124	−124	−140	−154	−139
−53	5 19	−193	−164	−152	−140	−119	−122	−127	−115	−124	−128	−135	−153	−138
−53	6 19	−161	−135	−135	−119	−104	−108	−112	−104	−112	−119	−123	−138	−121
−49	7 19	− 98	− 65	− 75	− 65	− 64	− 60	− 60	− 60	− 74	− 75	− 75	− 81	− 70
−42	8 19	+ 29	+ 59	+ 29	+ 33	+ 13	+ 26	+ 27	+ 18	0	+ 11	+ 19	+ 22	+ 24
−32	9 19	+188	+198	+157	+143	+113	+122	+129	+120	+106	+125	+148	+150	+141
−20	10 19	+331	+306	+269	+244	+189	+199	+218	+198	+197	+214	+251	+259	+238
− 7	11 19	+383	+357	+317	+293	+228	+235	+253	+228	+242	+257	+303	+319	+281
+ 7	12 19	+367	+331	+303	+273	+211	+215	+236	+204	+227	+234	+285	+298	+262
+20	13 19	+281	+253	+237	+208	+165	+164	+182	+151	+175	+191	+217	+239	+202
+32	14 19	+186	+159	+158	+131	+114	+110	+112	+ 97	+113	+122	+128	+163	+130
+42	15 19	+107	+ 67	+ 79	+ 70	+ 61	+ 59	+ 60	+ 51	+ 58	+ 58	+ 54	+ 92	+ 66
+49	16 19	+ 29	− 4	+ 18	+ 22	+ 22	+ 13	+ 19	+ 12	+ 19	+ 11	+ 5	+ 28	+ 15
+53	17 19	− 20	− 39	− 11	− 11	+ 3	− 9	+ 3	− 4	− 2	− 12	− 30	− 10	− 12
+53	18 19	− 34	− 59	− 29	− 37	− 21	− 23	− 26	− 25	− 19	− 23	− 36	− 33	− 30
+49	19 19	− 58	− 73	− 49	− 54	− 39	− 32	− 42	− 35	− 31	− 40	− 49	− 51	− 46
+42	20 19	− 86	− 89	− 76	− 69	− 55	− 51	− 53	− 44	− 43	− 56	− 67	− 75	− 63
+32	21 19	−109	−102	− 94	− 82	− 64	− 62	− 68	− 55	− 57	− 67	− 83	− 95	− 77
+20	22 19	−125	−113	−113	− 92	− 71	− 67	− 81	− 65	− 66	− 72	− 93	−111	− 87
+ 7	23 19	−137	−118	−115	− 97	− 74	− 77	− 86	− 70	− 75	− 77	− 97	−117	− 93

TABLE 467.—*Computed Diurnal Inequalities of Horizontal Force obtained by multiplying the average inequality of eleven years in column 15, table 466, by the respective factors for each year.*

Unity = 0·1γ

Bombay Civil Time.	Years.											
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
1	2	3	4	5	6	7	8	9	10	11	12	13
H. m.												
0 19	−146	−132	−120	−108	− 85	− 87	− 95	− 83	− 87	− 94	−108	−121
1 19	−165	−150	−136	−123	− 97	− 99	−107	− 94	− 99	−106	−123	−137
2 19	−178	−161	−146	−132	−104	−107	−116	−102	−107	−114	−132	−147
3 19	−190	−173	−156	−141	−112	−114	−124	−109	−114	−122	−141	−158
4 19	−195	−177	−160	−145	−114	−117	−126	−111	−117	−125	−145	−161
5 19	−193	−175	−159	−144	−113	−116	−126	−110	−116	−124	−144	−160
6 19	−169	−154	−139	−126	− 99	−102	−110	− 97	−102	−109	−126	−140
7 19	− 98	− 89	− 80	− 73	− 57	− 59	− 64	− 56	− 59	− 63	− 73	− 81
8 19	+ 34	+ 30	+ 28	+ 25	+ 20	+ 20	+ 22	+ 19	+ 20	+ 22	+ 25	+ 28
9 19	+197	+179	+162	+147	+116	+118	+128	+113	+118	+127	+147	+164
10 19	+333	+302	+274	+248	+195	+200	+217	+190	+200	+214	+248	+276
11 19	+393	+357	+323	+292	+230	+236	+256	+225	+236	+253	+292	+326
12 19	+367	+333	+301	+272	+215	+220	+238	+210	+220	+236	+272	+304
13 19	+283	+257	+232	+210	+166	+170	+184	+162	+170	+182	+210	+234
14 19	+182	+165	+149	+135	+107	+109	+118	+104	+109	+117	+135	+151
15 19	+ 92	+ 84	+ 76	+ 69	+ 54	+ 55	+ 60	+ 53	+ 55	+ 59	+ 69	+ 77
16 19	+ 21	+ 19	+ 17	+ 16	+ 12	+ 13	+ 14	+ 12	+ 13	+ 13	+ 16	+ 17
17 19	− 17	− 15	− 14	− 12	− 10	− 10	− 11	− 10	− 10	− 11	− 12	− 14
18 19	− 42	− 38	− 34	− 31	− 25	− 25	− 27	− 24	− 25	− 27	− 31	− 35
19 19	− 64	− 58	− 53	− 48	− 38	− 39	− 42	− 37	− 39	− 41	− 48	− 53
20 19	− 88	− 80	− 72	− 66	− 52	− 53	− 57	− 50	− 53	− 57	− 66	− 73
21 19	−108	− 98	− 89	− 80	− 63	− 65	− 70	− 62	− 65	− 69	− 80	− 89
22 19	−122	−110	−100	− 90	− 71	− 73	− 79	− 70	− 73	− 78	− 90	−101
23 19	−130	−118	−107	− 97	− 76	− 78	− 85	− 74	− 78	− 84	− 97	−108
Adopted factors for reduction.	1·40	1·27	1·15	1·04	0·82	0·84	0·91	0·80	0·84	0·90	1·04	1·16

TABLE 468.—*Showing the differences between the modified Diurnal Inequalities of H in table 466 and the computed inequalities in table 467.*

Unity = 0·1γ

Bombay Civil Time.	Years.											
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.
H. m.												
10 19 ...	− 7	0	− 9	+ 3	− 1	+ 4	− 1	+ 2	+ 2	+ 4	+ 2	− 6
11 19 ...	− 2	+ 5	0	− 4	+ 1	+ 1	0	0	0	− 1	+ 6	− 3
12 19 ...	+ 1	+ 7	+ 4	− 2	− 2	− 1	− 1	− 3	0	− 3	+ 2	+ 7
13 19 ...	+ 4	+ 8	− 1	+ 1	+ 2	− 5	− 6	− 3	− 5	+ 1	+ 9	+ 10
14 19 ...	+ 2	+ 5	+ 2	+ 6	− 2	− 6	− 3	− 4	− 7	+ 1	+ 5	+ 7
15 19 ...	0	+ 11	+ 7	+ 4	− 6	− 6	− 1	− 5	− 8	− 4	+ 9	+ 7
16 19 ...	+ 8	+ 19	+ 4	+ 7	− 5	− 6	− 2	− 7	− 10	− 10	+ 3	+ 2
17 19 ...	0	+ 24	+ 5	+ 8	− 7	− 1	+ 4	− 4	− 15	− 12	− 2	0
18 19 ...	− 5	+ 29	+ 1	+ 8	− 7	+ 6	+ 5	− 1	− 20	− 11	− 6	− 6
19 19 ...	− 9	+ 19	− 5	− 4	− 3	+ 4	+ 1	+ 7	− 12	− 2	+ 1	− 14
20 19 ...	− 2	+ 4	− 5	− 4	− 6	− 1	+ 1	+ 8	− 3	0	+ 3	− 17
21 19 ...	− 10	0	− 6	+ 1	− 2	− 1	− 3	+ 3	+ 6	+ 4	+ 11	− 7
22 19 ...	0	− 2	+ 2	+ 1	− 4	− 5	− 2	− 6	+ 7	− 2	+ 13	− 6
23 19 ...	− 2	− 4	+ 5	− 2	− 1	− 6	− 2	− 11	+ 5	+ 9	+ 7	+ 5
0 19 ...	+ 4	− 6	+ 9	− 4	+ 7	+ 1	− 6	− 7	+ 4	+ 5	− 7	+ 12
1 19 ...	+ 15	− 17	+ 3	+ 1	+ 7	+ 4	0	− 2	+ 3	− 1	− 15	+ 15
2 19 ...	+ 8	− 23	+ 1	+ 6	+ 10	0	+ 5	0	+ 6	− 2	− 11	+ 11
3 19 ...	− 3	− 24	+ 3	+ 1	+ 13	+ 1	+ 14	+ 6	+ 8	− 1	− 18	+ 4
4 19 ...	+ 8	− 21	+ 5	− 6	+ 4	+ 2	+ 1	− 1	+ 6	+ 4	− 5	+ 2
5 19 ...	+ 6	− 15	+ 4	− 6	− 1	+ 7	0	+ 2	+ 8	+ 1	− 1	+ 2
6 19 ...	+ 2	− 9	− 4	− 3	− 3	+ 2	+ 4	+ 6	+ 10	+ 1	− 1	− 2
7 19 ...	− 1	− 4	− 5	− 2	− 1	+ 3	+ 2	+ 7	+ 8	+ 2	− 3	− 6
8 19 ...	− 3	− 3	− 13	− 2	0	+ 6	− 2	+ 5	+ 7	+ 6	− 3	− 10
9 19 ...	− 7	0	− 8	0	+ 2	+ 1	− 1	+ 4	+ 3	+ 7	0	− 9

to separate the former from the true secular effect due to some distinctly separate and extra terrestrial cause which would thus affect solely the amplitudes of the inequalities periodically every 11 years, the whole phenomenon is capable of a simple and plausible explanation as incidentally referred to in paragraph 502.

We shall resume the discussion of this question in detail when the relation generally of the magnetic phenomenon to the metereological is examined in detail in Chapter XIV. The discussion of the seasonal variation is also reserved for that chapter.

3.—Declination, Absolute Phenomenon.

508. As observed elsewhere this element is not much perturbed at Colaba even during the incidence of the greatest of storms and any significantly large difference in the results of quiet and all-days can scarcely be expected in the average results. No discussion in detail hence, as in H, is either possible or profitable here or in the vertical force data which follow, and none has been attempted.

509. The numerical values of the diurnal variability of declination derived from the differences of the daily means of all-days as explained in the H results, for the period of 11 years 1894 to 1905 are shown in table 469. The value for the year 1894 is 17″ which diminishes to 10″ in the year 1901, the average condition of 11 years being represented by a variability of 12″. Considering that similar variability numbers for H are respectively 13γ, 5γ, and 8γ and that at Colaba a disturbance of 1γ in H, corresponds very nearly to a departure of about 5″·5 of declination, we find that on the average condition of 11 years the variability of H is about 3·7 times as great as that of D. This ratio is however changeable. In 1894 it becomes 4·2, while in 1901 it is 2·7. It is hence clear that this change in the ratio of the variability as reflected in the ranges or hourly ordinates, *vide* table 379, is in the main responsible for the want of symmetry referred to in the vector diagrams at the maximum and minimum spot epochs. (See paragraph 425.)

510. Taking up now the rough numerical values of variability derived as in paragraph 459, of the quiet-day from the preceding day, we have to note (see table 470) that for the years 1894 and 1901 and for the average of 11 years, the values are respectively 13″, 9″ and 11″. These when compared with the corresponding numbers of H, namely 6·6γ, 3·9γ and 4·9γ, show a ratio of 2·8, 2·4 and 2·4, respectively. The mean departures from the mean in all-days and in quiet-days indicate the same result also (see Chapter XIII). It will be seen that the ratios in quiet-days at least are less susceptible to change than in all-days. The table below gives the declination data in which for facility of comparison the data for the H element have been recopied (see tables 469 to 478). It will readily appear from the table any way that the perturbing action of disturbances, etc., on declination is very feeble, as compared with that on H.

	Declination.			Horizontal Force.		
	1894.	1901.	Average, 1894—1904.	1894.	1901.	Average, 1894—1904.
Difference in absolute value: Astronomer Royal's quiet-days less all-days, *vide* table 476	−9″ = 1·6γ	−1″ = 0·2γ	−3″ = 0·5γ	+11·8γ	+0·9γ	+4·9γ
Difference in absolute value: Locally selected quiet-days less all-days, *vide* table 478	−9″ = 1·6γ	−2″ = 0·4γ	−5″ = 0·9γ	+14·6γ	+5·4γ	+8·5γ
Difference in absolute value: All quiet days less all-days, *vide* table 474	−9″ = 1·6γ	0″ = 0·0γ	−2″ = 0·4γ	+11·0γ	+1·1γ	+4·3γ
Mean diurnal variability of all-days, *vide* table 469	17″ = 3·1γ	10″ = 1·8γ	12″ = 2·2γ	13·0γ	5·0γ	8·0γ
Mean diurnal variability of all-quiet days, *vide* table 470 ...	13″ = 2·4γ	9″ = 1·6γ	11″ = 2·0γ	6·6γ	3·9γ	4·9γ
Mean difference in absolute value of all quiet-days from that of the preceding day, *vide* table 473	−5″ = 0·9γ	−1″ = 0·2γ	−2″ = 0·4γ	+5·0γ	+1·1γ	+2·3γ
Mean departure of all-days from the mean of all-days, *vide* table 471	15″ = 2·7γ	10″ = 1·8γ	12″ = 2·2γ	16·5γ	5·0γ	9·0γ
Mean departure of quiet-days from their own mean, *vide* table 472	10″ = 1·8γ	10″ = 1·8γ	10″ = 1·8γ	6·8γ	3·9γ	4·9γ

TABLE 469.—*Showing the values of the diurnal variability of Declination or the sum without regard to signs of the difference of the daily mean of each day from that of the preceding day divided by the number of days.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	12	26	17	17	16	15	20	22	17	10	15	13	17
1895 ...	12	11	16	12	14	16	11	17	14	16	13	12	14
1896 ...	10	16	16	14	16	10	13	16	13	11	11	13	13
1897 ...	16	13	11	14	10	11	13	14	11	10	9	13	12
1898 ...	8	14	16	12	10	14	11	13	16	13	10	11	12
1899 ...	13	15	12	11	14	11	9	13	7	12	9	9	11
1900 ...	13	11	16	11	14	13	7	11	8	13	8	9	11
1901 ...	12	9	12	8	9	13	10	10	13	10	8	11	10
1902 ...	10	9	9	8	12	10	12	11	11	11	13	10	10
1903 ...	10	9	10	13	8	11	10	10	11	20	15	12	12
1904 ...	16	11	10	16	15	11	12	15	12	15	12	10	13
1905 ...	13	19	13	14	12	9	19	14	12	9	16	13	14
Mean, 1894—1904 ...	12	13	13	12	13	12	12	14	12	13	11	11	12

TABLE 470.—*Showing the rough numerical values of the variability of quiet-days shown in table 381; that is the sum without regard to signs of the difference of the daily mean of these quiet-days from that of the preceding day divided by the number of days.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	9	29	17	12	15	15	19	14	9	12	13	6	13
1895 ...	13	7	...	10	10	14	10	17	13	10	14	9	12
1896 ...	8	18	9	15	12	8	17	16	16	8	8	9	11
1897 ...	13	11	9	17	12	10	10	15	11	8	8	9	11
1898 ...	7	12	14	12	10	12	12	14	9	9	11	11	11
1899 ...	14	8	9	11	12	9	9	13	6	11	10	8	10
1900 ...	17	12	8	13	9	13	6	9	8	13	7	8	10
1901 ...	10	8	9	9	9	11	11	10	12	8	9	8	9
1902 ...	10	9	8	7	12	10	13	10	9	8	15	9	10
1903 ...	13	9	10	15	8	11	10	7	8	7	10	7	10
1904 ...	13	9	9	18	13	10	10	11	11	13	9	11	11
1905 ...	9	24	11	12	11	9	18	14	13	8	10	12	12
Mean, 1894—1904 ...	11	10	10	12	11	11	11	12	10	10	10	9	11

TABLE 471.—*Showing the mean departure of the daily mean of all-days from their corresponding monthly mean.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	8	23	20	15	14	16	19	20	13	9	17	12	15
1895 ...	8	10	12	13	11	20	14	13	13	14	11	12	13
1896 ...	11	11	11	16	17	10	16	12	9	13	17	21	14
1897 ...	16	14	16	11	7	10	13	11	11	13	10	14	12
1898 ...	9	14	15	9	11	16	11	12	19	12	12	12	13
1899 ...	9	12	13	13	15	9	9	10	13	11	9	8	11
1900 ...	12	12	16	8	13	8	10	8	10	10	6	8	10
1901 ...	9	9	11	7	10	11	10	7	17	9	8	9	10
1902 ...	16	6	7	8	11	9	8	10	8	11	11	9	9
1903 ...	8	10	9	14	9	11	9	9	9	22	15	15	12
1904 ...	12	14	11	13	13	11	19	12	13	13	12	10	13
1905 ...	9	15	12	11	13	15	13	14	12	8	15	12	12
Mean 1894 to 1904.	11	12	13	12	12	12	13	11	12	12	12	12	12

TABLE 472.—*Showing the mean departure of the daily mean of all quiet-days from their corresponding monthly mean value.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	6	11	12	13	8	8	16	13	7	10	3	9	10
1895 ...	8	9	...	17	8	17	7	12	10	6	10	8	11
1896 ...	2	11	5	13	13	7	15	15	11	10	12	14	11
1897 ...	10	15	10	5	6	7	11	10	11	16	10	13	11
1898 ...	10	15	5	5	9	13	11	11	6	9	11	10	10
1899 ..	9	6	13	7	10	5	9	10	5	7	8	7	9
1900 ...	9	11	11	8	6	8	9	7	11	8	5	7	8
1901 ...	10	10	10	8	9	10	10	6	19	7	9	7	10
1902 ...	18	6	6	5	11	7	7	9	6	8	12	8	9
1903 ...	10	10	10	11	8	11	9	9	6	6	9	10	10
1904 ...	9	11	8	10	12	11	19	9	11	8	9	9	10
1905 ...	8	7	5	10	11	13	14	6	15	8	8	9	10
Mean 1894 to 1904.	11	11	9	9	9	9	11	10	11	9	9	9	10

TABLE 473.—*Showing the average value of the difference of the daily mean of quiet-days shown in table 381 from that of the preceding day.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	−1	−15	−8	−8	−7	−10	−11	+2	+4	−3	−13	−3	−5
1895 ...	0	−6	...	−10	−3	−7	−6	0	−5	+2	−12	0	−4
1896 ...	−8	−9	−6	−4	−3	−2	+2	−7	+4	−3	−1	−5	−3
1897 ...	−6	−2	+3	−17	−8	−2	+2	+1	−1	−5	−4	−6	−3
1898 ...	0	+3	−4	−4	0	0	+1	+3	−6	0	−5	−8	−1
1899 ...	−1	−1	−5	−6	−2	−3	0	−2	+3	−3	−1	−2	−2
1900 ...	+5	−4	−6	−1	+1	0	−2	0	−1	−1	−2	0	−1
1901 ...	−1	−3	−2	−2	0	−3	−1	0	−3	0	0	−1	−1
1902 ...	−3	+1	0	−2	−3	+1	0	−3	−2	+1	−6	0	−2
1903 ...	+3	−1	0	−7	0	−1	−2	+2	−2	−1	−2	−6	−1
1904 ...	−1	0	−3	−6	−1	0	+1	+1	−1	−10	−6	−3	−2
1905 ...	−7	+10	+4	−4	+1	−2	−2	−1	+1	−3	−7	−1	−1
Mean 1894 to 1904.	−1	−2	−3	−4	−2	−2	−1	0	−1	−2	−4	−3	−2

TABLE 474.—*Showing the difference in the absolute values of Declination of all quiet-days less all-days.*

Unity = 1″

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	−1	−19	−20	−4	−8	−16	−9	−13	−2	−3	−12	−7	−9
1895 ...	−2	−1	...	−15	−1	−2	−4	0	−1	+7	−9	−7	−3
1896 ...	−11	−16	−6	0	−13	+1	−6	−10	−1	−5	−9	−13	−7
1897 ...	−6	−2	−9	−21	−4	−3	+2	+1	−3	−7	−5	−2	−3
1898 ...	+1	0	−9	−3	−6	+6	+2	0	−20	−6	+2	−10	−3
1899 ...	−4	−7	−2	−12	−5	−3	−2	−6	+14	−8	+3	+2	−3
1900 ...	+2	+2	−6	0	−7	0	0	0	−2	+1	−1	+1	−1
1901 ...	−1	−1	−3	−2	+3	−1	−3	+1	−1	+1	0	+1	0
1902 ...	−1	+1	−2	−2	−2	+2	+1	+3	+1	−6	−1	0	0
1903 ...	+1	0	+2	−6	+1	−2	+3	−4	−1	−9	−11	−7	−1
1904 ...	0	−6	+1	−7	−6	+3	+2	+2	+5	−9	−3	−1	−1
1905 ...	−2	−3	−3	−4	0	−7	−1	−11	−7	−1	−13	−3	−4
Mean 1894 to 1904.	−2	−2	−4	−4	−3	0	−1	−1	−1	−4	−3	−3	−2

511. In table 475 are collected the monthly mean values of absolute declination, derived from quiet-days of the Astronomer Royal, and in the next table are given the differences of these from the all-day results. A glance at column 14 of table 476 shows that here too, as in H, the secular progression though feebly marked is fairly definite. Similar differences derived from locally selected quiet-days are given in table 478 for comparison, which show that the results are fairly accordant. The character of a quiet-day at Colaba may hence be regarded definitely to indicate a smaller value of easterly declination than the average day. This difference is about 3 seconds of arc on the average of 11 years. During the maximum spot year 1894 it is accentuated to 9 seconds, while the difference almost vanishes about the minimum spot year 1901. The locally selected days indicate a difference of 5 seconds on the average of 11 years but the other results for the years 1894 and 1904 are practically the same. During the quiet-day hence the needle shows a decided tendency to a westerly elongation, while any easterly motion clearly connotes disturbed conditions.

512. In regard to the march of the absolute phenomenon from month to month, the annual variation does not seem to be specifically different when derived either from all-days or from quiet-days. Considering that the magnitudes of the differences (*vide* tables 476 and 478) are very small no definite conclusion in regard to them is justifiable, though even in this result, a tendency for the equinoctial months to exhibit somewhat larger differences than the solstitial months, is not altogether absent.

4.—Declination, Diurnal Variation.

513. The principal results of the quiet-day periodic variations are collected all together in tables 479 to 488.

The average variations of each year from 1894 to 1905 are shown in table 479, while in table 480 follow the excesses of the all-day variations over the corresponding quiet-day variations of each average year. The inequalities of the groups of summer months for each year and their corresponding differences from all-days appear in tables 481, 482; while similar inequalities for the winter group of months and their differences are shown in tables 483, 484.

In table 485 are collected the quiet-day inequalities for the average months derived from 11 years 1894 to 1904; in table 486 follow the differences from corresponding inequalities of all days; while in tables 487 and 488 are given the variations of the average months derived from groups of years of maximum spot and minimum spot respectively. The results shown in tables 479, 481, 483, 485, 487, 488, have been charted for reference in plates 91 and 92.

514. It will be readily noted that the phenomenon as generally presented by the difference tables giving the all-day less quiet-day results which indicate disturbance effects, are also very feebly pronounced; and uncertain as they are any generalisation is obviously hazardous. The examination of the results and the remarks below hence should be accepted with the necessary reservation.

The character of the real disturbance variation of declination as shown in Chapter X, plate 73, figure 12, third set, is clearly significant and large. The difference curve of all-day less quiet-day variation, which is charted in figure 12*a* in the same plate, though connoting practically the same phenomena, is derived by a different method of treatment of the data. It appears to be somewhat uncertain and small in magnitude, and is not in general agreement with the former, where the character approaches more nearly to the disturbance curve in H (inverted), while in the latter the effects of the second component appear to be much more pronouncedly mixed up.

As even the large storms have but a feeble influence at Colaba on the periodic curves of D or V any general discussion of the difference tables can scarcely be of any utility. The difference curve for the year 1894, which is the year of maximum magnetic activity, may however be examined. When analysed it shows that its first component is fairly the dominant one indicating the maximum epoch at 15 hours which is about the same time noted in the H results, but reversed in phase (see figure below). The co-efficients of analysis are $A = 0'{\cdot}07$ and $\mu = 262°$. The residuals however show that the second component is nearly as effective as the first, and the first component by itself fails to make up the whole difference curve as we have seen it almost does in the H element (see paragraph 489). Corroborative in one respect only as this result is, it fails to help us any further, and even this result cannot be traced in the curves of other years. To this we shall recur in paragraph 516.

515. It will be seen from tables 479 and 148 to 159 and 295 that the periodic ranges of all-day results do not on the average of 11 years, show any definite or appreciably marked difference from those of the quiet-day, the value of the former being $2'{\cdot}50$ and of the latter $2'{\cdot}57$, though in the year 1894 the figures stand respectively as $2'{\cdot}64$ and $2'{\cdot}83$ and in 1901 as $2'{\cdot}22$ and $2'{\cdot}30$. The examination of the aperiodic ranges hence may prove of some interest, but as the extraction of each day's range even for

TABLE 475.—*Showing the monthly and annual values of Declination derived from quiet-days selected by the Astronomer Royal and annual variation.*

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
1894 ...	40 42	40 11	40 2	39 17	39 3	38 59	38 54	39 12	39 26	39 20	39 6	38 40	39 24
1895 ...	38 28	38 13	37 54	37 26	37 22	36 58	36 42	36 24	36 23	36 15	36 28	36 2	37 3
1896 ...	35 34	35 29	35 14	34 50	35 25	34 33	34 29	34 17	34 58	34 50	34 12	33 56	34 49
1897 ...	33 44	33 25	33 42	33 30	33 10	32 33	32 33	31 55	31 56	31 46	31 19	31 21	32 34
1898 ...	30 56	30 48	30 50	30 7	29 31	29 51	29 31	29 24	29 10	29 6	28 39	27 53	29 39
1899 ...	27 49	27 36	27 21	26 55	26 41	26 46	26 27	25 52	25 42	26 3	25 43	25 16	26 31
1900 ...	25 49	25 59	25 14	24 54	24 44	24 20	24 16	24 18	23 52	23 40	23 38	23 20	24 30
1901 ...	22 51	22 41	22 7	22 7	22 10	21 57	21 44	21 35	21 17	21 12	21 20	21 1	21 50
1902 ...	20 43	20 42	20 26	20 15	19 59	19 19	19 12	18 56	18 54	18 33	18 2	17 52	19 24
1903 ...	18 54	18 21	18 34	17 49	17 10	17 5	17 45	17 39	17 9	17 10	17 0	16 34	17 36
1904 ...	16 44	16 30	16 41	16 8	15 32	15 27	15 41	15 4	14 40	14 37	14 18	14 34	15 30
1905 ...	14 7	14 2	14 6	14 22	14 9	14 25	13 34	14 1	13 45	13 50	13 22	13 19	13 55
Annual inequality corrected for progressive change (1894—1904) ...	+7	+6	+8	−6	−7	−12	−3	−5	+1	+8	+4	−1	...

TABLE 476.—*Differences in the absolute values of Declination, Astronomer Royal's quiet-days less all-days.*

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	− 2	− 22	− 10	− 12	− 13	− 8	− 8	− 10	− 4	+ 1	− 11	− 11	− 9
1895 ...	− 2	− 13	− 10	− 8	+ 6	− 4	− 4	− 1	− 4	− 5	− 7	− 4	− 5
1896 ...	− 11	− 8	− 11	− 13	+ 3	− 1	+ 1	− 1	− 15	+ 4	− 11	− 6	− 6
1897 ...	− 6	− 8	− 3	− 5	0	− 11	− 5	− 2	− 1	− 9	− 6	− 6	− 5
1898 ...	+ 4	− 1	− 14	− 1	− 12	+ 1	+ 2	− 3	− 11	+ 6	+ 3	+ 1	− 2
1899 ...	+ 2	− 8	+ 5	− 9	− 20	− 2	+ 7	− 10	+ 5	− 4	+ 5	− 1	− 2
1900 ...	− 3	+ 4	− 6	+ 3	− 9	− 6	− 11	+ 4	+ 11	− 2	0	+ 7	− 1
1901 ...	+ 2	− 7	− 3	− 9	+ 4	0	− 2	+ 2	− 2	− 1	+ 4	− 1	− 1
1902 ..	+ 1	+ 4	+ 1	+ 1	+ 7	− 4	− 3	+ 2	− 2	− 7	− 9	+ 1	− 1
1903 ...	+ 4	+ 8	+ 7	+ 2	+ 2	− 10	+ 5	+ 4	+ 6	− 8	0	− 6	+ 1
1904 ...	+ 1	+ 10	+ 11	+ 1	− 3	− 2	+ 10	− 6	− 4	− 7	− 3	− 5	0
1905 ...	− 10	− 7	0	− 2	+ 11	− 2	− 6	+ 2	− 11	+ 4	− 10	− 10	− 3
Mean, 1894—1904.	− 1	− 4	− 3	− 5	− 3	− 4	− 1	− 2	− 2	− 3	− 3	− 3	− 3

TABLE 477.—*Showing the monthly and annual values of Declination derived from quiet-days locally selected and annual variation.*

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
1894 ...	40 37	40 12	39 54	39 35	39 9	39 2	38 45	39 17	39 22	39 16	39 5	38 42	39 25
1895 ...	38 20	38 15	37 53	37 19	37 15	36 51	36 37	36 28	36 17	36 25	36 25	36 0	37 0
1896 ...	35 37	35 24	35 19	34 53	35 10	34 31	34 26	33 55	35 9	34 46	34 13	33 49	34 46
1897 ...	33 38	33 30	33 33	33 19	33 5	32 40	32 38	31 59	31 56	31 53	31 14	31 21	32 34
1898 ...	30 46	30 46	30 57	30 7	29 35	29 49	29 25	29 21	29 9	28 57	28 33	27 43	29 36
1899 ...	27 37	27 33	27 3	26 53	26 57	26 42	26 14	25 49	25 33	25 58	25 37	25 13	26 26
1900 ...	25 41	25 52	25 5	24 46	24 54	24 19	24 25	24 16	23 36	23 43	23 35	23 10	24 27
1901 ...	22 38	22 48	22 8	22 13	22 6	21 54	21 44	21 32	21 15	21 11	21 19	20 59	21 49
1902 ...	20 47	20 38	20 23	20 10	19 46	19 31	19 17	18 49	18 55	18 29	18 17	17 50	19 24
1903 ...	18 52	18 12	18 23	17 39	17 10	17 8	17 39	17 31	16 57	17 6	16 56	16 31	17 30
1904 ...	16 36	16 15	16 29	16 8	15 32	15 27	15 29	15 0	14 37	14 37	14 18	14 39	15 26
1905 ...	14 7	14 10	14 4	14 20	13 54	14 26	13 38	13 45	13 47	13 46	13 21	13 21	13 53

TABLE 478.—*Differences in the absolute values of Declination; locally selected quiet-days less all-days.*

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
	″	″	″	″	″	″	″	″	″	″	″	″	″
1894 ...	− 7	−21	−18	+ 5	− 7	− 4	−17	− 5	− 8	− 3	−12	−11	− 9
1895 ...	−10	−11	−11	−15	0	−11	− 9	+ 3	− 9	+ 5	−10	− 6	− 7
1896 ...	− 8	−13	− 6	−10	−12	− 3	− 2	−23	− 2	0	−10	−13	− 8
1897 ...	−12	− 3	−12	−16	− 5	− 4	0	+ 2	− 2	− 2	−11	− 6	− 6
1898 ...	− 6	− 3	− 7	0	− 8	− 1	− 4	− 6	−12	− 3	− 3	− 9	− 5
1899 ...	−10	−10	−13	−12	− 3	− 6	− 6	−13	+ 6	− 9	0	− 4	− 7
1900 ...	−11	− 3	−15	− 5	+ 1	− 7	− 2	+ 2	− 5	+ 1	− 3	− 6	− 4
1901 ...	−11	+ 1	− 2	− 3	0	− 3	− 2	0	− 3	− 2	+ 3	− 3	− 2
1902 ...	+ 4	0	− 2	− 4	− 6	+ 8	+ 2	− 5	− 1	−11	+ 6	− 2	− 1
1903 ...	+ 2	− 1	− 4	− 8	+ 2	− 7	− 1	− 4	− 6	−12	− 4	− 9	− 4
1904 ...	− 8	− 4	− 2	− 1	− 2	− 1	− 2	− 8	− 7	− 7	− 3	0	− 4
1905 ...	−10	+ 1	− 3	− 4	− 4	− 2	− 1	−14	− 9	0	−11	− 8	− 5
Means, 1894 to 1904 ...	− 7	− 6	− 8	− 6	− 4	− 3	− 4	− 6	− 5	− 4	− 5	− 6	− 5

TABLE 479.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for each average year 1894—1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean 1894—1904.
H. m.													
0 18	+0·13	+0·17	+0·15	+0·12	+0·07	+0·15	+0·10	+0·13	+0·08	+0 03	+0·05	+0·13	+0·11
1 18	+0·20	+0·23	+0·17	+0·15	+0·08	+0·18	+0·15	+0·13	+0·10	+0·07	+0·07	+0·15	+0·15
2 18	+0·20	+0·20	+0·15	+0·13	+0·08	+0·15	+0·13	+0·08	+0·07	+0·05	+0·07	+0·10	+0·12
3 18	+0·17	+0·15	+0·07	+0·08	+0·05	+0·13	+0·10	+0·03	+0·07	−0·02	0·00	+0·03	+0·07
4 18	+0·13	+0·10	+0·03	+0·03	0·00	+0·05	+0·03	−0·02	0·00	−0·05	−0·02	−0·03	+0·02
5 18	+0·23	+0-22	+0·10	+0·12	+0·08	+0·15	+0·07	+0·05	+0·10	+0·07	+0·08	+0·15	+0·12
6 18	+0·80	+0·77	+0·60	+0·50	+0·57	+0·58	+0·52	+0·42	+0·47	+0·58	+0·63	+0·73	+0·58
7 18	+1·25	+1·30	+1·02	+0·95	+0·98	+1·10	+0·95	+0·83	+0·93	+1·00	+1·22	+1·30	+1·05
8 18	**+1·38**	**+1·43**	**+1·15**	**+1·22**	**+1·13**	**+1·18**	**+1·13**	**+1·05**	**+1·13**	**+1·15**	**+1·43**	**+1·55**	**+1·22**
9 18	+0·90	+0·73	+0·73	+0·80	+0·68	+0·58	+0·73	+0·67	+0·80	+0·82	+0·87	+1·02	+0·75
10 18	+0·15	−0·20	+0·03	+0·15	+0·02	−0·20	−0·03	−0·13	+0·07	+0·18	+0·02	+0·17	+0·02
11 18	−0·87	−1·17	−0·88	−0·87	−0·83	−1·08	−0·97	−0 92	−0·88	−0·77	0·92	−0·97	−0·92
12 18	**−1·45**	**−1·62**	**−1·42**	**−1·32**	**−1·20**	**−1·48**	**−1·37**	**−1·25**	**−1·25**	**−1·22**	**−1·30**	**−1·53**	**−1·35**
13 18	−1·33	−1·33	−1·32	−1·12	−0·97	−1·17	−1·13	−1·05	−1·08	−1·07	−1·08	−1·48	−1·15
14 18	−0·90	−0·75	−0·77	−0·63	−0·53	−0·52	−0·62	−0·60	−0·68	−0·72	−0·60	−0·95	−0·67
15 18	−0·38	−0·15	−0·07	−0·12	−0·10	+0·02	−0·10	−0·10	−0·17	−0·13	−0·08	−0·33	−0·12
16 18	−0·05	+0·27	+0·30	+0·20	+0·22	+0·30	+0·28	+0·23	+0·17	+0·23	+0·23	+0·12	+0·22
17 18	+0·02	+0·15	+0·18	+0·08	+0·15	+0·22	+0·27	+0·20	+0·18	+0·22	+0·18	+0·15	+0·17
18 18	−0·12	−0·07	+0·02	−0·07	+0·03	+0·05	+0·05	+0·08	+0·07	+0·02	0·00	+0·05	0·00
19 18	−0·20	−0·15	−0·10	−0·15	−0·12	−0·08	−0·12	−0·03	−0·05	−0·10	−0·15	−0·03	−0·12
20 18	−0·17	−0·15	−0·12	−0·18	−0·18	−0·17	−0·13	−0·05	−0·08	−0·13	−0·18	−0·05	−0·13
21 18	−0·17	−0·10	−0·08	−0·15	−0·17	−0·03	−0·10	−0·02	−0·05	−0·12	−0·15	−0·12	−0·10
22 18	−0·10	−0·03	+0·02	−0·07	−0·08	+0·03	−0·02	+0·05	+0·02	−0·05	−0·10	0·00	−0·03
23 18	+0·03	+0·08	+0·08	+0·05	0·00	+0·08	+0·05	+0·08	+0·07	+0·02	−0·02	+0·08	+0·05
Range...	2·83	3·05	2·57	2·54	2·33	2·66	2·50	2·30	2·38	2·37	2·73	3·08	2·57

TABLE 480.—*Showing the excess Diurnal Inequality of Declination (all-days less quiet-days) for each average year 1894—1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean 1894—1904.
H. m.													
0 18	+0·04	+0·01	+0·05	+0·08	+0·08	+0·02	+0·05	−0·01	+0·02	+0·09	+0·02	0·00	**+0·04**
1 18	+0·02	−0·01	+0·06	+0·08	**+0·12**	0·00	+0·02	0·00	+0·02	+0·06	+0·05	+0·02	+0·04
2 18	0·00	0·00	+0·07	+0·07	+0·07	+0·02	+0·02	+0·04	+0·03	+0·07	+0·03	+0·03	+0·04
3 18	−0·05	0·00	+0·10	+0·05	+0·05	−0·05	−0·02	+0.04	−0·04	+0·07	+0·03	+0·02	+0·02
4 18	−0·06	−0·02	+0·09	+0·05	+0·05	−0·02	0·00	+0·04	−0·02	+0·05	+0·02	+0·03	+0·02
5 18	−0·08	−0·02	+0·07	+0·01	+0·02	−0·05	+0·03	0·00	−0·07	+0·01	+0·02	−0·05	−0·01
6 18	**−0·12**	−0·02	+0·02	+0·03	−0·04	−0·06	−0·04	0·00	−0·04	−0·06	0·00	−0·03	−0·03
7 18	−0·10	−0·05	−0·04	0·00	−0·03	**−0·15**	−0·03	0·00	−0·03	−0·05	−0·09	−0·10	−0·05
8 18	−0·11	−0·08	−0·07	−0·09	−0·10	−0·10	−0·05	−0·03	0·00	−0·03	**−0·18**	**−0·15**	**−0·08**
9 18	−0·03	+0·02	−0·10	−0·10	−0·11	−0·01	−0·06	0·00	0·00	−0·10	−0·17	−0·04	−0·06
10 18	−0·03	**+0·07**	**−0·13**	**−0·13**	−0·12	+0·07	−0·04	**+0·16**	−0·02	−0·15	−0·14	+0 06	−0·05
11 18	+0·02	+0·04	−0·12	0·00	**−0·14**	+0·08	0·00	+0·12	+0·03	−0·15	−0·13	**+0·10**	−0·02
12 18	+0·08	+0·05	0·00	+0·04	−0·13	**+0·11**	+0·07	+0·05	+0·03	**−0·18**	−0·13	+0·06	0·00
13 18	+0·11	+0·01	**+0·10**	**+0·12**	−0.06	+0·05	**+0·08**	+0·07	**+0·03**	−0·15	−0·09	+0·10	+0·02
14 18	**+0·15**	−0·03	+0·10	−0·04	0·00	−0·05	+0·04	+0·05	**+0·10**	−0·01	−0·03	+0·03	+0·03
15 18	+0·11	−0·03	−0·05	−0·05	+00·7	−0·05	+0·02	0·00	+0·04	−0·05	+0·03	0·00	0·00
16 18	+0·07	**−0·09**	−0·13	−0·07	+0·01	−0·03	−0·03	−0·05	+0·01	−0·01	+0·04	−0·07	−0·03
17 18	−0·04	−0·07	−0·08	−0·03	+0·02	−0·04	**−0·07**	−0·05	−0·03	+0·06	+0·04	−0·08	−0·03
18 18	−0·01	+0·02	−0·02	−0·01	0·00	−0·03	−0·03	−0·06	**−0·07**	**+0·10**	+0·05	−0 08	−0·01
19 18	+0·02	+0·03	0·00	−0·02	0·00	0·00	+0·02	−0·07	−0·05	+0·05	+0·08	−0·05	+0·01
20 18	+0·02	+0·03	0·00	+0·03	+0·03	+0·05	0·00	**−0·08**	−0·02	+0·06	**+0·11**	−0·02	+0·02
21 18	+0·05	0·00	0 00	+0·05	+0·07	−0·04	+0·03	−0·05	0·00	+0·10	+0·05	+0·05	+0·02
22 18	+0·07	+0·03	0 00	+0·07	+0·08	0·00	+0·04	−0·07	0·00	+0·08	+0·07	0·00	+0·03
23 18	+0·05	+0·04	+0·04	+0·07	+0·10	+0·02	+0·05	−0·01	0·00	+0·06	+0·05	0·00	+0·04
Range...	0·27	0·16	0·23	0·25	0·26	0·26	0·15	0·24	·017	0·28	0·29	0·25	0·12

TABLE 481.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Years.												Mean 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 18	+0·10	+0·18	+0·17	+0·13	+0·08	+0·18	+0·18	+0·18	+0·12	+0·07	+0·07	+0·12	+0·13
1 18	+0·23	+0·27	+0·27	+0·22	+0·12	+0·25	+0·23	+0·23	+0·15	+0·15	+0·13	+0·18	+0·22
2 18	+0·27	+0·22	+0·32	+0·23	+0·18	+0·28	+0·23	+0·23	+0·17	+0·17	+0·15	+0·17	+0·22
3 18	+0·32	+0·25	+0·25	+0·25	+0·18	+0·25	+0·22	+0·23	+0·17	+0·17	+0·13	+0·15	+0·22
4 18	+0·38	+0·32	+0·28	+0·25	+0·20	+0·28	+0·23	+0·22	+0·18	+0·20	+0·18	+0·18	+0·25
5 18	+0·72	+0·67	+0·55	+0·48	+0·47	+0·52	+0·33	+0·42	+0·38	+0·50	+0·47	+0·53	+0·50
6 18	+1·90	+1·85	+1·48	+1·27	+1·48	+1·33	+1·25	+1·20	+1·20	+1·53	+1·45	+1·70	+1·45
7 18	**+2·58**	**+2·58**	**+2·15**	**+1·88**	**+2·18**	**+1·98**	**+1·88**	**+1·90**	**+1·97**	**+2·10**	**+2·33**	**+2·47**	**+2·15**
8 18	+2·23	+2·35	+1·95	+1·85	+1·98	+1·73	+1·73	+1·83	+1·95	+1·87	+2·30	+2·30	+1·98
9 18	+0·92	+0·83	+0·95	+1·10	+0·92	+0·58	+0·80	+0·82	+1·00	+0·90	+1·08	+1·03	+0·90
10 18	−0·35	−0·67	−0·17	+0·02	−0·13	−0·52	−0·30	−0·62	−0·20	−0·25	−0·33	−0·33	−0·32
11 18	−1·58	−1·87	−1·37	−1·20	−1·30	−1·62	−1·45	−1·63	−1·42	−1·53	−1·52	−1·67	−1·50
12 18	**−2·30**	**−2·53**	**−2·15**	**−1·85**	**−1·97**	**−2·22**	**−2·03**	**−2·15**	**−1·93**	**−2·12**	**−2·10**	**−2·37**	**−2·12**
13 18	−2·13	−2·32	−2·15	−1·78	−1·92	−1·95	−1·83	−1·93	−1·82	−1·92	−1·98	−2·33	−1·98
14 18	−1·55	−1·50	−1·38	−1·22	−1·30	−1·13	−1·22	−1·22	−1·23	−1·35	−1·35	−1·68	−1·32
15 18	−0·73	−0·55	−0·43	−0·62	−0·60	−0·30	−0·47	−0·35	−0·40	−0·43	−0·52	−0·73	−0·48
16 18	−0·07	+0·22	+0·17	−0·07	+0·03	+0·23	+0·22	+0·30	+0·07	+0·23	+0·12	+0·07	+0·13
17 18	+0·20	+0·40	+0·25	+0·07	+0·17	+0·35	+0·38	+0·33	+0·17	+0·37	+0·32	+0·43	+0·27
18 18	+0·03	+0·07	−0·02	−0·08	+0·03	+0·05	+0·05	+0·08	−0·02	+0·03	+0·08	+0·27	+0·03
19 18	−0·37	−0·27	−0·33	−0·33	−0·20	−0·18	−0·22	−0·10	−0·18	−0·23	−0·27	−0·10	−0·25
20 18	−0·38	−0·33	−0·35	−0·33	−0·27	−0·18	−0·23	−0·12	−0·20	−0·27	−0·30	−0·20	−0·27
21 18	−0·28	−0·22	−0·25	−0·25	−0·22	−0·12	−0·17	−0·05	−0·12	−0·18	−0·23	−0·28	−0·18
22 18	−0·15	−0·08	−0·10	−0·12	−0·13	0·00	−0·02	+0·05	−0·02	−0·07	−0·13	−0·03	−0·07
23 18	−0·03	+0·05	+0·03	+0·03	−0·02	+0·08	+0·08	+0·12	+0·07	0·00	−0·05	+0·05	+0·03
Range ...	4·88	5·11	4·30	3·73	4·15	4·20	3·91	4·05	3·90	4·22	4·43	4·84	4·27

TABLE 482.—*Showing the excess Diurnal Inequality of Declination (all-days less quiet-days) for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc

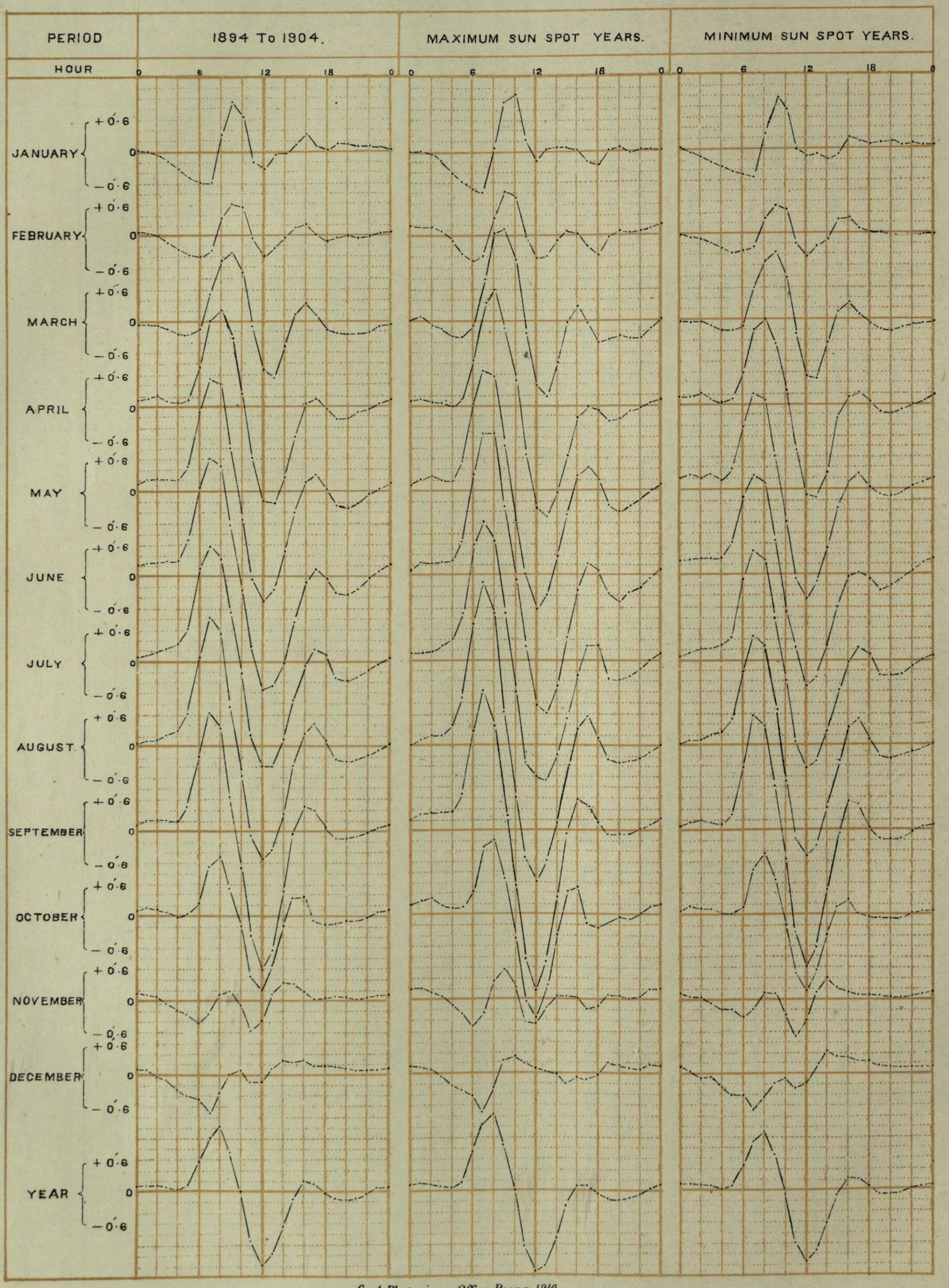
Bombay Civil Time.	Years.											Mean 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	
H. m.												
0 18	+0·02	+0·02	+0·01	+0·07	+0·07	0·00	0·00	−0·01	0·00	+0·05	0·00	+0·02
1 18	−0·03	+0·05	+0·03	+0·08	**+0·18**	+0·02	0·00	0·00	+0·02	+0·03	+0·04	+0·04
2 18	−0·04	**+0·10**	+0·01	+0·10	+0·10	+0·02	+0·02	+0·02	+0·01	+0·05	+0·07	+0·04
3 18	−0·07	+0·08	+0·10	+0·07	+0·12	+0·02	+0·03	+0·02	0·00	+0·06	+0·09	+0·05
4 18	−0·05	+0·08	+0·09	+0·08	+0·13	+0·02	+0·02	+0·05	0·00	+0·05	+0·05	**+0·05**
5 18	−0·09	+0·05	+0·08	+0·07	+0·06	0·00	**+0·12**	+0·01	−0·01	0·00	+0·05	+0·03
6 18	**−0·12**	+0·05	+0·07	+0·16	−0·01	0·00	+0·02	−0·03	−0·02	−0·06	**+0·13**	+0·02
7 18	−0·08	0·00	+0·03	**+0·19**	−0·06	−0·03	+0·04	−0·05	−0·05	+0·02	+0·04	0·00
8 18	−0·01	−0·15	−0·03	+0·07	−0·10	+0·07	+0·05	−0·05	−0·03	**+0·08**	**−0·15**	−0·02
9 18	**+0·11**	0·00	−0·10	**−0·15**	−0·07	+0·19	+0·05	+0·08	+0·03	0·00	−0·11	0·00
10 18	+0·08	+0·09	−0·13	−0·14	−0·07	**+0·25**	+0·08	**+0·35**	+0·03	−0·05	−0·07	+0·04
11 18	+0·06	+0·04	−0·11	−0·10	−0·13	+0·24	+0·05	+0·26	+0·05	−0·02	−0·11	+0·02
12 18	+0·05	+0·05	+0·02	−0·12	**−0·15**	+0·20	+0·06	+0·17	−0·02	−0·10	−0·15	0·00
13 18	−0·05	+0·07	**+0·15**	−0·07	−0·01	+0·10	+0·05	+0·11	+0·02	**−0·13**	−0·10	+0·01
14 18	+0·05	0·00	+0·06	−0·06	+0·03	−0·09	+0·02	+0·02	**+0·08**	−0·02	−0·05	0·00
15 18	+0·05	−0·05	−0·09	+0·02	+0·10	−0·15	0·00	−0·10	−0·02	−0·07	−0·01	−0·03
16 18	+0·02	−0·14	**−0·15**	−0·01	−0·01	−0·16	−0·10	**−0·22**	+0·05	−0·08	+0·03	−0·07
17 18	−0·03	**−0·20**	−0·13	−0·05	−0·02	**−0·18**	**−0·15**	−0·16	+0·01	−0·02	−0·02	**−0·09**
18 18	−0·01	−0·09	−0·05	−0·09	−0·08	−0·12	−0·08	−0·10	−0·05	+0·05	+0·02	−0·05
19 18	+0·05	−0·03	0·00	−0·05	−0·10	−0·07	−0·05	−0·10	**−0·07**	+0·05	+0·07	−0·03
20 18	+0·08	+0·03	0·00	−0·04	−0·05	−0·09	−0·07	−0·13	−0·03	+0·04	+0·02	−0·02
21 18	+0·03	0·00	−0·02	0·00	−0·03	−0·06	−0·03	−0·08	−0·05	+0·05	+0·01	−0·02
22 18	+0·02	−0·02	0·00	+0·04	+0·03	−0·03	−0·03	−0·08	−0·01	+0·04	+0·01	0·00
23 18	+0·01	+0·02	0·00	+0·04	+0·07	0·00	0·00	−0·04	−0·02	+0·03	+0·05	+0·01
Range ...	0·23	0·30	0·30	0·34	0·33	0·43	0·27	0·57	0·15	0·21	0·28	0·14

COLABA OBSERVATORY

Declination Diurnal Inequality (Magnetograph)

(Quiet days)

Plate 91.



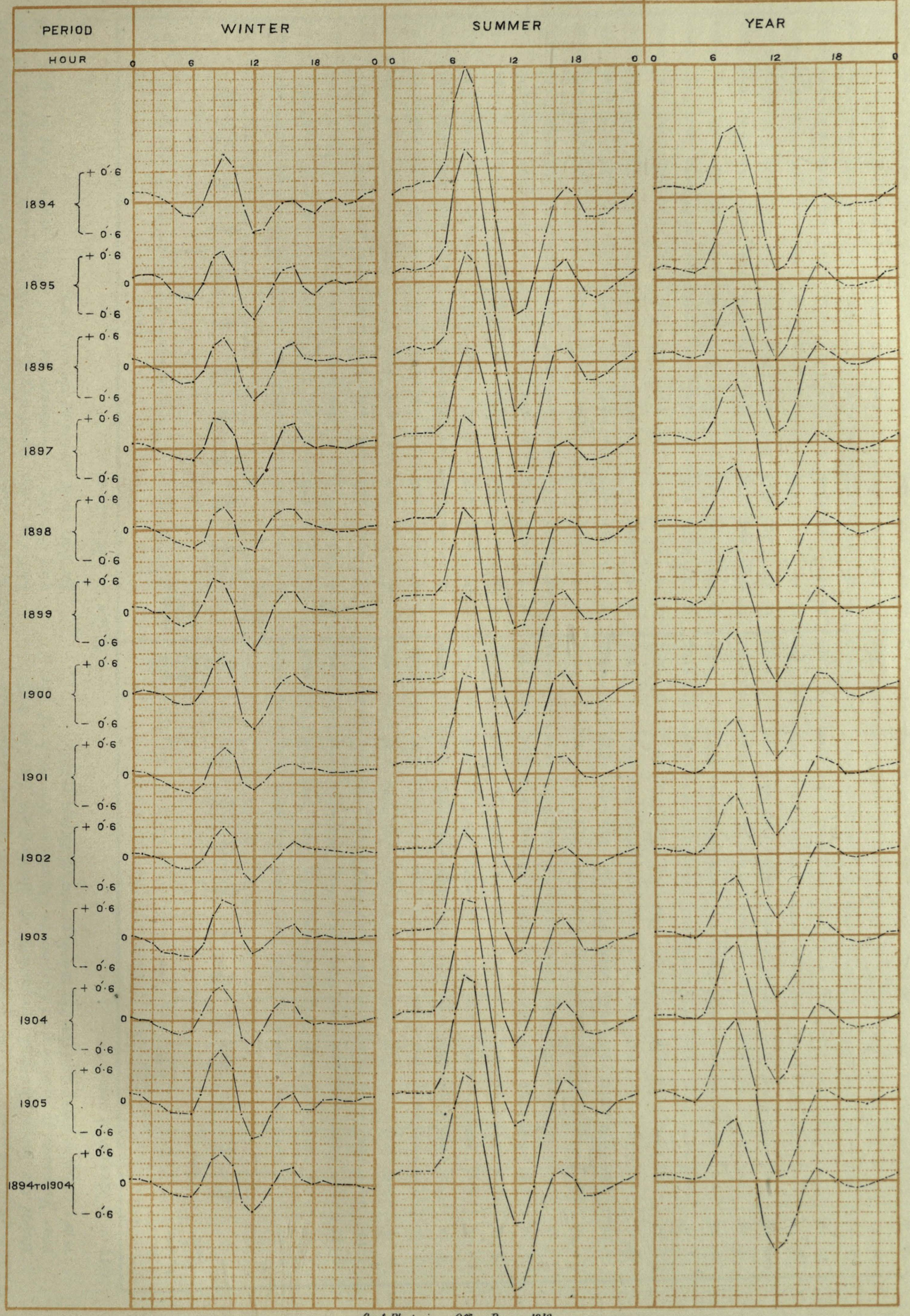
Govt. Photozinco. Office, Poona. 1910.

COLABA OBSERVATORY

Declination Diurnal Inequality (Magnetograph)

(Quiet days.)

Plate 92.



Gov.t Photozinco: Office, Poona. 1910.

TABLE 483.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Years.												Mean 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 18	+0·18	+0·13	+0·13	+0·12	+0·05	+0·10	0·00	+0·08	+0·07	+0·02	+0·03	+0·13	+0·08
1 18	+0·18	+0·18	+0·07	+0·08	+0·05	+0·08	+0·07	+0·03	+0·05	0·00	0·00	+0·10	+0·08
2 18	+0·13	+0·18	−0·03	+0·02	0·00	+0·02	+0·02	−0·05	0·00	−0·10	−0·03	−0·02	+0·02
3 18	+0·05	+0·07	−0·10	−0·10	−0·10	−0·02	−0·02	−0·15	−0·07	−0·23	−0·15	−0·08	−0·08
4 18	−0·08	−0·13	−0·23	−0·18	−0·20	−0·18	−0·17	−0·25	−0·18	−0·30	−0·23	−0·23	−0·20
5 18	−0·23	−0·27	−0·33	−0·22	−0·30	−0·25	−0·22	−0·32	−0·22	−0·35	−0·30	−0·25	−0·27
6 18	−0·28	−0·30	−0·30	−0·27	−0·35	−0·18	−0·20	**−0·35**	−0·23	**−0·38**	−0·22	−0·27	−0·28
7 18	−0·05	0·00	−0·12	0·00	−0·22	+0·20	+0·03	−0·20	−0·08	−0·12	+0·08	+0·12	−0·05
8 18	+0·52	+0·52	+0·35	**+0·58**	+0·30	**+0·62**	+0·57	+0·28	+0·33	+0·45	+0·53	+0·78	+0·45
9 18	**+0·90**	**+0·62**	**+0·52**	+0·52	**+0·43**	+0·55	**+0·68**	**+0·52**	**+0·58**	**+0·72**	**+0·63**	**+1·00**	**+0·60**
10 18	+0·67	+0·27	+0·23	+0·27	+0·17	+0·08	+0·22	+0·37	+0·35	+0·63	+0·33	+0·63	+0·33
11 18	−0·13	−0·47	−0·42	−0·53	−0·37	−0·57	−0·50	−0·18	−0·35	+0·02	−0·35	−0·28	−0·35
12 18	**−0·60**	**−0·72**	**−0·70**	**−0·77**	**−0·43**	**−0·77**	**−0·70**	−0·32	**−0·55**	−0·32	**−0·53**	**−0·72**	**−0·58**
13 18	−0·53	−0·35	−0·50	−0·45	−0·03	−0·42	−0·43	−0·15	−0·35	−0·20	−0·20	−0·63	−0·33
14 18	−0·25	−0·02	−0·15	−0·02	+0·23	+0·08	0·00	+0·05	−0·13	−0·05	+0·13	−0·22	−0·02
15 18	−0·05	+0·23	+0·30	+0·40	+0·38	+0·32	+0·23	+0·17	+0·10	+0·15	+0·35	+0·03	+0·25
16 18	0·00	+0·32	+0·42	+0·47	+0·38	+0·35	+0·33	+0·18	+0·25	+0·25	+0·33	+0·15	+0·30
17 18	−0·18	−0·08	+0·12	+0·12	+0·12	+0·07	+0·15	+0·07	+0·18	+0·05	+0·02	−0·17	+0·05
18 18	−0·25	−0·23	+0·07	−0·02	+0·03	+0·02	+0·05	+0·07	+0·12	0·00	−0·10	−0·17	−0·03
19 18	−0·03	−0·02	+0·10	+0·02	−0·02	+0·02	0·00	+0·05	+0·10	+0·02	−0·07	+0·02	+0·02
20 18	+0·03	+0·03	+0·12	0·00	−0·08	0·00	−0·03	+0·03	+0·07	0·00	−0·08	+0·05	0·00
21 18	−0·05	−0·02	+0·07	−0·02	−0·08	+0·02	−0·03	+0·03	+0·05	−0·02	−0·08	+0·02	−0·02
22 18	−0·02	0·00	+0·12	+0·02	−0·05	+0·05	−0·02	+0·05	+0·03	−0·02	−0·08	+0·02	0·00
23 18	+0·10	+0·13	+0·12	+0·08	+0·02	+0·08	+0·02	+0·08	+0·08	+0·02	−0·02	+0·10	+0·07
Range ...	1·50	1·34	1·22	1·35	0·86	1·39	1·38	0·87	1·13	1·10	1·16	1·72	1·18

TABLE 484.—*Showing the excess Diurnal Inequality of Declination (all-days less quiet-days) for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Years.												Mean 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.		
H. m.													
0 18	+0·05	+0·04	+0·07	+0·06	+0·10	+0·03	**+0·12**	−0·03	+0·01	+0·08	+0·04		+0·05
1 18	+0·04	−0·08	+0·10	+0·07	+0·03	+0·04	+0·03	0·00	+0·02	+0·08	+0·05		+0·03
2 18	+0·05	−0·11	+0·13	+0·06	+0·02	+0·03	+0·01	+0·02	0·00	+0·12	+0·01		+0·03
3 18	−0·07	**−0·12**	+0·08	+0·03	0·00	−0·08	−0·06	+0·02	−0·01	+0·10	+0·02		−0·01
4 18	−0·12	−0·09	+0·08	0·00	−0·05	−0·04	0·00	+0·02	−0·04	+0·03	0·00		−0·02
5 18	−0·12	−0·06	+0·03	−0·06	−0·02	−0·07	−0·03	0·00	−0·06	0·00	−0·02		−0·04
6 18	−0·12	−0·08	−0·03	−0·10	−0·03	−0·12	−0·10	0·00	**−0·09**	−0·04	−0·08		−0·07
7 18	−0·15	−0·08	−0·08	−0·15	−0·01	−0·23	−0·10	+0·02	−0·04	−0·08	−0·16		−0·10
8 18	−0·19	−0·02	−0·10	**−0·23**	−0·10	**−0·25**	−0·19	−0·03	+0·04	−0·15	**−0·18**		**−0·13**
9 18	**−0·22**	+0·05	−0·12	−0·07	−0·15	−0·20	−0·21	−0·07	−0·01	−0·19	−0·18		−0·12
10 18	−0·15	+0·05	**−0·13**	−0·10	**−0·17**	−0·08	**−0·27**	+0·05	−0·07	−0·26	−0·15		−0·12
11 18	−0·05	+0·04	−0·11	+0·10	−0·13	−0·05	−0·02	−0·05	+0·02	**−0·29**	−0·10		−0·06
12 18	+0·13	+0·07	0·00	**+0·17**	−0·12	+0·05	+0·07	**−0·10**	+0·05	−0·26	−0·07		0·00
13 18	**+0·28**	−0·05	+0·08	+0·08	−0·12	+0·05	+0·11	0·00	+0·07	−0·18	−0·05		+0·02
14 18	+0·25	−0·05	**+0·15**	−0·01	−0·05	−0·01	+0·05	+0·03	**+0·11**	−0·03	0·00		+0·04
15 18	+0·20	0·00	−0·02	−0·13	+0·05	+0·06	+0·07	+0·06	+0·05	0·00	+0·07		+0·04
16 18	+0·08	−0·04	−0·12	−0·14	+0·09	+0·12	+0·04	**+0·10**	0·00	+0·03	+0·07		+0·02
17 18	−0·04	+0·05	−0·05	−0·04	+0·06	**+0·15**	+0·02	+0·05	−0·05	**+0·15**	+0·10		+0·04
18 18	−0·05	**+0·13**	0·00	+0·04	+0·09	+0·10	+0·03	−0·02	−0·05	+0·15	+0·12		+0·05
19 18	−0·04	+0·09	+0·02	+0·03	+0·09	+0·06	+0·05	−0·05	−0·05	+0·08	**+0·14**		+0·04
20 18	−0·03	+0·02	0·00	+0·05	+0·10	+0·03	+0·08	−0·05	−0·02	+0·10	+0·13		+0·05
21 18	+0·05	+0·05	+0·05	+0·09	+0·11	+0·05	+0·08	−0·03	0·00	+0·12	+0·10		+0·06
22 18	+0·07	+0·10	+0·03	+0·08	**+0·13**	+0·05	+0·10	−0·05	+0·02	+0·12	+0·11		**+0·07**
23 18	+0·08	+0·05	+0·08	+0·07	+0·11	+0·04	+0·10	−0·03	0·00	+0·11	+0·10		+0·06
Range ...	0·50	0·25	0·28	0·40	0·30	0·40	0·39	0·20	0·20	0·44	0·32		0·20

TABLE 485.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for each average month of the period 1894—1904 and for the average year.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+0·05	+0·07	−0·02	+0·16	+0·16	+0·22	+0·08	+0·05	+0·17	+0·13	+0·16	+0·11	+0·11
1 18	+0·01	+0·03	−0·01	+0·20	+0·23	+0·29	+0·14	+0·14	+0·24	+0·20	+0·12	+0·10	+0·14
2 18	−0·04	0·00	−0·06	+0·23	+0·25	+0·30	+0·20	+0·18	+0·25	+0·15	+0·08	−0·01	+0·13
3 18	−0·16	−0·11	−0·12	+0·13	+0·22	+0·32	+0·23	+0·24	+0·22	+0·06	−0·02	−0·08	+0·08
4 18	−0·31	−0·23	−0·21	+0·08	+0·22	+0·33	+0·34	+0·32	+0·23	−0·01	−0·16	−0·27	+0·02
5 18	−0·47	−0·35	−0·23	+0·17	+0·48	+0·69	+0·65	+0·62	+0·47	+0·02	−0·23	−0·38	+0·12
6 18	−0·56	−0·37	−0·14	+0·75	+1·51	+1·67	+1·76	+1·66	+1·42	+0·25	−0·40	−0·42	+0·59
7 18	**−0·56**	−0·26	+0·53	+1·63	**+2·15**	**+2·21**	**+2·19**	**+2·44**	**+2·27**	+0·92	−0·24	**−0·67**	+1·05
8 18	+0·34	+0·34	+1·14	**+1·84**	+2·03	+2·06	+1·93	+2·14	+1·98	**+1·11**	+0·14	−0·32	**+1·23**
9 18	**+0·95**	**+0·63**	**+1·28**	+1·29	+0·83	+0·99	+0·94	+0·78	+0·67	+0·55	+0·21	+0·02	+0·76
10 18	+0·65	+0·54	+0·91	+0·27	−0·51	−0·25	−0·21	−0·58	−0·66	−0·17	−0·08	+0·10	0·00
11 18	−0·19	−0·05	−0·08	−0·95	−1·63	−1·33	−1·36	−1·67	−1·98	−1·11	**−0·55**	−0·13	−0·92
12 18	−0·32	**−0·41**	−0·91	−1·75	**−2·10**	**−2·12**	−1·95	**−2·13**	**−2·61**	**−1·39**	−0·35	−0·12	**−1·35**
13 18	−0·03	−0·22	**−1·01**	**−1·80**	−1·83	−2·07	**−1·97**	−1·93	−2·20	−0·89	+0·12	+0·16	−1·14
14 18	−0·01	−0·05	−0·48	−1·34	−1·12	−1·60	−1·44	−1·23	−1·09	−0·17	**+0·36**	**+0·31**	−0·65
15 18	+0·13	+0·17	+0·13	−0·58	−0·39	−0·82	−0·72	−0·36	−0·02	+0·37	+0·31	+0·28	−0·12
16 18	+0·33	+0·22	+0·35	+0·06	+0·19	−0·11	−0·08	+0·26	+0·51	+0·37	+0·18	+0·30	+0·21
17 18	+0·10	+0·03	+0·12	+0·17	+0·30	+0·13	+0·23	+0·43	+0·43	−0·07	+0·02	+0·19	+0·18
18 18	+0·02	−0·11	−0·16	−0·03	+0·02	−0·03	+0·12	+0·11	+0·08	−0·14	+0·05	+0·20	+0·01
19 18	+0·11	−0·01	−0·22	−0·23	−0·25	−0·32	−0·31	−0·21	−0·11	−0·13	+0·09	+0·20	−0·12
20 18	+0·11	+0·01	−0·23	−0·24	−0·27	−0·35	−0·35	−0·28	−0·12	−0·06	+0·07	+0·16	−0·13
21 18	+0·07	−0·02	−0·22	−0·13	−0·20	−0·22	−0·28	−0·22	−0·09	−0·07	+0·02	+0·09	−0·11
22 18	+0·09	+0·01	−0·19	−0·02	−0·03	−0·02	−0·14	−0·16	0·00	0·00	+0·05	+0·09	−0·03
23 18	+0·08	+0·05	−0·07	+0·07	+0·07	+0·09	−0·02	−0·06	+0·09	+0·08	+0·15	+0·11	+0·06
Range ...	1·51	1·04	2·29	3·64	4·25	4·33	4·16	4·57	4·88	2·50	0·91	0·98	2·58

TABLE 486.—*Showing the excess Diurnal Inequality of Declination (all-days less quiet-days) for each average month of the period 1894—1904 and for the average year.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m													
0 18	+0·05	+0·05	+0·10	+0·04	+0·04	−0·02	0·00	+0·02	+0·01	+0·07	+0·04	+0·02	**+0·04**
1 18	+0·04	+0·07	+0·06	+0·05	+0·04	+0·03	+0·04	+0·03	+0·01	0·00	+0·03	0·00	+0·03
2 18	+0·02	+0·05	+0·08	0·00	+0·03	+0·03	+0·07	+0·05	−0·02	+0·02	0·00	+0·01	+0·02
3 18	−0·01	+0·03	+0·04	0·00	+0·05	+0·03	+0·10	+0·04	+0·01	−0·03	−0·03	−0·07	0·00
4 18	−0·02	0·00	+0·04	−0·01	**+0·13**	+0·05	+0·08	+0·06	+0·02	−0·04	−0·04	−0·03	+0·01
5 18	−0·05	−0·02	+0·05	**−0·09**	+0·04	+0·04	**+0·10**	+0·08	−0·05	−0·10	−0·07	−0·05	0·00
6 18	−0·06	−0·10	+0·07	−0·02	+0·01	+0·05	−0·03	**+0·12**	**−0·10**	−0·18	−0·08	**−0·15**	−0·04
7 18	−0·02	−0·12	+0·04	−0·05	+0·03	+0·01	+0·03	+0·03	−0·05	**−0·22**	−0·16	−0·11	−0·05
8 18	−0·16	**−0·19**	−0·02	−0·07	−0·03	−0·06	+0·02	−0·06	−0·05	−0·18	−0·17	−0·03	**−0·08**
9 18	−0·17	−0·18	−0·13	−0·06	0·00	+0·03	+0·04	−0·08	+0·01	−0·08	**−0·19**	+0·01	−0·06
10 18	**−0·20**	−0·14	**−0·19**	+0·01	+0·03	**+0·13**	+0·08	−0·07	**+0·06**	−0·03	−0·07	−0·07	−0·04
11 18	−0·11	−0·13	−0·17	−0·03	+0·08	+0·01	+0·04	−0·10	+0·01	+0·04	+0·03	−0·02	−0·03
12 18	−0·10	−0·04	−0·11	−0·02	−0·03	+0·07	0·00	−0·09	−0·01	**+0·11**	+0·08	+0·05	0·00
13 18	−0·05	−0·03	−0·11	+0·08	−0·07	+0·07	+0·04	**−0·14**	+0·03	+0·07	**+0·11**	+0·04	+0·01
14 18	+0·06	**+0·13**	−0·09	**+0·17**	−0·10	+0·07	−0·03	−0·12	−0·01	+0·02	+0·09	+0·01	+0·02
15 18	**+0·07**	+0·13	−0·05	+0·11	−0·11	−0·08	−0·05	−0·09	−0·03	−0·02	+0·06	+0·04	−0·01
16 18	−0·01	+0·11	−0·08	−0·01	**−0·16**	**−0·16**	−0·09	−0·04	+0·01	+0·05	+0·07	+0·05	−0·01
17 18	+0·03	+0·07	−0·09	−0·05	−0·12	−0·16	**−0·15**	−0·03	−0·05	+0·09	+0·03	+0·04	−0·05
18 18	+0·06	+0·08	−0·04	−0·07	−0·05	−0·09	−0·10	−0·04	−0·06	+0·09	+0·05	+0·05	−0·01
19 18	+0·06	+0·09	+0·02	−0·05	−0·05	−0·05	−0·04	−0·06	+0·03	+0·08	+0·01	+0·03	0·00
20 18	+0·04	+0·04	+0·08	+0·01	−0·05	−0·02	−0·03	−0·05	0·00	+0·03	+0·01	+0·02	+0·01
21 18	+0·05	+0·07	**+0·14**	0·00	−0·02	−0·05	−0·04	−0·05	+0·04	+0·07	+0·05	**+0·06**	+0·03
22 18	+0·03	+0·07	+0·14	+0·02	−0·02	−0·05	−0·04	−0·01	+0·02	+0·08	+0·07	+0·06	+0·03
23 18	+0·04	+0·08	+0·10	+0·05	+0·03	−0·01	−0·03	+0·03	+0·01	+0·10	+0·03	+0·04	+0·04
Range ...	0·27	0·32	0·33	0·26	0·29	0·29	0·25	0·26	0·16	0·33	0·30	0·21	0·12

TABLE 487.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for each average month and year of the maximum sun-spot years 1894, 1895 and 1905.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+0·02	+0·22	+0·02	+0·14	+0·12	+0·12	+0·15	+0·01	+0·23	+0·23	+0·22	+0·17	+0·14
1 18	+0·02	+0·19	+0·09	+0·17	+0·25	+0·28	+0·19	+0·11	+0·33	+0·28	+0·22	+0·14	+0·19
2 18	0·00	+0·20	−0·08	+0·10	+0·30	+0·23	+0·20	+0·21	+0·37	+0·32	+0·16	+0·07	+0·17
3 18	−0·16	+0·11	−0·14	+0·07	+0·21	+0·26	+0·31	+0·21	+0·37	+0·20	+0·06	−0·03	+0·12
4 18	−0·39	−0·09	−0·28	+0·01	+0·21	+0·30	+0·42	+0·41	+0·40	+0·13	−0·10	−0·22	+0·07
5 18	−0·55	−0·32	−0·28	+0·15	+0·55	+0·67	+0·93	+0·91	+0·70	+0·17	−0·26	−0·29	+0·20
6 18	−0·71	**−0·47**	−0·08	+0·88	+1·66	+1·91	+2·21	+2·34	+1·90	+0·45	**−0·49**	−0·39	+0·77
7 18	**−0·77**	−0·37	+0·82	+1·96	**+2·29**	**+2·68**	**+2·62**	**+3·08**	**+2·63**	+1·29	−0·22	**−0·71**	+1·27
8 18	+0·10	+0·37	+1·63	**+2·22**	+2·20	+2·68	+2·29	+2·53	+1·97	**+1·44**	+0·38	−0·24	**+1·46**
9 18	+0·95	**+0·85**	**+1·73**	+1·49	+0·85	+1·32	+0·94	+0·67	0+·30	+0·68	**+0·59**	+0·26	+0·89
10 18	**+1·06**	+0·72	+1·17	+0·49	−0·54	−0·08	−0·59	−0·97	−1·03	−0·42	+0·26	**+0·39**	+0·04
11 18	+0·22	−0·01	−0·20	−0·90	−1·58	−1·33	−1·91	−2·13	−2·40	−1·64	−0·40	+0·20	−1·01
12 18	−0·17	−0·43	−1·20	−1·93	**−2·20**	−2·43	−2·17	**−2·57**	**−3·00**	**−1·93**	−0·43	+0·07	**−1·53**
13 18	+0·08	−0·36	**−1·40**	**−2·07**	−1·96	**−2·57**	**−2·26**	−2·17	−2·47	−1·29	−0·13	+0·07	−1·38
14 18	+0·11	−0·09	−0·73	−1·62	−1·22	−2·09	−1·75	−1·43	−1·27	−0·35	+0·08	+0·01	−0·86
15 18	+0·09	+0·09	0·00	−0·92	−0·45	−1·12	−1·04	−0·37	−0·07	+0·42	+0·08	−0·19	−0·29
16 18	+0·03	+0·03	+0·30	−0·22	+0·30	−0·28	−0·26	+0·33	+0·60	+0·53	+0·02	−0·06	+0·11
17 18	−0·16	−0·19	−0·02	+0·01	+0·47	+0·25	+0·28	+0·59	+0·47	−0·16	−0·18	−0·09	+0·11
18 18	−0·23	−0·36	−0·39	−0·08	+0·21	+0·09	+0·29	+0·16	+0·13	−0·25	−0·11	−0·01	−0·05
19 18	+0·05	−0·02	−0·32	−4·28	−0·25	−0·34	−0·33	−0·24	−0·03	−0·14	+0·10	+0·22	−0·13
20 18	+0·09	+0·09	−0·26	−0·25	−0·37	−0·50	−0·35	−0·31	−0·03	−0·03	+0·06	+0·19	−0·14
21 18	−0·01	+0·06	−0·29	−0·07	−0·24	−0·26	−0·28	−0·28	−0·03	−0·06	+0·01	+0·13	−0·11
22 18	+0·04	+0·10	−0·29	0·00	−0·13	−0·19	−0·13	−0·18	+0·03	+0·01	+0·04	+0·10	−0·05
23 18	+0·05	+0·18	−0·12	+0·06	+0·01	−0·05	+0·01	−0·11	+0·13	+0·19	+0·22	+0·20	+0·06
Range ...	1·83	1·32	3·13	4·29	4·49	5·25	4·88	5·65	5·63	3·37	1·08	1·10	2·99

TABLE 488.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Declination for each average month and year of the minimum sun-spot years 1899 to 1902.*

Unity = 1 Minute of arc.

Bombay Civil Time.	Month.												Year
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 18	+0·05	0·00	−0·01	+0·20	+0·24	+0·31	+0·10	+0·05	+0·11	+0·08	+0·16	+0·14	+0·12
1 18	−0·02	−0·04	−0·01	+0·20	+0·29	+0·33	+0·18	+0·13	+0·19	+0·20	+0·08	+0·07	+0·13
2 18	−0·10	−0·09	−0·01	+0·22	+0·24	+0·34	+0·23	+0·13	+0·21	+0·15	+0·07	−0·05	+0·11
3 18	−0·20	−0·16	−0·10	+0·15	+0·27	+0·34	+0·23	+0·23	+0·19	+0·13	−0·03	−0·01	+0·09
4 18	−0·30	−0·26	−0·19	+0·07	+0·20	+0·34	+0·30	+0·28	+0·16	+0·04	−0·18	−0·27	+0·02
5 18	−0·40	−0·36	−0·19	+0·15	+0·40	+0·65	+0·46	+0·54	+0·34	+0·02	−0·19	−0·37	+0·09
6 18	−0·47	−0·31	−2·09	+0·62	+1·23	+1·48	+1·54	+1·41	+1·20	+0·17	−0·34	−0·39	+0·50
7 18	**−0·50**	−0·23	+0·64	+1·42	**+1·84**	**+1·88**	**+2·11**	**+2·11**	**+2·20**	+0·88	−0·17	**−0·68**	+0·96
8 18	+0·32	+0·31	+1·11	**+1·62**	+1·71	+1·74	+1·91	+1·91	+2·02	**+1·18**	+0·14	−0·41	**+1·13**
9 18	**+1·00**	**+0·57**	**+1·26**	+1·17	+0·64	+0·69	+0·81	+0·69	+0·85	+0·68	+0·11	−0·16	+0·69
10 18	+0·77	+0·47	+0·81	+0·30	−0·56	−0·66	−0·35	−0·67	−0·52	−0·19	−0·28	−0·06	−0·08
11 18	0·00	−0·17	−0·25	−0·85	−1·67	−1·37	−1·50	−1·77	−1·90	−1·07	**−0·67**	−0·25	−0·96
12 18	−0·12	**−0·42**	−1·05	−1·67	**−2·05**	**−2·07**	**−2·05**	**−2·10**	**−2·57**	**−1·40**	−0·35	−0·15	**−1·33**
13 18	−0·07	−0·22	**−1·07**	**−1·72**	−1·70	−1·90	−1·87	−1·87	−2·20	−1·02	+0·17	+0·22	−1·10
14 18	−0·17	+0·10	−0·41	−1·27	−1·04	−1·31	−1·30	−1·15	−1·12	−0·36	**+0·43**	**+0·46**	−0·59
15 18	−0·07	+0·27	+0·16	−0·25	−0·31	−0·59	−0·54	−0·24	−0·05	+0·19	+0·26	+0·38	−0·07
16 18	+0·25	+0·31	+0·33	+0·17	+0·16	−0·01	+0·01	+0·38	+0·55	+0·29	+0·18	+0·33	+0·25
17 18	+0·15	+0·11	+0·11	+0·25	+0·31	+0·07	+0·26	+0·53	+0·47	+0·01	+0·12	+0·28	+0·22
18 18	+0·10	+0·01	−0·08	+0·07	+0·07	−0·08	+0·11	+0·13	+0·05	−0·02	+0·12	+0·27	+0·06
19 18	+0·12	+0·01	−0·15	−0·12	−0·08	−0·25	−0·26	−0·16	−0·14	−0·04	+0·09	+0·19	−0·07
20 18	+0·15	−0·04	−0·18	−0·17	−0·10	−0·19	−0·28	−0·20	−0·16	−0·02	+0·05	+0·17	−0·08
21 18	+0·07	−0·04	−0·12	−0·07	−0·04	−0·07	−0·23	−0·15	−0·14	−0·03	+0·05	+0·15	−0·05
22 18	+0·10	−0·03	−0·09	+0·05	+0·08	+0·10	−0·08	−0·13	−0·01	+0·04	+0·08	+0·13	+0·02
23 18	+0·05	0·00	−0·02	+0·10	+0·15	+0·24	+0·04	−0·03	+0·06	+0·09	+0·14	+0·13	+0·08
Range ...	1·50	0·99	2·33	3·34	3·89	3·95	4·16	4·21	4·77	2·58	1·10	1·14	2·46

TABLE 489.—*Showing the non-periodic diurnal ranges for each day (10h to 10h) of the year 1894 derived from hourly tabulations of Declination Magnetograms.*

Unity = 0′·01.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1 ...	301	224	238	264	445	626	319	448	588	904	103	132	...
2 ...	310	224	210	476	626	545	419	502	672	669	135	184	...
3 ...	370	241	465	232	353	528	442	499	669	620	327	181	...
4 ...	387	362	350	267	482	482	442	410	608	413	169	95	...
5 ...	241	273	330	339	626	471	732	580	815	451	330	161	...
6 ...	270	281	287	491	494	583	339	563	697	210	207	175	...
7 ...	258	296	287	376	416	654	631	525	789	442	169	195	...
8 ...	189	175	207	453	327	508	522	488	758	402	212	224	...
9 ...	267	158	293	471	396	603	517	436	683	382	103	172	...
10 ...	215	181	290	428	178	451	419	537	617	416	121	135	...
11 ...	181	192	258	525	468	505	367	563	390	367	98	204	...
12 ...	189	192	281	278	448	471	528	488	525	316	126	267	...
13 ...	264	215	284	287	568	594	419	580	436	310	697	333	...
14 ...	210	327	333	227	479	508	379	689	695	181	210	235	...
15 ...	241	255	327	419	697	528	563	551	709	278	212	396	...
16 ...	221	215	370	433	557	554	540	677	560	428	235	212	...
17 ...	273	258	316	752	580	872	528	560	740	373	319	218	...
18 ...	362	316	356	422	706	672	829	651	577	244	298	359	...
19 ...	273	293	258	451	591	606	594	772	571	324	247	166	...
20 ...	301	215	508	448	557	548	1114	904	697	255	184	258	...
21 ...	419	387	577	382	597	554	545	669	548	293	109	264	...
22 ...	367	390	385	608	430	672	517	505	385	149	201	247	...
23 ...	235	402	324	692	631	660	763	608	370	247	307	212	...
24 ...	293	175	410	387	588	560	634	577	273	210	301	276	...
25 ...	270	419	298	563	542	448	347	534	278	221	198	344	...
26 ...	301	273	356	502	669	370	241	522	253	436	218	184	...
27 ...	385	238	465	451	683	187	290	479	253	333	172	212	...
28 ...	385	276	367	359	692	218	456	519	313	198	143	255	...
29 ...	373		430	468	419	519	451	611	631	244	135	250	...
30 ...	390		815	373	548	350	453	471	554	129	201	189	...
31 ...	270		304		462		488	502		166		210	...
Monthly mean ...	293	266	354	427	524	528	511	562	555	342	216	224	4·00
*Mean of 5 quiet-days.	218	184	360	464	510	504	495	562	544	347	175	206	3·81

TABLE 489.—*Showing the non-periodic diurnal ranges for each day (10h to 10h) of the year 1901 derived from hourly tabulations of Declination Magnetograms.*

Unity = 0′·01.

1901 Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1 ...	212	294	130	432	339	525	254	409	548	249	179	113	...
2 ...	144	251	166	418	392	542	452	345	559	373	294	209	...
3 ...	127	184	249	492	437	424	322	593	712	407	181	147	...
4 ...	192	223	266	424	362	384	392	684	593	379	102	124	...
5 ...	232	246	249	294	186	463	446	348	531	271	164	172	...
6 ...	237	167	294	220	401	441	362	319	508	198	215	156	...
7 ...	243	132	175	407	237	356	379	407	503	362	79	254	...
8 ...	158	220	203	232	362	269	282	337	401	339	181	275	...
9 ...	226	195	232	271	311	399	371	395	518	249	181	209	...
10 ...	206	211	223	226	403	237	362	401	330	192	169	156	...
11 ...	122	175	220	421	305	367	288	322	480	215	169	229	...
12 ...	179	127	169	243	384	260	356	475	497	282	201	175	...
13 ...	232	139	218	427	480	136	450	305	576	328	215	153	...
14 ...	237	141	141	282	469	424	353	446	483	203	96	119	...
15 ...	241	190	158	175	390	367	593	452	571	147	90	107	...
16 ...	254	192	203	401	384	458	472	350	686	282	90	220	...
17 ...	254	149	198	475	373	412	533	390	576	141	203	113	...
18 ...	359	164	305	308	429	424	525	576	610	288	119	102	...
19 ...	223	164	273	441	576	605	548	316	452	169	158	122	...
20 ...	322	190	328	373	621	362	475	492	407	215	113	119	...
21 ...	172	237	373	467	489	492	494	333	520	158	73	192	...
22 ...	186	217	262	429	339	480	324	412	384	215	215	169	...
23 ...	232	111	324	260	325	302	523	432	316	141	237	113	...
24 ...	132	96	243	119	280	503	520	441	266	147	164	158	...
25 ...	156	215	362	192	407	322	503	533	322	198	160	167	...
26 ...	232	164	228	266	455	299	215	537	305	136	166	251	...
27 ...	313	209	450	220	354	661	350	471	429	181	73	220	...
28 ...	320	246	282	362	432	311	449	551	475	181	181	271	...
29 ...	243		246	328	565	232	421	486	356	245	175	181	...
30 ...	282		384	582	563	571	420	528	492	155	130	280	...
31 ...	390		266		580		347	503		271		130	...
Monthly mean ...	228	187	252	340	407	401	412	438	480	236	159	174	3·09
Mean of 5 quiet-days.	211	164	234	365	385	483	416	399	483	250	148	139	3·06

* The ranges in this row have been derived from the day of the Astronomer Royal reckoned from 10h to 10h; while the ranges in the table are from day 10h to 10h.

TABLE 489.—*Showing the non-periodic diurnal ranges for each day (10h to 10h) of the year 1898 derived from hourly tabulations of Declination Magnetograms.*

Unity = 0′·01.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1 ...	281	135	224	230	474	396	482	459	551	281	169	135	...
2 ...	278	270	253	241	485	459	278	505	479	339	250	155	...
3 ...	405	187	151	230	517	591	405	531	571	462	132	221	...
4 ...	184	218	172	356	528	488	405	373	505	353	215	189	...
5 ...	333	210	227	287	514	517	456	560	522	433	192	244	...
6 ...	227	244	278	453	408	528	344	419	514	273	149	187	...
7 ...	212	141	250	304	451	631	367	588	499	195	207	189	...
8 ...	344	307	356	396	494	491	307	362	485	178	244	155	...
9 ...	204	115	235	313	416	422	525	379	1510	149	86	143	...
10 ...	261	169	393	399	253	514	362	373	557	255	175	129	...
11 ...	344	261	304	439	614	379	379	608	560	364	132	146	...
12 ...	169	235	218	491	502	367	241	436	574	247	138	212	...
13 ...	221	158	313	293	324	344	379	422	631	462	109	201	...
14 ...	146	893	235	442	327	362	382	244	623	290	201	210	...
15 ...	164	244	677	284	491	465	319	476	425	258	143	273	...
16 ...	356	204	241	212	393	494	565	629	608	172	178	258	...
17 ...	118	95	281	258	293	319	290	419	580	178	253	158	...
18 ...	192	258	278	382	497	385	476	456	479	184	301	221	...
19 ...	169	298	353	428	390	422	428	445	588	192	149	187	...
20 ...	221	158	278	433	519	379	356	577	511	155	158	155	...
21 ...	184	244	118	430	534	577	359	474	433	189	241	230	...
22 ...	281	141	267	359	540	629	373	304	330	296	410	313	...
23 ...	336	215	230	445	580	528	430	502	491	192	210	195	...
24 ...	238	261	336	373	511	451	637	560	531	178	129	247	...
25 ...	310	164	298	402	600	540	373	436	439	210	212	342	...
26 ...	184	241	210	353	497	456	408	321	405	238	301	143	...
27 ...	218	158	143	511	554	459	465	416	465	112	207	284	...
28 ...	247	192	321	519	537	382	387	508	528	207	138	207	...
29 ...	123		264	459	554	511	534	488	290	353	235	227	...
30 ...	235		149	413	565	402	519	537	261	488	155	284	...
31 ...	270		339		402		425	525		204		215	...
Monthly mean ...	240	211	271	371	476	463	408	462	531	261	194	208	3·41
Mean of 5 quiet-days.	297	144	184	385	514	452	381	427	509	241	194	169	3·25

TABLE 489.—*Showing the non-periodic diurnal ranges for each day (10h to 10h) of the year 1899 derived from hourly tabulations of Declination Magnetograms.*

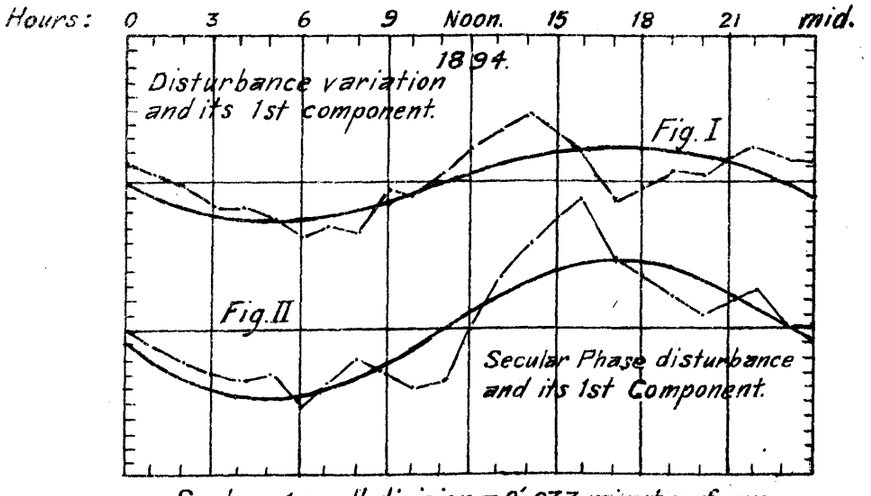
Unity = 0′·01.

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Annual mean.
1 ...	218	258	187	204	451	287	270	494	585	425	232	247	...
2 ...	238	255	164	347	324	399	402	416	672	428	187	307	...
3 ...	155	370	192	207	439	465	367	608	430	459	158	149	...
4 ...	333	267	307	307	241	456	468	425	494	362	138	178	...
5 ...	227	146	244	370	264	476	313	419	583	316	161	138	...
6 ...	230	132	344	253	451	471	465	339	505	258	187	210	...
7 ...	172	201	155	316	646	396	654	474	505	482	204	221	...
8 ...	293	132	336	333	528	296	666	413	565	356	230	247	...
9 ...	155	164	344	290	482	298	660	445	370	370	166	253	...
10 ...	253	281	350	333	571	261	689	517	577	379	143	146	...
11 ...	321	270	359	359	580	210	385	531	459	408	123	218	...
12 ...	359	413	333	316	459	456	577	387	499	333	166	158	...
13 ...	327	296	296	367	367	321	362	465	519	178	143	135	...
14 ...	362	284	224	356	574	296	479	465	273	224	201	98	...
15 ...	390	175	235	327	545	238	505	508	448	276	126	166	...
16 ...	353	184	178	399	382	560	608	422	310	304	118	184	...
17 ...	448	227	313	488	456	436	362	307	350	218	161	132	...
18 ...	405	175	244	321	476	525	319	436	471	155	184	175	...
19 ...	436	284	224	319	479	442	514	646	373	270	267	212	...
20 ...	402	155	255	264	359	370	270	491	439	189	166	155	...
21 ...	264	152	290	379	445	316	379	362	408	175	164	100	...
22 ...	247	112	232	445	508	235	304	482	336	204	281	247	...
23 ...	253	238	362	218	396	339	436	364	462	169	276	121	...
24 ...	290	178	476	370	626	680	433	402	396	187	235	178	...
25 ...	215	166	307	356	649	514	396	517	356	187	166	224	...
26 ...	224	264	232	344	499	540	517	531	405	149	158	356	...
27 ...	310	244	396	316	534	571	281	264	184	115	77	204	...
28 ...	413	296	336	568	210	448	344	448	350	258	192	304	...
29 ...	336		330	548	528	505	276	494	287	172	287	319	...
30 ...	267		333	548	247	327	390	373	301	126	207	273	...
31 ...	385		301		585		336	505		224		227	...
Monthly mean ...	299	226	286	352	461	404	433	450	430	270	183	203	3·33
Mean of 5 quiet-days.	267	177	319	372	496	510	377	412	472	326	130	143	3·33

the period of 11 years involves a considerable amount of labour, for the purpose of our requirements the data of a few selected years only have been considered sufficient. The aperiodic ranges hence for the typical years 1894, 1898, 1899 and 1901 have been derived. It will be seen from table 489 where the data are collected, that for the year 1894 the difference made out between the all-day and quiet-day results is 0'·19; the year 1898 shows likewise a difference of 0'·16 and the years 1899 and 1901 exhibit no difference. Thus as might be naturally expected the disturbed years clearly show larger aperiodic ranges for the all-day than for the quiet-day results, contrary however to conditions noted in the periodic ranges.

516. Passing on to the examination of the harmonic co-efficients of the inequalities given in table 490, it will be noticed that they tell almost precisely the same tale which the co-efficients of all-days have disclosed in Chapter VI. In the average result of 11 years the amplitudes of the four components in the quiet-day variations are 0'·40, 0'·49, 0'·50, and 0'·17 respectively. The all-day results give 0'·41, 0'·48, 0'·48, 0'·17. The phase angles in the former are 59° 27', 105° 41', 5° 48', and 44° 16' as against 54° 34', 105° 16', 5° 42' and 44° 30' in the latter result. Thus the periodic amplitudes in both the results appear to be the same within probable errors, so are also the phase angles in the 2nd, 3rd and 4th components in agreement. The phase angle however of the first component differs by about 5° indicating that the maximum falls in the all-day result earlier than in the quiet-day, and so far the phenomenon is accordant with the results noted in H. On the other hand, when we pass from the average conditions of 11 years to those of individual years, the co-efficients of a disturbed year like 1894 which would be naturally expected to exhibit significant differences due to disturbances, show that the amplitudes of both the first and second components become distinctly larger in quiet-days than in all-days, while curiously the phase angles do not appreciably at least differ much (see tables 490, 305 and 317). In the first component an earlier maximum is indicated in the all-day results by about 1° 51' and in the second component a later culmination by about 0° 39'. Thus for disturbance effects if these indications preferably to those of the average result of 11 years, are accepted as reliable, and if the admittedly small change in phase be neglected, the incidence of disturbances on the quiet-day variations of declination, may be taken to depend upon conditions contrary to those which obtain in the H results. In the latter the amplitudes remain uninfluenced and the phase alone changes; while in declination the amplitudes solely are affected, which are reduced in all-day results, and the phase remains practically unaffected. The phase angle of the disturbance curve hence will differ very nearly by 180° from the maximum phase of the original quiet-day inequality in both the components. The disturbance curve for the year 1894, that is all-day less quiet-day variation with its first component, is shown in figure I below (see paragraph 514).

517. Taking up now the consideration of the secular changes in the co-efficients from year to year there is clearly indicated in the amplitudes of the declination curves the usual tendency, though not so



Scale :- 1 small division = 0'·033 minute of arc.

well marked as in H, to become larger during the maximum spot years. The fourth component is however the only one of the four, which does not show any appreciable influence of the 11 year period. The amplitudes in H, it must have been noted, increase in value from the minimum spot to maximum spot years, by more than 50 per cent. while in the declination element the increase is only 25 per cent. The phase angles also, as in H, show a *later* culmination at times of maximum spot year in the first three components. As the small magnitude of the phenomenon generally precludes any other further discussion of the results here as has been attempted in H, the curve for the year 1894 alone is examined. In this curve the phase factor of the secular progression is shown in figure II above. The factor used

TABLE 490.—*Showing the values of the p, q co-efficients (reckoned from $0^h\ 18^m$) and of the Amplitude* P *and the first maximum* μ *(reckoned from $0^h\ 0^m$) for the first four orders of the Harmonic Components of the Diurnal Inequalities of Declination for each average year and the average months given in tables 479 and 485.*

Unity = 1 minute of arc.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	+·28	+·50	−·48	−·26	+·49	+·07	−·15	+·06
1895 ...	+·32	+·40	−·55	−·18	+·57	−·01	−·18	+·10
1896 ...	+·26	+·31	−·46	−·19	+ 51	+·06	−·17	+·03
1897 ...	+·20	+·34	−·41	−·18	+·48	+·06	−·19	+·05
1898 ...	+·16	+·30	−·42	−·16	+·45	+·02	−·14	+·07
1899 ...	+·28	+·28	−·49	−·12	+·52	−·02	−·17	+·08
1900 ...	+·24	+·28	−·45	−·16	+·50	+·05	−·17	+·05
1901 ...	+·24	+·22	−·41	−·17	+·45	+·03	−·15	+·06
1902 ...	+·21	+·28	−·43	−·22	+·45	+·06	−·16	+·05
1903 ...	+·16	+·30	−·43	−·22	+·47	+·06	−·15	+·03
1904 ...	+·15	+·35	−·48	−·21	+·53	+·02	−·16	+·09
1905 ...	+·27	+·42	−·55	−·33	+·57	+·09	−·17	+·07

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	−0·09	−0·13	+0·08	−0·17	+0·18	+0·19	−0·24	−0·02
February...	−0·06	−0·03	+0·05	−0·12	+0·19	+0·14	−0·19	−0·03
March ...	−0·10	+0·25	−0·19	−0·29	+0·46	+0·23	−0·28	−0·07
April ...	+0·33	+0·59	−0·60	−0·41	+0·66	+0·16	−0·20	+0·03
May ...	+0·46	+0·64	−0·86	−0·24	+0·75	−0·08	−0·12	+0·15
June ...	+0·52	+0·82	−0·85	−0·35	+0·70	+0·01	−0·07	+0·07
July ...	+0·43	+0·78	−0·89	−0.31	+0·67	0·00	−0·04	+0·07
August ...	+0·43	+0·68	−0·99	−0·22	+0·76	−0·09	−0·10	+0·15
September.	+0·56	+0·53	−1·00	−0·18	+0·86	−0·12	−0·22	+0·15
October ...	+0·20	+0·20	−0·36	−0·07	+0·50	−0·08	−0·26	+0·14
November.	+0·04	−0·14	+0·03	+0·05	+0·14	−0·01	−0·14	−0·10
December .	0·00	−0·29	+0·11	+0·05	+0·04	+0.07	−0·08	−0·01
Winter ...	0·00	−0·02	−0·05	−0·09	+0·25	+0·09	−0·20	−0·01
Summer ...	+0·45	+0·67	−0·86	−0·28	+0·73	−0·02	−0·12	+0·10
Year ...	+0·23	+0·32	−0·45	−0·19	+0·50	+0·03	−0·16	+0·06

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1894 ...	0·57	0·55	0·50	0·16	65 37	108 41	7 16	43 43
1895 ...	0·51	0·58	0·57	0.20	55 36	103 27	4 16	42 18
1896 ...	0·41	0·50	0·52	0·18	54 18	105 45	6 34	47 22
1897 ...	0·39	0·45	0·48	0·19	64 45	106 21	6 55	45 24
1898 ...	0.34	0·44	0·45	0·15	65 27	104 46	5 33	42 31
1899 ...	0·40	0·50	0·52	0·19	49 36	101 33	3 48	43 9
1900 ...	0·37	0·48	0·50	0·18	54 40	104 20	6 16	45 23
1901 ...	0·33	0·45	0·45	0·17	46 24	105 57	5 36	44 17
1902 ...	0·35	0·48	0.45	0·17	57 13	107 57	6 52	45 21
1903 ...	0·34	0·49	0·47	0.15	67 2	108 9	6 58	46 41
1904 ...	0·38	0·52	0·53	0·19	70 0	106 15	5 5	42 9
1905 ...	0·50	0·64	0·57	0·18	61 36	110 13	7 23	44 0

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	0·15	0·19	0·26	0·24	239 29	152 30	19 33	51 0
February...	0·06	0·13	0·23	0·19	213 2	149 53	16 36	51 35
March ...	0·27	0.34	0.52	0·29	116 30	122 51	13 25	52 52
April ...	0·67	0·73	0·68	0·20	65 26	111 36	9 9	47 17
May ...	0·79	0·89	0·76	0·20	58 57	102 11	2 24	36 45
June ...	0·98	0·92	0·70	0·10	62 3	105 45	4 46	38 21
July ...	0·89	0·94	0·67	0·08	65 24	104 16	4 23	34 34
August ...	0·81	1·01	0.77	0·18	61 59	100 52	2 14	35 25
September.	0·77	1·01	0·87	0·27	48 8	99 37	1 56	40 49
October ...	0·29	0·36	0·51	0·30	48 39	99 44	1 38	42 17
November.	0 15	0·06	0·14	0·17	290 46	32 40	2 54	40 32
December.	0·29	0·12	0·08	0·08	273 31	17 22	24 44	40 32
Winter ...	0·02	0.10	0·27	0·20	270 0	124 59	11 6	50 13
Summer ...	0·81	0·90	0·73	0·16	60 37	103 31	3 59	39 33
Year ...	0·40	0·49	0·50	0·17	59 27	105 41	5 48	44 16

for the derivation of the theoretical inequality for the year 1894, from the average inequality of 11 years is 1·07. The difference of the observed curve less this theoretical variation is charted in thin curve in figure 2 above, while the first component of this difference curve the co-efficients of which are $A' = 0'.15$ and $\mu' = 83°$ is charted in thick curve in the same figure. Here too the first component does not wholly make up the whole difference curve as already remarked elsewhere, the coincidence however of its phase angle with that indicated in the results of H, is however fairly well marked. The closely accordant value of μ in figure 2 with that in figure 1 the value of which is 262° (see paragraph 514), is also noteworthy.

5.—Vertical Force. Absolute Phenomenon.

518. As in the declination element, no detailed discussion is attempted here also, for reasons already referred to. In table 491 are collected the mean monthly values of absolute vertical force derived from the quiet-days of the Astronomer Royal and in the next table are appended for reference the differences of these quiet-day results from those of all-days.

These are all small in magnitude as in D, and it is doubtful if they indicate a definite phenomenon, as curiously they show that the vertical force stands lower in value on quiet-days than on ordinary days, while during disturbed conditions a definite rise of force is indicated. The mean difference on the average conditions of 11 years is 0·4γ; in the year 1894 it is 0·9γ while in 1901 it is 0·3γ

The annual variations given by both the quiet and the all-day results seem to be practically identical (see table 492, last row) and call for no remarks.

6.—Vertical Force. Diurnal Variation.

519. In tables 493 to 502 and plates 93 and 94 are given the whole data arranged precisely in the same order as in the declination results. Here too the difference variations are so feebly pronounced that any useful comments in regard to differentiating the quiet-day from the all-day results, are scarcely justifiable. It may yet be remarked, that small though the magnitudes of these differences are, distinct traces of whatever features that have been noted above in the results of H and D, can also be discerned in the general run of these curves. However as the more important of the deductions cannot thus be made from such data, we may take advantage of the curves of disturbances discussed in paragraph 453 in Chapter X, which are charted in figure 12 in plate 73, and requisition them here to see whether they cannot throw some light. When analysed the phase angle of the first component of the vertical force disturbance curve in figure 12, is shown to be 283° 57′. The phase angle similarly derived from the disturbance curve of H in figure 12, is 99° 31′, and it will be seen that they are almost supplementary.

520. The harmonic co-efficients collected in table 503, when examined, show that the annual values of the phase angles, as in the declination element, are practically the same in the quiet-day as in the all-day results. The amplitudes however of the 1st and 2nd components are distinctly larger in quiet-days than in all-days during the years of maximum sun-spots. The other two components appear to have practically the same amplitude in the quiet as in the all-day variations and are apparently not affected by disturbances.

In the secular change of the co-efficients, the later culmination to maximum, as the years pass from the minimum spot epoch to the maximum, is also indicated here as clearly as in the H and D results and affect both the first and the second components. In other respects the results are fairly similar to those noted in D.

TABLE 491.—*Showing monthly and annual values of Vertical Force derived from quiet-days selected by the Astronomer Royal and their Annual Variations.*

0·140000 C. G. S. +

Bombay Civil time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1894 ...	0659	0865	0622	1221	1312	1347	1418	1266	1437	1354	1689	1819	1251
1895 ...	1807	2079	1935	1929	2046	2233	2122	2318	2505	2486	2759	3093	2276
1896 ...	3002	3043	3217	3247	3375	3586	3533	3095	3385	3119	3319	3236	3263
1897 ...	3367	3345	3563	3637	3714	3872	3766	3820	3896	3898	3997	4184	3755
1898 ...	4200	4299	4355	4378	4429	4502	4540	4674	4760	4739	4741	4904	4543
1899 ...	5031	5197	5205	5200	5333	5430	5527	5632	5644	5831	5912	6060	5500
1900 ...	6100	6271	6311	6345	6389	6406	6474	6660	6759	6778	6862	6921	6523
1901 ...	7116	7139	7217	7287	7422	7545	7620	7711	7735	7703	7820	7948	7522
1902 ...	7958	8009	8074	8118	8173	8200	8379	8587	8483	8563	8760	8927	8353
1903 ...	8869	8713	8760	8745	8782	8954	9124	9328	9279	9238	9458	9508	9063
1904 ...	9695	9725	9704	9507	9641	9660	9773	9766	9719	9873	10007	10197	9772
1905 ...	10327	10569	10552	10367	10592	10733	11107	11047	11147	11112	11093	11293	10828
Annual Inequality corrected for progressive change 1894 to 1904	+38	+45	−4	−18	+1	+29	+4	−16	−21	−96	−11	+49	...

TABLE 492.—*Differences in the Absolute Values of Vertical Force; Astronomer Royal's quiet-days less all-days.*

Unity = 0·1γ = ·000001 C. G. S.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1894 ...	−10	+ 1	−10	−13	+ 1	−13	−26	−17	+ 9	−11	− 1	−20	− 9
1895 ...	− 8	−111	−16	−46	−40	−99	−73	−39	+26	− 2	+ 5	+35	−12
1896 ...	−15	− 6	− 8	− 9	− 4	+ 6	+ 8	−12	−27	−11	+ 3	− 1	− 6
1897 ...	−17	− 3	+22	+ 9	− 1	+17	− 9	+ 6	−10	+ 1	+ 1	+38	+ 4
1898 ...	−14	− 14	+48	−15	+15	−12	+ 1	+10	+ 1	− 3	− 3	0	+ 1
1899 ...	− 5	− 12	−14	−14	−24	0	+22	+11	−42	+11	− 2	− 3	− 6
1900 ...	+ 2	− 11	−10	+ 2	+ 3	−11	+11	−24	+17	− 1	0	− 2	− 2
1901 ...	−14	+ 3	+14	− 5	− 5	− 4	− 5	+10	− 1	−10	− 9	−11	− 3
1902 ...	+ 7	− 1	− 3	− 1	+ 3	0	+ 8	+ 2	−14	0	− 3	− 5	− 1
1903 ...	+21	− 20	−12	−13	−32	−18	− 2	−11	− 4	−15	− 4	− 4	− 9
1904 ...	0	− 10	+22	+10	0	− 6	−12	+18	−19	−10	+ 1	− 2	− 1
1905 ...	− 5	+ 14	−12	0	− 1	+16	−20	−26	−19	− 9	−10	0	− 6
Mean, 1894 to 1904 ...	− 5	+ 3	+ 3	− 9	− 8	−13	− 7	− 4	− 6	− 5	− 1	+ 2	− 4

TABLE 493.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for each average year of the period 1894—1905 and for the whole period of eleven years.*

Unity = 0·1γ = 000001 C. G. S.

Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	Mean, 1894—1904.
H. m.													
0 16	+ 43	+ 49	+ 38	+ 35	+ 31	+ 27	+ 35	+ 24	+ 27	+ 32	+ 36	+ 46	+ 35
1 16	+ 41	+ 50	+ 40	+ 35	+ 27	+ 27	+ 31	+ 24	+ 24	+ 30	+ 35	+ 44	+ 34
2 16	+ 41	+ 43	+ 36	+ 34	+ 36	+ 25	+ 31	+ 19	+ 25	+ 30	+ 32	+ 42	+ 32
3 16	+ 37	+ 45	+ 33	+ 27	+ 25	+ 25	+ 30	+ 20	+ 25	+ 26	+ 30	+ 40	+ 30
4 16	+ 37	+ 45	+ 31	+ 31	+ 25	+ 23	+ 28	+ 21	+ 26	+ 32	+ 34	+ 41	+ 30
5 16	+ 51	+ 61	+ 45	+ 44	+ 38	+ 34	+ 40	+ 30	+ 37	+ 47	+ 50	+ 59	+ 43
6 16	+ **83**	+ **88**	+ **72**	+ **62**	+ **63**	+ **56**	+ **64**	+ **52**	+ **62**	+ **68**	+ **79**	+ **91**	+ **68**
7 16	+ 60	+ 63	+ 52	+ 61	+ 51	+ 51	+ 54	+ 47	+ 61	+ 51	+ 71	+ 76	+ 56
8 16	− 2	− 9	− 2	+ 14	+ 7	− 19	+ 4	+ 1	+ 11	+ 1	+ 12	+ 6	+ 2
9 16	− 74	− 109	− 76	− 70	− 84	− 95	− 72	− 68	− 62	− 66	− 79	− 90	− 77
10 16	− 131	− **177**	− 138	− 142	− **135**	− **147**	− 146	− 116	− 129	− 132	− 148	− 175	− 140
11 16	− **149**	− 176	− **149**	− **153**	− 133	− 138	− **161**	− **127**	− **145**	− **149**	− **156**	− **189**	− **149**
12 16	− 102	− 114	− 113	− 102	− 85	− 82	− 106	− 84	− 96	− 105	− 104	− 142	− 99
13 16	− 44	− 35	− 47	− 33	− 23	− 11	− 40	− 28	− 37	− 42	− 37	− 62	− 34
14 16	+ 1	+ 16	+ 14	+ 14	+ 16	+ 37	+ 7	+ 18	+ 5	+ 10	+ 7	+ 12	+ 13
15 16	+ 19	+ 39	+ 42	+ 37	+ 32	+ 51	+ 38	+ 39	+ 33	+ 38	+ 28	+ 40	+ 36
16 16	+ 16	+ 25	+ 35	+ 29	+ 27	+ 41	+ 43	+ 37	+ 36	+ 39	+ 29	+ 38	+ 32
17 16	− 8	− 8	0	+ 3	+ 3	+ 12	+ 20	+ 17	+ 16	+ 14	+ 5	+ 11	+ 7
18 16	− 13	− 10	− 7	− 5	− 1	+ 2	+ 4	+ 2	+ 2	+ 1	− 5	+ 6	− 3
19 16	− 2	+ 1	+ 1	+ 3	+ 2	+ 4	+ 10	+ 4	+ 8	+ 8	− 1	+ 9	+ 3
20 16	+ 6	+ 9	+ 8	+ 9	+ 6	+ 11	+ 15	+ 10	+ 12	+ 13	+ 6	+ 15	+ 9
21 16	+ 13	+ 21	+ 17	+ 18	+ 16	+ 19	+ 17	+ 13	+ 20	+ 19	+ 15	+ 19	+ 17
22 16	+ 25	+ 35	+ 29	+ 25	+ 27	+ 22	+ 30	+ 22	+ 23	+ 28	+ 24	+ 33	+ 26
23 16	+ 41	+ 46	+ 36	+ 31	+ 31	+ 26	+ 33	+ 21	+ 25	+ 31	+ 32	+ 39	+ 31
Range ...	232	265	221	215	198	203	225	179	207	217	235	280	217

TABLE 494.—*Showing the excess Diurnal Inequality of Vertical Force (all-days less quiet-days) for each average year of the period 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = 000001 C. G. S.

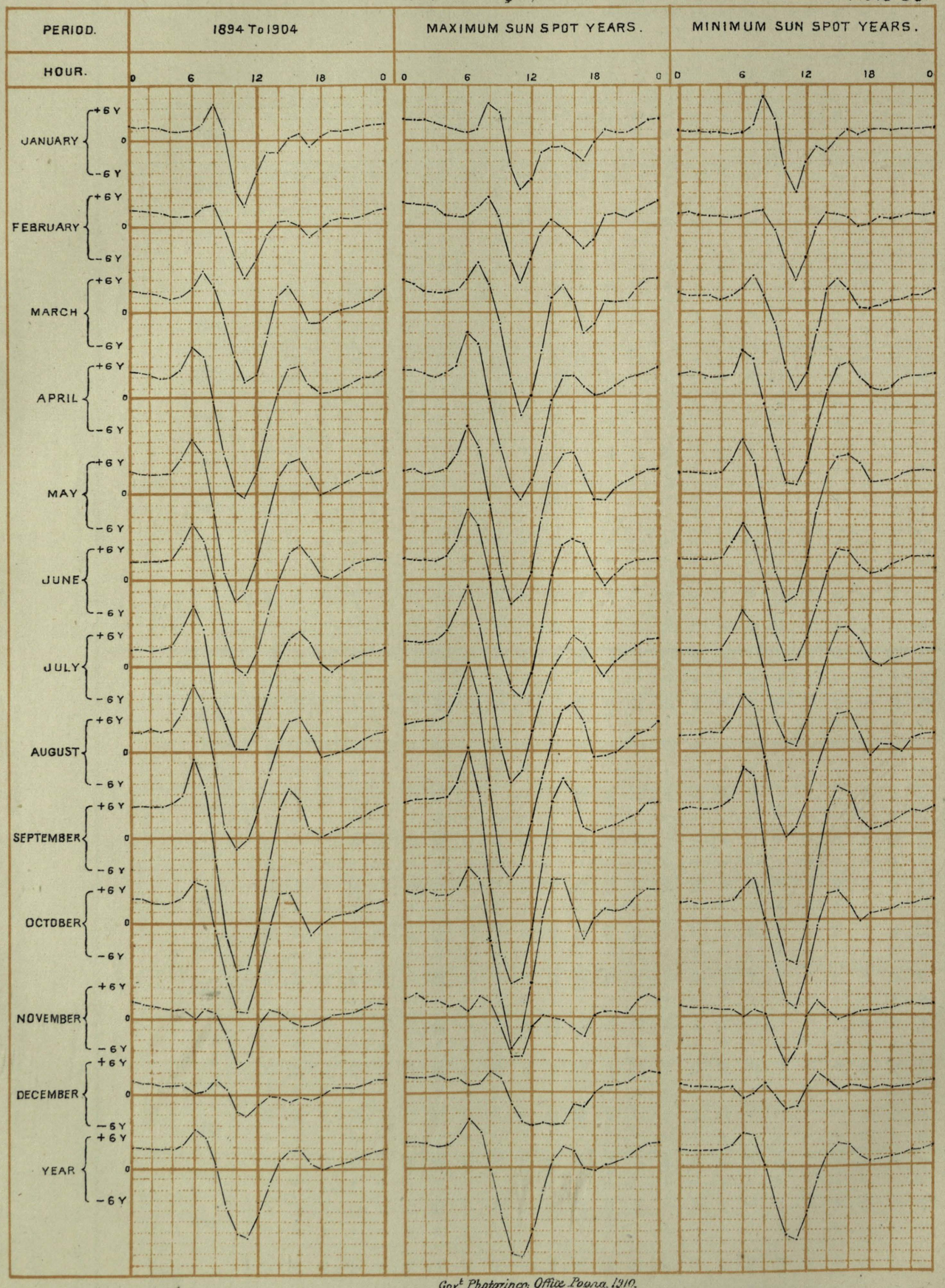
Bombay Civil Time.	Years. 1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	Mean, 1894—1904.
H. m.												
0 16	− 2	− 6	+ 2	+ 3	+ 5	+ 6	− 2	+ 3	+ 3	0	0	+ 1
1 16	− 1	− 6	0	+ 2	+ **9**	+ 4	+ 1	0	+ **5**	+ 1	+ 1	+ 1
2 16	− 2	− 1	− 1	0	− 5	+ 3	− 2	+ 2	+ 3	0	+ 3	0
3 16	− 4	− 5	− 2	+ 2	+ 3	− 1	− 4	− 1	+ 1	+ 1	+ 2	− 1
4 16	− 2	− 6	0	− 1	+ 3	+ 1	− 2	− 2	+ 1	− 4	+ 1	− 1
5 16	− 3	− **6**	− 3	− 2	+ 1	+ 1	− 3	− 2	+ 1	− 6	− 2	− 2
6 16	− 3	− 4	− 7	+ 1	0	0	− 5	0	0	− 3	− 6	− 2
7 16	+ 1	+ 1	− 5	− 6	− 1	− 3	− 1	0	− 1	+ 2	− **11**	− 2
8 16	+ 5	+ 2	− 5	− **13**	− **13**	+ **9**	− 2	+ 3	+ 2	− 2	− 10	− 2
9 16	+ 8	+ 10	− 4	− 8	+ 3	+ 6	− 1	+ **9**	− 2	+ **11**	+ 1	+ 1
10 16	+ 2	+ **16**	− 2	+ 1	− 2	+ 5	+ 6	+ 5	− 3	− 4	− 8	+ 1
11 16	+ 4	+ 13	+ 5	+ 5	− 8	− 6	+ **8**	− 1	− 2	− 3	− 1	+ 1
12 16	+ 4	+ 5	+ **16**	+ 1	− 7	− 7	+ 4	− 2	− **6**	0	+ 5	+ 1
13 16	+ **11**	0	+ 16	− 4	− 4	− **12**	+ 5	+ 4	− 1	+ **6**	+ 8	+ **3**
14 16	+ 6	0	+ 3	− 4	− 3	− 12	+ 3	− **13**	+ 1	+ 3	+ **9**	− 1
15 16	+ 2	− 1	− 6	− 4	+ 2	− 4	− 3	− 6	− 5	+ 1	+ 7	− 2
16 16	− 4	0	− **11**	− 1	+ 1	− 4	− **7**	− 5	− 6	+ 1	+ 1	− **3**
17 16	− **7**	− 1	0	− 1	+ 1	− 2	− 4	− 5	− 6	+ 2	− 1	− 2
18 16	− 2	− 1	+ 2	+ 2	− 1	− 2	0	− 1	− 1	+ 1	+ 1	0
19 16	− 2	− 1	− 1	+ 1	0	+ 1	− 2	0	− 1	− 5	− 1	− 1
20 16	− 1	0	+ 1	+ 4	+ 4	+ 1	− 1	0	+ 1	− 2	0	+ 1
21 16	− 1	− 1	+ 1	+ 3	+ 4	+ 2	+ 6	+ 4	− 1	+ 1	0	+ 2
22 16	+ 3	− 2	0	+ 5	+ 2	+ 5	− 1	0	+ 4	− 2	+ 3	+ 2
23 16	− 2	− 5	+ 2	+ **7**	+ 3	+ 5	− 1	+ 4	+ 4	− 1	+ 2	+ 2
Range ...	18	22	27	20	22	21	15	22	11	17	20	6

COLABA OBSERVATORY

Vertical Force Diurnal Inequality (Magnetograph)

(Quiet days)

Plate 93.



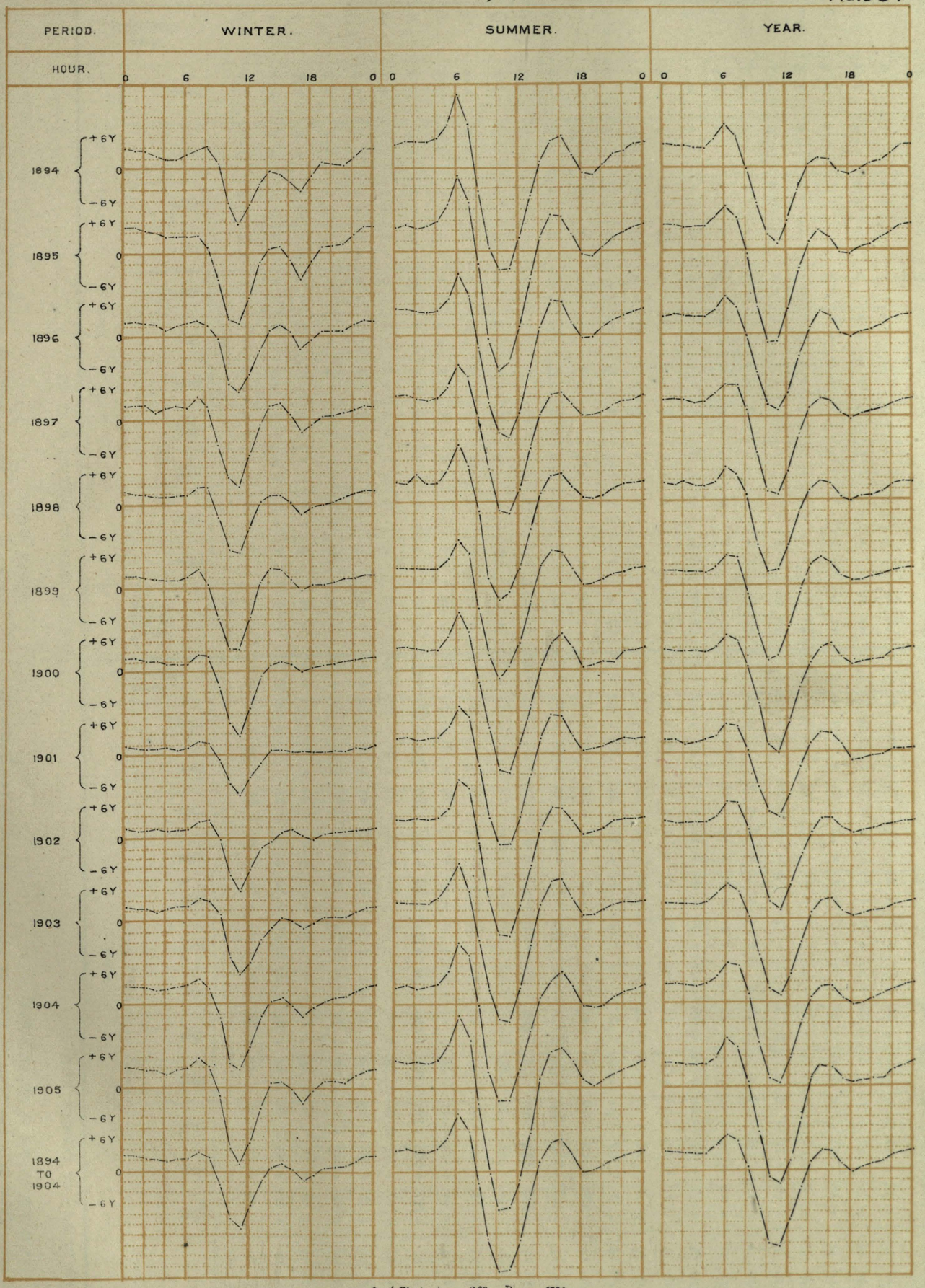
Gov.t Photozinco. Office Poona. 1910.

COLABA OBSERVATORY.

Vertical Force Diurnal Inequality (Magnetograph)

(Quiet days)

Plate 94



Govt. Photozincgo. Office, Poona. 1910.

TABLE 495.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean, 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H m.													
0 16	+ 48	+ 48	+ 49	+ 42	+ 38	+ 32	+ 43	+ 30	+ 34	+ 38	+ 36	+ 51	+ 40
1 16	+ 50	+ 50	+ 49	+ 42	+ 36	+ 32	+ 44	+ 34	+ 32	+ 37	+ 38	+ 49	+ 41
2 16	+ 49	+ 44	+ 47	+ 38	+ 53	+ 31	+ 41	+ 27	+ 34	+ 37	+ 31	+ 51	+ 39
3 16	+ 49	+ 49	+ 43	+ 35	+ 35	+ 31	+ 35	+ 29	+ 32	+ 35	+ 36	+ 46	+ 38
4 16	+ 57	+ 57	+ 48	+ 39	+ 36	+ 31	+ 39	+ 31	+ 35	+ 42	+ 39	+ 54	+ 41
5 16	+ 83	+ 88	+ 68	+ 58	+ 61	+ 52	+ 63	+ 51	+ 57	+ 69	+ 65	+ 81	+ 65
6 16	**+141**	**+145**	**+117**	**+101**	**+110**	**+ 89**	**+111**	**+ 91**	**+108**	**+109**	**+120**	**+140**	**+113**
7 16	+ 84	+ 93	+ 72	+ 79	+ 70	+ 62	+ 74	+ 69	+ 91	+ 58	+ 97	+ 92	+ 77
8 16	- 47	- 27	- 23	0	- 16	- 43	- 22	- 21	- 10	- 37	- 5	- 30	- 22
9 16	-155	-169	-130	- 98	-145	-132	-114	-125	-120	-137	-130	-163	-132
10 16	**-198**	**-232**	-187	-175	**-183**	**-177**	-194	-173	-185	-191	-183	**-233**	**-189**
11 16	-195	-218	**-196**	**-180**	-173	-157	**-199**	**-173**	**-190**	**-196**	**-184**	-232	-187
12 16	-139	-145	-154	-137	-126	-107	-141	-123	-130	-130	-126	-177	-133
13 16	- 55	- 53	- 71	- 57	- 51	- 30	69	- 42	- 55	- 46	- 53	- 85	- 53
14 16	+ 11	+ 25	+ 14	+ 2	+ 15	+ 40	+ 1	+ 30	+ 15	+ 32	+ 11	+ 17	+ 17
15 16	+ 51	+ 66	+ 64	+ 41	+ 49	+ 68	+ 54	+ 72	+ 56	+ 75	+ 45	+ 68	+ 58
16 16	+ 60	+ 65	+ 62	+ 49	+ 52	+ 65	+ 69	+ 69	+ 53	+ 80	+ 61	+ 78	+ 62
17 16	+ 25	+ 34	+ 21	+ 26	+ 27	+ 31	+ 41	+ 34	+ 28	+ 41	+ 35	+ 53	+ 32
18 16	- 10	- 6	5	+ 2	+ 5	+ 1	+ 1	+ 2	+ 5	+ 8	2	+ 17	0
19 16	- 14	- 11	- 3	+ 2	+ 3	+ 3	+ 8	+ 6	+ 9	+ 10	7	+ 4	+ 1
20 16	+ 6	+ 5	+ 11	+ 10	+ 9	+ 11	+ 16	+ 14	+ 16	+ 21	- 1	+ 16	+ 11
21 16	+ 22	+ 23	+ 26	+ 23	+ 21	+ 21	+ 13	+ 21	+ 27	+ 31	+ 15	+ 27	+ 22
22 16	+ 30	+ 35	+ 37	+ 31	+ 33	+ 26	+ 36	+ 30	+ 32	+ 36	+ 24	+ 37	+ 32
23 16	+ 45	+ 44	+ 43	+ 34	+ 36	+ 31	+ 39	+ 28	+ 32	+ 36	+ 30	+ 41	+ 36
Range ...	339	377	313	281	293	266	310	264	298	305	304	373	302

TABLE 496.—*Showing the excess Diurnal Inequality of Vertical Force (all-days less quiet-days) for the half-year April to September for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean, 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.		
H. m.													
0 16	- 3	+ 3	+ 1	+ 6	+ 8	+ 7	- 1	+ 3	+ 3	+ 2	+ 6		+ 3
1 16	- 4	+ 3	+ 2	+ 5	+14	+ 5	- 4	- 3	+ 5	+ 2	+ 4		+ 3
2 16	- 6	+ 6	- 1	+ 6	-11	+ 5	- 4	+ 1	+ 1	+ 2	**+12**		+ 1
3 16	- 6	+ 2	+ 1	+ 6	+ 7	+ 1	- 4	- 2	+ 2	+ 3	+ 5		+ 1
4 16	- 6	- 2	- 1	+ 3	+ 7	+ 3	- 2	- 3	+ 2	- 1	+ 7		+ 1
5 16	- 6	- 2	+ 1	+ 7	+ 3	+ 3	- 6	- 5	+ 1	- 1	+ 7		0
6 16	- 6	- 4	- 5	+ 9	+ 1	+ 4	**-10**	0	- 3	+ 3	- 3		- 1
7 16	+ 2	- 4	- 5	- 3	+ 4	+ 3	+ 1	+ 3	- 2	**+14**	-16		0
8 16	+20	-11	**-14**	-22	-14	**+15**	0	+ 8	+ 5	+ 3	-16		- 2
9 16	**+23**	+ 8	- 8	**-26**	**+15**	+ 8	- 1	**+17**	+ **5**	- 4	+ 3		**+ 4**
10 16	+11	**+13**	- 6	-13	- 3	+ 7	+14	+11	+ 4	- 9	**-25**		0
11 16	+ 9	+11	+ 6	- 9	**-17**	-12	+ 7	+ 3	- 2	- 8	-15		- 2
12 16	+ 3	- 3	**+17**	- 7	-14	11	+ 1	- 3	**-10**	**-13**	-12		- 5
13 16	+ 2	+ 1	+16	- 4	- 7	-13	+11	- 4	- 1	- 8	0		- 1
14 16	+ 2	- 5	+ 5	+ 6	- 9	**-21**	+ 6	-13	- 2	**-10**	+ 4		- 3
15 16	0	- 6	- 6	+ 4	- 5	-12	- 2	**-18**	- 8	- 7	+ 8		- 5
16 16	**- 9**	- 8	- 9	- 1	- 1	-10	- 8	-10	- 1	- 7	+ 1		**- 6**
17 16	- 7	**-14**	+ 2	- 4	0	- 4	- 8	- 5	- 6	- 3	- 4		- 5
18 16	- 2	- 6	+ 3	- 3	- 2	- 3	+ 2	+ 1	- 4	- 3	+ 3		- 1
19 16	- 2	+ 1	- 1	+ 1	+ 1	- 1	- 2	- 1	- 3	- 6	+ 3		- 1
20 16	- 1	+ 3	- 1	+ 6	+ 6	+ 1	- 1	- 1	0	- 6	+ 9		+ 1
21 16	- 6	0	- 1	+ 5	+ 8	+ 3	**+15**	+ 2	- 1	- 4	+ 6		+ 2
22 16	0	+ 1	- 1	+ 8	+ 6	+ 6	0	1	+ 2	- 1	+ 9		+ 3
23 16	- 6	+ 2	+ 2	**+11**	+ 8	+ 5	+ 2	+ 3	+ 4	0	+ 8		+ 4
Range ...	32	27	31	37	32	36	25	35	15	27	37		10

TABLE 497.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.												Mean, 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	1905.	
H. m.													
0 16	+ 39	+ 50	+ 27	+ 27	+ 25	+ 22	+ 26	+ 19	+ 20	+ 26	+ 37	+ 39	+ 29
1 16	+ 33	+ **51**	+ 31	+ 27	+ 20	+ 22	+ 26	+ 16	+ 15	+ 25	+ 33	+ 38	+ 27
2 16	+ 34	+ 43	+ 26	+ 27	+ 20	+ 19	+ 21	+ 12	+ 15	+ 25	+ 32	+ 33	+ 24
3 16	+ 25	+ 40	+ 22	+ 17	+ 16	+ 19	+ 21	+ 12	+ 17	+ 18	+ 26	+ 33	+ 21
4 16	+ 20	+ 31	+ 14	+ 22	+ 15	+ 16	+ 16	+ 12	+ 15	+ 22	+ 29	+ 26	+ 19
5 16	+ 19	+ 34	+ 21	+ 28	+ 16	+ 16	+ 18	+ 9	+ 17	+ 25	+ 31	+ 36	+ 21
6 16	+ 26	+ 33	+ 27	+ 22	+ 16	+ 21	+ 15	+ 12	+ 17	+ 27	+ 38	+ 39	+ 23
7 16	+ 38	+ 34	+ **32**	+ **42**	+ **31**	+ **38**	+ **32**	+ **26**	+ 30	+ **44**	+ **46**	+ **58**	+ **35**
8 16	+ **43**	+ 10	+ 21	+ 27	+ 31	+ 6	+ 29	+ 23	+ **31**	+ 39	+ 29	+ 42	+ 26
9 16	+ 8	− 49	− 23	− 43	− 24	− 59	− 31	− 10	− 4	+ 6	− 26	− 18	− 23
10 16	− 61	−123	− 91	−111	− 87	−117	−100	− 58	− 74	− 71	−113	−118	− 91
11 16	−**101**	−**133**	−**103**	−**127**	− **94**	−**119**	−**125**	− **80**	−**101**	−**102**	−**128**	−**146**	−**110**
12 16	− 64	− 84	− 73	− 67	− 44	− 57	− 73	− 45	− 63	− 80	− 81	−108	− 66
13 16	− 31	− 18	− 23	− 9	+ 6	+ 8	− 11	− 15	− 19	− 37	− 21	− 40	− 16
14 16	− 8	+ 7	+ 12	+ 26	+ 16	+ 35	+ 12	+ 7	− 6	− 13	+ 4	+ 7	+ 8
15 16	− 12	+ 12	+ 21	+ 32	+ 16	+ 33	+ 20	+ 7	+ 9	+ 1	+ 10	+ 10	+ 13
16 16	− 25	− 14	+ 7	+ 9	+ 3	+ 16	+ 15	+ 3	+ 17	− 1	− 4	− 3	+ 3
17 16	− 42	− 49	− 21	− 21	− 20	− 5	− 1	+ 4	+ 3	− 13	− 25	− 32	− 17
18 16	− 17	− 15	− 8	− 11	− 7	+ 5	+ 5	+ 3	− 2	− 7	− 9	− 4	− 5
19 16	+ 13	+ 12	+ 6	+ 4	0	+ 5	+ 11	+ 3	+ 6	+ 5	+ 5	+ 13	+ 6
20 16	+ 6	+ 15	+ 6	+ 8	+ 1	+ 10	+ 13	+ 6	+ 8	+ 6	+ 13	+ 13	+ 8
21 16	+ 4	+ 19	+ 9	+ 13	+ 10	+ 19	+ 20	+ 6	+ 11	+ 7	+ 15	+ 10	+ 12
22 16	+ 21	+ 35	+ 21	+ 20	+ 20	+ 19	+ 21	+ 13	+ 13	+ 19	+ 24	+ 28	+ 21
23 16	+ 39	+ 49	+ 29	+ 28	+ 25	+ 22	+ 25	+ 13	+ 16	+ 25	+ 34	+ 36	+ 28
Range ...	144	184	135	169	125	157	157	106	132	146	174	204	145

TABLE 498.—*Showing the excess Diurnal Inequality of Vertical Force (all-days less quiet-days) for the half-year January to March and October to December for each of the years 1894 to 1905 and for the whole period of eleven years.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Years.											Mean, 1894—1904.
	1894.	1895.	1896.	1897.	1898.	1899.	1900.	1901.	1902.	1903.	1904.	
H. m.												
0 16	− 1	− 14	+ 3	+ 2	+ 1	+ 5	− 1	+ 1	+ 3	− 3	− 8	− 1
1 16	+ 2	− **16**	− 2	0	+ 2	+ 2	− 2	+ 1	+ **7**	− 2	− 2	− 1
2 16	+ 1	− 9	− 2	− 3	0	+ 1	− 1	+ 3	+ 5	− 4	− 4	− 1
3 16	− 2	− 12	− 4	+ 1	− 2	− 3	− 4	0	0	− 3	− 3	− 3
4 16	− 1	− 9	+ 1	− 4	− 3	− 3	− 1	− 2	+ 1	− 8	− 5	− 3
5 16	0	− 10	− 5	− 10	− 1	− 1	− 1	0	0	− 10	− 7	− 4
6 16	− 1	− 6	− 9	− 6	− 2	− 3	+ 1	0	+ 2	− 9	− 9	− **4**
7 16	− 1	+ 5	− 5	− 7	− 5	− 6	0	− 3	0	− 11	− 8	− 4
8 16	− **10**	+ 15	+ 2	− 3	− **13**	+ 2	− **4**	− 1	0	− 7	− 3	− 2
9 16	− 8	+ 13	+ 2	+ 11	− 7	+ 5	− 1	0	− **10**	− **18**	− 4	− 2
10 16	− 10	+ **20**	+ 4	+ 17	− 1	+ 2	+ 1	− 2	− 8	− 2	+ 9	+ 3
11 16	− 2	+ 13	+ 4	+ **21**	+ 2	− 1	+ **11**	− 6	0	+ 2	+ 13	+ 5
12 16	+ 5	+ 14	+ **17**	+ 8	+ 1	− 3	+ 8	− 1	0	+ 13	+ **20**	+ **7**
13 16	+ **18**	0	+ 16	− 4	− 2	− **10**	0	+ **13**	− 2	+ **18**	+ 16	+ 6
14 16	+ 8	+ 5	+ 4	− **15**	+ 4	− 3	+ 2	+ 2	+ 4	+ 17	+ 14	+ 4
15 16	+ 3	+ 5	− 6	− 10	+ **7**	+ **6**	− 1	+ 4	− 1	+ 9	+ 7	+ 2
16 16	− 2	+ 8	− **12**	− 2	+ 2	+ 4	− 4	+ 2	− 8	+ 7	+ 2	0
17 16	− 7	+ 11	− 2	+ 2	+ 1	− 1	− 1	− **9**	− 6	+ 8	+ 2	0
18 16	− 2	+ 4	0	+ 6	+ 1	− 2	− 1	− 3	+ 2	+ 6	− 1	+ 1
19 16	− 5	− 2	− 2	+ 1	0	+ 4	− 2	0	+ 1	− 2	− 4	− 1
20 16	− 1	− 6	+ 1	+ 1	+ 3	+ 3	− 1	0	+ 3	+ 1	− **10**	− 1
21 16	+ 3	− 3	+ 3	+ 1	+ 1	− 1	− 2	+ 4	+ 2	+ 5	− 5	+ 1
22 16	+ 4	− 5	+ 2	+ 2	− 1	+ 3	0	+ 2	+ 6	− 1	− 4	+ 1
23 16	− 1	− 12	+ 1	+ 2	− 1	+ 4	− 2	+ 6	+ 6	− 2	− 5	0
Range ...	28	36	29	36	20	16	15	22	17	36	30	11

TABLE 499.—*Showing for the quiet-aays selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for each average month of the period 1894—1904 and for the aver age year.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 16	+ 28	+ 28	+ 32	+ 45	+ 39	+ 33	+ 30	+ 36	+ 53	+ 42	+ 26	+ 22	+ 34
1 16	+ 25	+ 28	+ 30	+ 45	+ 37	+ 33	+ 31	+ 38	+ 56	+ 41	+ 24	+ 17	+ 34
2 16	+ 26	+ 26	+ 27	+ 43	+ 33	+ 32	+ 28	+ 44	+ 54	+ 38	+ 21	+ 15	+ 32
3 16	+ 23	+ 22	+ 23	+ 35	+ 33	+ 32	+ 31	+ 39	+ 53	+ 35	+ 18	+ 11	+ 30
4 16	+ 17	+ 18	+ 20	+ 36	+ 36	+ 38	+ 35	+ 41	+ 59	+ 39	+ 14	+ 11	+ 30
5 16	+ 15	+ 17	+ 24	+ 47	+ 63	+ 67	+ 69	+ 68	+ 75	+ 45	+ 17	+ 12	+ 43
6 16	+ 15	+ 17	+ 39	**+ 95**	**+110**	**+105**	**+109**	**+124**	**+144**	**+ 72**	0	0	**+ 69**
7 16	+ 30	+ 31	**+ 69**	+ 74	+ 70	+ 72	+ 68	+ 90	+ 89	+ 68	+ 19	+ 04	+ 57
8 16	**+ 68**	**+ 38**	+ 42	− 10	− 34	− 08	− 16	− 25	− 45	− 15	+ 08	**+ 23**	+ 2
9 16	+ 20	− 02	− 16	− 104	− 148	− 105	− 105	− 146	− 188	− 105	− 38	+ 06	− 78
10 16	− 95	− 62	− 91	− 175	**− 205**	− 161	− 157	**− 182**	**− 253**	− 169	**− 90**	− 36	− 140
11 16	**− 127**	**− 100**	**− 135**	**− 189**	− 187	**− 177**	**− 159**	− 164	− 249	**− 170**	− 78	**− 45**	**− 148**
12 16	− 65	− 67	− 120	− 141	− 124	− 134	− 116	− 115	− 167	− 100	− 13	− 24	− 99
13 16	− 24	− 19	− 48	− 65	− 40	− 63	− 59	− 46	− 46	− 04	+ 18	− 02	− 33
14 16	− 25	+ 06	+ 27	+ 04	+ 25	− 03	+ 06	+ 18	+ 51	+ 54	+ 06	− 07	+ 13
15 16	+ 01	+ 07	+ 45	+ 51	+ 58	+ 50	+ 47	+ 54	+ 87	+ 54	− 06	− 15	+ 36
16 16	+ 09	0	+ 21	+ 56	+ 63	+ 63	+ 64	+ 62	+ 65	+ 13	− 16	− 07	+ 33
17 16	− 14	− 22	− 18	+ 24	+ 35	+ 41	+ 42	+ 29	+ 14	− 24	− 15	− 11	+ 7
18 16	+ 03	− 07	− 17	+ 03	− 01	+ 05	+ 03	− 14	0	− 03	− 02	− 02	− 3
19 16	+ 15	+ 08	0	+ 06	+ 02	0	− 13	− 05	+ 10	+ 07	+ 06	+ 06	+ 3
20 16	+ 12	+ 10	+ 06	+ 15	+ 15	+ 12	+ 01	0	+ 19	+ 12	+ 07	+ 07	+ 10
21 16	+ 16	+ 09	+ 12	+ 29	+ 27	+ 25	+ 13	+ 05	+ 29	+ 19	+ 12	+ 07	+ 17
22 16	+ 23	+ 16	+ 22	+ 37	+ 35	+ 34	+ 21	+ 22	+ 39	+ 30	+ 22	+ 15	+ 26
23 16	+ 26	+ 23	+ 30	+ 39	+ 37	+ 35	+ 25	+ 30	+ 49	+ 38	**+ 30**	+ 22	+ 32
Range...	195	138	204	284	315	282	268	306	397	242	120	68	217

TABLE 500.—*Showing the excess Diurnal Inequality of Vertical Force (all-days less quiet-days) for each average month of the period 1894—1904 and for the average year.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Mean, 1894—1904.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 16	− 2	− 4	0	0	+ 2	+ 7	+ 6	+ 4	+ 1	− 3	0	− 2	+ 1
1 16	− 1	− 5	− 1	− 2	+ 3	+ 6	+ 5	+ 4	+ 2	− 2	0	+ 1	+ 1
2 16	− 5	− 5	− 2	− 6	+ 3	+ 4	+ 7	− 1	+ 1	− 1	+ 2	0	0
3 16	− 7	− 7	− 3	− 4	+ 2	+ 3	+ 5	+ 4	+ 1	− 3	0	− 1	− 1
4 16	− 4	− 7	− 1	− 7	+ 2	+ 2	+ 5	+ 6	− 2	− 7	+ 1	− 1	− 1
5 16	− 5	− 9	− 2	− 6	+ 1	+ 5	− 1	+ 6	− 1	− 6	− 1	− 3	− 2
6 16	− 2	− 9	− 4	− 4	+ 1	+ 1	0	− 3	**− 11**	− 10	0	− 1	**− 3**
7 16	− 3	− 10	− 12	− 5	+ 2	− 2	**+ 11**	− 9	+ 3	− 5	− 1	+ 2	− 2
8 16	**− 7**	**− 13**	− 19	− 5	+ 4	+ 1	+ 9	− 14	− 10	+ 9	+ 5	+ 7	− 3
9 16	− 5	− 8	**− 24**	− 1	+ 4	**+ 10**	+ 9	− 5	**+ 6**	+ 9	+ 7	**+ 8**	+ 1
10 16	+ 2	− 3	− 9	+ 7	**+ 13**	+ 7	− 1	**− 16**	+ 5	+ 8	+ 13	− 1	+ 2
11 16	+ 9	+ 9	− 3	+ 5	+ 8	− 8	− 4	− 13	− 3	+ 6	**+ 13**	**− 10**	+ 1
12 16	− 2	+ 15	+ 8	+ 9	− 7	− 8	− 11	− 8	− 3	**+ 12**	+ 6	− 5	0
13 16	+ 1	**+ 15**	**+ 12**	**+ 17**	− 6	− 6	− 4	− 3	0	+ 1	0	− 9	+ 1
14 16	**+ 12**	+ 12	+ 10	+ 14	**− 9**	− 5	− 8	− 3	− 3	**− 12**	− 3	− 7	0
15 16	+ 6	+ 9	+ 5	0	− 6	**− 12**	− 9	+ 1	− 1	− 11	**− 5**	+ 4	− 2
16 16	− 3	0	− 3	**− 7**	− 7	− 11	**− 13**	+ 3	+ 2	− 5	− 2	+ 4	− 3
17 16	+ 2	0	+ 2	− 7	− 3	− 8	− 10	+ 3	− 2	− 1	− 4	+ 1	− 2
18 16	+ 1	− 2	+ 5	− 5	+ 2	0	− 4	+ 4	0	− 3	− 2	0	0
19 16	− 3	− 1	+ 4	− 4	− 1	0	0	0	+ 2	− 1	− 5	− 3	− 1
20 16	+ 1	− 4	+ 6	+ 1	0	0	+ 1	+ 5	+ 4	0	− 4	− 4	0
21 16	0	+ 1	+ 4	0	+ 1	− 1	+ 2	**+ 15**	+ 4	+ 1	− 3	0	**+ 2**
22 16	− 3	+ 1	+ 2	+ 1	+ 2	+ 1	+ 5	+ 7	+ 4	+ 3	− 1	− 1	+ 2
23 16	− 1	+ 2	0	+ 4	+ 3	+ 3	+ 6	+ 6	+ 1	+ 2	− 4	− 3	+ 2
Range...	19	28	36	24	22	22	24	31	17	24	18	18	5

TABLE 501.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for each average month and year of the maximum sun-spot years 1894, 1895 and 1905.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 16	+ 37	+ 40	+ 57	+ 50	+ 40	+ 37	+ 45	+ 48	+ 60	+ 58	+ 35	+ 30	+ 45
1 16	+ 34	+ 37	+ 48	+ 47	+ 41	+ 37	+ 41	+ 54	+ 64	+ 52	**+ 45**	+ 27	+ 44
2 16	+ 34	+ 35	+ 37	+ 41	+ 34	+ 37	+ 41	+ 54	+ 65	+ 59	+ 29	+ 23	+ 41
3 16	+ 27	+ 31	+ 32	+ 38	+ 38	+ 34	+ 46	+ 54	+ 65	+ 49	+ 29	+ 27	+ 39
4 16	+ 21	+ 18	+ 31	+ 41	+ 42	+ 41	+ 62	+ 64	+ 71	+ 47	+ 20	+ 20	+ 40
5 16	+ 18	+ 15	+ 39	+ 55	+ 69	+ 71	+ 99	+101	+ 95	+ 60	+ 24	+ 23	+ 56
6 16	+ 11	+ 16	+ 58	**+116**	**+124**	**+131**	**+146**	**+161**	**+162**	**+ 95**	+ 08	+ 10	**+ 86**
7 16	+ 19	+ 29	**+ 87**	+ 99	+ 84	+ 99	+ 76	+ 98	+ 72	+ 78	+ 35	+ 13	+ 66
8 16	**+ 66**	**+ 49**	+ 49	− 04	− 22	− 01	− 28	− 70	− 98	− 39	+ 25	**+ 40**	− 3
9 16	+ 49	+ 12	− 29	− 98	−149	−138	−157	−220	−228	−154	− 18	+ 23	− 92
10 16	− 51	− 70	−131	−173	**−208**	−204	**−227**	**−247**	**−280**	**−241**	**− 78**	− 30	−162
11 16	**− 97**	**−113**	**−195**	**−197**	−194	**−227**	−200	−217	−270	−217	− 77	− 60	**−172**
12 16	− 77	− 70	−160	−160	−150	−180	−127	−137	−180	−120	− 20	**− 63**	−120
13 16	− 27	− 17	− 75	− 87	− 49	− 93	− 63	− 57	− 50	+ 03	0	− 60	− 48
14 16	− 19	+ 07	+ 24	− 10	+ 34	+ 01	− 10	+ 17	+ 57	+ 74	− 06	− 63	+ 09
15 16	− 19	− 06	+ 46	+ 38	+ 69	+ 61	+ 17	+ 70	+104	+ 74	− 09	− 63	+ 32
16 16	− 29	− 26	+ 15	+ 38	+ 72	+ 74	+ 51	+ 83	+ 74	+ 19	− 28	− 30	+ 26
17 16	− 42	− 49	− 43	+ 14	+ 30	+ 64	+ 38	+ 49	+ 14	− 35	− 41	− 33	− 03
18 16	− 08	− 29	− 28	− 02	− 17	+ 15	+ 04	− 18	+ 04	+ 02	− 01	− 03	− 07
19 16	+ 15	+ 12	+ 17	+ 02	− 19	− 15	− 22	− 14	+ 15	+ 20	+03	+ 10	+ 02
20 16	+ 09	+ 15	+ 16	+ 15	+ 05	+ 02	+ 04	− 04	+ 19	+ 16	+ 03	+ 10	+ 09
21 16	+ 10	+ 09	+ 18	+ 29	+ 18	+ 23	+ 21	+ 12	+ 29	+ 21	+ 01	+ 13	+ 17
22 16	+ 20	+ 19	+ 37	+ 35	+ 29	+ 30	+ 32	+ 29	+ 39	+ 44	+ 27	+ 27	+ 31
23 16	+ 33	+ 30	+ 52	+ 40	+ 39	+ 33	+ 42	+ 36	+ 56	+ 58	+ 42	+ 37	+ 41
Range...	163	162	282	313	332	358	373	408	442	336	123	103	258

TABLE 502.—*Showing for the quiet-days selected by the Astronomer Royal the mean Diurnal Inequality of Vertical Force for each average month and year of the minimum sun-spot years 1899 to 1902.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
H. m.													
0 16	+ 17	+ 19	+ 32	+ 38	+ 37	+ 35	+ 24	+ 25	+ 45	+ 31	+ 19	+ 10	+ 28
1 16	+ 12	+ 22	+ 27	+ 41	+ 37	+ 35	+ 24	+ 23	+ 50	+ 31	+ 14	+ 07	+ 27
2 16	+ 17	+ 19	+ 26	+ 41	+ 32	+ 32	+ 22	+ 23	+ 45	+ 24	+ 11	+ 04	+ 25
3 16	+ 14	+ 17	+ 26	+ 33	+ 32	+ 32	+ 24	+ 28	+ 45	+ 29	+ 11	+ 04	+ 25
4 16	+ 09	+ 17	+ 19	+ 33	+ 32	+ 35	+ 24	+ 28	+ 50	+ 29	+ 06	+ 03	+ 24
5 16	+ 06	+ 13	+ 24	+ 38	+ 55	+ 65	+ 58	+ 54	+ 64	+ 31	+ 06	+ 03	+ 35
6 16	+ 08	+ 16	+ 38	**+ 81**	**+ 97**	**+100**	**+ 96**	**+ 99**	**+124**	+ 55	− 06	− 15	**+ 58**
7 16	+ 26	+ 23	**+ 63**	+ 66	+ 55	+ 67	+ 71	+ 79	+106	**+ 77**	+ 09	− 08	+ 53
8 16	**+ 76**	**+ 26**	+ 25	− 15	− 50	− 12	− 19	− 18	− 33	0	0	+ 12	− 01
9 16	+ 38	− 14	− 28	− 97	−152	−105	−101	−118	−163	− 92	− 47	− 11	− 74
10 16	− 57	− 67	−108	−165	**−207**	**−157**	−150	**−170**	−245	−157	**− 95**	**− 39**	−135
11 16	**−102**	**−107**	**−150**	**−170**	−197	−155	**−155**	−152	**−250**	**−170**	− 67	− 35	**−142**
12 16	− 50	− 67	−122	−132	−125	−115	−110	−100	−170	−102	− 05	+ 05	− 91
13 16	− 20	− 10	− 40	− 60	− 35	− 55	− 50	− 37	− 57	− 17	**+ 25**	**+ 32**	− 27
14 16	− 32	+ 20	+ 38	+ 02	+ 32	+ 10	+ 17	+ 25	+ 40	+ 42	+ 02	+ 16	+ 18
15 16	− 06	+ 19	+ 56	+ 50	+ 62	+ 52	+ 64	+ 63	+ 83	+ 47	− 12	− 01	+ 40
16 16	+ 11	+ 09	+ 34	+ 60	+ 67	+ 50	+ 66	+ 68	+ 73	+ 22	− 05	+ 05	+ 38
17 16	+ 01	− 06	0	+ 31	+ 50	+ 22	+ 44	+ 28	+ 23	− 05	+ 01	+ 03	+ 16
18 16	+ 11	+ 04	0	+ 11	+ 15	+ 02	+ 01	− 19	+ 01	+ 05	+ 03	− 02	+ 03
19 16	+ 14	+ 09	+ 03	+ 06	+ 17	+ 10	− 08	+ 03	+ 08	+ 08	+ 06	+ 02	+ 06
20 16	+ 10	+ 08	+ 13	+ 14	+ 20	+ 22	+ 03	+ 04	+ 19	+ 16	+ 08	− 01	+ 11
21 16	+ 13	+ 10	+ 16	+ 29	+ 30	+ 30	+ 10	− 08	+ 29	+ 23	+ 16	+ 01	+ 17
22 16	+ 13	+ 15	+ 24	+ 34	+ 37	+ 37	+ 20	+ 17	+ 39	+ 23	+ 18	+ 03	+ 23
23 16	+ 13	+ 15	+ 25	+ 34	+ 37	+ 37	+ 23	+ 24	+ 39	+ 31	+ 18	+ 10	+ 25
Range...	178	133	213	251	304	257	251	269	374	247	120	71	200

TABLE 503.—*Showing the values of the p, q co-efficients (reckoned from $0^h\ 16^m$) and of the Amplitude* P *and the first maximum* μ *(reckoned from $0^h\ 0^m$) for the first four orders of the Harmonic Components of the Diurnal Inequality of Vertical Force for each average year and the average months given in tables 493 and 499.*

Unity = 1γ = ·00001 C. G. S.

Years.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
1894 ...	+5·57	+0·76	−3·10	+2·78	+1·99	−3·50	+0·13	+1·58
1895 ...	+6·53	+0·10	−3·50	+3·95	+2·00	−4·66	+0·19	+2·07
1896 ...	+5·31	−0·10	−3·29	+3·11	+2·35	−3·62	−0·36	+1·56
1897 ...	+4·93	−0·04	−3·34	+2·86	+2·29	−3·62	−0·28	+1·95
1898 ...	+4·52	−0·24	−2·85	+2·89	+1·78	−3·51	+0·11	+1·73
1899 ...	+4·18	−1·22	−2·86	+3·60	+1·62	−3·94	+0·07	+1·81
1900 ...	+5·16	−0·64	−3·74	+3·02	+2·43	−3·43	−0·23	+1·61
1901 ...	+3·78	−0·68	−2·97	+2·64	+1·95	−3·04	−0·18	+1·37
1902 ...	+4·46	−0·28	−3·62	+2·49	+2·22	−3·20	−0·26	+1·60
1903 ...	+4·89	−0·34	−3·59	+2·84	+2·22	−3·36	−0·31	+1·38
1904 ...	+5·19	+0·35	−3·68	+2·98	+2·30	−3·83	+0·11	+1·85
1905 ...	+6·62	−0·06	−4·72	+3·57	+2·91	−4·23	−0·17	+2·06

Months.	p_1	q_1	p_2	q_2	p_3	q_3	p_4	q_4
January ...	+3·56	+0·60	−2·24	+0·29	+2·17	−1·36	−1·02	+1·98
February...	+3·01	+0·62	−1·47	+0·69	+1·62	−1·48	−0·90	+1·71
March ...	+3·86	+0·67	−2·78	+1·53	+3·13	−2·87	−1·59	+2·02
April ..	+6·70	−0·69	−4·71	+3·81	+3·08	−4·33	−0·17	+1·71
May ...	+6·46	−1·32	−4·75	+4·98	+2·30	−5·47	+0·65	+1·68
June ...	+6·07	−0·46	−5·14	+3·81	+2·86	−4·29	+0·06	+0·98
July ...	+5·30	−0·22	−4·79	+4·14	+2·65	−4·17	+0·42	+0·77
August ...	+5·85	−0·09	−4·65	+5·03	+2·39	−5·06	+0·91	+1·49
September.	+8·45	−1·29	−5·73	+6·71	+2·74	−7·08	+0·45	+2·81
October ...	+5·38	−0·45	−2·83	+3·98	+1·57	−4·99	+0·07	+2·87
November.	+2·75	−0·18	−0·34	+1·19	+0·21	−1·84	+0·41	+1·61
December .	+1·82	+0·36	−0·32	0·00	+0·57	−0·52	−0·18	+0·73
Winter ...	+3·40	+0·27	−1·66	+1·28	+1·54	−2·18	−0·53	+1·82
Summer ...	+6·47	−0·68	−4·96	+4·75	+2·67	−5·07	+0·39	+1·57
Year ...	+4·93	−0·20	−3·31	+3·01	+2·11	−3·62	−0·07	+1·70

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
1894 ...	5·62	4·16	4·03	1·59	11 46	73 3	103 52	25 20
1895 ...	6·53	5·28	5·07	2·08	4 53	69 46	101 45	25 11
1896 ...	5·31	4·53	4·32	1·60	2 55	72 18	105 0	29 45
1897 ...	4·93	4·40	4·28	1·97	3 32	73 43	104 46	28 32
1898 ...	4·53	4·06	3·94	1·74	0 58	71 18	102 58	25 36
1899 ...	4·35	4·59	4·26	1·81	347 44	68 15	101 27	25 57
1900 ...	5·20	4·81	4·20	1·63	356 56	74 32	105 46	28 32
1901 ...	3·84	3·97	3·61	1·38	353 48	73 11	104 54	28 22
1902 ...	4·47	4·39	3·89	1·62	0 24	76 44	105 35	28 48
1903 ...	4·90	4·58	4·03	1·41	0 1	74 49	105 9	29 40
1904 ...	5·20	4·74	4·47	1·85	7 51	74 30	104 20	25 39
1905 ...	6·62	5·92	5·13	2·60	3 29	74 27	104 31	27 41

Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
					° ′	° ′	° ′	° ′
January ...	3·61	2·26	2·56	2·23	13 34	90 18	113 18	33 19
February...	3·07	1·62	2·19	1·93	15 38	81 25	109 52	33 26
March ...	3·92	3·17	4·25	2·57	13 51	79 35	109 50	36 3
April ...	6·74	6·06	5·31	1·72	358 7	74 31	105 48	27 55
May ..	6·59	6·88	5·94	1·80	352 27	70 49	101 36	21 13
June ...	6·09	6·40	5·16	0·98	359 40	75 43	105 14	25 38
July ...	5·30	6·33	4·94	0·88	1 37	73 35	104 49	19 21
August ...	5·85	6·85	5·60	1·75	3 7	70 22	102 26	18 39
September.	8·55	8·82	7·59	2·85	355 19	69 15	101 3	24 14
October ...	5·40	4·88	5·23	2·87	359 13	66 42	99 49	26 9
November.	2·76	1·24	1·85	1·66	0 15	56 58	96 10	22 56
December .	1·86	0·32	0·77	0·75	15 11	90 0	109 53	29 58
Winter ...	3·41	2·10	2·67	1·90	8 32	75 11	105 45	30 33
Summer ...	6·51	6·87	5·73	1·62	358 0	72 7	103 15	23 1
Year ...	4·93	4·47	4·19	1·71	1 41	72 51	104 5	27 5

CHAPTER XII.

The Influence of the Moon on the Diurnal Variations of Magnetic Elements.

521. Up to now the analysis and discussion of the Colaba magnetic data have been chiefly restricted in the direction of the diurnal variations of the elements under the influence in some way, of solar action which, we have seen, is responsible for the bulk of the phenomenon of the diurnal variation. But the moon may likewise exercise a similar influence on the progression of the diurnal wave. The difficulties however of separating the true lunar effect, which is very small, from the much larger solar variations are by no means trifling. The action being very feeble it is easily masked by disturbances the smallest of which are relatively much larger, and to eliminate the latter, it becomes necessary to take as long a series of data as possible, involving enormous labour in computation. The solar and lunar days besides are very much of the same duration and some circumspection is necessary in dealing with the data for the complete elimination of the effect of the former. These are no doubt the reasons why up to now a definite opinion in regard to the real existence of this lunar influence has not been made possible. Attempts have been made by previous workers to throw light on the question, but as some doubt still prevails, it is hoped that the Colaba data and their analysis supplemented here will fill up the necessary gap in the evidence enabling, if possible, a definite answer to be given.

522. Chambers while discussing the Colaba data of H and D of the older series 1846—1872 in the Philosophical Transactions of the Royal Society, Vol. 178A, pages 1—43, arrives at the conclusion that "the bulk of the phenomenon dealt with is, properly speaking, *not a lunar diurnal variation* but solar diurnal variation which depends upon the relative position of the sun and moon, a variation such as may be expressed for any one season by the formula :—

$$fc_2\,(h)\,\cos 2\left(\frac{2\pi t}{p}\right) + fs_2\,(h)\,\sin 2\left(\frac{2\pi t}{p}\right) + \ldots\ldots$$

where h is the hour of the solar day, p the mean period of a lunation in mean solar days ; t the age of the moon in mean solar days ; and $fc_2\,(h)$ and $fs_2\,(h)$ are the observed variations at new moon and when the moon has the age of one-eighth of a lunation respectively."

The character of the curves obtained by him showed "that the great movements occur in them as in the curves of the mean solar diurnal variations for full lunations, in the solar *day hours* and the night hours are relatively quiescent ; or viewed in another aspect the significant movements occur at all hours of the lunar day in the course of a lunation and appear earlier and earlier as the age of the moon increases. And the second characteristic was that the curves regarded as solar diurnal curves have generally the same form and range at intervals of half a lunation ; and opposite forms at intervals of a quarter of a lunation ; and this with reference separately to each of the two magnetic elements and to each season of the year."

Figee on the other hand while dealing with the Batavia records of 12 years 1883 to 1894 shows that a true lunar diurnal inequality exists in all the elements, clearly indicating a double wave in 24 hours.

523. That a true lunar diurnal wave small in magnitude does exist, as we shall presently see, there is little doubt.

The data discussed by Chambers were derived from instruments which, as noted in Part I of this volume, were defective in certain respects, and it was thought desirable therefore in the first instance, to ascertain if the results obtained by him from the older record were confirmed in all details by the magnetograph record of subsequent years. As the treatment of the data extending over some 18 years of the record here dealt with, involved enormous labour, the material taken in hand for this purpose was restricted to the data of the winter quarter, November to January, which, according to Chambers, gives the largest effects in the year. The data for the examination of the seasonal change, derived from the summer quarter, May to July, of a shorter period, will be referred to later.

We have thus the magnetograph record of H, D* and V for the period 1872 to 1889 for the single winter quarter available for examination and inquiry. The previous discussion does not include

* The whole declination data are derived in C. G. S. units, initially and they have been used in the same unit in this chapter, except the data treated and referred to in paragraph 528.

TABLE 504.—*Declination Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											New Moon.													
1871-1872...	-12	-19	-17	-23	-32	-43	-39	-41	-28	-29	+13	+31	+67	+82	+53	+25	- 1	+ 7	+ 8	- 5	+11	+ 6	- 7	- 5
1872-1873...	+14	+ 2	-10	- 3	- 4	-10	-18	-14	-26	-27	- 37	-20	- 4	+14	+42	+41	- 3	- 4	+ 3	+14	+11	+13	+13	+13
1873-1874...	+ 6	+12	+11	+ 2	+14	- 1	+ 3	0	+ 6	- 1	- 7	- 6	+ 5	+ 3	+ 6	+ 3	- 5	-21	- 5	- 3	-12	-19	-11	+20
1874-1875...	+21	+26	+27	+20	+19	+ 9	0	-19	-12	-16	- 7	+10	+31	+ 8	+ 9	-14	-29	-23	-14	-24	-17	- 7	- 4	+ 8
1875-1876...	+11	+ 7	- 3	0	- 9	-23	-23	-33	-45	-33	+10	+22	+13	+23	+30	+22	- 2	- 7	+ 8	+ 9	+ 6	+10	+ 6	+ 3
1876-1877...	0	+11	+ 7	+ 6	+ 3	- 2	- 6	+ 4	+ 8	+16	+28	+ 8	+ 2	+17	+11	- 10	-16	-16	-11	-16	-15	-10	-13	- 8
1877-1878...	0	+ 3	+ 4	0	-17	-15	-11	-31	-38	-27	- 7	+ 7	+18	+40	+37	+21	- 2	- 4	- 4	+ 8	+ 7	+ 2	+ 1	+ 6
1878-1879...	+ 1	+ 2	- 4	- 2	- 1	- 1	-15	-37	-33	-20	- 2	+33	+42	+30	+13	+ 9	- 6	- 6	- 7	- 7	+ 2	+ 2	+ 1	+ 2
1879-1880...	-11	- 5	- 9	- 5	- 6	- 7	- 2	- 2	- 2	- 6	+21	+22	+18	+11	- 2	- 6	+ 8	+ 5	- 4	- 1	+ 1	- 4	- 7	- 5
1880-1881...	-10	- 2	-13	-14	-20	-14	-21	-18	-27	-18	+ 9	+14	+38	+35	+19	+15	- 1	- 6	+14	- 3	+ 2	+ 7	+ 5	+ 4
1881-1882...	- 1	- 1	+14	+17	+16	+ 9	- 7	-17	-18	-10	+ 7	+23	+46	+14	- 6	+ 3	-15	-27	-20	-21	-10	- 8	+ 2	+ 7
1882-1883...	+19	+17	+15	+17	- 8	-16	-39	-35	- 8	+20	+ 1	- 6	+12	+14	+23	+33	- 6	-17	-16	-21	- 8	- 3	+ 1	+14
1883-1884...	+11	+ 8	+10	-15	-13	-11	-24	-42	-44	-23	+13	+ 5	+21	+37	+41	+25	+ 2	- 5	-10	- 6	-10	+ 2	+10	+16
1884-1885...	- 7	- 7	-12	-19	-16	-16	-15	- 4	+ 5	+12	+17	+29	+27	+17	+ 9	- 7	- 5	- 2	0	+ 1	+ 2	0	- 2	- 7
1885-1886...	+ 4	+19	+10	- 2	- 2	- 5	-12	-17	-28	-21	-27	-10	+23	+35	+26	+10	-13	-18	- 2	- 3	+ 3	+ 6	+11	+ 8
1886-1887...	+ 3	+ 3	+ 5	- 6	-14	-29	-30	-27	-48	-33	+16	+40	+30	+38	+53	+19	+ 1	+ 2	- 3	+ 2	- 6	-11	- 5	+ 2
1887-1888...	+ 8	+20	+ 1	- 8	-20	-26	-26	-18	- 6	+13	+41	+54	+47	+28	+ 1	-37	-33	-27	-25	- 2	- 1	+ 5	+10	+ 2
1888-1889...	+ 7	+ 9	+10	+ 2	+ 6	-12	-11	-13	-19	-12	+ 7	+18	+33	+35	+17	-16	-27	-20	-12	-14	- 5	0	+10	+10
Mean, 1872-1873 to 1888-1889.	+ 4	+ 7	+ 4	- 1	- 4	-10	-15	-19	-20	-11	+ 5	+14	+24	+23	+19	+ 7	- 9	-12	- 6	- 5	- 3	- 1	+ 2	+ 6
Years.											One-eighth Phase.													
1871-1872...	-19	-26	-31	-30	-26	-19	-13	-16	- 4	+ 1	+11	+27	+30	+15	+ 5	+27	+53	+22	+13	+13	-15	-15	- 1	- 5
1872-1873...	- 5	0	+20	+28	+45	+33	+40	+29	+17	-17	- 9	-31	-40	-11	+15	+10	-16	- 5	-13	-26	-35	-11	- 5	-12
1873-1874...	-14	-16	-21	-16	-20	-45	-35	-19	- 1	+ 7	+ 7	+ 9	+ 9	+23	+44	+25	+ 1	+11	+ 7	+11	+15	+15	+ 3	- 4
1874-1875...	+13	+12	+12	+ 8	- 1	+ 3	-17	-26	-38	-38	+10	+44	+13	-11	-17	-17	- 1	+ 4	+ 4	+ 8	+17	+ 3	+ 7	+10
1875-1876...	-17	-24	-28	-13	-20	-20	-28	-21	-10	+ 6	+40	+54	+39	+14	+19	+13	+ 3	- 4	- 5	+ 7	0	+ 1	+ 3	- 9
1876-1877...	- 2	- 2	+13	+11	+ 6	+ 8	+16	- 1	-20	-20	+ 2	- 7	+ 9	- 7	-16	+ 2	+13	+ 7	- 1	- 2	- 4	- 9	+ 1	+ 1
1877-1878...	+ 5	- 7	- 4	+ 3	+12	+15	+12	+ 8	- 9	-43	-53	-47	-32	-11	+23	+55	+38	+20	+14	+10	+ 1	- 9	- 2	+ 2
1878-1879...	+ 3	+ 4	+ 5	+ 5	+ 9	+ 5	- 4	-10	-12	-13	- 6	+22	+30	- 1	-20	- 9	+ 5	+ 2	+ 2	- 7	- 1	- 7	- 2	+ 2
1879-1880...	-11	- 6	- 6	- 6	- 3	- 2	- 4	- 8	0	+14	+23	+19	+ 7	+ 6	+ 2	+11	+11	+ 6	+ 5	- 7	-12	-12	-12	-12
1880-1881...	+ 3	+ 7	+19	+18	+13	+ 6	-12	- 4	+ 9	+ 9	- 23	-24	-13	+12	+32	+16	- 7	-30	-11	0	-10	- 3	- 6	- 5
1881-1882...	+21	+ 2	+ 9	+ 9	+ 4	-20	-28	-40	-53	-32	-40	- 9	+10	+45	+56	+53	+42	+41	- 1	-16	-22	-19	-12	+ 3
1882-1883...	-17	-26	-18	-12	+ 4	-14	-26	-30	-23	+12	+77	+58	+42	+22	+13	+20	+18	-11	-18	-19	-24	-13	-15	+ 1
1883-1884...	0	+ 5	+ 8	+15	+ 5	+ 7	+ 2	+11	+16	+ 1	-20	- 9	-10	-21	-13	-15	+13	+ 8	+12	- 2	-10	+ 2	0	- 2
1884-1885...	+ 2	- 4	+ 6	+10	+21	+15	+21	+18	+19	+ 2	-18	-51	-46	-51	-36	+17	+23	+15	+12	+ 7	+ 2	+ 3	+11	+ 7
1885-1886...	- 4	-13	-17	-16	-10	-15	- 9	+ 2	+ 6	-22	-10	-33	-55	-38	+ 8	+54	+57	+34	+23	+13	+ 7	+12	+16	+ 9
1886-1887...	-17	-26	- 6	0	+ 4	- 2	0	- 1	- 8	-18	-31	-26	-13	+ 1	+16	+21	+35	+37	+26	+24	+17	- 2	- 9	-18
1887-1888...	-18	-17	-18	-14	-17	-17	- 9	- 2	+ 9	+ 2	-35	+ 2	+12	+ 5	+ 7	+12	+19	+28	+25	+12	+19	+10	- 6	-13
1888-1889...	-13	-16	-16	- 6	-10	-12	-18	- 4	-12	- 7	+22	+18	+16	+21	+11	+ 3	+22	+17	+ 7	- 1	0	+ 3	- 7	-15
Mean, 1872-1873 to 1888-1889.	- 4	- 7	- 2	+ 1	+ 2	- 3	- 6	- 6	- 6	- 9	- 4	- 1	- 1	0	+ 8	+16	+16	+11	+ 5	+ 1	- 2	- 2	- 2	- 3

TABLE 504.—*Declination Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											First Quarter.													
1871-1872...	− 3	− 9	−12	−18	−12	− 6	−15	+ 4	+ 7	+ 2	− 1	+ 1	−28	−37	+ 4	−12	− 1	+ 8	+14	+30	+29	+26	+24	+ 4
1872-1873...	+ 9	+15	+15	+25	− 1	+ 7	+10	+15	+40	+53	−15	−34	− 54	−54	−58	−44	−13	+22	+31	+ 7	+ 2	0	+12	+ 7
1873-1874...	− 7	+ 4	+16	+12	+18	+14	+ 7	+ 4	+13	+32	− 5	−20	−23	−20	−15	+ 5	+ 9	− 2	− 3	−10	−11	−10	− 2	− 7
1874-1875...	−10	− 9	− 2	− 1	+ 3	+13	+19	+45	+28	+ 6	−31	−48	−40	−28	− 8	+11	+21	+ 7	+10	+ 3	+ 3	+ 9	+ 4	− 3
1875-1876...	+ 3	− 1	− 6	− 5	0	+ 1	+ 3	− 4	+ 1	+12	+16	−25	−45	−35	−13	+ 3	+18	+ 9	+11	+14	+19	+12	+ 9	+ 6
1876-1877...	+ 3	−15	−16	−19	−23	−17	− 8	− 8	− 5	+ 2	−17	− 9	0	+ 9	+27	+30	+23	+12	+12	+15	+ 5	+ 2	− 1	− 2
1877-1878...	−19	−14	−12	− 7	− 2	+ 3	+ 8	+31	+55	+34	−18	−26	−16	−12	+ 4	−17	+ 6	+ 2	+ 7	+ 5	− 3	−10	−11	−19
1878-1879...	+10	+17	+ 9	+ 2	+ 1	− 1	+11	+25	+26	+11	− 9	−28	−36	−22	−17	−17	− 6	0	+ 1	+ 2	0	+ 6	+ 7	+11
1879-1880...	− 3	− 2	+ 3	+ 9	+11	+19	+14	+ 8	+ 4	−18	−19	−11	−16	−21	−12	+ 5	+16	+11	+10	+ 2	0	− 2	− 4	− 3
1880-1881...	+ 2	− 1	+ 4	+ 7	+17	+15	+21	+48	+46	+21	− 7	−41	−54	−31	−18	−12	− 6	+16	− 5	− 1	− 4	− 6	− 5	+ 1
1881-1882...	−18	−31	25	−30	−20	−13	+ 1	+26	+32	+22	− 3	−15	−28	−16	+ 8	+ 9	+31	+26	+27	+29	+12	+ 2	− 8	−17
1882-1883...	− 4	+ 2	+12	− 3	+11	+17	−11	−21	+35	+19	− 7	−47	−80	−75	−40	0	+37	+35	+27	+23	+28	+25	+12	+ 3
1883-1884...	−17	− 5	+ 4	+ 7	+16	+18	+22	+19	+24	+11	−16	−35	−22	− 8	+ 4	+ 5	+ 6	+16	− 1	− 4	− 8	−10	−11	−13
1884-1885...	+ 6	+13	+16	+11	+ 7	+13	+22	+38	+43	+20	−15	−29	−40	−53	−52	−15	+10	+11	− 4	− 1	− 2	− 4	+ 3	+ 2
1885-1886...	− 6	− 3	− 2	+ 3	+ 1	+ 5	+ 9	+25	+24	+18	+12	− 4	−32	−35	−37	−10	+ 4	+20	+13	+17	+ 7	− 2	−10	− 9
1886-1887...	−20	−16	−10	− 2	−14	− 4	− 5	− 9	−11	−20	−17	−20	+ 4	+12	− 6	+ 2	+31	+43	+32	+12	+17	+20	− 1	−17
1887-1888...	− 7	− 7	− 8	− 6	− 9	−12	−10	− 4	− 4	− 4	+ 7	− 2	−18	−22	−21	+ 3	+18	+33	+29	+14	+11	+ 8	+ 2	+ 6
1888-1889...	− 7	−10	− 6	− 7	+ 1	− 1	+ 3	+ 6	+ 9	+12	+15	− 5	−16	−18	− 2	0	+ 4	+14	+11	+ 6	0	− 3	+ 1	− 5
Mean, 1872-1873 to 1888-1889.	− 5	− 4	0	0	+ 1	+ 5	+ 7	+14	+21	+14	− 8	−23	−30	−25	−15	− 1	+12	+15	+12	+ 8	+ 4	+ 2	0	− 3
Years.											Three-eighth Phase.													
1871-1872...	+ 7	+15	+27	+17	+16	+11	+22	+18	+24	+27	+10	− 2	−45	−50	−46	−29	−22	−10	− 3	− 7	+ 4	+ 8	− 2	+11
1872-1873...	− 2	−10	−23	−39	−38	−33	−36	−23	− 9	0	+71	+82	+63	+26	− 5	−22	− 9	+ 6	+ 1	+12	+ 6	+ 5	−13	− 5
1873-1874...	+ 8	+ 9	+ 6	− 7	− 7	+13	+14	+20	+21	+34	+49	−28	−38	−25	−28	−37	−22	− 6	0	+ 1	+ 5	+12	+ 4	+ 3
1874-1875...	+ 4	− 3	−17	−14	− 7	− 1	− 1	+ 5	+10	+11	+24	+ 6	−18	−20	−21	−25	− 8	+10	+ 6	+ 1	+15	+ 7	+10	+ 5
1875-1876...	+ 2	− 1	+ 2	+ 1	− 2	+ 2	+ 1	+ 7	+ 8	+10	−10	+21	+20	− 4	−24	−20	−12	− 1	0	+ 1	+ 1	− 4	− 2	+ 1
1876-1877...	− 9	− 7	− 1	+ 8	+ 6	+18	+ 9	− 1	+15	+ 8	− 9	+ 6	+12	− 1	−13	−21	−10	− 2	− 2	0	− 1	+ 2	− 2	− 7
1877-1878...	− 6	− 2	−10	− 9	− 8	−12	− 9	−22	− 8	+41	+46	+14	+ 8	− 9	− 7	− 5	+ 2	+ 2	0	− 2	− 1	0	− 3	− 3
1878-1879...	+ 8	+ 5	+ 8	+ 6	+ 7	+10	+18	+27	+18	+14	−17	−14	− 1	−12	−22	−28	−15	−12	− 8	+ 1	− 1	+ 3	+ 1	+ 4
1879-1880...	+12	+ 3	+ 4	+ 2	− 4	− 7	− 2	− 9	−22	−22	−18	−12	− 6	+11	+ 9	+ 7	+ 5	− 2	+ 2	+ 2	+ 1	+13	+14	+11
1880-1881...	+20	+22	+10	+14	+22	+16	+18	+15	+20	− 4	−31	−41	−27	−52	−43	−23	−21	− 4	+ 5	+12	+12	+14	+24	+19
1881-1882...	−18	−18	−29	−26	−27	−26	−20	−14	− 9	− 6	+45	+63	+57	+25	− 9	−20	−15	− 1	+26	+12	+ 9	+ 2	− 3	+ 2
1882-1883...	+ 5	− 1	−24	−34	−45	−40	−19	−21	−34	−18	+24	+41	+33	+26	+ 1	− 2	+ 6	+15	+21	+13	+16	+18	+14	+ 7
1883-1884...	+ 9	+ 6	+ 8	+ 5	− 4	+ 1	−15	−13	− 6	+ 3	+34	+26	+22	+ 6	+ 2	−33	−38	−17	− 8	− 2	+ 7	0	0	+ 6
1884-1885...	−17	−13	−14	− 8	−10	+ 1	− 3	+ 6	+13	+39	+46	+16	+ 7	+ 5	− 8	−29	−32	−10	+ 1	+ 5	+ 7	+ 6	0	− 8
1885-1886...	0	0	− 3	− 8	−13	− 9	−13	−36	− 8	+15	+22	+41	+46	+29	+ 4	−15	−11	0	− 8	− 9	− 8	− 1	− 5	− 5
1886-1887...	+ 3	− 3	−13	−27	−25	−31	−34	−24	−21	−10	+ 9	+15	+27	+31	+17	− 3	− 9	+12	+21	+17	+10	+ 5	+20	+16
1887-1888...	+29	+18	+ 4	+ 9	+11	+ 3	+15	0	− 7	−47	−36	−28	−24	− 8	+ 4	+ 6	− 1	− 4	+ 2	+ 7	+ 3	+ 3	+17	+25
1888-1889...	+ 2	+ 2	− 7	−21	−14	−10	0	− 2	+ 3	+14	+13	+25	+15	−21	−27	−21	−17	−12	+ 2	+ 9	+17	+14	+17	+15
Mean, 1872-1873 to 1888-1889.	+ 3	0	− 6	− 9	− 9	− 6	− 5	− 5	− 1	+ 5	+15	+14	+12	0	−10	−17	−12	− 2	+ 4	+ 6	+ 6	+ 5	+ 5	+ 5

TABLE 504.—*Declination Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.												Full Moon.												
1871-1872 ...	+18	+20	+21	+21	+12	+19	+ 6	- 5	- 4	-24	-34	-49	-26	+21	+39	+22	+ 3	-22	-13	-20	-13	- 8	+ 3	+12
1872-1873 ...	+28	+19	+16	+10	+ 1	+10	+ 7	-19	-51	-39	-10	-25	-13	-10	+11	+ 4	+ 1	+ 9	-14	- 7	+15	+15	+30	+13
1873-1874 ...	+ 2	+ 8	+10	+12	+ 5	+11	+ 1	- 7	+ 4	- 4	+48	+46	+22	- 6	-15	-14	-11	-24	-21	-23	-20	-11	-10	- 3
1874-1875 ...	+13	+12	+10	+ 2	- 3	-20	-23	-41	-46	-18	+21	+20	+31	+45	+15	- 4	-15	-12	-14	- 7	- 3	+12	+14	+12
1875-1876 ...	- 1	+ 5	+ 8	+ 3	+ 3	+ 2	+ 7	+14	+ 4	-13	- 9	-13	+12	+22	+ 6	-14	-12	- 5	- 8	- 7	- 9	- 2	+ 4	+ 3
1876-1877 ...	+ 8	+ 8	+ 8	+ 2	+14	+ 9	+ 4	-14	-20	-17	-11	- 7	+11	+ 6	+ 6	+ 4	- 1	-11	- 1	- 6	- 2	+ 4	+ 1	+ 7
1877-1878 ...	- 2	- 5	- 4	- 3	- 7	- 8	-21	-40	-41	-25	+49	+77	+60	+47	+21	-13	-26	-17	- 7	-10	- 7	- 4	- 4	- 7
1878-1879 ...	+ 6	+ 8	+ 5	+ 8	+ 5	+ 5	- 6	-17	-27	-19	- 8	0	+12	+18	+25	+11	- 2	-11	- 7	- 6	- 5	- 3	0	+ 5
1879-1880 ...	+ 7	+14	+ 9	+ 7	+ 5	- 5	-14	-29	-31	-24	- 4	+ 1	+11	+18	+29	+27	- 7	-17	0	- 2	- 2	- 1	+ 5	+ 2
1880-1881 ...	- 9	-14	- 4	+ 3	0	+ 5	+ 7	+ 7	+17	+12	+12	+22	- 2	-13	-12	- 7	- 2	+ 3	+ 1	- 5	- 3	- 1	- 7	-12
1881-1882 ...	-23	-21	-16	- 9	-18	-11	-16	- 8	+ 1	+ 7	+31	+21	+20	+30	+37	+23	0	-12	- 3	- 5	- 2	0	-10	-17
1882-1883 ...	+21	+19	+12	+13	-12	-16	-15	-12	-31	-41	-15	+10	+ 8	+ 1	+25	+ 1	0	+ 7	+ 4	+ 6	+ 4	+ 2	+ 1	+ 8
1883-1884 ...	+14	+ 8	+10	+ 4	+ 2	-16	-22	-34	-37	-19	+17	+32	+34	+36	+23	+15	-14	-35	-17	- 9	-10	- 2	+ 7	+13
1884-1885 ...	+ 7	+ 2	- 1	- 2	-19	-53	-44	-64	-51	-14	+35	+53	+41	+45	+32	+ 1	-12	+ 3	- 6	0	+10	+13	+15	+10
1885-1886 ...	- 1	- 1	+ 5	+ 6	+ 8	+ 1	-11	-18	-17	- 9	+20	+27	+34	+37	+27	+ 4	-19	-25	-22	-17	-13	- 9	- 7	- 1
1886-1887 ...	+11	+ 1	- 5	- 6	- 9	- 8	- 6	- 3	+11	+15	+12	+23	+21	+ 9	-12	-19	-31	-27	-12	- 5	+ 2	+16	+12	+10
1887-1888 ...	+16	+22	+21	+16	+18	+ 8	- 5	-14	-16	- 6	- 1	-16	- 2	+15	+23	+ 3	-25	-29	-18	- 9	- 8	- 4	+ 4	+ 8
1888-1889 ..	- 2	0	+ 5	+ 8	+ 1	- 2	- 3	- 6	- 9	-37	-38	-14	+ 5	+28	+36	+41	+ 2	- 3	0	+ 7	- 4	- 2	-10	- 4
Mean, 1872-1873 to 1888-1889.	+ 6	+ 5	+ 5	+ 4	0	- 5	- 9	-18	-20	-15	+ 9	+15	+18	+19	+16	+ 4	-10	-12	- 9	- 6	- 3	+ 1	+ 3	+ 3
Years.												Five-eighth Phase.												
1871-1872 ...	+36	+39	+36	+45	+67	+38	+33	+17	-17	-21	-36	- 66	-49	-49	-28	+ 9	+ 2	0	-32	-15	-12	-14	+ 2	+14
1872-1873 ...	+ 3	+17	+19	+26	+29	+29	+ 6	0	- 7	-13	- 15	+ 1	-16	-25	-28	+ 3	+13	- 1	-17	- 7	+ 7	- 7	-13	- 8
1873-1874 ...	- 7	- 2	+12	+22	+27	+29	+52	+28	+12	- 9	- 7	- 34	-14	-10	+ 4	- 2	0	- 2	+ 3	-14	-20	-35	-17	-13
1874-1875 ...	-11	-11	-14	+ 3	+20	+27	+35	+28	+18	- 3	- 36	- 34	- 9	+12	+30	+54	+36	+ 3	-23	-23	-26	-24	-30	-19
1875-1876 ...	0	+ 6	+ 6	+ 3	+27	+30	+28	+16	+20	+25	- 45	- 64	-56	-20	- 3	+25	+26	+12	- 4	- 9	0	- 1	-10	-11
1876-1877 ...	+ 2	+ 5	+ 5	+ 8	+11	+12	+14	+ 4	+ 7	+16	+ 11	- 10	-12	-23	-19	- 1	+ 6	- 3	-11	- 5	- 7	- 6	- 9	+ 1
1877-1878 ...	+ 9	+11	+ 7	+11	+14	+ 6	+ 5	+ 5	-17	-48	- 40	- 7	0	+ 9	+12	+12	+ 9	+ 4	- 7	- 7	- 5	+ 4	+ 3	+ 7
1878-1879 ...	-10	-13	- 8	-12	-18	-15	-12	+ 8	-10	0	+ 8	- 11	-13	+ 4	+23	+28	+30	+18	+10	+11	+ 1	- 3	- 3	-13
1879-1880 ...	- 3	+ 1	- 2	+ 2	0	- 5	+ 2	+ 9	+ 3	+ 3	- 19	- 6	- 3	+ 3	+ 8	- 9	+ 2	+ 5	+ 6	+ 1	+ 2	0	0	+ 2
1880-1881 ...	+ 3	- 9	- 7	- 9	- 7	- 1	- 5	-29	-25	-12	+ 3	+ 20	+19	+21	- 2	- 1	+20	+ 5	+ 1	0	+12	+12	- 4	- 2
1881-1882 ...	+25	+26	+22	+ 8	+13	+17	+12	-25	-32	-53	-103	-108	-68	- 5	+18	+22	+23	+36	+34	+28	+27	+28	+33	+21
1882-1883 ...	-12	- 7	+12	+18	+ 4	+16	+27	+18	-24	-38	- 47	- 7	+ 6	+35	+30	+17	+ 4	+ 1	- 6	- 3	- 6	-16	-14	-10
1883-1884 ...	+ 9	+13	+ 1	+20	+19	+23	+30	+21	-14	-60	- 52	- 33	-26	- 6	+ 9	+17	+16	+ 5	- 2	0	+11	- 4	+ 1	+ 2
1884-1885 ...	-10	- 5	-10	-17	- 6	+ 2	+ 7	+14	+22	- 1	- 8	- 23	-14	+ 6	+14	+14	+10	+10	+ 7	+ 4	+ 2	- 2	- 8	- 5
1885-1886 ...	+ 9	+ 6	+14	+17	+ 2	+ 4	+ 3	- 7	-13	-22	- 10	- 1	+ 8	+29	+28	+14	-13	-33	-22	-10	- 7	- 4	- 3	+ 9
1886-1887 ...	+ 4	+12	+13	+14	+ 6	+ 6	+ 1	+ 9	+17	- 8	- 35	- 34	-24	- 8	+14	+41	+32	+ 6	- 5	-23	-19	-14	- 6	+ 1
1887-1888 ...	0	+ 1	+21	+19	+29	+35	+32	+23	+17	+11	- 17	- 25	-24	-27	-17	+ 7	+17	- 5	-21	-22	-22	-19	- 9	- 7
1888-1889 ...	- 1	+ 3	+ 3	+12	+12	+16	+10	+ 8	+12	0	- 29	- 34	-34	-18	+16	+33	+22	- 3	0	- 8	- 8	-13	+ 3	- 3
Mean, 1872 1873 to 1888-1889.	+ 1	+ 3	+ 6	+ 9	+11	+14	+15	+ 8	- 1	-12	- 26	- 24	-16	- 1	+ 8	+16	+15	+ 3	- 3	- 5	- 3	- 6	- 5	- 3

TABLE 504.—*Declination Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Last Quarter.													
1871-1872 ...	− 6	+ 4	− 1	0	+17	+15	+15	+ 3	−11	+10	+14	+26	+28	+10	−18	−10	−17	− 2	− 1	− 9	−27	−19	−10	−10
1872-1873 ...	−30	−51	−55	−43	−39	−36	−24	−23	−16	−10	+16	+54	+56	+66	+50	+25	+21	+13	+30	+19	+ 8	+ 5	−14	−20
1873-1874 ...	0	−13	−14	−15	− 8	− 1	−11	− 2	− 5	− 7	+ 7	+23	+20	−15	−42	−23	+10	+15	+11	+12	+16	+25	+ 7	+ 9
1874-1875 ...	− 9	−16	−14	−13	− 9	− 5	− 2	+20	+21	+39	−10	−22	−17	−18	−20	+ 3	+14	+20	+18	+17	+ 5	0	0	− 4
1875 1876 ...	− 4	− 3	− 2	− 5	− 7	− 5	− 9	+ 5	+24	+22	+28	+13	+12	0	− 6	−12	−12	− 2	− 3	− 9	−12	−10	− 7	0
1876-1877 ...	− 1	+12	+ 3	+ 1	+ 1	− 6	+ 2	+19	+29	+29	−14	−21	−34	−34	−22	− 4	+ 5	+ 9	+ 8	+ 7	− 3	− 1	+ 8	+ 4
1877-1878 ...	+ 7	+ 7	+12	+10	+ 7	+15	+30	+40	+31	−18	−65	−56	−32	−21	−28	− 7	+10	+17	+14	+ 5	+ 2	+ 7	+10	+ 7
1878-1879 ...	−17	−18	−15	− 6	− 9	− 7	− 9	−12	+ 1	− 2	+19	+ 4	− 9	+ 2	+15	+32	+23	+14	+13	+ 8	− 1	− 3	− 8	−14
1879-1880 ...	− 9	−12	−16	−11	− 9	0	− 3	+ 4	+12	+17	+ 4	+11	+14	+ 7	+ 3	+ 1	+ 6	+ 4	+ 1	+ 1	0	− 5	− 7	− 8
1880-1881 ...	− 8	− 4	− 5	− 3	− 4	0	− 9	− 5	−15	0	+14	+20	+12	+16	+12	+ 6	+10	+10	− 4	− 9	− 8	− 8	− 5	− 6
1881-1882 ...	+15	+29	+22	+19	+13	+ 5	+ 1	− 7	+12	+25	− 1	− 17	−19	−13	− 3	− 2	− 7	−13	−22	−18	−13	− 5	− 2	+ 5
1882-1883 ...	0	− 4	+ 4	+19	+32	+39	+34	+28	+ 7	−18	−34	−31	−13	− 5	−16	−24	−15	− 2	+ 3	+ 7	+ 2	+ 2	− 4	− 8
1883-1884 ...	+ 2	− 1	0	0	+ 9	+13	+24	+28	+24	+12	−81	−62	−51	−46	−44	− 1	+31	+38	+32	+18	+27	+20	+ 9	+ 2
1884-1885 ...	+18	+ 4	+ 8	+ 3	+ 5	+10	− 3	−19	−24	−20	+ 1	+ 4	0	+26	+ 6	− 7	− 2	+ 4	+ 3	− 2	− 6	− 5	− 9	+ 3
1885-1886 ...	+ 5	+ 6	+ 7	+10	+11	+27	+38	+42	+21	−12	−46	−69	−64	−55	−39	− 7	+29	+25	+17	+11	+13	+13	+ 8	+ 6
1886-1887 ...	+22	+14	+ 7	+18	+27	+33	+35	+24	+25	+15	−28	−40	−49	−50	−30	−11	−12	−14	−10	+15	+ 3	− 4	− 1	+14
1887-1888 ...	− 7	− 8	− 7	− 1	0	+ 8	+14	+11	+15	+30	+16	− 21	−24	−12	+ 3	+ 9	+ 8	− 1	− 6	−11	− 5	− 4	− 3	− 6
1888-1889 ...	+ 6	+ 7	+12	+16	+ 8	+21	+10	0	−10	− 8	− 1	−18	−15	− 9	− 5	− 2	+21	+ 7	−12	− 3	− 3	− 4	−12	− 5
Mean, 1872-1873 to 1888 1889.	− 1	− 3	− 3	0	+ 2	+ 7	+ 7	+ 9	+ 9	+ 6	−10	−13	−13	− 9	−10	− 1	+ 8	+ 8	+ 5	+ 4	+ 1	+ 1	− 2	− 1
Years.											Seven-eighth Phase.													
1871-1872 ...	+ 9	+ 2	+ 4	+ 7	− 3	−20	−25	−43	−25	+ 6	+19	+35	+43	+18	−14	−29	−17	− 5	+ 4	+ 9	+12	+ 8	+ 3	− 3
1872-1873 ...	− 8	+ 6	+ 1	−12	−16	−14	−19	−13	− 2	+31	+ 9	−12	− 1	− 3	−11	− 9	− 8	− 6	+ 1	+13	+13	+19	+21	+18
1873-1874 ...	− 9	+ 1	− 9	−10	−13	−23	−14	−18	−24	−26	−11	+18	+35	+48	+23	+ 7	+ 7	+16	+ 9	+ 7	0	−12	0	− 6
1874-1875 ...	−13	− 5	− 2	− 6	−19	−19	−12	−13	+20	+24	+16	+20	+20	+ 7	0	− 4	−21	− 3	+ 5	+ 2	+ 4	+ 2	+ 1	− 5
1875-1876 ...	+11	+ 8	+12	+ 5	− 6	− 2	− 4	−10	−19	−19	−19	− 2	+11	+14	+ 7	− 9	−13	−10	+ 3	+ 9	+ 5	+ 7	+11	+10
1876 1877 ...	0	−11	−13	−13	−15	−27	−43	−26	−17	−10	+29	+45	+32	+41	+20	− 6	−26	−12	+ 2	+ 1	+17	+14	+11	+ 5
1877-1878 ...	+ 7	+10	+ 8	+ 5	+ 3	− 7	−16	−13	−11	+33	+50	+20	+ 3	− 8	−21	−27	−25	−16	−14	− 8	+ 3	+ 6	+ 5	+ 7
1878-1879 ...	− 2	− 8	0	− 2	+ 4	+ 2	+ 6	+ 9	+23	+21	+10	− 3	−11	−13	−14	−26	−22	− 3	+ 3	+ 3	+11	+ 7	+ 6	+ 2
1879 1880 ...	+18	+ 6	+11	− 4	− 5	− 9	−10	− 2	− 8	+21	+17	− 4	−13	−22	−26	−21	− 8	− 4	− 6	+ 7	+11	+13	+12	+13
1880-1881 ...	− 6	−10	−14	−22	−30	−32	−19	−27	−21	+13	+36	+32	+29	+11	+10	− 5	+ 3	+24	+12	+17	+10	− 5	− 3	− 3
1881-1882 ...	0	+ 9	+ 7	+12	+14	+24	+27	+38	+44	+36	+35	+24	−13	−57	−79	−64	−33	−17	−17	+ 1	+ 2	+ 2	+ 5	− 2
1882 1883 ...	−15	− 7	− 8	− 9	+13	+16	+33	+48	+67	+59	− 1	−15	+ 2	+ 2	−11	−25	−30	−24	−17	− 7	−17	−19	− 9	−22
1883 1884 ...	−24	−32	−40	−35	−37	−32	−22	− 7	+14	+38	+63	+52	+35	+25	+28	+15	0	− 4	+ 6	+ 7	+ 2	− 9	−19	−24
1884-1885 ...	+ 5	+ 6	+ 2	+12	+10	+ 7	−12	−17	−30	−10	−17	+ 3	+14	− 2	+ 9	+10	+ 6	− 14	+ 3	+ 2	0	+ 5	+ 7	+ 5
1885-1886 ...	0	− 5	− 7	− 2	+ 4	− 2	− 4	−11	−10	+ 8	+ 6	+14	+12	− 3	− 8	−16	− 7	+ 8	+11	+ 7	+ 5	+10	0	− 6
1886-1887 ...	− 3	+ 7	+ 7	+ 4	+19	+22	+18	+10	+ 8	+27	+37	+13	− 5	−10	−13	−27	−27	−29	−19	−14	− 9	0	− 6	− 9
1887-1888 ...	−18	−24	−18	−16	−13	−11	−18	−19	− 8	+20	+32	+39	+45	+28	−11	−17	− 6	+ 3	+ 14	+10	+ 5	+ 5	− 9	−12
1888-1889 ...	+ 2	+ 1	− 3	− 3	− 2	− 2	− 3	−10	+ 1	+24	+21	+22	+19	+ 4	−32	−37	−23	− 3	+11	+ 2	+ 2	+ 4	+ 1	+ 1
Mean, 1872-1873 to 1838-1889.	− 3	− 3	− 4	− 6	− 5	− 6	− 7	− 5	+ 3	+17	+18	+16	+13	+ 4	− 8	−15	−14	− 6	0	+ 3	+ 4	+ 3	+ 2	− 2

TABLE 505.—*Vertical Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											New Moon.													
1872-1873 ...	− 2	0	0	− 5	− 2	+ 8	+13	+ 5	−18	−39	+11	+26	+16	+ 7	+ 9	+ 2	−12	−22	+ 1	+ 5	− 5	− 8	+ 9	+ 3
1873-1874 ...	0	− 9	−12	− 7	− 7	− 9	− 9	−11	−14	− 8	+18	+15	+29	+36	+26	+11	−11	− 6	− 7	− 3	− 8	− 6	− 4	− 5
1874-1875 ...	+ 6	+ 6	+ 3	+ 1	+ 2	− 1	− 5	−14	−17	−20	−11	+ 3	+14	+ 1	+ 8	− 4	− 9	+ 2	+ 5	+ 4	+ 8	+ 9	+ 7	+ 6
1875-1876 ...	0	0	− 5	− 3	− 3	− 6	− 4	−15	−23	+ 2	+23	+24	+11	+ 9	+ 6	0	−14	− 5	+ 3	− 1	0	+ 1	+ 1	0
1876-1877 ...	+ 6	+ 9	+ 3	+ 7	+ 8	+ 1	+ 3	− 2	− 8	− 7	+17	+ 1	+ 5	0	− 5	−10	− 8	− 3	− 6	− 6	− 6	− 3	0	+ 3
1877-1878 ...	+ 1	+ 1	+ 2	− 3	− 3	+ 6	+ 2	− 9	+ 3	+ 3	− 1	+ 5	− 5	− 6	− 5	−14	−15	− 3	+ 2	+13	+ 6	+ 6	+ 7	+ 8
1878-1879 ...	+ 2	− 1	− 3	− 5	− 5	− 7	−13	−24	−18	− 4	+13	+35	+25	+ 9	− 2	−10	−10	− 2	0	+ 2	+ 5	+ 5	+ 3	+ 5
1879-1880 ...	− 2	− 4	− 5	− 7	− 9	− 4	−12	−12	− 2	+ 9	+42	+34	+17	+ 9	0	−12	−11	−13	−10	− 4	− 2	0	+ 6	− 4
1880-1881 ...	− 7	+ 2	− 1	0	−12	+ 1	−10	− 5	−18	− 3	− 8	+ 2	+20	+ 5	− 1	0	− 8	−10	0	+ 5	+11	+20	+18	+10
1881-1882 ...	− 9	−10	0	− 5	− 6	− 9	−15	−14	− 4	+ 6	+15	+36	+36	+17	+ 8	− 9	−17	−12	− 5	0	+ 3	0	− 3	− 6
1882-1883 ...	+ 5	+ 3	+ 3	+ 3	0	+ 2	− 4	0	+ 6	0	− 9	−13	− 6	− 9	− 2	+ 2	·· 1	- 1	− 1	+ 5	+ 5	+ 4	+ 3	+ 4
1883-1884 ...	− 9	−11	− 9	−19	−11	−15	−22	−31	−30	− 5	+47	+53	+54	+46	+29	+15	0	−19	−17	−15	− 7	− 4	−11	− 9
1884-1885 ...	− 1	− 1	− 3	− 5	− 2	− 3	− 5	− 2	+ 1	+ 5	+14	+10	+10	− 7	−19	− 5	+ 6	+ 4	+ 7	+ 4	+ 3	− 7	− 3	− 1
1885-1886 ...	+ 7	+ 7	+ 1	0	+ 1	− 3	− 6	−11	−15	−16	−17	− 8	+11	+16	+ 6	− 2	−10	− 5	+ 6	+ 5	+ 6	+11	+ 8	+ 7
1886-1887 ...	+ 4	− 6	+ 2	− 3	− 4	0	− 5	−12	−13	−10	+21	+28	+ 4	+ 7	+ 3	− 9	−11	− 5	− 2	+ 5	0	− 1	+ 4	+ 4
1887-1888 ...	+ 8	+ 6	− 1	+ 2	0	+ 8	+ 7	+11	+10	+ 1	+11	+11	− 10	−37	−35	−27	−13	− 4	+ 4	+18	+10	+ 9	+10	+ 4
1888-1889 ...	+ 2	+ 1	+ 2	+ 2	+ 5	− 2	− 2	− 6	−13	−13	+10	+21	+21	+ 6	−13	−18	−13	- 4	+ 3	+ 1	+ 2	+ 2	+ 3	+ 3
Mean, 1872-1873 to 1888-1889.	+ 1	0	− 1	− 3	− 3	- 2	− 5	− 9	−10	− 6	+12	+17	+15	+ 6	+ 1	− 5	− 9	− 6	− 1	+ 2	+ 2	+ 2	+ 3	+ 2
Years.											One-eighth Phase.													
1872-1873 ...	− 2	+11	+ 9	+ 2	+ 9	+ 6	−16	0	+ 1	−11	−16	− 4	+13	+ 1	+12	+ 3	− 2	− 2	− 2	− 9	−14	0	+13	+ 2
1873-1874 ...	0	+ 2	+ 5	+ 6	+ 6	− 5	+ 3	+11	+13	+ 3	−11	− 1	+ 6	+19	+12	−12	−22	− 5	−10	− 7	− 4	− 2	− 4	− 1
1874-1875 ...	+ 8	+ 4	+ 2	+ 8	0	+ 1	− 6	− 4	−11	− 9	+ 7	+ 7	−19	−21	− 7	+ 1	+11	+ 5	− 2	+ 4	+ 2	0	+ 8	+ 8
1875-1876 ...	+ 1	− 4	0	+ 3	+ 1	+ 1	+ 3	+ 6	+12	+24	+13	+ 3	− 9	−12	− 2	+ 1	− 9	−11	−12	− 3	− 6	− 1	0	− 2
1876-1877 ...	+ 3	+ 3	+10	+ 5	+11	+10	+13	− 6	− 8	− 8	−15	−17	− 5	0	+ 7	+14	− 3	−10	− 4	− 2	− 2	0	+ 7	+ 7
1877-1878 ...	− 2	+ 3	+ 3	− 2	+ 7	+ 1	0	− 7	−10	−27	−17	− 6	+ 3	+21	+33	+37	+18	− 2	− 5	−10	−13	−16	− 9	− 4
1878-1879 ...	+ 7	+ 6	+ 4	− 2	− 6	− 3	−14	−13	−26	−23	+14	+11	+13	+ 1	+ 9	+14	+ 1	+ 7	+ 4	+ 1	− 1	− 5	+ 1	+ 5
1879-1880 ...	+ 4	0	0	+ 1	+ 7	+ 1	+ 2	+10	+17	+38	+12	+ 4	− 8	− 5	− 2	− 9	−12	−15	−14	−14	− 7	− 7	− 3	0
1880-1881 ...	+ 7	+ 5	+13	+ 3	0	+ 1	+ 9	+31	+28	− 4	−39	−43	−33	− 8	+15	+15	− 2	−23	− 4	+ 1	− 4	+11	+ 7	+15
1881-1882 ...	+10	−18	− 7	− 8	−10	−11	− 2	− 3	−16	+ 2	+19	+25	+29	+41	+25	+ 7	− 9	−23	−30	−19	− 5	+ 2	0	− 2
1882-1883 ...	+ 8	+10	+10	+10	+10	+ 6	+ 6	+ 8	+ 4	− 4	−19	−28	−20	− 6	− 3	+ 7	+ 1	−14	− 6	− 6	− 1	+ 9	+11	+10
1883-1884 ...	− 6	− 5	− 8	− 3	− 9	− 2	− 7	− 8	+ 3	− 8	+11	+24	+30	+23	+15	+ 2	+ 6	− 5	− 9	−14	−10	− 6	− 9	− 9
1884-1885 ...	+ 9	+ 9	+10	+ 6	+ 7	+ 5	+10	+ 6	− 3	−19	−37	−66	−27	0	+21	+26	+13	− 1	+ 2	+ 2	+ 3	+ 8	+ 9	+ 0
1885-1886 ...	− 9	−16	− 7	− 1	+ 2	+ 1	+ 9	+11	+ 8	−13	− 8	−14	−19	−13	+31	+28	+22	− 9	−10	− 3	− 3	+ 2	+ 3	+ 7
1886-1887 ...	− 8	− 2	+ 5	0	− 5	− 2	+ 6	+ 4	+ 1	− 5	−26	−13	+ 5	0	+15	+24	+17	+ 2	− 8	− 5	− 2	− 2	+ 1	- 1
1887-1888 ...	− 3	+ 1	0	0	− 3	− 4	+ 2	+10	+ 7	− 7	0	+13	+ 2	0	− 5	− 3	− 3	+ 1	0	− 1	+ 3	+ 1	− 5	− 1
1888-1889 ...	+ 4	+ 4	+ 4	+ 3	+ 4	+ 2	+ 2	+ 1	− 2	+ 3	− 6	−11	− 8	− 7	−11	0	+ 9	+ 2	− 1	− 1	0	+ 3	+ 2	+ 3
Mean, 1872-1873 to 1888-1889.	+ 2	+ 1	+ 3	+ 2	+ 2	0	+ 1	+ 3	+ 1	− 4	− 7	− 7	− 3	+ 2	+10	+ 9	+ 2	− 6	− 7	− 5	− 4	0	+ 2	+ 3

TABLE 505.—*Vertical Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											First Quarter.													
1872-1873 ...	+11	+12	+ 7	+ 5	+ 6	+11	+ 7	+ 8	+18	+ 5	−18	−21	−30	−34	−33	−18	+12	+24	+ 7	+ 5	+ 5	+ 3	+ 3	+ 6
1873-1874 ...	0	+ 7	+ 6	+ 3	+ 1	− 5	0	+ 3	+ 2	+16	−22	−12	−14	+ 1	+ 4	+ 6	+ 6	− 4	− 3	− 2	0	+ 2	+ 3	0
1874-1875 ...	3	0	+ 3	+ 1	+ 5	+ 6	+15	+18	− 4	− 8	+ 3	− 9	−16	−13	− 4	+ 7	+ 6	0	+ 4	− 2	+ 1	− 3	− 4	0
1875-1876 ...	0	+ 1	+ 2	+ 4	+ 6	+ 7	+ 5	+ 2	+13	+17	− 6	−21	−24	−21	− 8	+ 3	+10	+ 3	+ 5	− 2	+ 1	− 4	0	+ 2
1876-1877 ...	− 4	−11	− 5	− 4	− 4	+ 2	+ 5	+12	+20	+ 9	0	+ 9	+13	+10	+ 6	− 1	− 2	−10	−10	− 9	−11	− 8	− 4	− 6
1877-1878 ...	− 2	0	− 1	+ 3	+ 4	+ 4	+ 6	+15	+ 8	−13	−20	−14	−13	− 9	+ 6	+13	+12	+ 2	+ 6	+ 3	− 1	− 1	− 2	− 2
1878-1879 ...	− 2	− 2	− 5	+ 1	− 2	− 2	+ 6	0	0	+ 1	− 7	− 8	− 5	+ 3	+ 4	− 2	− 6	+ 1	+ 2	+ 4	+ 5	+ 9	+ 7	+ 3
1879-1880 ...	+ 1	+ 7	+ 9	+ 6	+ 7	+10	+ 6	+11	+ 6	− 7	0	+ 4	−20	−32	− 9	− 2	−13	0	+ 2	+ 1	+ 2	+ 4	+ 3	+ 2
1880-1881 ...	− 2	− 6	− 4	− 2	− 3	− 1	+ 4	+24	+34	+37	− 7	−14	− 8	0	−10	−10	− 3	+ 5	+ 1	− 3	− 8	−14	− 3	− 6
1881-1882 ...	−12	− 3	− 7	− 4	− 4	− 3	− 8	+ 3	+10	+29	−30	−21	−19	+ 1	+ 9	+12	+25	+10	− 1	− 1	−10	− 8	− 6	− 3
1882-1883 ...	+ 3	+ 7	+ 7	+ 5	+ 7	+ 6	+10	+17	+19	+ 9	−28	−43	−37	−24	− 3	+ 3	+11	+ 9	− 1	+11	− 4	+ 6	+ 6	+ 4
1883-1884 ...	− 6	− 2	− 3	− 2	0	− 1	+ 1	+ 9	+22	+28	+ 1	+ 2	− 11	−20	− 6	0	+25	+25	−11	−11	− 8	−14	−10	−11
1884-1885 ...	+ 1	+ 4	+ 2	− 1	− 2	+ 3	+ 8	+10	+14	+ 4	− 9	−17	−32	−32	−11	+11	+16	+ 8	+ 3	+ 4	+ 4	+ 4	+ 5	+ 3
1885-1886 ...	+10	+12	+ 8	+15	+10	+12	+11	+13	+ 6	+ 3	− 9	−34	−36	−35	−29	− 7	+ 6	+ 9	+ 4	+ 5	+ 6	+ 6	+ 6	+ 7
1886-1887 ...	− 5	− 5	− 3	+ 4	0	− 2	− 6	+ 3	+ 9	+22	+22	+20	+ 7	− 8	−18	−11	+ 6	+ 5	− 4	−10	− 5	− 4	− 7	−10
1887-1888 ...	−12	−12	−10	− 8	−10	−11	− 4	− 6	− 4	+17	+14	+14	+ 9	+15	+21	+21	+16	+ 4	− 5	−13	− 8	−11	− 9	−10
1888-1889 ...	− 5	0	− 2	− 2	− 1	0	0	+ 9	+14	+12	+13	−13	−14	− 2	+ 5	− 2	+ 1	+ 5	− 1	− 3	− 7	− 3	− 3	− 4
Mean, 1872-1873 to 1888-1889.	− 2	+ 1	0	+ 1	+ 1	+ 2	+ 4	+ 9	+11	+11	− 6	−11	−15	−12	− 4	+ 1	+ 8	+ 6	0	− 1	− 2	− 2	− 1	− 1
Years.											Three-eighth Phase.													
1872-1873 ...	− 2	−10	−17	−18	−16	−11	−10	−13	− 2	+27	+50	+22	0	− 4	−20	−14	+ 2	+14	+ 8	+ 6	+ 8	+ 5	− 1	− 2
1873-1874 ...	+ 5	+ 3	+ 1	+ 1	+ 3	+11	− 2	− 2	+ 1	− 8	− 6	−16	−22	−28	−20	− 5	+14	+14	+12	+ 9	+ 9	+16	+ 7	+ 1
1874-1875 ...	− 3	− 1	− 3	0	0	+ 7	0	+ 4	+ 4	+20	+ 5	− 1	−13	−13	−13	− 8	+ 4	+ 8	+ 5	+ 5	− 2	− 5	+ 1	− 1
1875-1876 ...	− 5	− 6	− 2	− 4	− 7	− 7	− 6	− 2	− 3	− 8	+24	+19	−10	−17	− 9	0	+ 7	+ 5	+ 3	+ 5	− 1	− 2	− 4	
1876-1877 ...	− 1	− 3	− 3	− 1	− 7	− 6	− 9	− 7	+ 2	0	+ 4	+ 8	−16	−13	−10	− 2	+ 8	+ 9	+ 9	+ 8	+12	+ 7	+ 4	+ 2
1877-1878 ...	− 5	0	− 2	+ 1	0	+ 1	− 1	− 3	+ 3	+ 4	+ 4	−15	− 7	0	+ 3	+ 4	+ 6	+ 4	+ 6	+ 4	+ 1	− 2	− 3	− 4
1878-1879 ...	+ 3	+ 1	+ 5	+ 4	+ 2	0	+ 2	− 2	− 9	− 6	− 6	+ 7	+ 7	− 4	−18	−16	− 4	+ 1	+ 7	+ 9	+ 9	+ 4	+ 2	+ 2
1879-1880 ...	− 7	− 5	− 2	+ 3	− 1	0	− 3	− 7	−12	−12	−14	− 3	+ 7	+ 3	+ 2	+13	+18	+12	+ 7	+ 3	0	− 2	− 5	0
1880-1881 ...	+ 6	+ 2	− 4	− 5	− 3	−10	−10	−14	−11	−11	+18	+20	+20	+ 2	+ 4	−10	− 2	+12	+ 5	+ 5	0	0	− 1	− 7
1881-1882 ...	−12	− 3	− 7	− 4	− 4	− 3	− 8	+ 3	+10	+29	+36	+35	+ 5	−28	−31	−21	− 4	+ 7	+12	− 1	0	− 6	− 6	− 3
1882-1883 ...	− 5	− 5	−12	− 8	− 7	− 4	− 2	− 5	0	+11	+32	+22	+ 1	− 5	−11	− 6	+ 4	+ 7	+ 3	− 5	+ 2	0	− 6	− 2
1883-1884 ...	+ 1	+ 3	+ 7	+ 7	+ 2	+ 8	0	+ 3	+ 9	+16	+ 5	+ 2	+ 2	−10	−26	−35	−12	0	− 1	+ 8	+ 8	+ 2	+ 2	0
1884-1885 ...	− 4	− 1	− 1	+ 2	0	+ 3	− 1	+10	+19	+26	− 4	− 7	− 3	+ 4	− 4	−24	−16	0	+ 2	+ 2	+ 3	+ 2	− 4	− 4
1885-1886 ...	+ 2	− 2	− 2	− 4	− 5	− 3	− 7	− 8	+ 8	+24	+32	+32	+ 9	− 9	−21	−24	−10	+ 7	− 8	− 4	− 2	− 8	+ 2	− 1
1886-1887 ...	− 5	− 7	− 3	− 8	− 1	− 4	− 2	− 2	+ 3	+ 6	+24	+28	+26	+ 4	−20	−30	−17	+ 4	+ 7	+ 1	0	− 1	0	− 2
1887-1888 ...	− 1	− 6	− 9	− 6	− 3	− 7	+ 4	− 9	−14	−24	− 2	+ 6	+ 9	+23	+28	+ 7	− 2	+ 2	+ 3	− 3	− 2	− 2	+ 3	+ 4
1888-1889 ...	− 3	− 5	− 1	− 4	+ 2	+ 1	+ 5	+ 2	+ 4	+23	+ 8	+ 8	−12	−22	−17	−10	− 8	+ 2	+ 7	+ 9	+ 6	+ 2	+ 1	− 1
Mean, 1872-1873 to 1888-1889.	− 2	− 3	− 3	− 3	− 3	− 1	− 3	− 3	+ 1	+ 7	+12	+10	+ 2	− 6	−11	−11	− 1	+ 6	+ 5	+ 3	+ 3	+ 1	0	− 1

TABLE 505.—*Vertical Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Full Moon.													
1872-1873 ...	− 5	− 7	− 4	− 5	−16	−16	−18	−33	−42	−22	− 7	+ 3	+18	+40	+60	+40	+18	+ 6	− 2	− 6	+ 8	+ 3	− 2	− 8
1873-1874 ...	+15	+12	+12	+10	+ 6	+ 5	− 6	− 3	− 9	−14	− 6	−15	−33	−27	−18	− 8	+ 1	+ 3	+ 9	+ 8	+15	+16	+16	+16
1874-1875 ...	0	− 3	− 8	−10	− 8	−12	−19	−27	−18	− 2	+45	+39	+36	+29	− 9	−14	−12	−10	− 4	+ 3	+ 2	+ 4	+ 2	− 2
1875-1876 ...	0	+ 2	+ 2	− 3	− 1	+ 5	− 2	0	− 8	−23	−18	+ 2	+22	+12	− 4	− 7	− 4	+ 3	+ 2	+ 5	+ 4	+ 6	+ 4	+ 4
1876-1877 ...	− 2	− 2	− 1	− 2	− 1	− 2	− 9	−16	+ 2	+11	+ 5	+16	+17	+ 1	0	+ 1	− 2	−11	− 1	0	− 1	0	0	0
1877-1878 ...	− 3	− 5	− 1	+ 4	+ 1	− 2	− 9	−14	− 3	+26	+59	+33	+16	+ 1	−13	−29	−23	− 7	− 3	− 7	− 5	− 4	− 8	− 7
1878-1879 ...	− 1	− 2	− 4	− 5	− 1	− 1	−16	−14	− 8	+10	+ 7	+ 9	+12	+14	+ 9	+ 2	− 3	− 4	− 1	+ 2	0	− 1	− 1	− 2
1879-1880 ...	+ 6	+12	+ 5	+ 3	+ 5	0	+ 7	+ 3	0	−14	−23	−27	−18	− 7	+ 5	+ 2	− 4	+ 3	+ 9	+ 2	+ 2	+ 5	+14	+13
1880-1881 ...	0	− 6	− 5	0	− 1	− 5	− 1	−15	−14	−15	+16	+15	0	+ 4	+ 7	+11	+11	+13	+ 7	+ 4	− 2	− 5	−10	− 4
1881-1882 ...	− 8	− 2	− 1	+ 2	− 3	+ 2	− 2	+ 7	+ 8	− 6	+20	+10	+17	+15	+ 4	−12	−23	− 9	0	− 1	− 6	− 6	− 4	− 4
1882-1883 ...	+ 1	− 4	− 4	− 4	− 8	− 8	−12	−16	−14	− 5	+21	+34	+25	+15	+13	+ 1	− 5	− 2	− 5	− 2	− 3	− 7	− 6	− 6
1883-1884 ...	+ 2	0	+ 3	+ 3	+ 4	0	+ 2	+ 3	− 5	− 8	− 8	− 6	−10	− 5	+ 2	+ 8	− 3	− 3	+ 2	+ 2	+ 1	+ 4	+ 6	+ 4
1884-1885 ...	− 1	0	+ 1	+ 1	− 4	−11	− 5	−19	− 1	+12	+30	+30	+23	+10	− 5	−20	−25	−14	−10	− 4	+ 3	+ 6	+ 5	+ 1
1885-1886 ...	−10	− 9	−10	−10	− 5	− 5	−13	−13	−12	− 7	+29	+41	+35	+22	+ 9	−11	−13	− 6	− 2	0	+ 2	0	− 3	− 8
1886-1887 ...	+ 3	+ 1	− 1	+ 1	− 1	0	0	+ 3	+12	+ 1	−20	− 9	− 8	− 6	− 2	− 2	− 4	− 1	+ 6	+ 5	+ 8	+ 9	+ 5	+ 2
1887-1888 ...	+ 1	+ 1	− 4	− 6	− 8	−10	−18	−13	− 6	− 5	+12	+12	+30	+25	+ 5	− 9	− 7	− 8	0	0	0	+ 2	+ 3	+ 1
1888-1889 ...	− 2	− 3	− 2	− 1	− 3	− 3	− 4	−11	−11	−23	+ 2	+26	+37	+30	+15	− 5	−29	−11	− 1	+ 3	+ 2	0	− 3	− 2
Mean, 1872-1873 to 1888-1889.	0	− 1	− 1	− 1	− 3	− 4	− 7	−10	− 8	− 5	+10	+13	+13	+10	+ 5	− 3	− 7	− 3	0	+ 1	+ 2	+ 2	+ 1	0
Years.											Five-eighth Phase.													
1872-1873 ...	+14	+12	+10	+10	+ 4	− 3	−12	−14	−10	+ 8	−42	−20	−27	−28	−10	+27	+46	+19	− 8	− 2	+ 4	−11	−14	+22
1873-1874 ...	+ 1	+ 3	+ 6	+ 2	+ 3	+ 5	+11	− 7	− 8	− 8	−11	− 7	0	− 3	+17	+14	+ 6	− 2	− 4	− 6	− 6	− 6	+ 1	+ 2
1874-1875 ...	+ 7	+ 4	+ 3	+10	+ 9	+ 5	+ 8	− 3	− 8	−27	−45	−28	− 5	+28	+35	+30	+ 4	−17	−11	− 6	− 1	+ 6	− 4	+ 8
1875-1876 ...	+ 9	+ 7	+ 5	+11	+14	+ 8	+ 4	+ 3	+ 6	− 7	−42	−38	−20	+11	+10	+15	+ 5	− 4	− 3	− 1	0	0	+ 3	+ 2
1876-1877 ...	+ 7	+ 9	+ 3	+ 3	+ 3	0	+ 3	+10	+14	+10	−20	−21	−18	−28	−18	− 4	+ 5	+ 3	+ 5	+ 8	+ 7	+ 9	+ 3	+10
1877-1878 ...	− 4	− 4	− 7	− 8	− 8	−10	− 7	− 7	− 8	+ 7	+26	+37	+36	+23	+ 2	− 6	− 9	− 9	−15	−11	− 9	− 8	− 4	− 4
1878-1879 ...	− 4	− 2	+ 1	− 3	− 4	+ 2	0	+ 6	+ 3	+ 6	+26	− 4	− 1	+ 3	+17	+17	+ 4	−10	−13	−15	−14	−11	− 4	− 2
1879-1880 ...	− 2	− 1	− 3	0	− 2	− 4	− 3	+ 4	− 5	−10	− 3	+ 3	+24	+15	+ 4	− 5	+ 9	+ 5	+ 2	− 1	− 7	−11	− 8	+ 1
1880-1881 ...	− 7	− 6	− 7	− 3	+ 1	− 3	−10	− 8	− 1	+15	+32	+39	+20	− 6	−15	−18	+ 9	+ 8	−11	− 6	+ 3	− 5	− 7	− 8
1881-1882 ...	− 1	+ 7	+ 2	0	0	0	− 3	−19	− 4	− 8	−38	−28	+ 2	+38	+10	+16	+19	+ 9	+ 2	− 3	− 5	+ 3	+ 4	− 4
1882-1883 ...	− 5	− 5	− 3	− 4	−11	− 6	− 8	−19	−32	−28	+ 7	+21	+31	+38	+28	+15	+ 3	− 2	− 1	− 3	− 2	− 5	− 3	− 3
1883-1884 ...	+10	+ 6	+ 2	0	− 4	− 5	− 2	−20	−47	−29	+ 6	− 3	+ 5	+11	+11	+ 8	+ 9	+13	+10	+ 8	−16	+ 3	+10	+12
1884-1885 ...	+13	+ 9	+ 5	+ 6	+ 7	+ 8	+ 8	+ 7	0	−14	− 7	− 5	−11	−10	− 9	−11	− 8	− 4	−10	− 4	− 1	+ 7	+ 9	+13
1885-1886 ...	− 8	− 3	− 4	− 8	−12	−12	−11	− 7	−12	−22	− 8	+ 2	+25	+42	+56	+34	+ 4	− 7	0	−10	−11	− 9	− 7	− 7
1886-1887 ...	+ 7	+ 6	+ 4	− 2	0	− 3	+ 1	+ 1	−17	−28	−12	−16	− 4	+13	+28	+34	+14	− 7	− 8	− 9	− 1	− 2	+ 1	+ 3
1887-1888 ...	+13	+11	+11	+ 3	+ 4	+ 6	0	− 8	−12	−13	−23	−16	−12	− 8	− 3	+13	+12	0	− 4	0	+ 1	+ 6	+11	+10
1888-1889 ...	+ 1	+ 2	+ 3	+ 5	+ 1	+ 4	− 5	− 1	− 4	−19	−23	− 8	+ 3	+ 6	+23	+28	+16	−13	− 7	−10	− 5	− 4	+ 5	− 2
Mean, 1872-1873 to 1888-1889.	+ 3	+ 3	+ 2	+ 1	0	0	− 2	− 5	− 9	−10	−10	− 5	+ 3	+ 9	+11	+12	+ 9	− 1	− 4	− 4	− 4	− 2	+ 1	+ 3

TABLE 505.—*Vertical Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Last Quarter.													
1872-1873 ..	− 5	+ 5	− 1	− 1	− 1	− 12	− 17	− 19	+ 23	+ 46	+ 62	+ 51	+ 37	− 4	− 40	− 45	− 24	− 4	− 5	− 8	− 7	− 5	− 13	− 15
1873-1874 ...	− 8	− 11	− 3	− 2	+ 4	+ 5	+ 3	+ 11	+ 11	+ 16	+ 13	+ 8	− 5	− 11	− 15	0	+ 6	+ 6	+ 2	− 2	− 4	− 5	− 11	− 7
1874-1875 ...	− 4	− 1	+ 1	+ 2	+ 2	+ 3	+ 10	+ 16	+ 33	+ 23	− 23	− 26	− 17	− 17	0	+ 10	+ 10	+ 7	− 4	− 6	− 6	− 2	− 3	− 5
1875-1876 ...	− 3	− 3	− 2	− 5	− 4	− 5	− 3	+ 6	+ 12	+ 8	+ 12	0	− 3	− 1	+ 3	+ 2	+ 9	+ 8	− 3	− 7	− 5	− 5	− 4	− 3
1876-1877 ...	− 5	+ 2	− 6	− 4	− 4	− 4	+ 6	+ 10	+ 2	+ 4	− 18	− 28	− 14	− 1	+ 1	+ 13	+ 20	+ 16	+ 9	+ 8	− 1	− 2	− 1	− 7
1877-1878 ...	0	− 6	− 5	− 7	− 10	− 9	− 5	+ 3	− 16	− 20	− 8	+ 12	+ 20	+ 16	+ 7	+ 2	+ 1	+ 5	0	+ 3	+ 3	+ 5	+ 4	+ 2
1878-1879 ...	+ 1	+ 3	+ 1	+ 5	+ 3	+ 7	+ 11	+ 18	+ 27	+ 22	− 2	− 14	− 18	− 11	− 5	+ 3	+ 2	− 9	− 9	− 7	− 6	− 6	− 6	− 5
1879-1880 ...	− 6	− 5	− 8	− 13	− 14	− 18	− 8	− 6	+ 19	+ 6	− 13	− 16	+ 17	+ 26	+ 21	+ 16	+ 19	+ 16	− 1	0	− 4	− 2	− 12	− 9
1880-1881 ...	− 2	+ 5	0	− 2	0	0	− 6	− 7	− 4	+ 4	+ 9	+ 4	− 8	− 5	− 6	+ 15	+ 8	+ 1	+ 1	− 5	0	− 2	+ 4	0
1881-1882 ...	+ 3	+ 9	+ 1	0	− 4	− 8	− 9	− 5	+ 14	+ 12	− 1	− 9	− 4	− 9	+ 10	+ 13	+ 2	− 3	− 10	− 5	0	− 1	− 2	+ 5
1882-1883 ...	+ 1	− 1	+ 2	+ 5	+ 5	+ 5	+ 2	0	− 2	− 5	− 3	− 3	0	− 5	− 8	− 3	+ 1	+ 3	+ 5	0	+ 2	0	− 1	+ 2
1883-1884 ...	− 6	− 1	− 3	− 2	+ 1	0	0	+ 4	+ 21	+ 7	− 10	− 4	− 10	+ 3	− 11	− 5	+ 3	+ 6	+ 2	− 2	+ 4	+ 4	− 1	− 3
1884-1885 ...	− 5	− 12	− 8	− 12	− 4	− 3	− 8	− 3	+ 3	+ 17	+ 14	+ 8	+ 7	+ 18	+ 11	+ 10	+ 10	+ 11	− 5	− 6	− 9	− 10	− 10	− 10
1885-1886 ...	+ 4	+ 3	+ 3	0	+ 3	+ 4	+ 10	+ 7	− 2	− 16	− 22	− 20	− 21	− 11	− 5	+ 16	+ 14	+ 10	+ 8	+ 7	+ 5	+ 1	0	+ 2
1886-1887 ...	+ 6	+ 7	− 2	+ 5	+ 3	+ 7	0	− 2	− 12	− 18	− 22	− 19	− 19	− 2	+ 9	+ 12	+ 11	+ 10	+ 9	+ 11	0	+ 2	0	+ 5
1887-1888 ...	− 1	+ 3	+ 6	+ 6	+ 4	+ 4	+ 7	+ 10	+ 17	+ 25	− 22	− 38	− 24	− 8	+ 9	+ 12	+ 9	− 2	− 6	− 4	− 2	− 4	− 4	0
1888-1889 ...	+ 4	− 1	+ 2	0	− 7	0	− 3	− 4	+ 3	− 1	− 9	− 17	− 5	+ 20	+ 16	+ 12	+ 17	+ 2	− 9	− 7	− 4	− 6	− 6	0
Mean, 1872-1873 to 1888-1889.	− 2	0	− 1	− 1	− 1	− 1	− 1	+ 2	+ 9	+ 8	− 3	− 7	− 4	0	0	+ 5	+ 7	+ 5	− 1	− 2	− 2	− 2	− 4	− 3
Years.											Seven-eighth Phase.													
1872-1873 ...	− 24	− 15	− 3	+ 2	+ 3	− 5	+ 7	+ 26	+ 31	+ 35	+ 4	+ 18	+ 30	+ 34	+ 27	− 5	− 42	− 19	− 15	− 17	− 15	− 7	− 21	− 24
1873-1874 ...	− 9	− 3	− 11	− 8	− 12	− 8	0	− 8	+ 2	+ 11	+ 11	+ 27	+ 37	+ 14	− 5	− 16	− 3	+ 3	+ 3	+ 1	− 8	− 12	− 5	− 6
1874-1875 ...	− 4	− 4	− 2	− 11	− 4	− 6	− 8	+ 4	+ 11	+ 8	− 7	+ 4	+ 5	− 4	− 7	− 8	− 4	+ 12	+ 8	+ 5	+ 7	+ 5	+ 4	− 4
1875-1876 ...	0	+ 3	+ 4	0	− 2	0	− 1	− 3	− 3	+ 6	+ 7	+ 8	+ 1	− 2	− 8	− 17	− 12	− 3	+ 6	+ 7	+ 4	+ 3	0	+ 2
1876-1877 ...	− 2	− 5	0	0	− 4	− 4	− 7	− 2	− 7	+ 2	+ 13	+ 24	+ 15	+ 11	− 7	− 19	− 20	− 1	+ 5	− 2	+ 4	+ 2	0	0
1877-1878 ...	+ 10	+ 7	+ 5	+ 3	+ 2	+ 1	− 3	− 2	+ 8	+ 19	− 27	− 24	− 18	− 29	− 23	− 8	− 2	+ 6	+ 7	+ 10	+ 19	+ 16	+ 13	+ 10
1878-1879 ...	− 2	− 2	+ 6	+ 6	+ 9	+ 6	+ 14	+ 13	+ 15	+ 8	− 9	− 22	− 17	− 8	− 14	− 10	− 3	+ 9	+ 6	+ 2	− 3	+ 1	+ 1	− 6
1879-1880 ...	+ 5	− 3	+ 4	+ 5	+ 6	+ 7	0	− 1	− 3	+ 2	− 8	− 4	− 2	− 8	− 14	− 8	− 7	− 8	+ 3	+ 7	+ 10	+ 10	+ 8	0
1880-1881 ...	− 11	+ 5	+ 9	+ 9	+ 11	+ 9	+ 15	− 2	− 15	− 25	− 15	− 6	+ 1	+ 11	+ 23	+ 6	− 10	+ 1	+ 1	0	+ 6	0	− 10	− 8
1881-1882 ...	+ 8	+ 8	+ 1	+ 5	+ 6	+ 6	+ 5	+ 8	+ 2	− 9	− 1	− 13	− 31	− 46	− 31	− 4	+ 13	+ 16	+ 15	+ 13	+ 9	+ 9	+ 10	+ 7
1882-1883 ...	− 2	− 1	+ 1	− 1	+ 3	+ 2	+ 5	+ 9	+ 13	+ 4	− 8	+ 6	+ 8	− 11	− 3	− 6	− 4	− 2	0	0	0	− 7	− 3	− 5
1883-1884 ...	− 3	− 3	− 8	0	+ 2	− 4	− 7	− 6	0	− 5	+ 13	+ 21	+ 17	+ 14	− 4	− 25	− 15	− 10	+ 10	+ 4	+ 5	− 2	+ 2	+ 2
1884-1885 ...	− 6	− 5	− 6	− 3	− 4	− 8	− 15	− 15	− 16	− 7	+ 8	+ 27	+ 14	− 4	+ 5	+ 7	+ 5	+ 7	+ 14	+ 10	+ 3	+ 1	− 3	− 7
1885-1886 ...	− 1	+ 1	+ 1	− 1	− 3	− 5	− 6	− 7	+ 1	+ 12	− 9	− 3	+ 4	+ 2	− 7	− 9	+ 5	+ 8	+ 6	+ 7	+ 9	+ 3	− 5	− 1
1886-1887 ...	− 6	− 2	− 5	+ 1	+ 3	0	− 4	− 10	− 3	+ 2	− 2	+ 1	+ 32	+ 25	+ 6	− 4	− 10	− 8	0	+ 1	− 4	− 4	− 8	− 3
1887-1888 ...	− 2	+ 1	+ 4	+ 6	+ 9	+ 6	− 6	− 3	+ 3	+ 5	+ 9	+ 13	+ 6	− 14	− 34	− 22	− 7	+ 8	+ 12	+ 5	+ 4	+ 3	− 4	− 2
1888-1889 ...	− 1	+ 2	− 2	+ 1	+ 1	0	0	+ 3	+ 12	+ 30	+ 16	+ 6	− 17	− 34	− 30	− 17	− 1	+ 10	+ 8	+ 4	+ 4	+ 5	+ 3	+ 1
Mean, 1872 1873 to 1888 1889.	− 3	− 1	0	+ 1	+ 2	0	− 1	0	+ 3	+ 6	0	+ 5	+ 5	− 3	− 7	− 10	− 7	+ 2	+ 5	+ 3	+ 3	+ 2	− 1	− 3

TABLE 506.—*Horizontal Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											New Moon.													
1871-1872 ...	−13	+ 6	+ 4	+ 6	+ 3	+18	+18	+37	+58	+75	+ 56	+ 20	+34	−11	−14	−23	−43	−68	−40	−10	−68	−39	− 7	− 2
1872-1873 ...	−52	−50	+10	+25	0	+29	+ 8	+15	− 7	+11	+ 5	+ 4	+ 8	+ 3	+ 3	− 3	+ 5	+26	− 5	− 3	−19	−11	+11	−11
1873-1874 ...	−21	−30	+ 8	− 7	−21	− 3	+ 5	−11	+ 2	+19	+ 28	+ 43	+31	+34	+ 6	+ 5	+ 5	− 12	−24	− 7	−22	−38	−13	−20
1874-1875 ...	+12	− 9	−30	−34	−30	−26	−13	+ 7	+38	+39	− 24	− 55	−59	− 4	−16	−17	0	+13	+27	+42	+34	+41	+42	+26
1875-1876 ...	+ 2	−11	+16	+15	+ 3	+ 9	0	+23	+52	+53	+ 29	+ 10	+ 7	−13	−53	−50	−32	−25	−20	−12	−12	−12	+13	+10
1876-1877 ...	− 5	− 5	−27	−10	− 3	+14	+17	+14	+20	+23	+ 25	+ 28	+10	− 6	−15	− 1	+ 3	+23	−13	−41	−17	−36	−12	+10
1877-1878 ...	− 7	+ 7	−12	− 7	+ 7	− 5	+ 1	+28	+54	+37	+ 84	+ 28	− 2	−43	−21	−28	−37	−28	−26	−29	+ 5	−19	− 1	+12
1878-1879 ...	+ 5	+ 5	+ 3	+ 1	+ 2	0	+16	+ 7	+ 7	+21	− 13	− 31	−49	−50	−23	−16	+13	+11	−12	+37	+18	+26	+13	+13
1879-1880 ...	+41	+11	+ 8	+ 2	+ 3	+ 8	+ 8	+16	+18	+31	− 27	− 29	−31	−59	−45	−22	−22	−13	−11	− 7	+17	+30	+37	+34
1880-1881 ...	− 5	+ 2	+12	− 1	+ 3	+13	+19	+ 6	+15	+ 6	+ 39	+ 47	+ 2	+ 7	−27	− 9	−21	−32	−11	−16	0	− 8	−27	−14
1881-1882 ...	−48	−21	−42	−28	−52	−46	−33	−18	+12	+20	+ 5	+ 27	+22	+28	+19	− 7	+29	+57	+64	+43	+ 9	+16	−19	−40
1882-1883 ...	−67	−66	−47	−26	−34	−20	− 2	+29	+94	+77	+113	+ 85	+42	+11	−14	−20	−15	−20	+14	−19	0	−35	−29	−51
1883-1884 ...	−11	−27	−38	− 1	− 4	−17	− 9	0	+29	+44	+ 78	+ 63	+37	+ 1	−27	−24	−34	−32	−26	−19	+12	− 5	+17	− 6
1884-1885 ...	− 6	− 2	+ 4	− 1	− 1	− 1	− 2	+31	+37	+32	+ 17	+ 15	+ 5	−10	−18	+13	+10	+11	−10	−18	−26	−16	−47	−18
1885-1886 ...	− 5	−14	− 8	+ 4	0	+ 5	+11	−21	− 4	+17	+ 47	+ 16	−46	−75	−50	−10	+17	+37	+46	+13	0	+ 3	+19	− 2
1886-1887 ...	+ 7	+11	−11	+ 7	+27	+12	+33	+20	+21	+22	− 41	− 40	−32	−35	−25	+17	− 3	−25	−38	−27	+17	+45	+45	− 7
1887-1888 ...	−17	−33	−28	−28	−17	− 8	− 9	+12	+49	+98	+128	+132	+82	− 8	−52	−50	−67	−44	−12	− 6	−10	−29	−42	−42
1888-1889 ...	−24	−12	−27	−14	−15	+ 1	+ 6	+ 9	+21	+41	+ 37	+ 30	+ 9	−16	−22	−20	+ 4	+23	+20	− 2	+15	−13	−25	−25
Mean, 1871-1872 to 1888-1889.	−12	−13	−11	− 5	− 7	− 1	+ 4	+11	+29	+37	+ 33	+ 22	+ 4	−14	−22	−15	−10	− 5	− 4	− 4	− 3	− 6	− 1	− 7
Years.											One-eighth Phase.													
1871-1872 ...	+13	+30	+43	+10	+ 7	+ 2	− 2	− 3	− 3	+41	+106	+89	+93	+33	+14	−58	−115	−79	−58	−54	−12	−43	−46	−10
1872-1873 ...	+36	+12	+13	+15	− 4	− 5	−18	−16	−16	− 4	+ 29	+25	+25	−53	−32	−46	− 30	−34	+ 9	+25	+20	+29	− 3	+20
1873-1874 ..	0	+ 9	+25	+ 6	+ 4	+37	+46	+16	+23	+46	+ 13	− 15	+35	+25	− 5	−14	− 18	−31	−38	−31	−43	−38	−34	−19
1874-1875 ...	−29	+ 6	+22	+12	+13	+ 8	− 1	+13	+14	+34	+ 60	+48	+34	+26	0	− 9	− 25	−20	−60	−78	−39	−18	− 5	− 2
1875-1876 ...	− 8	+ 1	+12	− 7	− 8	+ 2	+ 3	+ 3	− 9	−14	+ 64	+67	+44	+17	+28	+ 7	− 20	−20	−25	− 3	−35	−32	−35	−29
1876-1877 ...	+ 2	+20	− 6	−11	− 9	− 7	−13	0	+16	+37	+ 21	+29	+39	+61	+45	+22	− 34	−73	−44	−22	−25	−11	−12	−28
1877-1878 ...	− 9	+56	+40	+46	+14	− 2	−22	−40	− 44	− 24	+ 11	+50	+51	+31	−12	−25	− 27	−39	−36	−21	−22	+17	+22	−19
1878-1879 ...	− 6	− 3	+ 4	−13	−17	−19	−14	−10	+ 8	+23	+ 19	+16	− 1	+ 3	− 8	−21	− 11	+ 9	+ 8	+ 6	+11	+12	+ 2	− 1
1879-1880 ...	−24	−21	−18	+ 8	−13	− 7	− 3	− 3	− 2	+11	− 6	−11	+ 1	+ 2	+ 5	− 8	+ 2	+13	− 5	+22	+56	+35	−10	−17
1880-1881 ...	− 3	+ 2	− 3	+ 9	+ 4	− 6	+10	+14	+24	+38	+ 30	+52	+42	+10	−33	−39	− 42	−34	−26	−27	−31	−10	+21	0
1881-1882 ...	−57	−26	+ 3	−29	−17	− 3	+ 7	−20	−12	+10	+ 77	+99	+83	+46	+20	− 9	− 78	−58	−42	+ 3	+23	+10	− 5	−31
1882-1883 ...	−21	−40	−36	−24	−28	+ 2	+ 1	− 2	+18	+68	− 13	+20	+ 4	− 9	+26	−40	− 7	−12	+19	+46	+16	+32	−10	− 9
1883-1884 ...	+17	+11	− 5	−11	+37	+32	+ 3	+26	+41	+71	+ 16	+24	+23	− 5	−11	−28	− 50	−58	−33	−32	−38	−34	− 2	+ 5
1884-1885 ...	+26	+41	+ 6	+18	+14	+12	+12	−10	−16	−24	+ 3	+13	+11	+22	+19	− 9	+ 13	−11	−15	−23	−25	−32	−27	−18
1885-1886 ...	+13	+38	+27	+31	+ 6	0	−14	−29	−10	− 4	+ 40	+58	+59	+79	−25	−60	− 48	−36	−43	−31	−31	− 2	0	−19
1886-1887 ...	+ 3	+24	+ 2	− 5	−11	−18	−19	−29	−36	−14	+ 30	+45	+31	+16	− 4	−17	+ 6	−13	−27	−33	− 4	+ 9	+24	+40
1887-1888 ...	+ 5	+10	+18	+28	+35	+31	+29	+ 3	−11	−20	+ 23	− 11	+ 4	+ 5	+28	− 1	− 4	−48	−40	−51	−13	+ 2	− 3	+ 2
1888-1889 ...	+ 9	+10	+17	+ 7	+ 4	+ 7	− 9	− 4	− 5	+ 5	+ 26	+33	+ 8	− 7	−11	− 2	− 4	+13	− 5	−18	− 1	−27	−33	−14
Mean, 1871-1872 to 1888-1889.	− 2	+10	+ 9	+ 5	+ 2	+ 4	0	− 5	− 1	+16	+ 30	+35	+32	+17	+ 2	−20	− 27	−29	−26	−18	−11	− 6	− 9	− 8

TABLE 506.—*Horizontal Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											First Quarter.													
1871-1872 ...	−13	−16	0	+15	+41	+ 9	−12	−28	−33	− 44	+47	+39	+33	+50	−22	+ 10	− 1	+ 7	−33	−42	− 3	− 5	− 5	+10
1872-1873 ...	+28	+21	− 3	−27	−44	−48	−53	−65	−76	− 82	−43	−65	−66	−12	+73	+119	+121	+81	+65	+52	+35	+ 6	− 7	−12
1873-1874 ...	+17	+19	−30	−14	−22	−17	−10	− 7	−25	− 52	−39	−26	−17	−16	− 9	0	+ 24	+32	+33	+43	+51	+50	+24	− 2
1874-1875 ...	+30	+ 8	+ 1	−14	− 6	−10	− 5	−20	−43	− 45	−17	+23	+34	+41	+16	+ 9	− 3	−36	−29	+ 1	+ 9	+28	+18	+15
1875-1876 ...	− 9	− 9	+10	+ 5	+ 9	+18	+ 8	− 3	−23	− 21	−20	+ 2	+38	+19	+ 9	− 2	− 5	− 3	+23	− 3	− 4	+ 4	−12	−28
1876-1877 ...	− 8	+13	+ 9	+19	+ 9	+10	−13	−21	−11	− 58	− 3	− 3	+ 8	+ 7	− 3	+ 6	+ 13	+18	− 9	− 6	− 3	+ 9	+ 8	+13
1877-1878 ...	+14	−17	−11	− 4	− 5	−11	−18	−33	−22	− 14	+ 5	+26	+59	+53	+49	+ 20	+ 7	− 6	− 7	−22	−43	−12	−10	+ 2
1878-1879 ...	+15	−21	− 2	+13	+ 4	+16	− 2	−20	−55	− 72	−28	0	+21	+21	+12	+ 15	+ 8	+ 8	+23	+23	+ 6	+ 1	0	+17
1879-1880 ...	+25	+42	+40	+17	+12	+ 8	+ 5	−19	−24	− 19	−43	−33	− 8	+24	+17	− 2	− 31	−42	− 8	+ 3	+ 9	+18	+ 5	+ 5
1880-1881 ...	+17	− 6	+ 8	+13	+ 5	+ 8	−17	−44	−49	− 86	−95	−80	−26	− 2	+14	+ 14	+ 40	+63	+41	+44	+37	+36	+34	+27
1881-1882 ...	+44	+30	+38	+45	+55	+28	+20	−20	−55	− 80	−58	−82	−60	−29	− 4	+ 4	+ 19	+17	+24	−10	+ 7	+15	+36	+22
1882-1883 ...	− 5	− 3	− 9	+30	−13	−25	−11	−47	−72	−115	+43	+51	+92	+84	+48	+ 59	+ 6	− 3	−39	−25	+26	−22	−27	−21
1883-1884 ...	+27	+17	−13	− 5	−21	−25	−33	−54	−58	− 62	−29	−25	−24	− 1	+26	+ 44	+ 39	+34	+38	+32	+32	+31	+15	+14
1884-1885 ...	+ 8	+ 1	−27	−11	+13	−14	−36	−53	−66	− 52	0	+14	+ 2	+ 2	+15	+ 15	+ 26	+33	+38	+20	+12	+34	+26	+ 4
1885-1886 ...	+ 4	0	+ 5	+ 8	+ 9	0	0	+ 9	+ 4	+ 6	−18	−31	−30	−24	−20	− 32	− 11	− 1	+17	+28	+32	+20	+ 9	+18
1886-1887 ...	+55	+17	+40	+18	+20	+10	+30	+22	− 7	− 26	−28	−41	− 9	+ 1	+ 1	− 13	− 42	− 22	0	+48	+ 3	−43	−31	− 3
1887-1888 ...	+36	+ 5	+12	+24	+15	+12	0	−13	−23	− 33	−26	−27	− 4	+18	+31	+ 7	− 13	− 13	− 7	−40	−20	+ 3	+15	+39
1888-1889 ...	−11	− 7	− 8	+ 7	+ 4	+12	− 8	−23	−28	− 5	+13	+36	+34	+30	+ 7	+ 3	− 21	−19	− 8	+ 8	+12	− 5	−11	−10
Mean, 1871-1872 to 1888-1889.	+15	+ 5	+ 3	+ 8	+ 5	− 1	− 9	−24	−37	−48	−19	−12	+ 4	+15	+14	+15	+ 10	+ 8	+ 9	+ 9	+11	+ 9	+ 5	+ 6
Years.											Three-eighth Phase.													
1871-1872 ...	+38	+11	− 1	−24	−12	− 8	−10	−27	−27	− 47	−32	−52	−26	− 1	+41	+28	+40	+35	+45	− 8	− 1	+13	+25	− 3
1872-1873 ...	+18	+ 3	+ 9	+20	+26	+23	+34	+40	+53	+44	−55	−48	−53	+ 1	−10	− 3	+ 9	−12	−52	−27	− 3	−38	+ 1	+16
1873-1874 ...	+ 4	−31	−24	+14	+20	+ 5	+17	+24	− 3	− 34	−49	−76	−58	−34	−12	+16	+27	+46	+44	+45	+43	+14	− 2	+ 6
1874-1875 ...	−25	−31	−23	+ 9	−10	+ 4	+12	+ 6	+ 5	− 12	−16	−21	−25	−16	+22	+48	+53	+35	+22	+ 3	−14	− 7	− 6	−10
1875-1876 ...	+21	+12	0	− 2	+ 7	+16	+18	+ 6	−35	− 47	−40	−43	−36	−26	−14	+ 8	+12	+29	+13	+11	+26	+15	+25	+29
1876-1877 ...	+24	+24	+13	− 2	+16	− 5	+ 2	+ 4	−30	− 42	−19	−24	−23	−22	+ 1	+ 4	+16	− 1	− 4	− 3	+19	+ 2	+14	+31
1877-1878 ...	+ 7	− 6	+ 3	− 9	− 3	− 6	−21	− 3	+ 7	+38	− 1	−25	−43	−10	+ 3	+ 2	+17	+31	+30	+11	− 2	− 7	− 7	+ 1
1878-1879 ...	− 3	+12	+14	+ 6	+10	+ 3	− 3	+ 9	+47	+46	− 7	−31	−35	−36	−41	− 21	− 20	0	+ 7	+15	+15	+ 1	+12	0
1879-1880 ...	−16	− 6	−14	−19	− 1	+ 2	− 5	+ 8	+ 9	− 11	+27	+12	+10	− 5	0	+23	+32	+24	− 3	−13	−16	−20	−18	0
1880-1881 ...	−48	−35	− 3	− 4	−19	−16	−14	+ 6	+ 6	− 9	−39	− 8	+21	+62	+52	+37	+43	+30	+15	+18	+ 6	−28	−33	−40
1881-1882 ...	+17	+52	+32	+26	+32	+25	+23	+37	+16	− 19	−69	−81	−70	−49	−29	+ 7	+ 14	+ 2	+12	+11	− 7	− 1	+ 6	+12
1882-1883 ...	+44	+15	+19	+12	+14	+26	+16	+43	+53	+55	−24	−23	−34	−46	−39	−22	−18	−11	−30	− 5	−27	0	−10	− 6
1883-1884 ...	−14	+12	+ 3	− 7	+ 1	0	+ 7	−10	−21	− 3	−13	−13	+17	+16	+16	+14	− 5	−18	− 5	+19	+12	+ 5	−14	− 1
1884-1885 ...	+18	+21	+18	+27	+10	+ 5	+21	+25	− 6	− 25	−88	−86	−45	−12	−14	+ 8	+26	+37	+10	+14	+15	+ 8	+17	− 3
1885-1886 ...	−33	−33	−19	−20	−11	− 4	− 1	+10	+ 6	− 7	− 8	+ 6	+15	+39	+66	+73	+18	− 1	− 7	− 1	− 7	−17	−33	−32
1886-1887 ...	−17	+11	+13	+41	+27	+33	+27	+19	+29	+ 9	−42	−39	−26	−15	−40	−32	−29	−13	− 1	+ 5	+40	+ 5	+14	−20
1887-1888 ...	− 4	+29	+ 6	− 5	0	+18	+ 9	+17	+ 7	− 7	−71	−53	−37	−14	− 5	+26	+38	+36	+17	+ 5	+18	− 5	−13	−10
1888-1889 ...	+ 6	− 1	+ 1	+36	+15	−12	− 4	− 1	+16	−42	−37	−52	−37	−16	+ 4	− 4	+ 7	+34	+41	+25	+ 4	+16	+17	−15
Mean, 1871-1872 to 1888-1889.	+ 2	+ 3	+ 3	+ 5	+ 7	+ 6	+ 7	+12	+ 7	− 6	−32	−36	−27	−10	0	+12	+16	+16	+ 9	+ 7	+ 7	− 2	0	− 2

TABLE 506.—*Horizontal Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Full Moon.													
1871-1872 ...	−24	−14	+ 3	+17	+ 3	− 2	− 4	− 3	+14	+26	+ 5	−18	−28	−43	−19	−19	−15	−10	+20	+39	+37	+30	+15	− 8
1872-1873 ...	−49	−57	−64	−46	− 5	−14	−15	+ 9	+34	+46	+50	+57	+62	+19	−35	− 6	−18	− 4	0	+12	−12	+ 2	+29	+ 7
1873-1874 ...	+13	− 2	− 5	− 4	− 4	− 3	− 7	− 1	+11	+21	−28	− 9	− 7	−24	−34	−23	−14	− 5	−10	+18	+16	+35	+33	+34
1874-1875 ...	− 6	− 9	+ 1	− 2	+ 8	+29	+25	+52	+73	+72	+27	−15	−31	−50	−58	−50	−30	−12	− 8	+21	+ 3	+ 8	−20	−24
1875-1876 ...	+ 5	− 9	− 9	−12	0	− 3	−11	+18	+46	+70	+20	+15	+ 5	−12	−22	−15	+ 1	− 1	− 6	−18	−12	−18	−18	−15
1876-1877 ...	0	−15	−17	+ 4	+ 6	+ 6	+14	+40	+50	+48	−25	−26	−47	−37	−34	−22	+ 2	+29	+25	+16	− 3	−11	+ 4	−13
1877-1878 ...	+15	+22	+12	+ 9	− 3	− 5	+15	+26	+36	+19	+ 9	+ 3	−57	−47	−45	−22	−20	− 5	− 7	0	+ 7	+ 3	+11	+22
1878-1879 ...	−31	−24	−27	−22	−30	−24	− 7	+32	+54	+64	+63	+65	+48	+14	− 4	−27	−24	−31	−22	−12	−10	−12	− 8	−26
1879-1880 ...	+17	− 9	−11	− 5	+ 5	− 9	+ 1	+22	+48	+51	+ 8	−12	−36	−42	−31	−26	−16	−18	− 7	+ 4	+19	+25	+24	+ 2
1880-1881 ...	+24	+20	+ 6	−24	−17	−29	− 9	−18	− 9	+13	−14	−18	−10	−12	−16	0	− 4	+14	+22	+14	+16	+13	+18	+24
1881-1882 ...	+20	+14	− 1	−14	−17	− 4	+ 1	+14	+29	+54	+ 1	+ 9	+16	+14	+14	+12	−10	−22	−29	−45	−20	−35	−21	+21
1882-1883 ...	−18	−24	+ 1	−32	+12	+ 3	+ 7	+10	+14	+ 7	+21	+47	+ 7	+ 3	+ 5	− 2	−29	−32	+19	+16	−11	−33	−13	+22
1883-1884 ...	−12	− 9	− 9	0	− 5	+16	+28	+40	+49	+59	− 4	−22	−32	−27	−28	−29	−25	− 4	+ 2	+ 5	+ 4	+17	− 5	− 8
1884-1885 ...	−18	−14	−21	−27	− 4	+ 4	+20	+43	+59	+48	+75	+23	+ 7	−23	−21	−14	+ 7	+ 5	−18	−29	−39	−21	−22	−22
1885-1886 ...	+ 8	+ 7	− 6	−19	−12	−16	+14	+13	+27	+54	+42	+46	+16	−12	−30	−36	−40	−32	− 8	− 9	− 1	−18	+11	0
1886-1887 ...	+14	0	+13	+ 4	+ 7	+15	+12	+ 8	+25	+20	+30	+ 7	−49	−61	−40	−34	+ 7	+13	+ 7	−11	−17	+13	+13	+ 4
1887-1888 ...	+16	+ 3	+25	+21	− 6	−12	0	+18	+16	+ 2	−23	−29	−51	−36	−38	−30	+ 4	+21	+25	+45	+ 6	−13	+15	+22
1888-1889 ...	+22	+12	+22	0	+ 6	+22	+18	+21	+21	+22	−20	−41	−18	−30	−44	−48	−42	−14	+ 1	+ 8	+10	+14	+23	+35
Mean, 1871-1872 to 1888-1889.	0	− 6	− 5	− 8	− 3	− 1	+ 6	+19	+33	+39	+13	+ 5	−11	−23	−27	−22	−15	− 6	0	+ 4	0	0	+ 5	+ 4
Years.											Five-eighth Phase.													
1871-1872 ...	−34	−35	−37	−35	−13	− 8	−14	−27	−56	−54	+ 13	− 1	− 1	+21	+32	+48	+91	+86	+50	+40	− 4	− 6	−28	−30
1872-1873 ...	−23	+ 6	−18	−32	−12	−24	−23	−65	−73	−31	+ 47	+ 59	+39	+24	+37	+12	+ 2	+13	+25	− 2	− 3	+34	+ 9	− 6
1873-1874 ...	+23	+29	+25	+22	+ 9	+ 2	−38	−25	−56	−39	+ 9	+ 4	+23	− 1	+14	+37	+ 4	−15	0	− 5	+ 3	0	− 2	−18
1874-1875 ...	−31	− 9	+ 8	+ 2	−24	−40	−45	−59	−29	−19	+ 24	+ 39	+45	+22	+14	+21	+10	+32	+ 5	+ 6	+15	− 7	+16	+ 4
1875-1876 ...	−35	−24	− 3	+16	−15	−44	−34	−71	−16	+ 2	+ 73	+ 62	+39	+53	+41	+ 6	+ 3	+ 6	+ 7	−35	−33	− 6	−12	+19
1876-1877 ...	− 7	−23	−17	−15	−13	−16	−30	−21	+11	+41	+ 59	+ 35	+21	+10	+28	+17	− 8	− 3	− 3	−10	−15	−16	−10	−18
1877-1878 ...	−19	−31	− 7	−23	−20	− 6	+ 6	− 9	− 9	− 9	+ 31	+ 37	+34	+24	+21	+12	+ 9	+ 1	0	+12	+14	−14	−21	−29
1878-1879 ...	+ 7	− 8	− 8	−11	+ 1	− 7	−11	−14	−21	−15	+ 95	+ 89	+69	+41	+25	− 6	−16	−11	−36	−79	−53	−29	− 4	0
1879-1880 ...	− 1	− 6	− 5	− 4	− 4	+ 8	+13	+ 1	+ 3	+ 4	+ 25	+ 29	+17	+17	− 1	−17	− 3	− 2	− 8	− 9	−23	−16	− 2	−13
1880 1881 ...	− 7	+21	+20	+23	+24	− 8	+ 3	+20	+13	+31	+ 41	+ 43	+22	+16	+39	− 4	−22	−51	−42	−65	−51	−16	−31	−18
1881-1882 ...	−26	−22	−14	+18	+19	+12	− 9	− 3	+17	+86	+196	+147	+67	−12	−30	−37	−58	−68	−75	−73	−49	−39	−35	−20
1882-1883 ...	+62	+66	+25	+31	+43	+41	+19	−12	−34	−18	− 43	− 52	−31	−34	− 3	0	+ 2	−14	−21	−31	−22	− 6	+18	+13
1883-1884 ...	+ 4	−25	+20	− 2	−16	−33	−46	−41	−39	−43	+ 30	+ 45	+65	+69	+41	+20	+ 9	+10	+ 4	−21	−22	−38	− 4	+11
1884-1885 ...	+19	− 5	−18	+24	− 1	− 6	− 5	+11	+14	+54	+ 10	+ 11	0	+ 2	−24	−26	−41	−45	−23	−22	+ 2	+15	+28	+24
1885-1886 ...	−22	−12	−18	−17	− 9	+ 4	− 1	+ 1	+14	+53	+ 61	+ 63	+56	+43	+13	− 5	−14	+ 2	−26	−48	−40	−27	−36	−35
1886-1887 ...	−28	0	−11	− 1	+17	+ 8	+17	+ 2	+25	+40	+ 25	+ 38	+21	+30	+32	−11	−16	−40	−17	−16	−23	−25	−55	−13
1887-1888 ...	−10	− 8	−17	−34	−33	−33	−45	−46	−30	− 1	+ 1	+ 18	+21	+33	+25	+23	+34	+38	+ 7	+12	− 2	+13	+18	+14
1888-1889 ...	− 8	− 4	−11	−15	+ 5	− 7	−12	−22	− 5	− 1	+ 39	+ 15	+30	+28	+32	+32	+24	−10	−33	−32	−30	+ 4	− 9	−10
Mean, 1871-1872 to 1888-1889.	− 8	− 5	− 5	− 3	− 2	− 9	−14	−21	−15	+ 4	+ 41	+ 38	+30	+21	+19	+ 7	+ 1	− 4	−10	−21	−19	−10	− 9	− 7

TABLE 506.—*Horizontal Force Magnetograph—Showing for the quarter November to January the mean Lunar Diurnal Variation.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Last Quarter.													
1871-1872 ...	+10	− 3	− 2	+ 2	− 3	− 8	0	+33	+32	−24	−66	−62	−51	−10	+20	+21	+39	+36	+28	+26	− 3	−12	−10	+10
1872-1873 ...	+32	+19	+55	+35	+21	+39	+35	+25	−20	−76	−37	−30	−12	− 7	−59	−79	−46	−23	− 1	+ 1	+24	+56	+21	+31
1873-1874 ...	−29	+18	+13	+ 4	+ 7	−14	+ 2	− 5	−10	−15	− 9	+ 9	− 2	+18	+42	+32	+31	+13	−10	− 9	−15	−31	−13	−25
1874-1875 ...	− 4	+27	+35	+26	+25	+ 8	+ 5	−11	−45	−55	0	+14	+24	+11	+10	+ 6	− 6	0	+16	−15	− 7	−25	−31	− 7
1875-1876 ...	+ 4	+ 3	− 8	− 9	− 1	− 6	+ 6	− 1	−26	−40	−29	−28	−12	+11	+18	+21	+21	− 6	+12	+30	+15	+ 6	− 6	+23
1876-1877 ...	−17	−27	−15	−27	−20	−14	− 3	−19	−38	−35	−44	−32	− 7	+ 9	+17	+41	+48	+45	+40	+42	+44	+46	− 8	−24
1877-1878 ...	+ 6	+ 7	− 2	− 1	+ 5	+22	+20	0	−35	−48	−77	−52	−26	−15	+ 2	+25	+28	+14	+17	+23	+28	+28	+19	+15
1878-1879 ...	+ 4	+12	+23	+23	+34	+34	+33	+11	− 4	− 7	−44	−31	− 8	+ 2	+17	+18	− 5	−23	−31	−27	−17	−13	− 8	+ 3
1879-1880 ...	+ 2	− 5	+ 9	0	−10	− 4	−12	−21	−25	−39	+15	+26	+23	+30	+14	+ 9	− 4	− 2	− 5	0	+ 9	+ 5	− 4	− 9
1880-1881 ...	+19	− 7	− 7	− 3	−12	0	− 1	+ 1	+22	+35	+41	−14	−22	−56	−35	−25	− 8	+ 4	+20	+19	+18	−14	+18	+ 9
1881-1882 ...	−15	−49	−30	−40	−38	−29	−20	+ 3	− 7	+ 8	− 1	+ 7	+17	+47	+54	+60	+40	+26	− 5	+ 6	− 9	− 6	+ 1	−24
1882-1883 ...	− 6	+13	+ 8	− 4	− 1	− 8	− 8	− 2	−32	−17	−22	−31	0	+17	+22	+39	+20	+33	−15	−22	−10	+ 2	+13	+10
1883-1884 ...	− 7	+ 7	+12	+ 5	+19	+19	+14	+ 5	−38	−79	−17	−26	−24	− 6	+24	+ 6	+30	+23	+12	+18	+12	+ 4	− 6	− 9
1884-1885 ...	−18	− 8	+26	− 4	− 2	+14	+ 7	−22	−41	−38	−17	−11	− 3	− 3	+ 2	−10	−31	− 5	+ 5	+ 4	+31	+28	+51	+48
1885-1886 ...	+ 1	+ 1	+10	+24	+21	+19	+11	−22	−42	−62	−86	−76	−28	−17	+16	+43	+35	+31	+16	+21	+16	+26	+12	+28
1886-1887 ...	−20	−27	−29	−31	−51	−55	−57	−18	−12	+ 2	+41	+48	+52	+50	+36	+38	+19	+39	+21	− 7	−35	− 1	−13	+10
1887-1888 ...	+ 6	− 6	− 7	− 9	−22	−30	−26	−49	−57	−72	− 1	+19	+30	+28	+34	+38	+24	+21	+23	+30	+11	+28	− 3	− 9
1888-1889 ...	+20	− 4	−10	−18	−14	−23	− 5	+ 6	−23	+ 2	+ 3	+14	+ 4	+33	+56	+37	+17	−23	−31	−13	−25	− 7	+ 7	− 3
Mean, 1871-1872 to 1888-1889.	− 1	− 2	+ 4	− 1	− 2	− 2	0	− 5	−22	−31	−19	−14	− 2	+ 8	+16	+18	+14	+11	+ 6	+ 7	+ 5	+ 7	+ 2	+ 4
Years.											Seven-eighth Phase.													
1871-1872 ...	−20	−13	−32	−25	−33	−13	+31	+38	+14	−28	−26	+ 8	−11	+10	− 3	+21	+33	+ 5	− 4	+ 6	+40	+25	− 6	− 9
1872-1873 ...	−15	+34	+12	+22	+16	+14	+38	+61	+76	+44	+ 1	−11	− 7	+ 4	+13	+13	− 9	−21	− 6	−52	−58	−70	−53	−46
1873-1874 ...	+ 9	+10	− 1	−14	+ 1	+ 5	− 5	+ 7	+19	+36	+37	+31	−10	−12	−13	−32	−41	−17	+ 8	−41	−20	+13	+11	+14
1874-1875 ...	+45	+37	+ 8	+23	+36	+33	+18	+ 9	−12	−25	−43	−41	−44	−58	−37	−17	+ 1	−15	+ 2	0	+18	+13	+24	+22
1875-1876 ...	+ 2	+27	− 9	− 9	+ 1	+ 5	+13	+23	+12	+12	−47	−50	−70	−46	− 1	+12	+ 7	+16	−10	+18	+32	+20	+40	− 1
1876-1877 ...	0	0	+41	+20	+ 6	+ 3	+19	+20	+22	+15	+38	+18	+13	−15	−27	−62	−58	−35	−15	+ 5	−16	− 1	+ 9	+ 3
1877-1878 ...	− 6	−19	−13	− 4	+ 3	+27	+29	+37	+19	− 8	−73	−54	−22	−13	− 9	+ 7	+ 9	+18	+19	+19	+27	+14	− 2	− 8
1878-1879 ...	+11	+40	+ 4	+ 3	+ 3	− 3	− 3	− 6	−33	−51	−47	−48	−36	− 2	+13	+35	+37	+27	+16	+22	+22	+14	− 7	−11
1879-1880 ...	−41	−44	−13	+ 2	+ 2	+ 3	+ 1	− 8	−19	−29	+ 1	+18	+24	+23	+30	+32	+39	+42	+45	+ 5	−24	−30	−25	−38
1880-1881 ...	+31	+26	−10	− 3	+12	+42	+19	+23	−28	−47	−32	−42	−58	−42	−13	+19	+11	0	−22	+14	+15	+41	+ 8	+32
1881-1882 ...	+45	+ 9	+ 6	+ 7	+ 9	+ 5	0	−13	−33	−76	−96	−98	−56	−35	−19	− 3	+31	+32	+36	+55	+55	+51	+28	+55
1882-1883 ...	+16	+37	+22	− 7	− 1	−15	− 8	−13	−34	−17	−44	−52	−62	−30	−29	− 8	+30	+37	+51	+34	+18	+24	+37	+12
1883-1884 ...	+15	+11	+23	+ 9	+ 7	+ 7	+18	+23	+30	+ 3	−42	−41	−52	−33	−26	− 3	+27	+28	− 3	−16	−18	+12	+17	+ 5
1884-1885 ...	− 2	−15	+13	− 8	−14	0	+ 4	+15	+27	+14	+ 5	+15	+11	+10	+30	− 3	−31	−39	− 8	+12	+ 3	−21	−19	+ 2
1885-1886 ...	+33	+34	+24	+ 2	− 1	−10	−26	− 2	+ 6	−41	−56	−61	−41	− 8	+18	0	+18	+ 1	+ 1	+20	+23	+14	+22	+29
1886-1887 ...	−21	−13	0	−11	−20	− 5	−12	+ 2	−16	−32	−10	−17	− 5	+ 5	+19	+30	+42	+26	+18	+12	+18	− 3	− 7	+ 1
1887-1888 ...	−17	0	− 9	− 5	+10	+15	+36	+48	+42	+31	−28	−40	−27	−23	−22	− 6	+ 4	− 1	− 1	+ 7	+ 3	− 1	+ 1	−20
1888-1889 ...	− 2	+10	+16	+ 3	+ 6	+18	+29	+36	+38	+12	−51	−39	−62	−53	−35	− 2	+13	−11	− 4	0	+13	+ 7	+25	+34
Mean, 1871-1872 to 1888-1889.	+ 5	+ 9	+ 5	0	+ 2	+ 7	+11	+17	+ 7	−10	−28	−28	−29	−18	− 6	+ 2	+ 9	+ 5	+ 7	+ 7	+ 8	+ 7	+ 6	+ 4

TABLE 507.—*Showing for the quarter November to January the average Lunar Diurnal Variations of Declination and Vertical Force for each phase of the Moon and for the whole Lunation.*

Unity = 0·1γ = ·000001 C. G. S.

	Declination.									Vertical Force.								
Lunar Hours.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	+ 4	+ 1	+ 7	+ 5	+18	+16	+ 5	+ 3	+ 7	+ 1	+ 2	+ 4	+ 7	+13	+12	− 1	+ 2	+ 5
1	+ 7	+ 2	+14	+15	+19	+15	+ 4	+ 2	+10	0	+ 2	+ 9	+12	+10	+ 9	− 2	− 1	+ 5
2	+ 4	− 3	+21	+14	+16	+ 3	+ 1	− 2	+ 7	− 1	0	+11	+10	+ 5	− 1	− 2	− 3	+ 2
3	− 1	− 6	+14	+12	+ 4	− 3	+ 1	− 3	+ 2	− 3	+ 1	+11	+ 2	− 3	− 4	− 2	− 3	0
4	− 4	− 6	− 8	0	−10	− 5	− 2	− 3	− 5	− 3	+ 3	− 6	− 6	− 7	− 4	− 4	− 1	− 3
5	−10	− 6	−23	−10	−12	− 3	− 1	− 4	− 9	− 2	+ 1	−11	−11	− 3	− 4	− 3	0	− 4
6	−15	− 9	−30	−17	− 9	− 6	− 1	− 6	−12	− 5	− 4	+15	−11	0	− 2	− 2	+ 1	− 5
7	−19	− 4	−25	−12	− 6	− 5	− 3	− 5	−10	− 9	− 1	−12	− 1	+ 1	+ 1	0	+ 2	− 3
8	−20	− 1	−15	− 2	− 3	− 3	− 3	− 6	− 7	−10	− 1	− 4	+ 6	+ 2	+ 3	− 1	0	− 1
9	−11	− 1	− 1	+ 4	+ 1	+ 1	0	− 7	− 2	− 6	− 3	+ 1	+ 5	+ 2	+ 3	− 1	− 1	0
10	+ 5	0	+12	+ 6	+ 3	+ 3	+ 2	− 5	+ 3	+12	+ 2	+ 8	+ 3	+ 1	+ 3	− 1	0	+ 3
11	+14	+ 8	+15	+ 6	+ 3	+ 6	+ 7	+ 3	+ 8	+17	+10	+ 6	+ 3	0	+ 2	− 1	+ 3	+ 5
12	+24	+16	+12	+ 5	+ 6	+ 9	+ 7	+17	+12	+15	+ 9	0	+ 1	0	+ 1	− 1	+ 6	+ 4
13	+23	+16	+ 8	+ 5	+ 5	+11	+ 9	+18	+12	+ 6	+ 2	− 1	0	− 1	0	+ 2	0	+ 1
14	+19	+11	+ 4	+ 5	+ 5	+14	+ 9	+16	+10	+ 1	− 6	− 2	− 1	− 1	0	+ 9	+ 5	+ 1
15	+ 7	+ 5	+ 2	+ 3	+ 4	+15	+ 6	+13	+ 7	− 5	− 7	− 2	− 2	− 1	− 2	+ 8	+ 5	− 1
16	− 9	+ 1	0	0	0	+ 8	−10	+ 4	− 1	− 9	− 5	− 1	− 3	− 3	− 5	− 3	− 3	− 4
17	−12	− 2	− 3	− 6	− 5	− 1	−13	− 8	− 6	− 6	− 4	− 1	− 3	− 4	− 9	− 7	− 7	− 5
18	− 6	− 2	− 5	− 9	− 9	−12	−13	−15	− 9	− 1	0	− 2	− 3	− 7	−10	− 4	−10	− 5
19	− 5	− 2	− 4	− 9	−18	−26	− 9	−14	−11	+ 2	+ 2	+ 1	− 3	−10	−10	0	− 7	− 3
20	− 3	− 3	0	− 6	−20	−24	−10	− 6	− 9	+ 2	+ 3	0	− 1	− 8	− 5	0	+ 2	− 1
21	− 1	− 4	0	− 5	−15	−16	− 1	0	− 5	+ 2	+ 2	+ 1	− 3	− 5	+ 3	+ 5	+ 5	+ 1
22	+ 2	− 7	+ 1	− 5	+ 9	− 1	+ 8	+ 3	+ 1	+ 3	+ 1	+ 1	− 3	+10	+ 9	+ 7	+ 3	+ 4
23	+ 6	− 2	+ 5	− 1	+15	+ 8	+ 8	+ 4	+ 5	+ 2	+ 3	+ 2	+ 1	+13	+11	+ 5	+ 3	+ 5

TABLE 508.—*Showing the average Lunar Diurnal Variations of Horizontal Force for each phase of the Moon and for the whole Lunation.*

Unity = 0·1γ = ·000001 C. G. S.

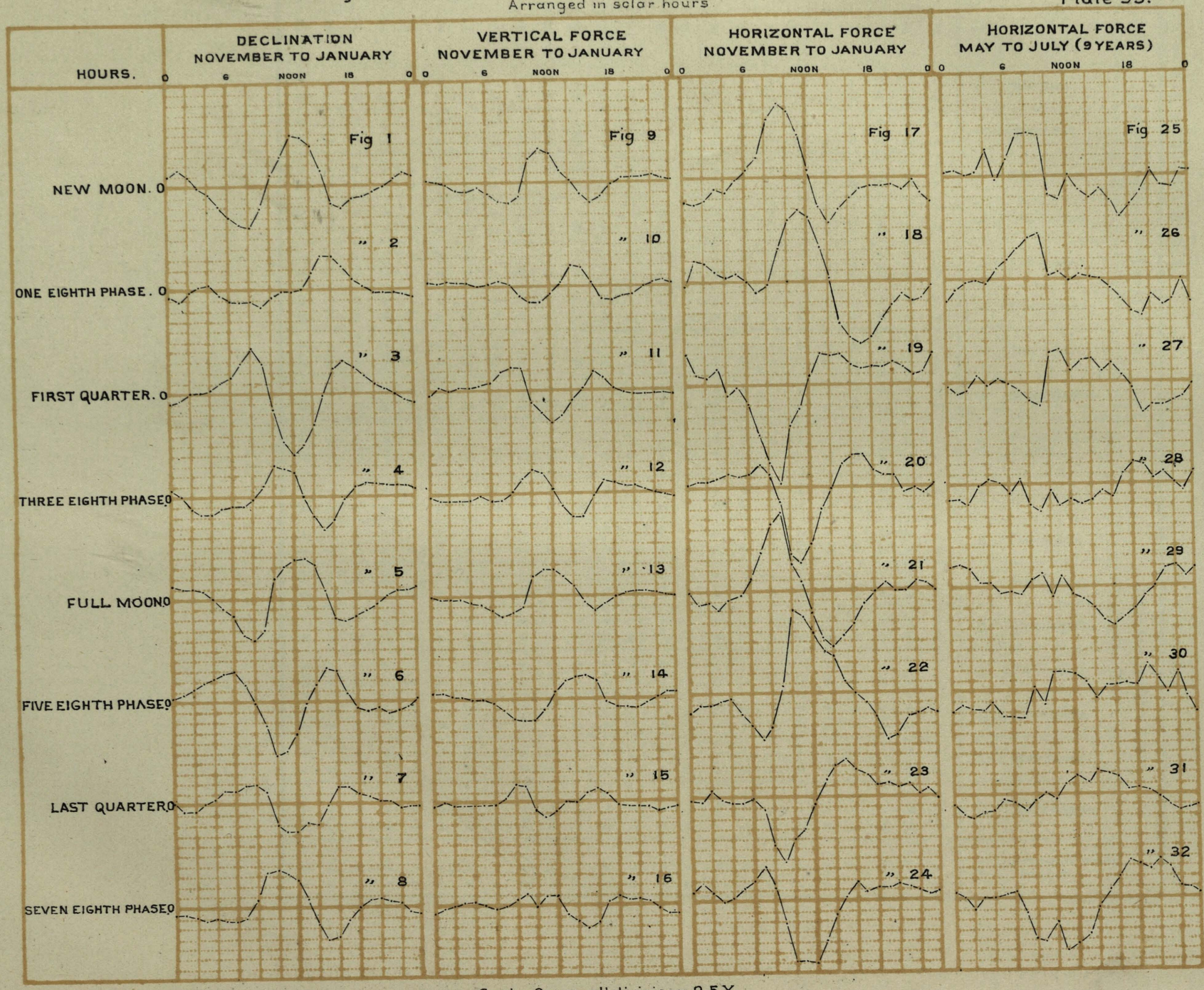
	November to January, average of 18 years.									May to July, average of 9 years.								
Lunar Hours.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	−12	+ 5	− 9	− 6	−11	+ 7	+ 6	+ 7	− 2	+ 2	0	0	−12	− 3	+ 3	+ 4	+16	+ 1
1	−13	+ 2	−24	−32	−23	+ 1	+ 7	+ 6	− 9	+ 3	− 2	− 3	− 2	− 5	+ 3	+ 3	+ 7	0
2	−11	+ 4	−37	−36	−27	− 4	+ 5	+ 4	−13	+ 1	+ 6	− 8	− 9	− 9	+ 4	0	+ 6	− 1
3	− 5	0	−48	−27	−22	−10	+ 7	+ 5	−12	+ 2	+10	−11	− 6	−15	+ 3	− 4	+ 3	− 2
4	− 7	− 5	−19	−10	−15	−21	+ 2	+ 9	− 8	+14	+16	+15	− 8	−18	+14	− 7	+ 1	+ 3
5	− 1	− 1	−12	0	− 6	−19	+ 4	+ 5	− 4	− 1	+21	+16	− 7	−13	+ 7	− 6	− 4	+ 2
6	+ 4	+16	+ 4	+12	0	−10	− 1	0	+ 3	+ 9	+23	+ 6	− 2	−10	0	− 4	+ 1	+ 3
7	+11	+30	+15	+16	+ 4	− 9	− 2	+ 2	+ 8	+22	+ 2	+11	− 5	− 3	+10	− 8	+ 1	+ 4
8	+29	+35	+14	+16	0	− 7	+ 4	+ 7	+12	+22	+ 5	+12	+ 6	+ 1	− 2	−10	+ 3	+ 5
9	+37	+32	+15	+ 9	0	− 8	− 1	+11	+12	+21	0	+ 6	+11	+10	− 9	− 7	+ 4	+ 4
10	+33	+17	+10	+ 7	+ 5	− 5	− 2	+17	+10	− 8	+ 3	+10	+10	+12	− 6	− 6	− 5	+ 1
11	+22	+ 2	+ 8	+ 7	+ 4	− 5	− 2	+ 7	+ 5	−11	+ 2	+ 4	+ 3	+ 6	− 7	− 2	−18	− 3
12	+ 4	−20	+ 9	− 2	0	− 3	0	−10	− 3	+ 1	+ 1	− 3	+ 7	+11	− 8	− 3	−19	− 2
13	−14	−27	+ 9	0	− 6	− 2	− 5	−28	− 9	− 6	− 4	−14	+ 1	+12	− 5	− 7	−10	− 4
14	−22	−29	+11	− 2	− 5	− 9	−22	−28	−13	−10	− 9	−11	− 3	+10	−11	− 2	−24	− 7
15	−15	−26	+ 9	+ 2	− 8	−14	−31	−29	−14	− 6	−15	−11	+ 7	+ 3	−11	+ 2	−21	− 6
16	−10	−18	+ 5	+ 3	− 3	−21	−19	−18	−10	−12	−17	− 9	+ 6	+ 3	−12	− 1	−16	− 7
17	− 5	−11	+ 6	+ 3	− 1	−15	−14	− 6	− 5	−19	− 7	− 7	+ 9	− 2	+ 3	+ 6	− 3	− 2
18	− 4	− 6	+15	+ 5	+ 6	+ 4	− 2	+ 2	+ 2	−13	−12	− 1	0	− 1	− 6	+10	+ 5	− 2
19	− 4	− 9	+ 5	+ 7	+19	+41	+ 8	+ 9	+ 9	− 7	− 9	− 5	+ 3	− 3	+10	+ 7	+11	+ 1
20	− 3	− 8	+ 3	+ 6	+33	+38	+16	+ 5	+11	+ 3	+ 1	− 3	+ 1	+ 5	+10	+13	+19	+ 6
21	− 6	− 2	+ 8	+ 7	+39	+30	+18	+ 7	+13	− 4	−10	+ 4	− 4	+ 8	+ 9	+11	+17	+ 4
22	− 1	+10	+ 5	+12	+13	+21	+14	+ 7	+10	− 5	− 5	− 1	+ 4	− 4	+ 5	+ 9	+15	+ 2
23	− 7	+ 9	− 1	+ 7	+ 5	+19	+11	+ 8	+ 6	+ 3	− 1	+ 2	− 9	+ 6	− 3	+ 3	+10	+ 1

COLABA OBSERVATORY

Curves showing the average lunar diurnal variations for each phase of the Moon.

Arranged in solar hours

Plate 95.



Scale: One small division = 0·5 Y.

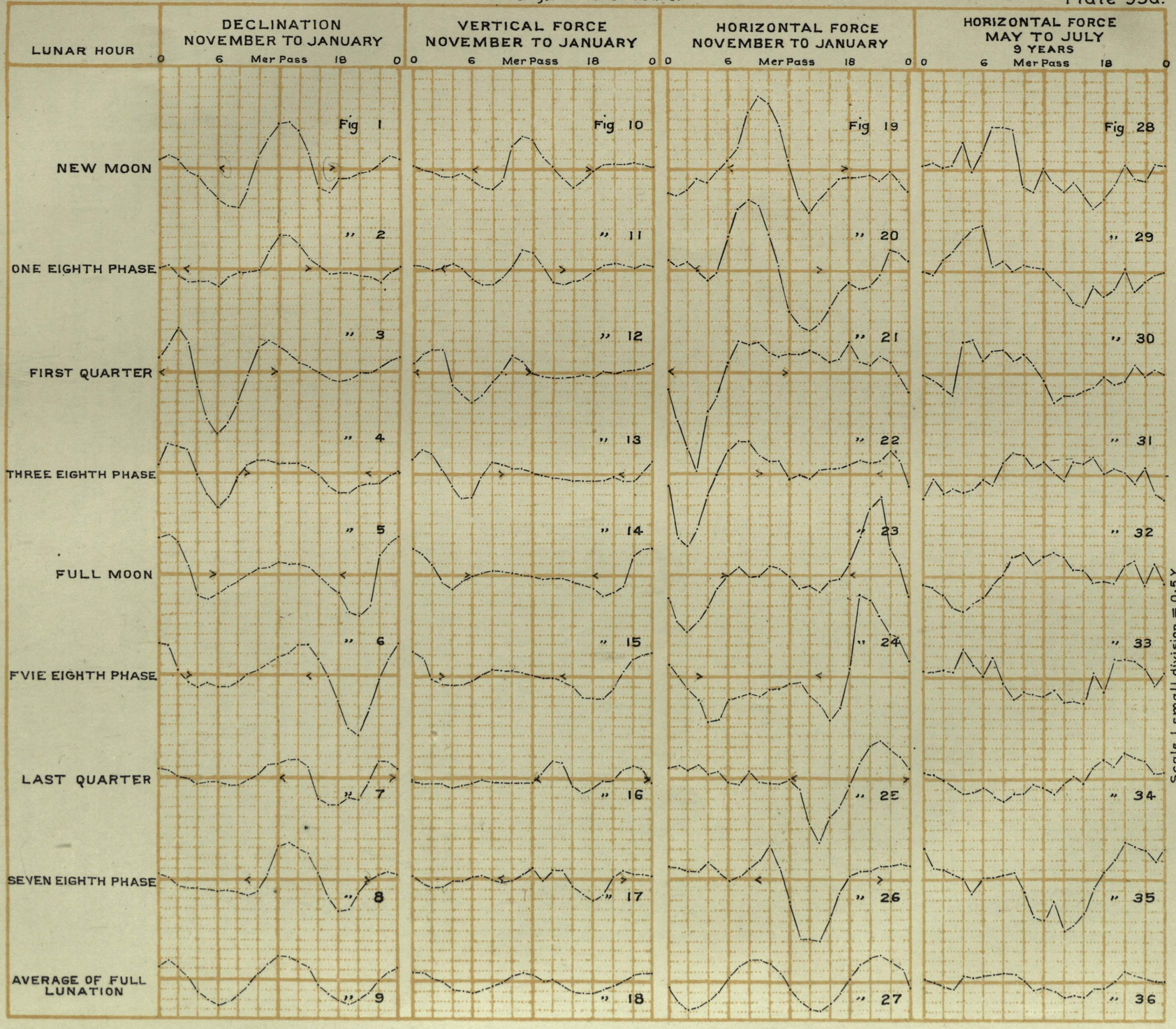
Gov^t Photozinco. Office, Poona, 1916.

COLABA OBSERVATORY.

Curves showing the average lunar diurnal variations for each phase of the Moon and for the whole lunation.

Arranged in lunar hours.

Plate 95a.



Interval between arrow heads on the zero lines, shows the incidence of solar day hours

Gov^t Photozinco. Office Poona. 1910.

the vertical force data which are derived and utilised for the first time in this volume. The method of reduction is as detailed below.

The tabulated hourly ordinates which are first modified by separating values* to eliminate disturbance effects, are so arranged in abstract form 1 as to have the 24-hourly ordinates of the day entered horizontally and 29 days in the month entered vertically. These are then smoothed by taking overlapping means of 29 ordinates of the same hour in each line vertically. This smoothing operation allows in abstract form 2 the diurnal variation which is the average of 29 days—that of any one particular day and of 14 previous and 14 succeeding days—to appear in that day's column horizontally, and such data of a full month are entered in each abstract. The differences of each hourly entries in these two abstracts are then entered in a third abstract which contains the data eventually dealt with. They contain the residual lunar effects only, as it is assumed that in these differences the solar diurnal variation of 24 hours is nearly eliminated for each day. This is of course true only for the average result of 29 days, the whole period from which it is derived, that is the average variation in the period of a complete lunation ; but it is not strictly so for a portion of a lunation, and is much less true for each day. Moreover in the treatment adopted which only takes away from each day an average variation, there is no continuity in the run of the variation from one day to the next. The data however have been made use of as much for a complete lunation as for a portion of it, and the defects of the treatment have been specially enumerated to show that they can hardly interfere to any serious extent with the result aimed at, as the data extend over a sufficiently long period (18 years) to allow of the effects of any defective elimination of the solar diurnal variation to be reduced to a minimum. The next operation consists in grouping the days which are nearly concurrent with a certain age of the moon. Thus the variations alternately of three and four days are averaged separately about the new moon day and about the epoch of each of the other seven phases and entered in eight forms, one for each phase, as also for each year and for the average of the period as shown in tables 504 to 506. The average curves are also charted in plate 95.

524. The examination of the data may now be undertaken with a mind free from bias in regard to the previous results about the existence or otherwise of this lunar effect. Whatever may the view about the explanation of the phenomenon advanced by Chambers be, a careful study of the curves makes one point at least perfectly clear, namely that the results obtained by him from the older data at Colaba in the case of the H and D elements, are almost in all points faithfully reproduced and fully confirmed in a general way by the more recent series registered by the magnetographs. There are of course minor differences in the two sets of results, as must be expected from the nature of the phenomenon dealt with, to which reference will be made in due course. On the whole however the results are closely accordant, the magnetograph results being relatively much the smoother of the two. The curves of H here as in the older series are relatively much more affected by irregularities than either the D or V results, as must be expected, for disturbances have little influence on the latter elements at Colaba.

As the solar hours to which the treatment has throughout been restricted are very nearly of the same duration as lunar hours, we may, by properly shifting the hours according to the particular phase of a lunation to which the curves belong, transform each variation in tables 504 to 506, plate 95, to an approximate lunar variation typical of a particular phase as shown in tables 507 and 508 and plate 95a. These transformed variations may hence be regarded on the average as roughly approximate lunar inequalities from lower to lower culmination of the moon after the lapse of a lunar day. It will be observed from plate 95a (*vide* figures 9, 18 and 27) how regular and uniform is the sweep of the semi-diurnal pulse in each of the three elements as shown in the average curves of a complete lunation, while the incident effects of the partial lunations, figures 1 to 8, 10 to 17 and 19 to 26, whatever be their cause, seem to be effectually eliminated, as they overlap from phase to phase through a complete cycle of a lunation. This remarkably accordant character of the variations indicating an almost semi-diurnal pulse as recorded by three independent instruments, namely the H, D and V magnetographs, is worthy of note especially when we remember that while a significantly large semi-diurnal term is indicated in the solar diurnal variations of D and V, the dominant pulse in the variation of H is of the 24-hour period. In the lunar curves of D and V it will be seen (*vide* figures 9 and 18) that the maxima occur almost an hour after the upper or lower meridian passage of the moon, while the minima or negative effects are incident similarly an hour after moon-rise and moon-set. The coincidence of these epochs with the tidal effects of the moon is suggestive. In the H inequality however these phases fall earlier by about 3 hours which is the only point where it materially differs from the variations of D or V. These results, it will be seen later, are confirmed by other independently derived data.

525. Proceeding in the first instance to the examination in detail of the effects which are much more important and difficult to explain, *e.g.*, those which change from phase to phase and cut out in a

* The separating values used in the reductions are for H, $\pm 33\gamma$; for D, $\pm 15\gamma$ and for V, $\pm 10\gamma$

TABLE 509.—*Showing the calculations for the derivation of the theoretical Lunar Diurnal Variations for each phase from the constant Lunar Diurnal Variation (average of a whole lunation).*

Unity = 0·1γ.

Declination.

Lunar hours.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the solar effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.	Average lunar diurnal variation of Declination, column 10, table 507.	Cosine of the hour angle of the sun reckoned from noon.	Column 1 × column 2 or the interaction of the sun effect as affecting lunar diurnal variation.	Lunar diurnal variation modified by solar effect or column 1 + column 3.
Phases.	New Moon.				One-eighth.				First Quarter.				Three-eighths.				Full Moon.				Five-eighths.				Last Quarter.				Seven-eighths.			
Columns.	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
0	+ 7	−1·00	− 7	0	+ 7	− ·71	− 5	+ 2	+ 7	0	0	+ 7	+ 7	+ ·71	+ 5	+12	+ 7	+1·00	+ 7	+14	+ 7	+ ·71	+ 5	+12	+ 7	0	0	+ 7	+ 7	− ·71	− 5	+ 2
1	+10	− ·97	−10	0	+10	− ·50	− 5	+ 5	+10	+ ·26	+ 3	+13	+10	+ ·87	+ 9	+19	+10	+ ·97	+10	+20	+10	+ ·50	+ 5	+15	+10	− ·26	− 3	+ 7	+10	− ·87	− 9	+ 1
2	+ 7	− ·87	− 6	+ 1	+ 7	− ·26	− 2	+ 5	+ 7	+ ·50	+ 3	+10	+ 7	+ ·97	+ 7	+14	+ 7	+ ·87	+ 6	+13	+ 7	+ ·26	+ 2	+ 9	+ 7	− ·50	− 3	+ 4	+ 7	− ·97	− 7	0
3	+ 2	− ·71	− 1	+ 1	+ 2	0	0	+ 2	+ 2	+ ·71	+ 1	+ 3	+ 2	+1·00	+ 2	+ 4	+ 2	+ ·71	+ 1	+ 3	+ 2	0	0	+ 2	+ 2	− ·71	− 1	+ 1	+ 2	−1·00	− 2	0
4	− 5	− ·50	+ 2	− 3	− 5	+ ·26	− 1	− 6	− 5	+ ·87	− 4	− 9	− 5	+ ·97	− 5	−10	− 5	+ ·50	− 2	− 7	− 5	− ·26	+ 1	− 4	− 5	− ·87	+ 4	− 1	− 5	− ·97	+ 5	0
5	− 9	− ·26	+ 2	− 7	− 9	+ ·50	− 4	−13	− 9	+ ·97	− 9	−18	− 9	+ ·87	− 8	−17	− 9	+ ·26	− 2	−11	− 9	− ·50	+ 4	− 5	− 9	− ·97	+ 9	0	− 9	− ·87	+ 8	− 1
6	−12	0	0	−12	−12	+ ·71	− 9	−21	−12	+1·00	−12	−24	−12	+ ·71	− 9	−21	−12	0	0	−12	−12	− ·71	+ 9	− 3	−12	−1·00	+12	0	−12	− ·71	+ 9	− 3
7	−10	+ ·26	− 3	−13	−10	+ ·87	− 9	−19	−10	+ ·97	−10	−20	−10	+ ·50	− 5	−15	−10	− ·26	+ 3	− 7	−10	− ·87	+ 9	− 1	−10	− ·97	+10	0	−10	− ·50	+ 5	− 5
8	− 7	+ ·50	− 3	−10	− 7	+ ·97	− 7	−14	− 7	+ ·87	− 6	−13	− 7	+ ·26	− 2	− 9	− 7	− ·50	+ 3	− 4	− 7	− ·97	+ 7	0	− 7	− ·87	+ 6	− 1	− 7	− ·26	+ 2	− 5
9	− 2	+ ·71	− 1	− 3	− 2	+1·00	− 2	− 4	− 2	+ ·71	− 1	− 3	− 2	0	0	− 2	− 2	− ·71	+ 1	− 1	− 2	−1·00	+ 2	0	− 2	− ·71	+ 1	− 1	− 2	0	0	− 2
10	+ 3	+ ·87	+ 3	+ 6	+ 3	+ ·97	+ 3	+ 6	+ 3	+ ·50	+ 1	+ 4	+ 3	− ·26	− 1	+ 2	+ 3	− ·87	− 3	0	+ 3	− ·97	− 3	0	+ 3	− ·50	− 1	+ 2	+ 3	+ ·26	+ 1	+ 4
11	+ 8	+ ·97	+ 8	+16	+ 8	+ ·87	+ 7	+15	+ 8	+ ·26	+ 2	+10	+ 8	− ·50	− 4	+ 4	+ 8	− ·97	− 8	0	+ 8	− ·87	− 7	+ 1	+ 8	− ·26	− 2	+ 6	+ 8	+ ·50	+ 4	+12
12	+12	+1·00	+12	+24	+12	+ ·71	+ 9	+21	+12	0	0	+12	+12	− ·71	− 9	+ 3	+12	−1·00	−12	0	+12	− ·71	− 9	+ 3	+12	0	0	+12	+12	+ ·71	+ 9	+21
13	+12	+ ·97	+12	+24	+12	+ ·50	+ 6	+18	+12	− ·26	− 3	+ 9	+12	− ·87	−10	+ 2	+12	− ·97	−12	0	+12	− ·50	− 6	+ 6	+12	+ ·26	+ 3	+15	+12	+ ·87	+10	+22
14	+10	+ ·87	+ 9	+19	+10	+ ·26	+ 3	+13	+10	− ·50	− 5	+ 5	+10	− ·97	−10	0	+10	− ·87	− 9	+ 1	+10	− ·26	− 3	+ 7	+10	+ ·50	+ 5	+15	+10	+ ·97	+10	+20
15	+ 7	+ ·71	+ 5	+12	+ 7	0	0	+ 7	+ 7	− ·71	− 5	+ 2	+ 7	−1·00	− 7	0	+ 7	− ·71	− 5	+ 2	+ 7	0	0	+ 7	+ 7	+ ·71	+ 5	+12	+ 7	+1·00	+ 7	+14
16	− 1	+ ·50	0	− 1	− 1	− ·26	0	− 1	− 1	− ·87	+ 1	0	− 1	− ·97	+ 1	0	− 1	− ·50	0	− 1	− 1	+ ·26	0	− 1	− 1	+ ·87	− 1	− 2	− 1	+ ·97	− 1	− 2
17	− 6	+ ·26	− 2	− 8	− 6	− ·50	+ 3	− 3	− 6	− ·97	+ 6	0	− 6	− ·87	+ 5	− 1	− 6	− ·26	+ 2	− 4	− 6	+ ·50	− 3	− 9	− 6	+ ·97	− 6	−12	− 6	+ ·87	− 5	−11
18	− 9	0	0	− 9	− 9	− ·71	+ 6	− 3	− 9	−1·00	+ 9	0	− 9	− ·71	+ 6	− 3	− 9	0	0	− 9	− 9	+ ·71	− 6	−15	− 9	+1·00	− 9	−18	− 9	+ ·71	− 6	−15
19	−11	− ·26	+ 3	− 8	−11	− ·87	+10	− 1	−11	− ·97	+11	0	−11	− ·50	+ 5	− 6	−11	+ ·26	− 3	−14	−11	+ ·87	−10	−21	−11	+ ·97	−11	−22	−11	+ ·50	− 5	−16
20	− 9	− ·50	+ 4	− 5	− 9	− ·97	+ 9	0	− 9	− ·87	+ 8	− 1	− 9	− ·26	+ 2	− 7	− 9	+ ·50	− 4	−13	− 9	+ ·97	− 9	−18	− 9	+ ·87	− 8	−17	− 9	+ ·26	− 2	−11
21	− 5	− ·71	+ 4	− 1	− 5	−1·00	+ 5	0	− 5	− ·71	+ 4	− 1	− 5	0	0	− 5	− 5	+ ·71	− 4	− 9	− 5	+1·00	− 5	−10	− 5	+ ·71	− 4	− 9	− 5	0	0	− 5
22	+ 1	− ·87	− 1	0	+ 1	− ·97	− 1	0	+ 1	− ·50	0	+ 1	+ 1	+ ·26	0	+ 1	+ 1	+ ·87	+ 1	+ 2	+ 1	+ ·97	+ 1	+ 2	+ 1	+ ·50	0	+ 1	+ 1	− ·26	0	+ 1
23	+ 5	− ·97	− 5	0	+ 5	− ·87	− 4	+ 1	+ 5	− ·26	− 1	+ 4	+ 5	+ ·50	+ 2	+ 7	+ 5	+ ·97	+ 5	+10	+ 5	+ ·87	+ 4	+ 9	+ 5	+ ·26	+ 1	+ 6	+ 5	− ·50	− 2	+ 3

complete lunation, it will be observed that about the new moon (figures 1, 10 and 19, plate 95*a*) when the hours of both lunar and solar days fall nearly concurrent, that part of the semi-duirnal lunar wave represented in the average result (*vide* figures 9, 18 and 27) which lies between 6 a.m. and 6 p.m. appears by the interaction of some independent cause (not by mere superposition of effects) to be effectively accentuated in amplitude equally whether the ordinate carries a positive or a negative sign; while that half of the lunar effect which lies concurrent with the night hours receives no such stimulus and the ordinates, positive or negative, appear if anything to be distinctly contracted. Such an interpretation of the phenomenon will be examined in detail later, for it is conceivable that the more sensitive condition of the atmosphere in the day than during the night hours, through which the independent lunar effect is incident, may produce some such action on the latter. As the age of the moon changes, the above interaction effect which of course follows the sun, appears gradually to overlap the constant lunar effect and about the time when the moon is in her first quarter (see figures 3, 12 and 21) the effect is concurrent with 0^h to 12^h of the lunar day and the ordinates of this particular moiety of the semi-diurnal wave are accentuated. The phenomenon thus apparently at least seems to progress from phase to phase till the overlapping effects after having traversed through all the hours of the lunar day cut out in about 29 days. It will be observed that the progression of the phenomenon in the manner explained above is suggested by the facts (1) that figures 1 to 8, 10 to 17, and 19 to 26, though apparently irregular, are marked by an inherent symmetry; (2) that the phases of the maxima and minima as indicated by the average curve (see figures 9, 18 and 27) lie nearly unaffected in the same position in the curves throughout the lunation; (3) that not only do these turning points roughly continue to remain coincident but the points of greatest change, that is the principal points where the curves cross the zero line, also remain everywhere roughly coincident in time with those in the average curve; and (4) that the only marked change appears to lie in the magnitude of the amplitudes which alone show either a marked diminution or an enlargement. These considerations at any rate negative the idea that the effects are possibly due to the defective elimination of the superposed solar effect of the 24-hour period. But even if this is conceded it is difficult to conceive how the average results of such a large period as 18 years, can allow such solar residual effects to affect the curves so regularly as to vary with the phases of the moon. Dismissing hence this view as inadmissible, one is forced to look into other directions for the necessary explanation.

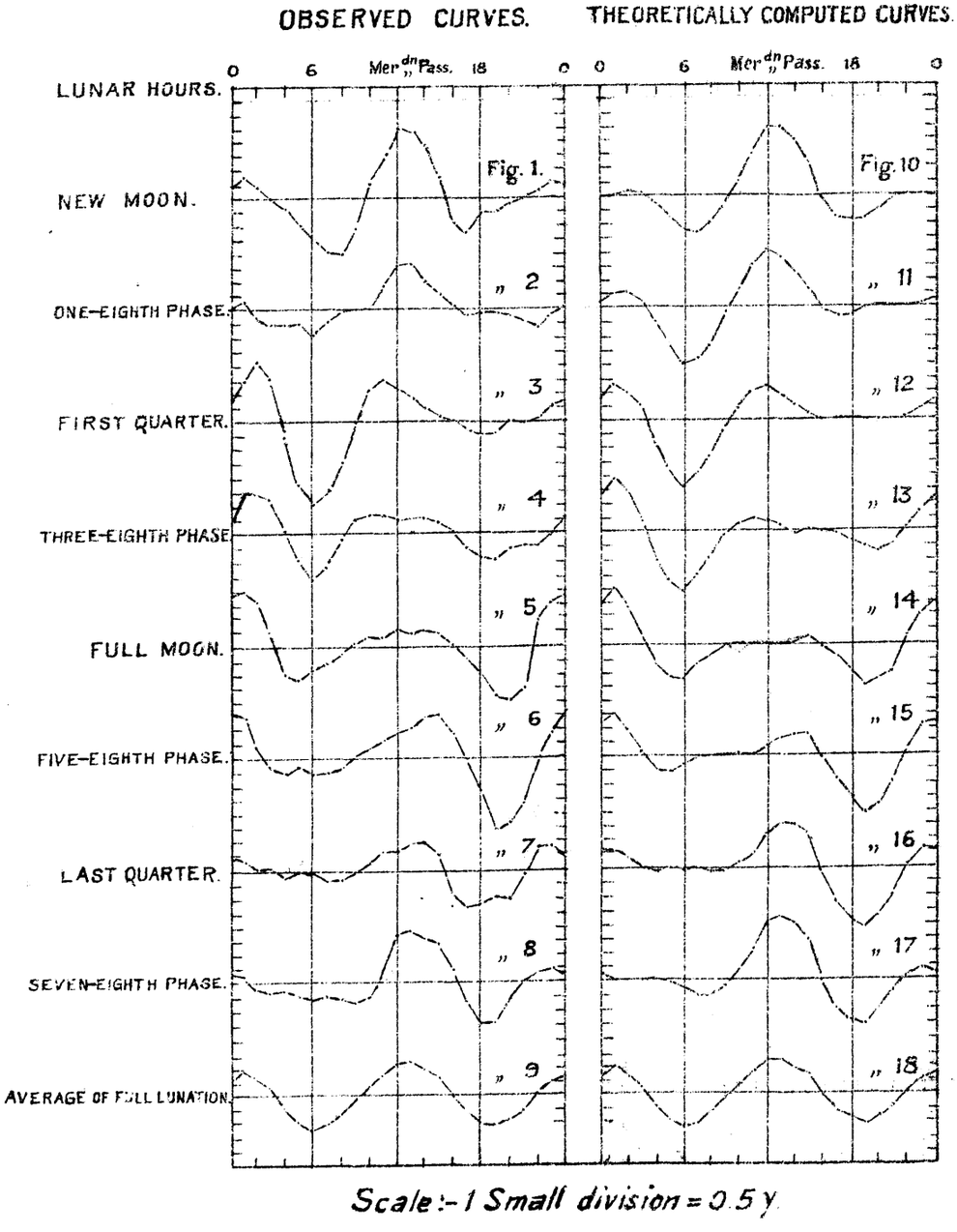
526. Chambers explains the phenomenon on the hypothesis of a phenomenal relation and not of a physical causation, that it is *not* a lunar effect but a solar variation depending upon the relative position of the sun and moon. Amplifying further he says "the luni-solar variation of a given season is a combination of *solar-diurnal variations* of constant types that go through cycles of a wave-like change of amplitude in the period of a lunation, half a lunation, etc., etc.". In light of what has been made clear in the last paragraph perhaps the following explanation may be regarded as more plausible. From the results disclosed by the average curves discussed above, as also from others independently derived which follow (*vide* paragraph 528), it is difficult to resist the conviction that we are dealing with a true lunar phenomenon. If this is conceded the luni-solar variation may be regarded rather as a combination of this lunar variation* of a constant type (figures 9, 18 and 27) which for each element passes through a cycle of wave-like changes of amplitude in the period of a lunation. No analogy is suggested in the example cited below, but incidentally it may be remarked that we may have the oscillation of a body in a frictionless medium expressed by the simple equation $y = \sin 2x$. If the oscillations are damped in a viscous medium or by the use of dampers, the conditions would be expressed by $y = e^{kx} \sin 2x$. If now instead of this constant damping effect as given by the equation $y = e^{kx}$, it were possible to provide a varying periodic effect such as would be expressed by the equation $y = \sin x$ so that the period though nearly the same in both in one case is 24 hours and in the other of 25 hours, we may expect a result somewhat similar to the one above referred to. To demonstrate graphically what is advanced here, for convenience of treatment, the lunar day is taken as approximately equal to the solar day, but the growing difference due to the overlapping effects of one period over the other as they are really not equal to each other, is provided for by considering the phenomenon in eight different phases which complete one whole lunation and making due allowance for the necessary shift.

The curves of declination which are more pronounced than those of the vertical force, and less susceptible to irregular disturbance effects than those of H, have been dealt with to represent this typical action. It will be seen however that the method can be made applicable with equal effect to the other elements also. In table 509 are shown the results of calculation in detail. Column 1 contains the constant lunar wave in declination which is re-entered from column 10 of table 507; column 2 contains the cosine factors† which are dependent upon the position of the sun in any one particular phase of a lunation; in column 3 are collected the interaction effects derived by multiplying the corresponding numbers in the

* The inversion of these results due to seasonal changes from winter to summer conditions will be referred to later.

† The co-efficient is arbitrarily assumed as unity, as no attempt has been made for equality in magnitude, the reference being intended for the character of the curve only.

first two columns; and column 4 contains the final results the sums or differences of numbers in columns 1 and 3. Eight such theoretical curves derived one for each of the eight phases of a lunation,



are charted above in figures 10 to 17 side by side with the observed curves shown in figures 1 to 8 and apart from the question of magnitude the parallelism between the runs of the two sets of figures is, it will be seen, strikingly close. So apparent is the similarity that it is difficult to avoid the inference that the effects may perhaps interact in the manner indicated and that the explanation of the phenomenon thus given may conceivably be in the right direction. If the lunar curve shown in column 10, table 507 (figure 9 above), is analysed, the co-efficients when corrected for 18 minutes, the exact time of tabulation after the full hour, to reduce the same to lunar midnight, corresponding to the lower meridian passage of the moon, show that it is almost wholly represented by a semi-diurnal term the amplitude of which is 1·1γ, and μ the angle of first maximum is 14°·2.* The maximum thus occurs at Colaba about 1 hour after the lower and upper meridian passage of the moon, and the co-efficients of the other orders are relatively very small and may be neglected The lunar variation of declination hence may be approximately expressed by the simple equation $y = a \cos 2\ (n\ 15^{c} - 15^{c})$ where a is the amplitude and n the number of hours reckoned

* The epochs derived directly from the lunar variations—an independent result referred to in paragraph 528—show fairly the same result indicating similar later culminations immediately after meridian passages.

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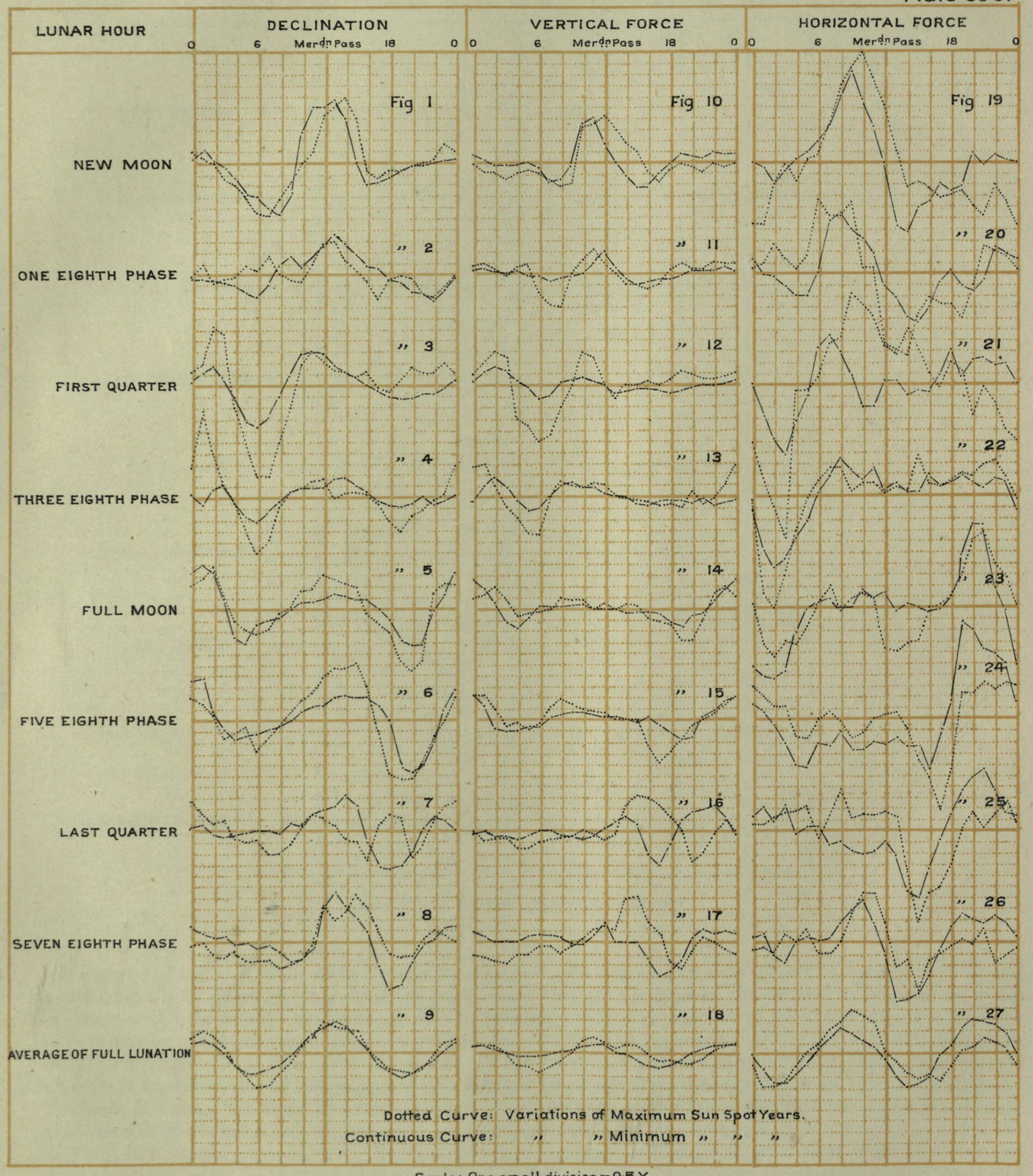
Curves showing for the quarter November to January and for the maximum and minimum sun spot years the average lunar diurnal variations for each phase of the moon and for the whole lunation.

Plate 95 b.



Scale: One small division = 0·5 Y

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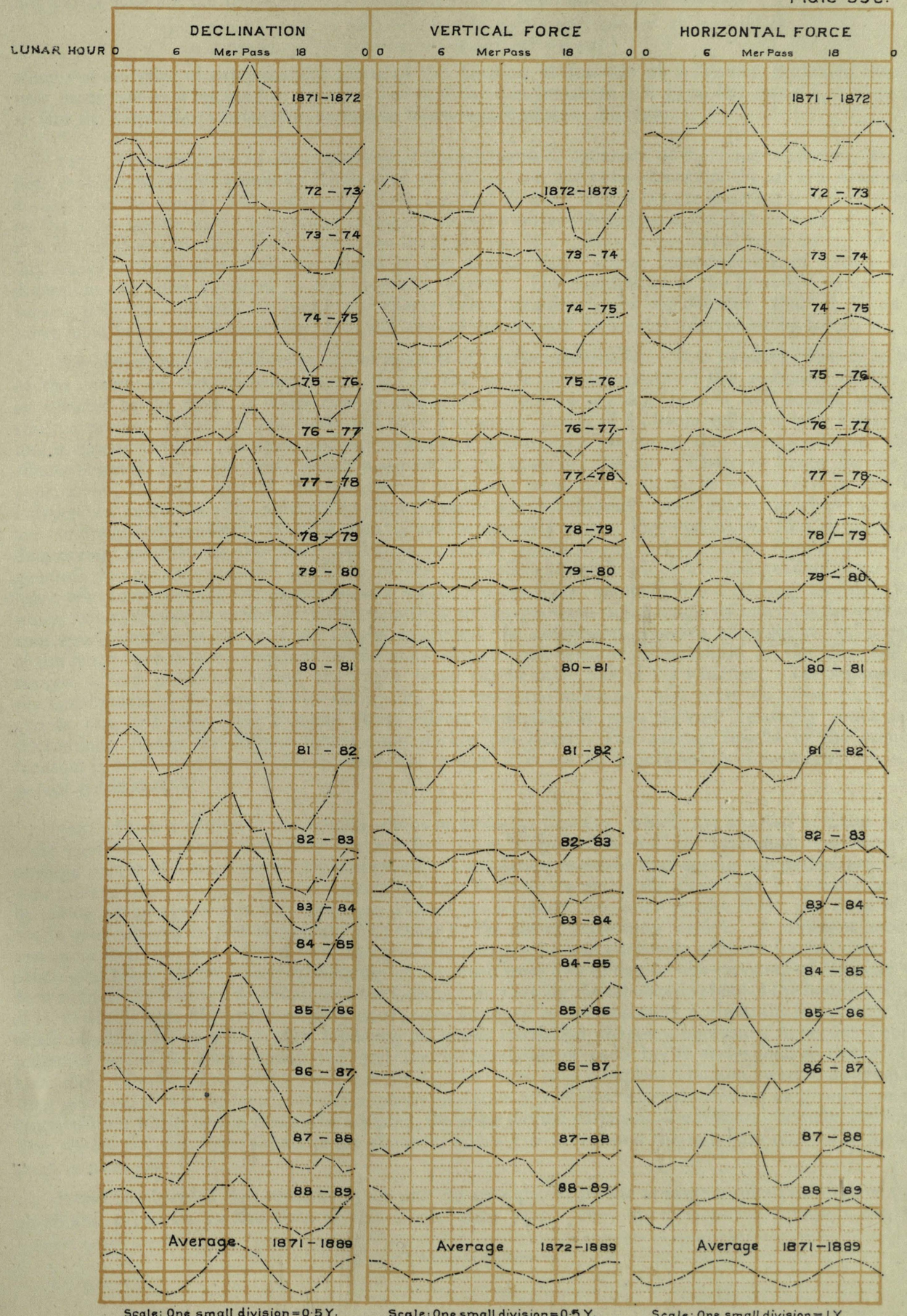
COLABA OBSERVATORY

Curves showing for the quarter November to January and for the complete lunations, the average lunar diurnal variations for each year and for the whole period

Plate 95c.



Scale: One small division = 0·5 Y.

Scale: One small division = 0·5 Y.

Scale: One small division = 1 Y.

Govt. Photozinco. Office, Poona. 1910.

from the lower meridian passage of the moon. While with the interaction of the solar hours incident at any partial lunation the conditions may be approximately expressed by the equation

$$y = a \cos (n\, 30^\circ - 30^\circ) - a \cos (n\, 30^\circ - 30^\circ) \cos (n^1\, 15^\circ + 2\, \pi v) \text{ or}$$
$$= a \cos (n\, 30^\circ - 30^\circ) [1 - \cos (n^1\, 15^\circ + 2\, \pi v)]$$

when v is the value of any particular phase of the lunation in fraction of a lunation reckoned from the new moon [at new moon for example $v = 0$, at the quarter phase it is $\frac{1}{4}$, at full moon $\frac{1}{2}$, and so on]; n^1 (for the solar effect) being the interval in hours reckoned from midnight.

527. Recurring now to the possibility of the independent existence of the lunar variation, we may note that if it be true as shown by Rutherford and others that the radio activity of the air is to some extent derived from the ground, and as recently shown by Paul Besson* that a minute variation is probably set up by the moon similar to the tidal effect acting on the radio active substances in the surface crust of our earth, it is not inconceivable that some such cause may give rise to a minute semi-diurnal pulse during the lunar day similar to those so persistently shown in the Colaba data, acting independently of causes which determine the solar variation in the magnetic curves. The coincidence in the D and V curves of the turning points in time with the lunar tidal effects hence acquires some significance, that of H on the other hand being nearly coincident with the time of the greatest horizontal tide-producing force.

Any direct magnetic influence of the moon is of course inadmissible. It is possible however to think of the source of the influence to lie also in the feeble ionising effect of the radiation of the sun as reflected by the moon, in which case among other factors the incident effects will depend upon the relative position of the sun and moon and have a dominant period of 25 hours indicated with a maximum and minimum effect at full moon and new moon and intermediate effects at the quarter phases. Such effects however are not at least plainly apparent in the observed results. Whatever hence be the true explanation, the existence of the semi-diurnal pulse in a lunar day as shown so persistently by the three independent instruments can scarcely be passed over as due to fortuitous causes especially when the results are confirmed independently by other data as will be presently seen. Figee points out that in the Batavia data during disturbances, the lunar action is relatively much larger. If therefore during disturbance generally the greater sensitive condition of the atmosphere through which the independent lunar action takes effect may amplify the oscillation as a whole, it is not quite unintelligible if during the day hours which connote more disturbed condition relatively to the quiescent night hours as much as the maximum spot epoch conditions do to those of the minimum, the amplitudes, positive or negative, of a moiety of the lunar wave may be amplified by the more ionised and sensitive atmosphere in the day and the reverse effects produced during the night hours on the other half of the variation. The separation in the Colaba data of the lunar curves during the maximum and minimum spot years do show (*vide* tables 510 to 512, and plate 95*b*) that the phase effects unmistakably pass through relatively much larger fluctuations during the former epoch than during the latter. The average results of the complete lunation in each spot epoch also indicate this, though it is not so pronouncedly accentuated as in the partial phase results.

528. From a glance at the annual curves in tables 513 to 515, which are charted in plate 95*c*, it must have been noticed that they are not free from irregularities and are smoothed only when the average curves of a large period are dealt with. Considering however that during the period the Colaba data are available, the year 1900 is especially noted to be an exceptionally quiet year, it seemed possible by taking advantage of this fact to secure without much labour the lunar results from the data of this single year without further tampering with them by the use of separating values. A different mode of treatment from the one referred to in the previous paragraphs was purposely adopted for this data. The exact solar hours for the lower culmination of the moon from day to day for the meridian of Bombay were derived from the Nautical Almanac, and the Colaba data showing the tabulated values of the hourly ordinates of H, D and V from May 1900 to May 1901, were arranged in the abstracts horizontally for 25 solar hours which nearly make up a lunar day, repeating an hourly tabulation whenever necessary to secure a correct sequence so as to always have the first hourly tabulation of each day to correspond to the 0^h of the lunar day. Twelve such tables, each containing the data of a complete lunation, were thus prepared. The process, it will be seen, attempts merely to derive a true lunar diurnal variation as given in one full lunation from which by the treatment adopted, the solar diurnal variation of 24 hours, is fully eliminated. The results for the three elements are shown in tables 516 to 518 and the same are charted in figures 1 to 41 in plate 96.

It will be observed how remarkably smooth, as anticipated, are the average results (*vide* figures 13-14, 27-28 and 41) given by the data of this single quiet year. They shew moreover precisely the same

* Academie des Sciences.

TABLE 510.—*Showing for the quarter November to January and for groups of maximum and minimum sun-spot years the average Lunar Diurnal Variations of Declination for each phase of the moon and for the whole lunation.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Maximum sun-spot years, 1871 to 1874 and 1882 to 1885.									Minimum sun-spot years, 1875 to 1880 and 1886 to 1889.								
	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	+ 5	− 1	+ 6	+14	+11	+10	+13	− 1	+ 7	+ 2	− 2	+ 2	+ 1	+16	+17	+ 1	+ 7	+ 5
1	+ 2	+ 5	+10	+39	+14	+ 7	+ 7	0	+10	+ 6	− 2	+ 6	− 3	+20	+18	+ 2	+ 4	+ 6
2	0	− 4	+27	+22	+19	+ 2	+ 3	− 5	+ 8	+ 1	− 3	+ 9	+ 3	+17	+ 4	− 2	+ 2	+ 4
3	− 7	− 2	+23	+ 7	+ 5	− 8	+ 5	− 7	+ 2	− 2	− 4	+ 4	+ 6	+ 5	− 4	− 3	+ 2	0
4	−10	− 1	−10	− 2	− 5	− 6	− 3	− 4	− 5	− 7	− 5	− 5	− 2	−13	− 8	− 2	− 1	− 5
5	−16	+ 4	−27	−14	−10	− 3	− 4	− 8	−10	−14	− 8	−16	− 8	−15	− 7	− 1	0	− 9
6	−22	+ 1	−41	−25	−11	−13	− 3	− 8	−15	−15	−10	−18	−11	− 7	− 6	0	− 3	− 9
7	−23	+ 8	−41	−19	− 9	− 8	−10	− 8	−14	−20	− 5	−14	− 7	− 5	− 4	0	− 2	− 7
8	−16	0	−26	− 4	− 2	− 3	−10	−11	− 9	−23	+ 4	− 5	− 2	− 4	− 3	− 1	− 4	− 5
9	− 8	− 2	−10	+ 2	+ 1	+ 3	− 6	−10	− 4	−13	+ 8	+ 4	+ 2	0	0	+ 3	− 9	− 1
10	0	− 3	+ 8	+ 4	+ 8	+ 9	+ 3	− 8	+ 3	+14	+ 3	+14	+ 4	+ 3	+ 3	+ 2	− 8	+ 4
11	+ 5	+ 5	+15	+ 7	+ 9	+12	+ 7	0	+ 7	+25	+ 5	+15	+ 4	+ 3	+ 6	+ 7	− 2	+ 8
12	+21	+14	+11	+ 8	+15	+19	+ 6	+16	+14	+25	+13	+14	+ 4	+ 5	+ 7	+ 9	+15	+11
13	+28	+15	+ 7	0	+13	+23	+ 2	+10	+12	+28	+18	+ 9	+ 8	+ 7	+10	+11	+22	+14
14	+29	+ 7	+ 6	+ 2	+11	+23	− 4	+13	+11	+20	+14	+ 6	+ 8	+ 6	+11	+16	+16	+12
15	+20	+ 2	+ 4	+ 2	+10	+26	− 5	+21	+10	0	+ 9	+ 4	+ 5	+ 4	+10	+11	+10	+ 7
16	− 3	− 3	+ 6	+ 1	− 2	+16	−13	+15	+ 2	−10	+ 4	0	+ 2	+ 4	+10	− 5	+ 4	+ 1
17	− 7	−11	− 1	− 3	− 7	− 5	+ 2	+ 4	− 3	− 9	+ 2	− 3	− 2	0	+ 6	−16	−11	− 4
18	− 3	− 3	− 3	−11	−11	−24	+ 7	− 5	− 7	− 7	− 3	− 5	− 4	− 5	0	−17	−21	− 8
19	− 3	− 1	+ 3	−15	−23	−27	+ 6	− 7	− 8	− 3	− 4	− 6	− 4	−14	−21	−15	−19	−11
20	− 1	− 2	+ 8	− 8	−28	−27	−11	− 6	− 9	− 1	− 8	− 6	− 3	−16	−24	− 9	− 9	− 9
21	0	− 9	+ 6	− 6	−23	−19	− 7	+ 1	− 7	− 1	− 9	− 4	0	−16	−21	+ 1	− 1	− 6
22	+ 1	−11	+ 6	− 2	+ 7	− 8	+ 5	+ 5	0	0	−12	− 4	− 3	− 1	−10	+ 6	+ 1	− 3
23	+ 8	− 6	+10	+ 1	+11	0	+11	+ 2	+ 5	+ 1	− 7	− 1	− 2	+ 6	+ 4	+ 4	+ 6	+ 1

TABLE 511.—*Showing for the quarter November to January and for groups of maximum and minimum sun-spot years the average Lunar Diurnal Variations of Vertical Force for each phase of the moon and for the whole lunation.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Maximum sun-spot years, 1872 to 1874 and 1882 to 1885.									Minimum sun-spot years, 1875 to 1880 and 1886 to 1889.								
	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	− 1	+ 4	+ 5	+14	+ 5	+11	0	− 5	+ 4	+ 3	+ 1	+ 2	− 2	+13	+11	− 1	+ 4	+ 4
1	− 4	+ 5	+ 9	+15	+ 7	+11	− 4	− 6	+ 4	+ 1	+ 2	+ 6	+ 5	+ 9	+ 7	0	+ 2	+ 4
2	− 4	+ 2	+15	+15	+10	+ 5	− 3	− 8	+ 3	− 1	+ 1	+ 8	+ 8	+ 2	− 4	− 2	0	+ 1
3	− 7	− 1	+12	− 4	+ 4	− 3	− 3	− 9	− 1	− 1	0	+ 7	+ 4	− 6	− 5	− 2	0	0
4	− 4	+ 3	−15	− 9	− 3	− 1	− 7	− 5	− 5	− 1	+ 1	+ 2	− 2	− 9	− 5	− 4	0	− 2
5	− 3	+ 4	−18	−16	− 2	− 4	− 7	− 5	− 6	0	− 1	− 1	− 6	− 4	− 3	− 2	+ 2	− 2
6	− 5	− 8	−25	−17	− 1	− 2	− 5	− 2	− 8	− 3	− 1	− 6	− 5	+ 1	− 3	0	+ 3	− 2
7	− 8	−14	−22	− 2	0	+ 6	− 4	− 2	− 6	− 9	− 3	− 5	0	+ 1	+ 1	0	+ 3	− 1
8	−11	−15	−10	+ 7	+ 5	+ 9	− 3	− 5	− 3	− 8	− 2	+ 1	+ 5	+ 1	+ 2	− 2	+ 2	0
9	− 9	0	0	+ 5	+ 4	+ 7	− 2	− 2	0	− 2	− 1	+ 2	+ 6	+ 2	+ 3	− 2	− 1	+ 1
10	+16	+ 7	+14	+ 4	+ 4	+ 5	+ 1	+ 1	+ 6	+17	0	+ 3	+ 4	+ 2	+ 3	− 4	− 1	+ 3
11	+18	+11	+12	+ 6	+ 1	+ 4	− 1	+ 6	+ 7	+20	+ 5	+ 1	+ 4	+ 1	+ 2	− 2	+ 3	+ 4
12	+21	+ 5	− 1	+ 5	+ 2	+ 3	− 4	+ 8	+ 5	+ 8	+10	− 1	+ 1	0	+ 1	+ 1	+ 9	+ 4
13	+15	− 1	− 6	0	0	0	− 1	+ 6	+ 2	0	+ 2	− 4	0	0	+ 1	+ 4	0	0
14	+ 9	− 5	0	− 1	+ 2	0	+11	+20	+ 4	− 6	− 3	− 3	0	− 1	0	+ 6	0	− 1
15	+ 5	− 5	0	− 1	+ 1	− 1	+16	+21	+ 4	−12	− 5	− 2	− 3	− 1	− 1	+ 3	0	− 3
16	− 4	− 7	+ 1	− 2	− 4	−11	+15	+ 9	0	−12	− 4	− 2	− 4	− 1	+ 1	−10	− 7	− 5
17	− 9	− 5	0	− 4	− 6	−19	+12	+ 4	− 3	− 5	− 3	− 3	− 2	− 2	− 3	−15	−15	− 6
18	− 3	+ 2	+ 2	− 3	− 8	−14	+ 6	− 9	− 3	− 1	− 3	− 4	− 2	− 6	− 7	− 6	−13	− 5
19	− 1	+ 4	+ 6	− 4	−14	− 9	0	−12	− 4	+ 3	− 1	− 3	− 2	− 8	− 9	+ 5	− 8	− 3
20	− 2	+ 2	+ 4	+ 1	−14	− 3	−13	− 4	− 4	+ 2	+ 1	− 2	− 3	− 3	− 8	+ 8	+ 2	0
21	− 4	+ 2	+ 2	− 3	− 7	0	− 9	+ 2	− 2	+ 2	+ 1	0	− 1	− 2	+ 1	+ 9	+ 6	+ 2
22	− 1	+ 5	− 2	− 1	+ 6	+ 2	− 1	0	+ 1	+ 4	+ 1	0	− 4	+ 3	+ 4	+11	+ 4	+ 3
23	− 2	+ 5	+ 3	+ 5	+ 9	+ 7	+ 4	− 3	+ 3	+ 3	+ 3	+ 1	− 3	+ 8	+ 8	+ 6	+ 5	+ 4

TABLE 512.—*Showing for the quarter November to January and for groups of maximum and minimum sun-spot years the average Lunar Diurnal Variations of Horizontal Force for each phase of the moon and for the whole lunation.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Maximum sun-spot years, 1871 to 1874 and 1882 to 1885.									Minimum sun-spot years, 1875 to 1880 and 1886 to 1889.								
	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.	New moon.	One-eighth.	First quarter.	Three-eighths.	Full moon.	Five-eighths.	Last quarter.	Seven-eighths.	Average of whole lunation.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
0	−28	+ 2	−26	− 2	+ 1	+15	+ 3	− 3	− 5	0	+ 7	0	− 7	−26	+ 7	+ 6	+ 2	− 1
1	−28	+ 5	−42	−43	−16	+11	+ 3	− 2	−14	− 3	− 1	−14	−24	−31	+ 3	+10	+ 4	− 7
2	−10	+13	−55	−50	−22	+ 6	+ 6	− 4	−14	−10	− 2	−24	−32	−32	− 3	+ 4	− 5	−13
3	− 1	+ 7	−68	−33	−15	+ 6	+ 8	+ 3	−12	− 4	− 6	−31	−28	−28	−10	+11	− 9	−13
4	− 9	+ 2	− 3	−13	−16	− 7	+ 9	0	− 5	+ 1	−10	−16	−18	−11	−20	− 2	0	− 9
5	+ 1	+ 8	− 2	− 3	− 8	− 8	+11	+ 6	+ 1	+ 4	−10	− 5	−11	− 1	−21	+ 1	+ 2	− 5
6	+ 3	+33	+ 3	+ 7	+ 2	0	− 3	− 4	+ 5	+ 9	0	+17	+ 1	+ 2	−11	+ 1	0	+ 2
7	+17	+26	+18	+13	+10	+ 3	+ 8	− 4	+11	+16	+23	+22	+ 9	+ 4	−12	− 6	+ 1	+ 7
8	+35	+26	+22	+13	− 1	− 1	+19	0	+14	+30	+27	+15	+17	0	− 6	− 5	+ 8	+11
9	+43	+32	+41	+ 2	+ 4	+ 8	+ 6	+13	+19	+41	+20	+ 4	+12	0	−13	− 9	+14	+ 9
10	+49	+ 2	+36	+ 6	+ 6	+ 6	+ 7	+22	+17	+28	+16	−10	+ 7	+ 8	−13	−10	+19	+ 6
11	+38	+ 2	+31	+ 6	+ 4	0	+ 7	+22	+14	+16	+ 9	−10	+13	+ 4	−10	− 9	+ 8	+ 3
12	+26	−32	+17	0	−18	+ 1	+ 8	+ 9	+ 1	− 1	− 6	+ 1	+ 1	+ 7	−11	− 5	− 6	− 2
13	+ 5	−34	+13	+ 3	−20	+ 2	+ 6	−11	− 4	−29	−11	+ 1	+ 5	− 2	− 8	−11	−27	−10
14	−11	−37	+25	+ 1	−16	− 5	−18	− 8	− 9	−32	−20	− 5	+ 2	+ 1	−12	−27	−26	−15
15	− 9	−19	+16	+18	−15	−18	−41	−22	−11	−21	−22	− 3	+ 2	0	−12	−30	−23	−14
16	−12	−11	+ 4	+ 5	0	−26	−28	− 8	− 9	−18	−15	− 4	+ 9	− 2	−22	−17	−15	−10
17	−16	−14	− 1	+ 4	+ 1	−41	−25	− 5	−12	−10	− 4	+ 4	+ 4	− 1	− 5	− 4	− 4	− 2
18	−15	−14	+10	+ 7	+ 5	−22	−15	− 2	− 6	−14	+ 1	+15	+ 6	+ 5	+ 8	+ 7	+ 6	+ 4
19	−13	−20	+ 6	+10	+16	+11	+ 1	+ 1	+ 1	−11	− 6	+ 3	+ 9	+23	+43	+18	+12	+11
20	−20	− 5	−14	+ 8	+30	+11	+ 8	− 1	+ 2	+ 4	− 8	+11	+ 6	+37	+40	+24	+10	+15
21	−24	+12	− 2	+14	+34	+16	+ 1	+ 6	+ 7	− 1	− 3	+12	+ 3	+37	+31	+28	+ 8	+14
22	−11	+10	− 8	+16	+20	+13	+ 7	− 9	+ 5	+ 3	+12	+ 8	+ 7	+ 8	+29	+18	+11	+12
23	−18	+ 8	−20	+ 8	+13	+16	+13	− 6	+ 2	+ 1	+ 9	+ 9	+ 6	− 2	+25	+ 8	+ 9	+ 8

TABLE 513.—*Showing for the quarter November to January and for complete lunations the average Lunar Diurnal Variations of Declination for each year and for the whole period.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Years.																	Average, 1872-1873 to 1888-1889.
	1871-1872.	1872-1873.	1873-1874.	1874-1875.	1875-1876.	1876-1877.	1877-1878.	1878-1879.	1879-1880.	1880-1881.	1881-1882.	1882-1883.	1883-1884.	1884-1885.	1885-1886.	1886-1887.	1887-1888.	1888-1889.	
0	− 5	+10	+ 7	+20	+ 6	+ 5	+18	+11	− 1	+ 2	+ 3	− 2	+16	+16	+11	+ 5	− 7	+ 6	+ 7
1	− 2	+23	+ 5	+24	+ 3	+ 4	+20	+11	+ 2	+ 3	+14	+ 3	+15	+20	+11	+ 7	− 3	+ 8	+ 9
2	− 3	+25	−10	+10	+ 2	+ 3	+15	+ 7	+ 3	− 2	+18	+10	+12	+13	+ 8	− 1	− 6	+ 8	+ 7
3	−12	+18	− 5	− 6	− 2	+ 3	+ 6	+ 2	+ 2	− 6	+15	+ 3	+ 3	+ 5	+ 6	− 4	−11	+ 6	+ 2
4	−15	+ 5	− 9	−13	− 5	− 3	− 6	− 5	− 4	−12	+ 4	− 4	− 6	− 2	+ 2	− 6	−12	− 3	− 5
5	−16	− 3	−13	−18	− 9	− 9	− 8	−11	− 3	−12	− 5	−12	−11	− 3	− 4	−12	−11	− 9	− 9
6	−15	−19	−17	−19	−11	− 8	− 8	−15	− 1	−13	− 4	−16	−16	− 7	−13	− 6	−12	− 8	−11
7	−13	−20	−14	−15	− 8	− 2	−11	−13	− 2	−17	− 2	− 3	−19	−13	−10	− 4	−14	− 1	−10
8	− 3	−17	−13	− 3	− 4	0	− 9	− 9	− 3	−14	+ 6	+ 5	−13	−11	−12	− 4	− 8	− 1	− 6
9	− 1	−16	− 7	− 1	0	+ 2	− 6	− 3	− 2	− 7	+13	+16	− 6	− 7	−11	+ 4	+ 1	+ 2	− 2
10	+ 4	− 3	− 5	+ 1	+ 4	+ 3	− 2	− 3	+ 5	− 2	+20	+18	+ 2	− 3	− 9	+16	+ 7	+ 4	+ 3
11	+11	+ 4	+ 1	+ 3	+ 4	− 1	+ 4	+ 3	+ 4	+ 3	+21	+23	+ 7	− 1	+ 5	+22	+16	+10	+ 8
12	+25	+14	+ 2	+ 9	+ 1	+ 3	+19	+ 5	+10	+ 6	+19	+26	+13	+ 3	+18	+22	+20	+10	+12
13	+34	+ 2	+ 4	+11	+ 7	+14	+22	+ 3	+ 9	+ 8	+13	+15	+20	0	+19	+22	+21	+14	+12
14	+25	+ 2	+12	+12	+13	+14	+13	+ 1	+ 3	+ 2	+11	+ 8	+19	− 1	+13	+20	+22	+10	+10
15	+22	− 1	+17	+12	+12	+ 7	+ 1	+ 1	+ 3	+ 6	0	+ 9	+15	− 2	+ 5	+ 9	+18	+ 2	+ 7
16	+14	− 2	+13	0	+ 9	+ 2	−10	+ 2	0	+ 1	−20	− 5	− 5	− 2	− 7	− 2	+10	− 2	− 1
17	+ 5	− 3	+10	− 6	+ 5	− 1	−17	0	− 3	+ 1	−29	−18	−10	− 4	−14	− 7	− 1	− 9	− 6
18	− 1	− 1	+ 3	−10	+ 6	− 4	−21	− 5	− 4	+ 4	−29	−20	−17	− 4	−15	−18	− 6	−11	− 9
19	− 6	− 1	− 1	−19	− 4	−11	−18	− 2	− 8	+ 5	−31	−22	−18	− 3	−12	−20	− 7	−14	−11
20	−11	− 6	− 2	−14	−10	− 9	−13	0	− 7	+11	−23	−14	−16	− 7	− 6	−18	− 7	−11	− 9
21	−11	− 8	− 1	− 2	−11	− 7	− 7	+ 3	− 5	+10	−15	−15	− 6	− 3	− 1	−13	− 1	−10	− 5
22	−15	− 4	+11	+ 8	− 5	− 8	+ 4	+ 7	0	+13	− 1	− 5	+ 8	+ 6	+ 6	−11	− 3	− 5	+ 1
23	−11	+ 1	+11	+15	− 4	0	+13	+ 9	+ 1	+12	+ 3	0	+15	+12	+ 9	− 2	− 8	+ 1	+ 5

TABLE 514.—*Showing for the quarter November to January and for complete lunation the Lunar Diurnal Variation of Vertical Force for each period and for the whole period.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Years.																	Average.
	1872-1873.	1873-1874.	1874-1875.	1875-1876.	1876-1877.	1877-1878.	1878-1879.	1879-1880.	1880-1881.	1881-1882.	1882-1883.	1883-1884.	1884-1885.	1885-1886.	1886-1887.	1887-1888.	1888-1889.	
0	+ 8	− 4	+14	+ 5	+ 5	+ 4	+ 3	− 3	− 3	+ 4	+ 9	0	+ 6	+15	+ 4	+ 2	+11	+ 5
1	+15	− 4	+ 7	+ 5	+ 6	+ 4	0	+ 1	+ 5	+ 7	+10	0	+ 1	+10	+ 3	+ 3	+ 8	+ 5
2	+12	− 8	− 5	+ 3	+ 5	− 2	− 1	+ 1	+ 8	+ 7	+ 7	+ 4	− 2	+ 6	+ 3	0	+ 3	+ 2
3	− 2	− 4	− 7	+ 3	+ 1	− 6	− 4	0	+ 7	+ 3	+ 2	+ 3	− 5	+ 1	+ 5	+ 1	− 2	0
4	− 4	− 8	− 5	− 2	− 1	− 7	− 7	− 2	+ 3	−11	− 4	− 3	− 6	− 3	+ 1	+ 5	− 6	− 4
5	− 5	− 6	− 6	− 3	− 2	− 3	− 9	+ 1	+ 5	−11	− 6	− 8	− 7	− 8	0	+ 7	− 6	− 4
6	− 7	− 5	− 6	− 2	+ 1	− 5	− 8	+ 2	− 3	− 5	− 8	−10	−11	−11	− 3	+ 3	− 3	− 5
7	− 3	− 3	− 3	− 2	0	− 5	0	− 2	− 4	+ 2	− 5	− 5	−12	− 9	− 5	+ 6	− 2	3
8	− 2	+ 1	0	− 2	− 1	− 1	0	+ 1	− 7	+ 4	− 2	− 1	− 9	− 7	− 4	+ 8	− 2	− 1
9	− 2	+ 4	− 3	+ 1	− 1	+ 1	+ 3	0	− 5	+ 7	− 2	+ 4	− 2	− 8	+ 1	+ 5	− 2	0
10	+ 8	+ 8	− 1	+ 3	+ 3	+ 1	+ 4	+ 3	− 4	+11	− 1	+14	+ 3	− 5	+ 4	+ 5	+ 1	+ 3
11	+11	+ 8	+ 1	+ 4	0	+ 3	+ 9	+ 3	0	+ 8	0	+13	+ 4	+ 3	+ 7	+ 3	+ 4	+ 5
12	+ 7	+ 8	+ 5	+ 4	+ 3	+ 5	+ 7	+ 1	0	+ 1	0	+ 5	+ 4	+ 5	+ 3	0	+ 6	+ 4
13	− 1	+ 7	+ 3	+ 3	+ 2	− 3	+ 2	− 1	− 3	− 1	− 3	+ 7	+ 2	+ 3	+ 1	− 3	+ 3	+ 1
14	+ 5	+10	+ 6	+ 3	0	− 8	+ 2	0	− 7	− 3	− 3	+ 7	+ 2	− 3	− 2	− 1	− 1	0
15	+ 7	+10	+ 2	− 1	0	− 8	+ 1	− 3	− 2	−10	− 1	+ 2	+ 5	− 5	− 1	− 2	− 6	− 1
16	+ 5	+ 2	− 6	− 1	− 2	− 9	− 1	− 5	0	−14	− 6	− 4	+ 3	− 5	− 3	−10	− 9	− 4
17	+ 1	− 1	− 6	− 1	− 5	− 5	− 3	− 7	0	− 9	− 7	−11	+ 1	− 6	− 6	−14	− 8	− 5
18	+ 2	− 5	− 9	− 4	− 5	− 1	− 5	− 1	+ 2	− 5	− 5	−10	+ 2	− 6	− 8	−11	− 6	− 4
19	−13	− 3	−10	− 8	− 9	+ 4	0	+ 2	+ 1	− 4	0	− 3	+ 2	− 1	− 3	− 7	− 1	− 3
20	−16	− 2	− 1	− 7	− 4	+ 6	0	+ 3	+ 4	0	+ 2	− 5	+ 4	+ 1	− 1	− 2	+ 1	− 1
21	−15	− 2	+ 4	− 4	0	+10	+ 4	+ 4	+ 4	+ 3	+ 5	− 1	+ 3	+ 6	0	+ 1	+ 1	+ 1
22	− 8	− 1	+13	+ 1	− 2	+13	+ 2	+ 3	+ 3	+ 6	+ 9	0	+ 7	+11	+ 1	+ 1	+ 5	+ 4
23	− 1	0	+13	+ 3	+ 4	+10	+ 1	0	+ 2	+ 2	+11	+ 1	+ 8	+17	+ 4	− 1	+ 8	+ 5

TABLE 515.—*Showing for the quarter November to January and for complete lunation the Lunar Diurnal Variation of Horizontal Force for each year and for the whole period.*

Unity = 0·1γ = ·000001 C. G. S.

Lunar Hours.	Years.																		Average.
	1871-1872.	1872-1873.	1873-1874.	1874-1875.	1875-1876.	1876-1877.	1877-1878.	1878-1879.	1879-1880.	1880-1881.	1881-1882.	1882 1883.	1883-1884.	1884-1885.	1885 1886.	1886-1887.	1887-1888.	1888-1889.	
0	+ 1	- 5	- 3	+ 3	0	- 8	+ 6	+ 8	- 6	+ 3	- 6	- 4	- 6	-10	+ 7	0	0	-10	- 2
1	+ 3	-26	-12	- 8	0	- 6	- 4	- 9	- 8	-10	-17	-18	- 5	-26	+ 1	-14	- 6	- 8	-10
2	- 3	-20	-13	-12	- 6	- 7	-11	-18	- 9	- 8	-24	-18	-10	-21	+ 2	-24	-10	-18	-13
3	- 8	- 8	-14	-16	- 5	-10	-11	-23	-10	-10	-24	-22	- 6	-12	+ 1	-17	-10	-19	-12
4	+ 6	- 3	-12	- 8	- 7	- 5	- 6	-18	-15	- 5	-31	- 6	- 4	0	- 6	-10	- 5	- 9	- 8
5	+ 7	- 3	- 6	+ 5	- 4	+ 7	- 1	-14	-11	- 4	-32	- 1	0	+ 6	+ 1	-13	- 6	+ 1	- 4
6	+15	+ 3	0	+13	+ 2	+10	+ 2	- 1	+ 2	+11	-19	+17	+ 2	- 6	+ 2	- 9	+ 4	+ 9	+ 3
7	+26	+12	+ 6	+33	+11	+ 5	+12	+ 3	+ 8	+ 8	- 9	+16	+ 3	+ 5	- 4	-11	+20	+ 9	+ 8
8	+19	+16	+ 5	+26	+20	+ 1	+23	+ 6	+ 8	+18	+ 5	+18	+12	+14	0	- 1	+17	+13	+12
9	+31	+19	+19	+16	+ 7	+ 5	+19	+ 7	+ 6	+12	+ 2	+16	+19	+ 8	- 1	- 2	+14	+14	+12
10	+12	+20	+25	+ 1	+ 4	+10	+19	+ 3	- 9	+20	- 2	+18	+18	+ 8	+16	-12	+20	+ 9	+10
11	0	+19	+22	-16	+ 6	+11	+ 8	- 6	-13	+12	0	+11	+20	+10	- 1	-13	+23	+ 5	+ 5
12	-16	- 2	+17	-16	+11	+ 3	- 5	-13	-12	- 3	- 3	- 6	+ 7	+ 8	-18	-15	+ 7	+ 4	- 3
13	-20	- 2	+12	-15	-10	- 5	-21	-11	-13	- 1	-14	- 7	-12	+ 1	-26	+ 3	-21	- 3	- 9
14	- 8	-12	+ 6	-20	-22	-14	-23	-12	- 4	-11	-14	- 6	-22	- 9	-24	- 8	-29	- 7	-13
15	-10	-15	- 6	-27	-26	- 7	-15	-11	- 4	-11	-11	- 9	-27	- 1	-24	- 6	-27	-12	-14
16	-21	-10	-10	-25	-23	- 8	-22	- 7	+ 5	- 6	+ 8	- 4	-17	+ 4	-18	0	-19	-11	-10
17	-24	- 8	-18	- 7	-17	- 2	-15	- 1	+10	-10	+17	-12	-16	+ 6	- 7	+11	- 7	+ 1	- 5
18	-26	+ 3	-14	+ 8	- 9	- 6	- 2	+ 3	+11	- 2	+31	+ 4	-10	+ 8	+ 8	+25	+ 5	+ 5	+ 2
19	- 6	+10	- 2	+15	+ 7	+ 3	+ 3	+24	+17	- 5	+48	0	+11	- 2	+10	+21	+ 6	+10	+ 9
20	- 6	+ 4	- 3	+18	+16	+ 3	+ 8	+26	+22	- 1	+38	+ 4	+19	- 4	+11	+32	+11	+ 8	+11
21	+ 3	+ 4	+ 6	+17	+15	+10	+ 5	+25	+17	- 3	+30	+ 7	+18	+ 6	+22	+24	+ 9	+10	+12
22	+13	- 1	- 5	+11	+18	+ 7	+16	+18	+ 8	- 1	+16	0	+ 9	+11	+27	+25	+ 5	+ 2	+10
23	+14	+ 3	- 2	+ 7	+11	+ 2	+14	+21	- 1	+ 5	+ 8	+ 4	- 4	- 4	+18	+16	+ 2	0	+ 6

characteristic lunar curves as the much more laboriously derived average results of the data of 18 years, which have already been discussed. After these confirmatory results, one may without much hesitation, regard them as indicating a true lunar phenomenon.

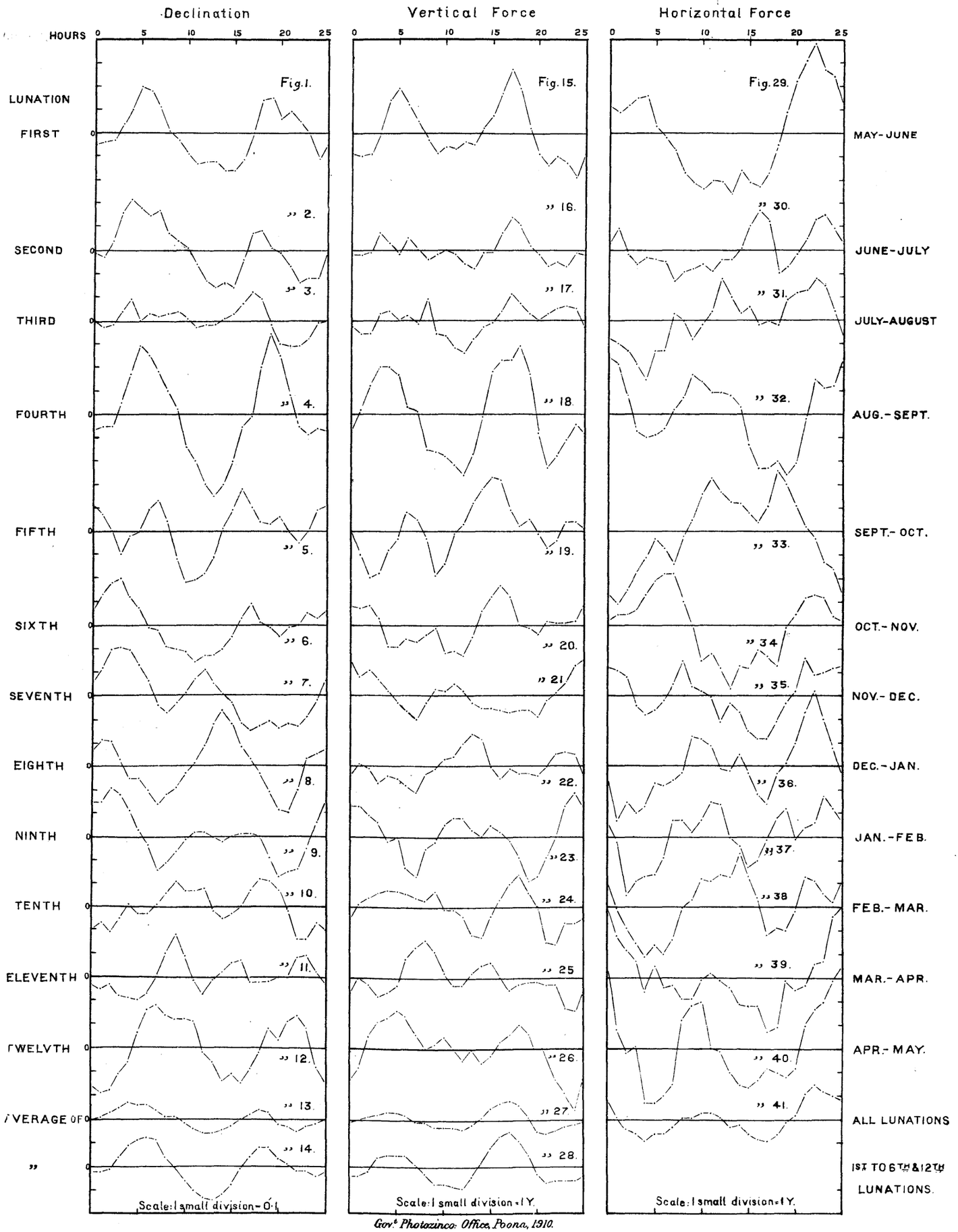
529. From the average lunar action and its changes from phase to phase in a lunation, we may proceed to the consideration of the seasonal change from lunation to lunation which now remains to be inquired into. The lunar diurnal curve itself as given by the annual results is, we have seen, a very minute inequality and for the purpose of examining the seasonal changes in it, it is doubtful, even if it were possible to undertake the enormous labour of dealing with the data of 18 years, for all months of the year, if the results so laboriously secured would allow the still minuter changes from month to month to be definitely determined. It will be observed from the average results of the year 1900-1901, that in the declination element (see figure 13, plate 96) the variation is exactly inverse in character to the curve of winter months, November to January, shown in figure 9, plate 95*a*, while no such inversion of effects is seen in the H results (see figures 27 and 36, plate 95*a*, and figure 41, plate 96). A careful examination of the curves in plate 96 shows that in D and V the average results of the first six and the twelfth lunations (*vide* figures 14 and 28), which occur during the eight months April to November, give identically the same characteristic curve as the annual diurnal curve (see figures 13 and 27) except that it is larger in amplitude. A complete inversion in the run is thus apparently indicated during the seventh to the eleventh lunations which fall to occur during the winter months of the year. The change from month to month, it will be seen, though irregular in its progression, is almost nearly the same in the D and V curves. In H, however, it is distinctly dissimilar in type, and the irregularities are also much more pronounced. It may be interesting in passing to note that when these changes from lunation to lunation are examined for each element in comparison with the seasonal changes in the respective solar diurnal variations (see figures 1 to 12, plates 21, 39 and 55) a general resemblance is indicated suggesting at least that the two phenomena show relatively the same order of progression possibly under a common influence.

While complete inversion is thus readily detected in the D and V curves, figures 1 to 28, plate 96, the irregularities in the H curves, figures 29 to 40, preclude any definite conclusion from being drawn in this respect, though the average result for the year shown in figure 41, when compared with the average curve of the winter months shown in figure 27, plate 95*a*, at any rate indicates no inversion of effects. The examination of the variations in tables 516 to 518 where they have purposely been grouped into four quarters of the year 1900-1901 for the elucidation of this point, fails to indicate any certain results.

530. To ascertain definitely hence whether the curves of H element truly behave differently in regard to seasonal changes, from those of D and V, it becomes necessary to supplement additional material. Hence data for the summer months, May to July, for the nine years 1873, 1874, 1875, 1876, 1877, 1881, 1883, 1884 and 1885 were dealt with precisely as the winter data have been as shown in paragraph 525. These summer results are collected in table 519 and the average results are charted in figures 25 to 32 in plate 95. The same data re-arranged in lunar hours appear in table 508 and are charted in figures 28 to 35 in plate 95*a*. It will be readily seen from these curves that the original result derived by Chambers, namely that in the H results there is no seasonal inversion when the season passes from winter to summer conditions, is fully corroborated. It becomes evident that the seasonal influence while strong enough to invert the curves completely in D and V, succeeds in the H element only to diminish the amplitude in the summer months. The Fourier co-efficients of the average curves of the whole lunation in table 508 show that the amplitude in the winter months is 1·3γ while in the summer it is only 0·4γ; the angle of first maximum μ is respectively 134° 37′ and 128° 9′, or occurring at about 8·9 hours and 8·5 hours after the lower meridian passage of the moon.

LUNAR DIURNAL VARIATIONS.
MAY 1900 - MAY 1901.

Plate 96.



Gov^t Photozinco: Office, Poona, 1910.

TABLE 516.—*Showing the Lunar Diurnal Variations of Declination for 12 complete lunations from June 1900 to May 1901.*

Unity = 0·01 Minute of arc.

Solar hours in Lunar day commencing from moon's lower culmination.	1900 May 25^d 0^h to 1900 June 26^d 22^h.	1900 June 26^d 23^h to 1900 July 26^d 23^h.	1900 July 27^d 0^h to 1900 August 24^d 22^h.	1900 August 24^d 23^h to 1900 September 23^d 22^h.	1900 September 23^d 23^h to 1900 October 23^d 23^h.	1900 October 24^d 0^h to 1900 November 21^d 22^h.	1900 November 21^d 23^h to 1900 December 21^d 22^h.	1900 December 21^d 23^h to 1901 January 20^d 23^h.	1901 January 21^d 0^h to 1901 February 18^d 23^h.	1901 February 19^d 0^h to 1901 March 20^d 23^h.	1901 March 21^d 0^h to 1901 April 18^d 23^h.	1901 April 19^d 0^h to 1901 May 18^d 23^h.	Average of 12 lunations.	Average of I to VI and XII lunations.	Average: May to July (Lunations XII, I and II).	Average: August to October (Lunations III, IV and V).	Average: November to January (Lunations VI, VII and VIII).	Average: February to April (Lunations IX, X and XI).
Number of lunation.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII						
0	− 5	− 1	0	− 7	+11	+ 6	+ 6	+ 7	+15	−10	− 3	−16	0	− 2	− 7	+ 1	+ 6	+ 1
1	− 4	− 3	− 3	− 5	+ 7	+13	+12	+12	+15	− 7	− 5	−19	+ 1	− 2	− 9	0	+12	+ 1
2	− 3	+ 4	− 2	− 5	0	+18	+20	+11	+21	−11	− 3	−18	+ 3	− 1	− 6	− 2	+16	+ 2
3	+ 4	+16	+ 4	+ 5	−10	+20	+21	+ 3	+18	− 5	− 8	−11	+ 5	+ 4	+ 3	0	+15	2
4	+10	+22	+ 9	+17	− 2	+12	+20	− 5	+11	+ 1	− 9	− 6	+ 7	+ 9	+ 9	+ 8	+ 9	+ 1
5	+20	+18	0	+29	0	+ 7	+13	− 5	+ 3	− 3	−10	+ 6	+ 6	+11	+15	+10	+ 5	− 3
6	+18	+15	+ 3	+25	+ 9	− 1	+ 6	−10	− 3	− 3	− 7	+16	+ 6	+12	+16	+12	− 2	− 4
7	+11	+17	+ 2	+18	+13	− 2	− 4	−16	−14	+ 1	0	+18	+ 4	+11	+15	+11	− 7	− 4
8	+ 1	+ 7	+ 3	+10	+ 4	− 9	− 7	−12	−11	+ 6	+10	+14	+ 1	+ 4	+ 7	+ 6	− 9	+ 2
9	− 3	+ 4	+ 4	+ 2	−12	−10	− 3	− 9	− 6	+11	+18	+12	+ 1	0	+ 4	− 2	− 7	+ 8
10	− 9	+ 1	+ 1	−14	−22	−11	+ 1	− 3	− 1	+ 7	+ 9	+12	− 2	− 6	+ 1	−12	− 4	+ 5
11	−13	− 6	− 3	−20	−21	−16	+ 7	+ 1	+ 2	+ 7	− 1	+11	− 4	−10	− 3	−15	− 3	+ 3
12	−12	−13	− 2	−31	−18	−13	+11	+ 9	+ 2	+ 8	− 7	− 2	− 6	−13	− 9	−17	+ 2	+ 1
13	−12	−16	− 2	−35	−11	−13	+ 5	+18	0	− 2	− 1	− 6	− 6	−14	−11	−16	+ 3	− 1
14	−16	−14	+ 1	−30	+ 1	−10	0	+24	− 2	− 5	+ 2	−14	− 5	−12	−15	− 9	+ 5	− 2
15	−16	−16	+ 3	−20	+ 9	− 5	− 3	+18	0	− 3	+ 6	−11	− 3	− 8	−14	− 3	+ 3	+ 1
16	− 9	− 4	+ 7	− 5	+18	+ 3	−12	+ 8	+ 1	0	+ 7	−15	0	− 1	− 9	+ 7	0	+ 3
17	0	+ 7	+12	− 1	+10	+ 9	−15	+ 3	+ 1	+ 7	− 2	− 9	+ 2	+ 4	− 1	+ 7	− 1	+ 2
18	+14	+ 8	+ 9	+20	+ 4	+ 1	−13	− 3	0	+12	− 2	− 2	+ 4	+ 8	+ 7	+11	− 5	+ 3
19	+15	+ 1	− 2	+34	+ 3	− 1	−11	−11	− 9	+11	− 2	+ 8	+ 3	+ 8	+ 8	+12	− 8	0
20	+ 6	− 1	−10	+25	+ 6	− 5	−14	−19	−17	+ 7	0	+ 3	− 2	+ 3	+ 3	+ 7	−13	− 3
21	+ 9	− 7	−11	+ 8	− 1	− 1	−12	−20	−15	− 2	0	+11	− 3	+ 1	+ 4	− 1	−11	− 6
22	+ 5	−14	−11	− 5	− 5	0	−13	−10	−14	−14	+ 8	+14	− 5	− 2	+ 2	− 7	− 8	− 7
23	0	−12	− 8	− 9	0	+ 5	− 9	+ 3	− 5	−14	+ 9	+ 8	− 3	− 2	− 1	− 6	0	− 3
24	−11	−12	− 1	− 6	+ 9	+ 3	− 2	+ 5	+ 6	− 7	+ 2	− 8	− 2	− 4	−10	+ 1	+ 2	0

TABLE 517.—*Showing the Lunar Diurnal Variations of Horizontal Force for 12 complete lunations from June 1900 to May 1901.*

Unity = 0·1γ = ·000001 C. G. S.

Solar hours in Lunar day commencing from moon's lower culmination.	1900 May 29d 0h to 1900 June 26d 22h.	1900 June 26d 23h to 1900 July 26d 23h.	1900 July 27d 0h to 1900 August 24d 22h.	1900 August 24d 23h to 1900 September 23d 22h.	1900 September 23d 23h to 1900 October 23d 23h.	1900 October 24d 0h to 1900 November 21d 22h.	1900 November 21d 23h to 1900 December 21d 22h.	1900 December 21d 23h to 1901 January 20d 23h.	1901 January 21d 0h to 1901 February 18d 23h.	1901 February 19d 0h to 1901 March 20d 23h.	1901 March 21d 0h to 1901 April 18d 23h.	1901 April 19d 0h to 1901 May 18d 23h.	Average of 12 lunations.	Average: May to July (Lunations XII, I and II).	Average: August to October (Lunations III, IV and V).	Average: November to January (Lunations VI, VII and VIII).	Average: February to April (Lunations IX, X and XI).
Number of lunation.	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII					
0	+12	+ 3	− 8	+24	−27	+ 2	+13	− 4	+ 6	+11	+30	+35	+ 8	+17	− 4	+ 4	+16
1	+ 9	+ 9	−10	+21	−31	+ 5	+11	−23	− 2	− 1	+18	+ 8	+ 1	+ 9	− 7	− 2	+ 5
2	+12	− 2	−13	+ 8	−25	+ 5	+ 8	−15	−25	− 9	+12	− 2	− 4	+ 3	−10	− 1	− 7
3	+15	− 6	−19	− 7	−17	+ 7	− 4	−20	−19	−15	+ 7	+ 1	− 6	+ 3	−14	− 6	− 9
4	+16	− 3	−25	−10	−11	+13	− 8	−17	−17	−21	− 6	−23	− 9	− 3	−15	− 4	−15
5	+ 3	− 4	−13	− 9	− 3	+19	− 6	− 7	−16	−16	+ 5	−23	− 6	− 8	− 8	+ 2	− 9
6	− 2	− 5	−13	− 6	− 7	+22	− 2	− 8	− 9	−20	− 4	−20	− 6	− 9	− 9	+ 4	−11
7	− 7	−13	+ 3	+ 2	−14	+22	+ 5	− 6	+ 7	−14	− 3	−15	− 3	−12	− 3	+ 7	− 3
8	−17	− 9	0	+ 7	− 2	+10	+15	− 3	+ 7	− 1	− 9	+12	+ 1	− 5	+ 2	+ 7	− 1
9	−21	− 8	− 8	+17	+ 5	0	+ 4	+13	+ 2	+ 3	− 9	+18	+ 1	− 4	+ 5	+ 6	− 1
10	−24	− 6	− 2	+14	+16	−15	+ 2	+12	+ 9	+12	− 1	+20	+ 3	− 3	+ 9	0	+ 7
11	−20	− 9	+ 4	+ 9	+23	−12	− 1	+ 9	+15	+11	+ 2	0	+ 3	−10	+12	− 1	+ 9
12	−21	− 4	+18	+ 9	+17	−18	−11	− 1	+14	+14	− 1	− 1	+ 1	− 9	+15	−10	+ 9
13	−26	− 4	+10	+ 8	+13	−27	− 3	− 2	0	+13	− 4	−10	− 3	−13	+10	−11	+ 3
14	−16	+ 1	+ 3	+ 3	+12	−17	− 7	+ 5	− 4	+23	−11	−15	− 2	−10	+ 6	− 6	+ 3
15	−21	+10	+ 6	−13	+ 8	−18	−15	− 3	−13	+13	−12	−16	− 6	− 9	0	−12	− 4
16	−23	+17	− 2	−23	+ 4	−11	−18	−12	−10	+ 4	−12	−13	− 8	− 6	− 7	−14	− 6
17	−17	+12	0	−23	+11	−13	−18	−16	− 1	−12	−23	− 8	− 9	− 4	− 4	−16	−12
18	− 5	− 9	− 2	−20	+26	−17	−11	− 3	+ 8	− 9	−21	−10	− 6	− 8	+ 1	−10	− 7
19	+ 9	− 7	+ 9	−26	+20	− 1	− 3	+ 1	+12	−10	− 1	−12	− 1	− 3	+ 1	− 1	0
20	+22	− 2	+12	−21	+11	+ 5	+ 2	+10	− 1	− 2	− 5	− 8	+ 2	+ 4	+ 1	+ 6	− 3
21	+31	+ 5	+13	− 2	+ 2	+12	+16	+23	+ 4	+13	+ 3	+10	+11	+15	+ 4	+17	+ 7
22	+38	+13	+18	+15	− 3	+13	+ 9	+32	+ 6	+11	+ 6	+17	+15	+23	+10	+18	+ 8
23	+27	+15	+15	+11	−13	+12	+10	+20	+17	+ 6	+ 7	+20	+12	+21	+ 4	+14	+10
24	+24	+ 9	+ 4	+12	−16	+ 4	+12	+ 8	+12	+ 2	+26	+29	+10	+21	0	+ 8	+13

TABLE 518.—*Showing the Lunar Diurnal Variations of Vertical Force for 12 complete lunations from June 1900 to May 1901.*

Unity = 0·1γ = ·000001 C. G. S.

Solar hours in Lunar day commencing from moon's lower culmination.	1900 May 29^d 0^h to 1900 June 26^d 22^h.	1900 June 26^d 23^h to 1900 July 26^d 23^h.	1900 July 27^d 0^h to 1900 August 24^d 22^h.	1900 August 24^d 23^h to 1900 September 23^d 22^h.	1900 September 23^d 23^h to 1900 October 23^d 23^h.	1900 October 24^d 0^h to 1900 November 21^d 22^h.	1900 November 21^d 23^h to 1900 December 21^d 22^h.	1900 December 21^d 23^h to 1901 January 20^d 23^h.	1901 January 21^d 0^h to 1901 February 18^d 23^h.	1901 February 19^d 0^h to 1901 March 20^d 23^h.	1901 March 21^d 0^h to 1901 April 18^d 23^h.	1901 April 19^d 0^h to 1901 May 18^d 23^h.	Average of 12 lunations.	Average of I to VI and XII lunations.	Average: May to July (Lunations XII, I and II).	Average: August to October (Lunations III, IV and V).	Average: November to January (Lunations VI, VII and VIII).	Average: February to April (Lunations IX, X and XI).
Number of lunation.	I	II	III	IV	V	VI	VII	VIII	IX	X	X	XII						
0	− 9	− 2	− 3	− 8	+ 1	+ 8	+15	− 4	+13	− 5	− 6	−13	− 1	− 4	− 8	− 3	+ 6	+ 1
1	−10	− 2	− 6	+ 2	−10	+ 7	+ 8	+ 1	+13	+ 1	0	− 8	0	− 4	− 7	− 5	+ 5	+ 5
2	− 9	− 1	− 6	+12	−20	+ 8	+11	− 1	+ 9	+ 4	− 3	+ 5	+ 1	− 2	− 2	− 5	+ 6	+ 3
3	0	+ 7	+ 3	+20	−18	+ 3	+ 7	− 7	+ 6	+ 6	− 8	+11	+ 2	+ 4	+ 6	+ 2	+ 1	+ 1
4	+14	+ 3	+ 4	+20	− 8	− 9	+ 2	− 4	− 2	+ 7	− 6	+13	+ 3	+ 5	+10	+ 5	− 4	0
5	+19	− 2	0	+17	− 3	− 9	− 3	− 5	0	+ 7	− 3	+16	+ 3	+ 5	+11	+ 5	− 6	+ 1
6	+12	+ 5	+ 2	+ 3	+ 8	− 6	− 7	− 8	−13	+ 6	+ 8	+14	+ 2	+ 5	+10	+ 4	− 7	0
7	+ 5	0	− 2	+ 1	+ 5	− 7	−10	−11	−17	+ 4	+13	+ 6	− 1	+ 1	+ 4	+ 1	− 9	0
8	− 3	− 4	+ 9	−15	− 3	− 4	− 3	− 3	− 5	+ 3	+16	0	− 1	− 3	− 2	− 3	− 3	+ 5
9	− 9	− 2	− 6	−16	−19	− 1	+ 3	− 1	− 2	+ 7	+11	+ 2	− 3	− 7	− 3	−14	0	+ 5
10	− 6	0	− 7	−18	−14	−12	+ 2	+ 3	+ 5	− 1	+ 2	+ 5	− 3	− 7	0	−13	− 2	+ 2
11	− 7	− 2	−12	−22	− 1	−11	+ 5	+ 4	+ 8	− 1	− 3	0	− 3	− 8	− 3	−12	− 1	+ 1
12	− 4	− 6	−14	−26	+ 3	−13	+ 2	+10	+ 8	− 4	− 3	− 5	− 4	− 9	− 5	−12	0	0
13	− 5	− 8	− 8	−17	+12	− 5	− 3	+14	+ 3	−12	+ 2	0	− 2	− 4	− 4	− 4	+ 2	− 2
14	+ 2	− 1	− 3	− 1	+18	+ 6	− 5	+12	0	−13	+ 5	− 6	+ 1	+ 2	− 2	+ 5	+ 4	− 3
15	+ 7	− 1	− 1	+18	+23	+12	− 5	− 1	+ 5	− 4	+ 6	− 3	+ 5	+ 8	+ 1	+13	+ 2	+ 2
16	+17	+ 7	+ 4	+23	+22	+17	− 6	− 5	+ 2	+ 3	0	+ 3	+ 7	+13	+ 9	+16	+ 2	+ 2
17	+27	+14	+11	+23	+ 9	+12	− 7	− 1	− 2	+10	− 5	+ 6	+ 8	+15	+16	+14	+ 1	+ 1
18	+19	+10	+ 7	+29	+ 2	0	− 6	− 3	− 9	+14	− 3	+10	+ 6	+11	+13	+13	− 3	+ 1
19	+ 2	+ 2	+ 3	+17	+ 5	− 1	− 6	− 3	−19	+ 6	− 2	+ 6	+ 1	+ 5	+ 3	+ 8	− 3	− 5
20	− 9	− 2	0	− 8	− 1	− 4	− 9	− 4	−17	0	− 2	0	− 5	− 3	− 4	− 3	− 6	− 6
21	−14	− 7	+ 3	−23	− 7	+ 2	− 2	0	− 9	−15	− 3	0	− 6	− 7	− 7	− 9	0	− 9
22	−10	− 5	+ 5	−18	− 4	+ 1	+ 1	+ 5	0	−16	− 3	−13	− 5	− 6	− 9	− 6	+ 2	− 6
23	−13	− 7	+ 6	−11	+ 4	+ 1	+ 5	+ 6	+13	− 7	−13	−19	− 3	− 6	−13	0	+ 4	− 2
24	−19	− 1	+ 5	− 4	+ 4	+ 2	+13	+ 5	+19	− 7	−14	−26	− 2	− 6	−15	+ 2	+ 7	− 1

TABLE 519.—*Horizontal Force Magnetograph—Showing for the quarter May to July the mean Lunar Diurnal Variations.*

Unity = 0·1γ = ·000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.												New Moon.												
1873 ...	+10	- 9	-23	-23	+26	-24	+18	+23	-22	-26	-46	-41	+19	+15	+ 5	+18	+10	- 9	0	+27	+36	- 1	+ 5	+10
1874 ...	+31	+18	+14	+13	+56	+45	+37	+25	+22	+23	- 64	-77	- 54	-47	-43	-14	-12	-17	-10	+ 2	+15	+11	+14	+ 9
1875 ...	+ 3	+33	+ 5	+ 3	+ 7	-12	- 3	+ 3	- 8	-16	- 1	- 3	+ 7	- 4	+ 2	- 9	-30	-16	- 8	+ 3	+23	+19	- 2	+ 2
1876 ...	- 4	- 8	- 3	- 7	+ 2	+ 3	+ 5	+15	+20	0	-33	-34	-28	-26	- 7	+16	+39	+ 9	-14	+ 7	+ 6	+17	+10	+14
1877 ...	+19	+25	+37	+41	+30	+25	+20	+24	+39	+50	- 51	-39	-39	-34	-34	-37	-28	-23	- 7	- 9	-10	-12	+ 7	+ 6
1881 ...	+ 9	- 2	+ 4	+ 6	- 3	-25	-18	+ 9	+23	+28	0	- 8	+10	+22	+ 5	- 6	-18	-20	-19	-17	+ 6	+ 6	- 1	+12
1883 ...	-17	-12	-24	-20	-17	-18	+ 1	+27	+23	+34	+74	+67	+64	+50	+16	+ 5	-16	-30	-31	-28	-33	-31	-46	-37
1884 ...	-17	-10	+14	+25	+28	+22	+33	+76	+84	+87	+38	+17	0	-64	-61	-37	-39	-55	-42	-30	-23	-17	-15	-15
1885 ...	-20	- 6	-19	-18	- 3	-29	-16	- 4	+17	+12	+11	+16	+30	+31	+24	+ 7	- 14	- 6	+14	-21	+ 5	-24	-14	+29
Mean ...	+ 2	+ 3	+ 1	+ 2	+14	- 1	+ 9	+22	+22	+21	- 8	-11	+ 1	- 6	-10	- 6	-12	-19	-13	- 7	+ 3	- 4	- 5	+ 3
												One-eighth Phase.												
1873 ...	-57	-34	-27	- 8	-27	- 9	- 9	+59	+81	+76	+26	+40	+20	+43	+29	+15	-10	-34	-34	-24	0	-36	-42	-36
1874 ...	+12	+27	+37	+48	+45	+58	+45	+20	- 3	+ 2	-23	-72	-67	-40	-33	-26	-11	-11	+11	+ 2	- 1	-39	- 9	+27
1875 ...	- 9	-36	-41	-32	-26	-24	- 8	- 9	-41	-29	+ 8	+ 6	+14	+15	+37	+76	+76	+52	+20	+ 1	-21	- 8	- 6	-12
1876 ...	-19	+13	+ 6	- 5	+ 1	+ 8	+ 7	- 2	+21	+41	+ 5	- 3	+ 5	+ 6	+ 3	-28	-28	-12	-12	- 9	+ 1	0	- 8	+ 6
1877 ...	-28	-19	-19	+ 2	+ 5	+19	+27	+41	+48	+48	+77	+70	+35	- 8	-24	-29	-49	-30	-27	-24	-36	-48	-32	- 5
1881 ...	+10	- 1	- 6	-11	- 5	- 5	-20	- 7	+19	+33	+31	+36	+28	+28	+25	+ 6	-26	-30	-32	-26	-25	-15	- 4	- 6
1883 ...	-47	-24	-13	-22	-12	- 1	+34	+38	+56	+81	- 8	+10	-10	+17	-14	+ 7	+28	- 5	-22	-45	-14	+ 3	-20	-17
1884 ...	+15	+13	+30	+ 9	+ 4	+ 8	- 2	-14	-12	-33	-31	+ 7	+ 4	+ 1	-11	-35	-25	0	-10	- 3	+20	+20	+23	+23
1885 ...	+32	+14	+24	+21	- 2	+ 1	+15	+21	+17	- 9	-64	-52	-32	-35	+10	+25	+13	- 8	-31	-29	+14	+11	+20	+25
Mean ...	-10	- 5	- 1	0	- 2	+ 6	+10	+16	+21	+23	+ 2	+ 5	0	+ 3	+ 2	+ 1	- 4	- 9	-15	-17	- 7	-12	- 9	+ 1
												First Quarter.												
1873 ...	-22	-25	-22	+ 5	- 9	-14	0	+ 6	+26	+44	+80	+59	+45	+40	+40	+ 2	+54	- 1	-30	-73	-68	-53	-42	-39
1874 ...	- 2	- 4	0	- 9	-12	- 6	- 3	- 1	+ 2	+ 7	+22	+26	+20	+30	+21	-25	-37	-25	- 8	- 9	+ 8	+12	- 2	- 5
1875 ...	+24	+17	+25	+41	+36	+35	+35	+12	-18	-42	-75	-75	-97	- 64	-26	-16	+25	+36	+52	+29	+ 4	+16	+13	+10
1876 ...	+17	- 3	- 4	+ 1	+ 8	+13	+11	+ 1	- 6	- 4	+ 7	+ 3	0	- 6	- 3	- 3	-17	-10	- 9	- 8	+ 3	+ 1	+ 3	+ 6
1877 ...	0	+ 9	+ 5	+12	+11	+ 5	+11	- 7	-23	-19	- 6	+ 2	+20	+11	+10	+ 6	+32	+32	+ 9	- 9	-30	-35	-24	-24
1881 ...	-60	-52	-23	-11	-20	-11	-17	-17	- 6	-20	+72	+65	+40	+40	+42	+69	+55	+29	-10	-21	-20	-37	-45	-41
1883 ...	+33	+15	+19	+24	+17	+19	-24	-25	-44	-67	-45	-32	-68	-32	-13	+ 5	+15	+15	+23	+18	+26	+27	+44	+50
1884 ...	-17	-11	-23	-12	-22	- 6	+ 7	+23	+24	+18	+47	+64	+67	+56	+22	- 3	-23	-22	-35	-46	-22	-31	-29	-27
1885 ...	+14	+12	- 1	-14	-20	-21	-18	-20	-27	-12	+35	+34	+24	+26	+16	+16	-12	-21	-15	-10	+ 2	+ 4	- 2	+10
Mean ...	- 1	- 5	- 3	+ 4	- 1	+ 2	0	- 3	- 8	-11	+15	+16	+ 6	+11	+12	+ 6	+10	+ 4	- 3	-14	-11	-11	- 9	- 7
												Three-eighth Phase.												
1873 ...	+24	+30	+19	-10	-16	+12	-15	- 8	-10	-11	-14	-25	-32	-35	-26	-11	-27	+16	+24	+29	+10	+33	+16	+22
1874 ...	+ 3	+12	+31	+10	+17	-18	- 9	+ 8	-32	-49	+ 5	- 5	-27	-17	-34	0	+20	+30	+31	+11	+12	+27	-10	-15
1875 ...	+ 8	- 3	+16	+ 4	+12	+19	+17	+15	+19	-11	-12	0	+ 5	+ 3	0	-22	-13	- 9	-14	-12	- 7	- 5	- 3	- 6
1876 ...	+ 5	- 7	0	- 6	- 5	-14	-20	-19	-15	0	- 9	+ 8	+ 9	+ 3	+10	+15	+ 9	- 4	+ 7	+ 3	0	+ 9	+15	+ 7
1877 ...	- 2	-12	-11	-28	-30	-16	- 2	+ 7	- 4	-10	+ 7	-22	-21	- 7	- 2	+ 2	-12	+ 9	+42	+25	+39	+29	+17	- 3
1881 ...	+20	+20	+ 7	+ 8	+13	-26	+44	+48	+14	+ 8	-25	-11	+ 4	-25	-10	-15	-32	-36	-21	-10	-13	- 2	- 9	- 2
1883 ...	-20	+12	+11	+19	+21	+ 7	- 9	-22	-25	-24	-25	+10	+32	+33	+24	+11	+ 4	+ 7	+ 7	+ 6	-10	-25	-16	-27
1884 ...	+20	+23	+19	+14	+14	- 9	-19	+16	+13	+18	+20	-60	-37	-26	-23	+ 6	- 6	+14	+16	+ 6	0	- 5	- 8	- 5
1885 ...	+ 6	-20	-14	-15	- 3	+ 5	-21	-13	-37	-31	+37	+20	+ 9	0	- 5	- 1	+13	+25	+ 4	+32	0	+ 3	+ 7	- 1
Mean ...	+ 7	+ 6	+ 9	0	+ 3	+ 1	- 4	+ 4	- 9	-12	- 2	- 9	- 6	- 8	- 7	- 2	- 5	+ 6	+11	+10	+ 3	+ 7	+ 1	- 3

TABLE 519.—*Horizontal Force Magnetograph—Showing for the quarter May to July the mean Lunar Diurnal Variations.*

Unity = 0·1γ = 000001 C. G. S.

Civil Hours.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Years.											Full Moon.													
1873 ...	+21	+21	−12	− 1	− 9	0	− 4	−10	+33	+28	−29	−15	−16	− 9	−19	−11	−20	+11	+ 3	+ 5	+15	+ 8	+ 6	+ 3
1874 ...	+28	+44	+20	0	−20	−17	− 7	0	+ 7	+11	−65	−53	−28	−17	− 1	+ 8	+ 5	+ 2	+ 5	+14	+10	+17	+26	+14
1875 ...	0	+16	+15	+ 2	+10	− 8	0	+21	+49	+61	+25	+ 5	+25	+10	− 9	−22	−47	−58	−52	−25	−11	− 3	− 4	− 3
1876 ...	−15	−10	− 9	− 7	−13	− 8	+ 9	+15	+37	+22	+39	+48	0	+ 1	0	− 6	−27	− 4	− 3	−22	−20	−10	− 6	−12
1877 ...	+19	+22	+17	+13	+12	−14	−23	−22	−41	−45	+ 9	+16	+28	+19	+17	+ 3	− 6	−13	−25	− 5	+ 4	+ 1	− 1	+18
1881 ...	− 6	+ 9	+ 7	+17	+20	+28	+18	− 6	− 9	−13	+36	+52	+18	− 8	−25	−20	− 9	− 2	−12	−22	−31	−15	−17	−11
1883 ...	+30	− 2	+37	0	+14	−20	−15	−22	−40	−22	−12	−17	−15	−18	−14	−36	−24	−11	+ 7	+25	+23	+51	+58	+24
1884 ...	+ 3	+ 2	− 2	−12	−17	− 6	− 5	− 5	0	+10	+ 7	+44	+ 4	+ 5	− 7	−32	−27	−31	+ 1	+ 4	+23	+15	+17	+ 9
1885 ...	+15	+10	+13	+11	+34	+30	+18	+ 4	+ 5	+17	−48	−30	−39	−31	−24	−18	− 10	− 7	−11	− 2	− 2	+24	+31	+10
Mean ...	+11	+12	+10	+ 3	+ 3	− 2	− 1	− 3	+ 5	+ 8	− 4	+ 6	− 3	− 5	− 9	−15	−18	−13	−10	− 3	+ 1	+10	+12	+ 6
											Five-eighth Phase.													
1873 ...	+ 1	+ 2	+14	−17	−16	−24	−53	−48	+ 9	− 9	+81	+64	+55	−21	+ 1	+10	−42	−10	−24	− 1	+18	− 6	+27	−12
1874 ...	− 4	−24	−33	−28	−35	−10	+ 4	− 8	+13	−28	+38	+56	+43	+14	−17	−11	− 1	− 1	+ 4	+24	−15	−12	+33	0
1875 ...	−26	− 4	+10	+20	+18	+15	−11	−30	−53	−36	+42	+27	+40	+19	−45	−18	+ 6	−11	− 1	+ 9	+ 9	− 8	+14	+16
1876 ...	−21	−20	−21	−12	−24	−31	−39	−31	−11	− 1	+42	+53	+48	+36	+ 9	+ 1	+14	+20	+12	+14	− 4	−16	− 6	−16
1877 ...	−18	−26	−17	−11	+11	− 4	−12	− 7	+20	+16	+ 8	+ 4	+ 5	+10	−10	− 8	−13	− 9	− 4	+13	+17	+31	+23	−21
1881 ...	+24	+20	+14	+14	+17	− 7	− 8	−11	−22	− 3	−35	−36	−45	−31	−20	− 6	+ 6	+11	+11	+16	+30	+22	+30	+22
1883 ...	− 4	+10	−23	− 9	+11	− 6	+21	+38	+53	+33	−56	−47	−31	− 4	+ 7	+10	+ 7	−13	+ 8	+10	+ 8	−14	−10	− 1
1884 ...	+ 5	+13	+18	−12	− 1	− 2	+ 5	−20	−15	−20	−39	−49	−39	− 1	+18	+15	+20	+15	0	+20	+17	+15	+16	+20
1885 ...	−35	−28	−25	−15	−25	−31	−10	+ 8	+30	− 3	+10	+17	+ 6	+21	+38	+33	+32	+36	+23	+17	−16	−11	−40	−30
Mean ...	− 9	− 6	− 7	− 8	− 5	−11	−11	−12	+ 3	− 6	+10	+10	+ 9	+ 5	− 3	+ 3	+ 3	+ 4	+ 3	+14	+ 7	0	+10	− 2
											Last Quarter.													
1873 ...	+27	+ 7	+16	+20	+17	+36	+49	+16	− 2	−43	−75	−43	−72	−70	−37	−16	+ 5	−10	+26	+37	+13	+31	+38	+33
1874 ...	−32	−40	−40	−34	−32	−27	−21	−20	+ 6	+40	+32	+58	+39	+38	+58	+35	+18	− 7	−20	−15	−15	− 6	−17	0
1875 ...	−11	−17	−16	−16	−14	− 9	−16	− 2	+21	+39	− 3	+20	+10	+14	+19	+ 6	− 3	+11	+ 2	− 3	− 5	− 7	−12	−13
1876 ...	− 5	+ 4	− 1	0	+ 6	+ 9	+ 4	+11	0	− 1	+ 6	− 9	+16	+21	+ 7	0	+ 1	−10	− 1	− 6	− 7	−12	−19	−15
1877 ...	+11	+ 4	− 8	0	− 4	0	− 8	−19	−16	−16	−39	−29	−22	− 8	− 2	+14	+ 8	+14	+16	+26	+26	+21	+16	+10
1881 ...	+ 2	+ 8	− 4	− 7	− 3	− 1	−10	−18	−33	−37	−14	−37	− 8	+15	+18	+14	+24	+16	+23	+19	+ 9	+ 6	+10	+ 6
1883 ...	− 4	−21	−33	−32	−21	−36	−29	0	+26	+48	+93	+73	+73	+27	+21	+27	+ 5	+ 1	−28	−31	−20	−42	−58	−38
1884 ...	+ 2	+ 4	+12	+16	+ 8	+24	+16	−12	−17	−23	−26	−14	+ 9	− 7	+ 6	+ 2	+19	+ 8	+ 1	+ 1	− 3	− 7	− 5	−14
1885 ...	−26	−17	−15	−14	− 8	−14	−16	−15	− 1	+11	+15	+33	+46	+31	+28	+14	+ 1	+ 3	+10	0	− 2	−17	−20	−24
Mean ...	− 4	− 8	−10	− 7	− 6	− 2	− 3	− 7	− 2	+ 2	− 1	+ 6	+10	+ 7	+13	+11	+ 9	+ 3	+ 4	+ 3	0	− 4	− 7	− 6
											Seven-eighth Phase.													
1873 ...	+ 1	+12	+19	+17	+31	− 1	+ 6	−18	− 89	−33	−25	−32	−18	+ 1	+13	+17	+ 8	+35	+47	+20	+ 8	+22	−27	−10
1874 ...	−21	−16	−22	−10	−14	−15	−27	−17	−23	−22	+24	+30	+42	+19	+24	+28	+16	+30	− 4	− 9	−17	+ 3	+ 2	− 5
1875 ...	+11	+ 3	−11	−15	−15	− 5	+ 2	− 3	+12	+ 3	+13	+ 4	− 8	−11	+ 2	+ 6	− 1	+ 5	+ 1	− 3	+ 2	0	− 4	+ 8
1876 ...	+25	+18	+21	+25	+23	+24	+21	+12	−15	−34	−45	−60	−47	−40	−31	−13	+ 8	+16	+15	+21	+21	+16	+13	+ 6
1877 ...	− 8	−13	−11	−14	−21	− 7	−12	−17	−16	−17	+ 8	− 1	− 9	+ 3	+24	+36	+49	+ 6	− 9	− 5	+ 3	+30	+ 1	+ 4
1881 ...	+ 9	− 2	−13	−19	−13	−12	+ 6	+12	+17	+14	−50	−58	−40	−29	− 9	−24	−11	+ 9	+34	+44	+40	+36	+39	+20
1883 ...	+10	+ 8	− 7	+ 5	+14	+38	+41	− 9	− 9	−34	+19	−25	−30	−46	−18	−10	−21	+12	+10	+13	+ 6	+ 6	+10	+16
1884 ...	− 4	−21	−35	−18	−10	−25	−20	− 7	−26	−37	−27	−45	−45	−10	+13	+37	+50	+58	+45	+41	+29	+22	+20	+14
1885 ...	+ 5	+18	+27	+36	+18	+34	+20	+ 3	−16	−15	−11	−31	−30	−34	−43	−34	0	+ 3	+18	+11	+ 1	+ 8	+ 8	+ 2
Mean ...	+ 3	+ 1	− 4	+ 1	+ 1	+ 3	+ 4	− 5	−18	−19	−10	−24	−21	−16	− 3	+ 5	+11	+19	+17	+15	+10	+16	+ 7	+ 6

CHAPTER XIII.

THE ABSOLUTE PHENOMENA FROM DAY TO DAY.

1.—Daily Means of Horizontal Force.

531. We have examined the absolute values of force from year to year, in their secular progression as also from month to month in their seasonal variation. Their march from day to day in all details needs next our consideration.

The data dealt with appear in table 520 which gives for the period* 1894—1905 the departures of each day's mean shown in tables 61 to 72 from the mean value of the month.

532. The examination of this table in the first instance shows, as remarked elsewhere, that the daily departures of absolute force are not symmetrically distributed on both sides of the mean, the negative departures being much larger than the positive. The mean value of force for the month under the circumstances can scarcely be regarded as the most probable value of the element, and the most prevailing value of the daily mean† would apparently hence lie on the positive side of the mean. It may be of interest therefore to analyse the data and find this 'median' which, it will be seen presently, would also prove otherwise useful in the discussion. The data in table 520 considered for the period of 11 years 1894—1904 divided into 8 convenient groups with their respective frequencies are shown below, as recopied from table 522 in paragraph 536 :—

	Positive Departures.				Negative Departures.			
Unity = 1γ.	> +29·5.	+29·5 to +19·6.	+19·5 to +9·6.	+9·5 to 0.	0 to −9·5.	−9·5 to −19·5.	−19·6 to −29·5.	> −29·5.
Numbers of days in 1894 ...	17	45	66	91	69	26	23	28
1901 ...	0	0	13	189	134	25	3	1
The average of 1894—1904 ...	2	12	52	142	102	33	12	10

To find the median the variates are grouped into three divisions. The middle group is 0 to +9·5γ, the other two being the sums of the variates on each side of the central division. The abscissal distance of the median 'm' above the lower limiting value of the central division, namely 0, in this case equals $\frac{365}{2}$ less the sum of the negative variates multiplied by the total range of the central division which is 9·5, and finally divided by the number of variates in the central division. In the classification, days with zero departures have been divided equally into adjacent positive and negative divisions, half the number being considered positive and the other half negative.

The value of the median for the 11 years thus works out at +1·7γ from the mean of all days. In the year 1894, which is characteristic of great magnetic activity, it stands higher by +3·9γ, while in 1901, the year of minimum disturbance, the value approaches nearest to the all-day mean, the difference being only 1·0γ. We have seen in paragraph 464, Chapter XI, that the difference of the mean values of Horizontal force derived from all days and from the five selected quiet-days of the Astronomer Royal is shown to be +0·9γ for the year 1901. Thus when disturbances reach their lowest minimum limit, the quiet-day mean tends nearly to approximate to the median and the most frequent value of the daily mean in the year then is that of the quiet-day. Examining now the average conditions obtaining in the period of 11 years, we find that the median stands 1·7γ higher and the mean of the quiet-day 4·9γ higher than the mean of all-day. In 1894 when the disturbance activity is at its maximum, the median and the mean of the quiet-day stand respectively 3·9γ and 11·8γ higher than the mean of all-day. In these shifts however it is really the mean of all-days which is affected and moves away from the ever unattainable limiting condition of absolute cessation of disturbance when the mean, the median and the quiet-day mean all fall coincident together.

533. So far we see that the position of the quiet-day in the phenomenon is fairly well defined. It fully bears out the stipulation previously made, that in the selection of quiet-days, the consideration of the additional factor which requires the mean of the selected days to stand higher, if possible, than the mean value of the month, clearly offers an advantage. The mean departure of the quiet-day from its own

* Data of four additional years 1890—1893 have been included in the table. They are not nearly so accurate as the data for 1894—1905, as they are corrected only for the mean instrumental creep, the temperature correction being omitted. As, however, the temperature of any day in the month rarely exceeds the mean of the month by 0°·5 F., the correction in extreme cases is always less than 2γ.

† Considering that data of 11 years only have been discussed, the probable errors of all the means referred to in the chapter would be appreciably large but not such as seriously to affect the results indicated.

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1890 and 1891.*

Unity = 1γ = ·00001 C. G. S.

1890. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 5	+ 7	+12	− 4	+ 3	+ 1	− 2	+12	**+18**	**+20**	− 2	− 8
2 ...	+ 5	+ 4	+ 6	− 3	+ 6	**−22**	+ 1	0	+13	+11	− 9	− 4
3 ...	**−16**	− 5	+ 5	+ 3	+ 6	−20	+ 3	+13	+ 1	+15	+ 5	− 3
4 ...	− 7	− 6	+ 3	+ 6	− 5	−10	+ 4	+10	+ 7	+16	+14	− 6
5 ...	− 4	− 1	+ 6	+ 7	**−23**	− 7	+ 7	+ 9	+ 6	+ 6	+ 5	**−15**
6 ...	− 8	+ 1	+ 5	0	− 9	+ 5	+ 9	+11	+ 7	− 9	**+16**	− 9
7 ...	− 9	+ 4	+ 9	− 4	− 8	+ 1	+ 6	+ 6	− 2	+ 3	0	− 8
8 ...	− 1	+ 3	+ 5	− 8	− 2	+ 5	− 4	+ 7	+ 3	−12	**−40**	−10
9 ...	+ 2	+ 2	− 1	− 1	+ 5	+ 2	+ 2	+ 2	+ 7	−12	−19	−10
10 ...	+ 5	+ 9	+ 6	− 1	+ 2	− 2	+ 7	+ 1	+ 5	−14	−12	− 1
11 ...	− 2	+ 8	+ 1	0	+ 2	+ 5	+ 1	+ 3	−20	− 5	− 2	− 1
12 ...	+ 3	**−12**	− 2	+ 6	+ 4	− 4	− 3	+ 9	**−25**	− 9	0	+ 8
13 ...	**+10**	− 2	− 9	+ 1	+ 5	+ 1	− 3	+ 9	−14	− 6	− 4	+ 3
14 ...	− 2	− 2	− 2	− 2	+ 1	+ 7	+ 1	+ 5	−10	− 1	− 3	+ 8
15 ...	− 6	−10	0	− 1	− 4	− 2	− 4	−11	− 8	− 6	− 4	+ 8
16 ...	− 2	− 6	**−19**	0	+ 5	+ 2	+11	−12	−10	− 2	+ 3	+ 5
17 ...	− 5	− 1	−10	− 1	+ 1	+ 2	− 9	−15	− 9	+ 9	− 2	+ 3
18 ...	− 6	− 9	−17	+ 8	0	+ 3	−10	−15	+ 2	**−18**	0	+ 5
19 ...	− 7	−10	− 9	+ 3	0	+ 8	**−10**	− 9	+ 9	−14	+ 2	+11
20 ...	− 5	−10	− 4	− 4	+ 4	**+15**	−10	**−17**	+ 4	− 1	+ 7	**+13**
21 ...	0	− 1	− 2	− 7	− 7	0	− 8	−10	− 1	+ 2	0	+ 4
22 ...	+ 1	+ 2	− 6	− 8	− 6	− 6	− 4	− 7	− 3	+ 2	+ 9	+ 1
23 ...	+ 2	+ 6	− 6	**− 9**	**+ 9**	− 5	− 4	− 5	+ 1	+ 4	+ 8	− 5
24 ...	+ 6	+ 4	+ 2	− 7	+ 5	+ 1	− 7	− 6	+ 6	−16	+ 2	0
25 ...	+ 6	+ 5	+ 4	− 1	0	− 2	− 4	− 5	−16	+ 5	+ 8	− 2
26 ...	+ 7	**+13**	+ 7	+ 1	− 6	+ 1	− 4	−11	+ 9	+ 2	0	+ 2
27 ...	+ 9	− 2	0	**+10**	− 3	+ 3	+ 1	− 1	+10	−10	+ 1	+ 4
28 ...	+ 8	+ 7	0	+ 8	+ 4	− 1	+ 2	− 1	+ 9	+ 3	+ 3	+ 7
29 ...	+ 4		0	+ 9	+ 5	+10	+10	+ 6	− 4	+10	+14	+ 5
30 ...	+ 6		+ 4	0	+ 3	+ 9	**+13**	**+14**	+ 5	+14	+ 1	− 2
31 ...	+ 9		**+14**		+ 4		+12	+ 7		+13		− 2
Sums without regard to signs.	168	152	176	123	147	162	176	249	244	270	195	173

Unity = 1γ = ·00001 C. G. S.

1891. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 1	− 5	+17	−12	+24	+ 2	+11	**+22**	− 6	− 7	+ 3	− 2
2 ...	− 2	+ 5	−14	− 4	**+30**	+ 5	+ 5	+ 8	−10	− 18	+ 5	+13
3 ...	+ 3	+15	−14	+ 3	+ 8	+ 1	− 9	−16	+ 5	− 8	+ 2	+11
4 ...	+ 8	**+17**	−20	+ 9	+12	− 7	−16	− 4	−12	− 1	+ 2	+ 5
5 ...	**+12**	+13	−12	+11	+23	+ 7	− 1	− 1	+ 6	+ 3	− 5	+11
6 ...	+ 4	− 1	− 6	+17	+ 5	− 8	−12	+ 3	+11	+10	+11	+ 9
7 ...	+ 5	+ 7	− 2	+ 9	+ 7	− 2	−12	+ 8	+12	+ 4	+ 5	**−44**
8 ...	+ 8	+15	+ 3	−24	+ 6	+ 4	− 8	+ 6	+15	+ 7	+11	− 3
9 ...	+ 9	+ 6	+11	−14	+13	+ 3	+ 3	+ 5	−18	0	**+22**	−26
10 ...	+ 6	− 5	+ 6	− 8	+ 5	+ 5	− 7	0	**−40**	−14	+13	−15
11 ...	+ 8	+ 1	+13	0	+15	+ 6	− 2	− 9	−37	+10	+12	−11
12 ...	+ 5	−19	− 2	− 9	+20	+ 5	+ 4	− 4	−18	+ 9	+15	− 3
13 ...	+ 5	−15	−13	−16	− 1	+11	+18	+ 4	0	+ 2	+13	0
14 ...	− 4	−23	− 4	− 8	−53	− 5	+ 8	+ 4	+ 9	+ 9	+ 9	− 3
15 ...	+ 8	**−37**	+ 2	− 5	**−77**	−15	− 1	− 4	− 4	+ 9	− 1	+ 3
16 ...	− 9	− 5	− 9	− 3	−44	**−18**	+ 2	− 8	+ 7	+13	+ 3	+ 8
17 ...	−18	− 5	− 2	**−45**	−26	− 4	**−43**	− 7	− 5	+18	+ 7	+11
18 ...	−16	− 3	− 2	−16	−13	+ 4	−13	+10	+ 8	**+21**	+ 2	**+23**
19 ...	**−24**	0	− 2	+ 3	−10	− 4	− 4	+ 9	+19	+ 3	+17	+ 7
20 ...	−14	+ 1	+ 3	+ 8	− 4	−10	− 3	− 2	+25	− 1	**−40**	+ 3
21 ...	−10	+ 6	+12	+ 6	− 2	− 5	+ 1	− 5	+18	+ 5	−33	−10
22 ...	− 8	+ 7	**+18**	+ 5	− 1	− 4	+11	+ 6	+22	+13	−15	−19
23 ...	+ 2	+ 4	+11	+ 9	+ 2	+ 5	**+14**	+ 6	− 6	+ 5	− 8	− 2
24 ...	− 7	+ 9	− 1	+10	+ 1	+ 4	−13	+ 7	+ 9	**+22**	− 5	+ 6
25 ...	− 2	+12	+ 2	+ 4	+ 2	+ 1	−11	+19	**+29**	−15	− 2	+ 7
26 ...	+ 5	+ 1	+ 6	+13	+13	− 8	+ 5	+ 8	− 1	−15	−16	+ 9
27 ...	+ 5	+ 1	+ 6	+14	+26	− 2	+ 9	+10	+13	− 8	−13	+ 4
28 ...	+ 3	− 1	+ 8	**+21**	+ 2	+ 5	+14	+16	−24	−10	− 7	+ 5
29 ...	+ 3		+10	+ 9	+ 9	+ 8	+14	**−50**	−15	−16	+ 1	+12
30 ...	+11		+ 2	+11	+ 4	**+11**	**+19**	− 23	− 8	− 5	+ 5	−10
31 ...	+ 6		**−21**		+ 7		+15	−16		− 2		+ 4
Sums without regard to signs.	231	239	254	326	465	179	308	300	420	283	303	299

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1892 and 1893.*

Unity = 1γ = ·00001 C. G. S.

1892. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 6	+ 32	− 30	+ 6	− 70	− 7	+ 5	+ 4	− 12	+ 6	+ 11	+ 6
2 ...	+ 18	+ 11	− 6	+ 9	− 41	+ 4	+ 6	+ 13	− 5	+ 9	+ 10	+ 17
3 ...	+ 21	+ 16	+ 4	+ 11	− 26	− 67	+ 20	0	− 3	+ 13	+ 18	+ 22
4 ...	+ 15	+ 17	0	+ 10	− 1	− 26	+ 17	− 26	+ 3	+ 4	− 9	− 3
5 ...	− 22	+ 15	+ 16	+ 19	+ 4	− 12	+ 23	− 9	+ 14	+ 3	− 64	− 81
6 ...	− 48	+ 16	− 39	+ 17	+ 1	0	+ 26	+ 3	+ 10	0	− 32	− 50
7 ...	− 28	+ 20	− 48	− 1	+ 5	+ 5	+ 30	+ 7	+ 6	+ 16	− 7	− 18
8 ...	− 23	+ 14	− 8	+ 19	− 23	+ 10	+ 34	− 29	− 1	+ 15	0	− 12
9 ...	− 4	+ 13	− 4	+ 1	+ 8	+ 9	+ 20	− 1	+ 5	+ 27	− 1	− 2
10 ...	+ 1	+ 29	+ 9	− 3	+ 4	+ 7	+ 12	+ 12	+ 15	+ 14	− 1	+ 8
11 ...	− 3	+ 25	− 8	+ 3	+ 16	+ 17	+ 20	+ 19	+ 11	− 19	+ 18	+ 14
12 ...	− 7	+ 28	− 80	+ 7	+ 24	+ 20	− 3	− 54	+ 12	− 30	+ 16	+ 4
13 ...	+ 3	− 139	− 43	+ 11	+ 30	+ 22	− 62	− 58	+ 9	− 37	+ 15	− 7
14 ...	+ 10	− 103	− 8	+ 11	+ 24	+ 25	− 49	− 18	+ 8	− 26	− 2	0
15 ...	+ 15	− 44	+ 11	+ 12	+ 30	+ 31	− 2	− 2	+ 5	− 24	− 2	+ 11
16 ...	− 2	− 13	+ 6	+ 17	+ 32	+ 7	− 12	+ 2	− 26	− 7	+ 11	+ 8
17 ...	− 9	+ 6	+ 20	+ 19	− 23	+ 11	− 50	+ 4	− 8	+ 1	− 18	− 1
18 ...	− 9	+ 8	+ 17	+ 20	− 78	+ 5	− 24	+ 10	− 3	− 28	− 17	+ 11
19 ...	+ 4	+ 7	+ 27	+ 22	− 54	+ 14	− 12	+ 19	+ 6	− 21	− 8	− 10
20 ...	+ 3	+ 10	+ 28	+ 23	− 3	+ 25	− 4	+ 19	+ 15	− 3	+ 5	+ 10
21 ...	+ 14	− 11	+ 20	+ 24	+ 3	+ 11	− 6	+ 7	0	− 2	+ 3	+ 12
22 ...	+ 10	+ 10	+ 30	+ 27	+ 8	+ 11	− 23	+ 13	− 30	− 6	− 1	+ 14
23 ...	+ 17	+ 17	+ 34	+ 21	+ 6	+ 15	+ 2	+ 19	− 15	− 1	+ 12	− 6
24 ...	+ 8	+ 4	+ 30	− 29	+ 18	+ 15	+ 7	− 6	− 10	− 3	− 2	+ 1
25 ...	+ 9	+ 6	− 4	− 32	+ 17	+ 5	+ 3	− 4	0	+ 4	− 2	+ 10
26 ...	+ 12	− 4	− 4	− 19	+ 26	+ 13	− 22	+ 3	+ 8	+ 12	+ 5	+ 8
27 ...	+ 15	− 15	+ 7	− 37	+ 22	− 89	0	+ 10	+ 11	+ 6	+ 12	+ 9
28 ...	+ 15	+ 6	− 4	− 26	+ 18	− 39	+ 12	+ 10	− 9	+ 20	+ 8	+ 7
29 ...	− 40	+ 19	+ 4	− 51	+ 18	− 21	+ 5	+ 12	− 14	+ 17	+ 9	− 5
30 ...	− 6		+ 12	− 25	+ 15	− 21	+ 17	+ 19	− 3	+ 17	+ 16	+ 6
31 ...	+ 3		+ 15		− 6		+ 10	+ 16		+ 25		+ 12
Sums without regard to signs.	400	658	576	532	654	564	538	428	277	416	335	385

Unity = 1γ = ·00001 C. G. S.

1893. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 10	+ 17	+ 20	+ 14	0	+ 22	− 16	+ 22	+ 12	+ 5	− 39	− 8
2 ...	− 7	+ 22	+ 10	+ 16	+ 8	+ 23	− 11	+ 17	+ 1	− 11	− 76	− 1
3 ...	0	− 11	+ 2	− 1	+ 13	+ 23	− 3	+ 32	+ 9	− 25	− 38	+ 3
4 ...	− 4	− 19	+ 1	+ 1	+ 11	− 11	+ 4	+ 28	+ 14	− 4	− 18	+ 10
5 ...	0	− 44	+ 12	+ 6	+ 11	− 10	+ 13	+ 19	+ 2	− 15	− 9	− 25
6 ...	− 17	− 26	+ 11	+ 11	+ 12	− 11	+ 13	− 15	− 14	− 10	− 5	− 11
7 ...	− 3	− 14	+ 15	+ 6	0	− 13	+ 11	− 85	+ 14	− 9	+ 5	− 1
8 ...	0	− 3	+ 8	− 1	− 9	0	+ 14	− 25	− 25	+ 4	+ 9	+ 2
9 ...	− 22	+ 4	+ 7	+ 9	− 32	+ 4	+ 18	− 9	− 28	+ 2	+ 5	− 4
10 ...	− 7	0	+ 15	+ 7	− 28	− 12	+ 13	+ 15	− 9	− 39	+ 5	+ 3
11 ...	− 11	+ 13	+ 7	+ 8	− 22	− 26	+ 19	+ 28	− 7	− 4	+ 12	+ 2
12 ...	− 1	+ 18	+ 13	− 23	− 19	− 9	+ 18	+ 16	+ 5	+ 2	+ 16	+ 3
13 ...	0	+ 33	+ 5	− 8	− 15	+ 11	+ 19	− 2	+ 12	0	+ 10	+ 5
14 ...	+ 5	+ 21	− 14	− 9	− 2	+ 13	− 7	0	+ 10	+ 6	+ 11	+ 5
15 ...	+ 13	− 25	− 32	− 7	− 8	− 12	− 7	− 1	+ 1	− 1	+ 14	+ 7
16 ...	+ 10	− 29	− 15	− 11	− 9	− 4	− 54	+ 15	+ 11	+ 6	+ 15	+ 3
17 ...	+ 26	− 17	− 3	− 1	+ 10	+ 10	− 24	+ 18	+ 2	+ 7	+ 1	+ 6
18 ...	+ 21	− 12	0	0	+ 4	+ 12	− 14	− 67	+ 3	+ 7	+ 3	+ 17
19 ...	− 8	− 6	+ 8	− 3	− 1	− 18	− 4	− 40	+ 7	+ 17	+ 15	+ 15
20 ...	+ 7	− 7	+ 10	+ 15	+ 5	− 17	+ 2	− 16	− 1	+ 18	+ 14	+ 17
21 ...	− 3	0	+ 13	+ 13	+ 9	− 8	− 4	− 9	+ 1	+ 18	+ 14	+ 19
22 ...	− 15	0	+ 11	+ 9	+ 12	+ 3	− 6	− 1	+ 13	+ 25	+ 24	+ 27
23 ...	− 3	+ 3	+ 13	+ 19	+ 9	+ 14	− 5	− 7	+ 14	+ 31	+ 15	+ 20
24 ...	+ 1	+ 8	+ 19	+ 10	+ 15	+ 14	− 6	+ 4	+ 13	+ 25	+ 19	− 21
25 ...	+ 1	+ 23	+ 3	+ 3	− 6	+ 14	− 5	+ 5	+ 17	− 35	+ 17	− 28
26 ...	− 4	+ 17	− 48	− 17	− 4	+ 21	+ 1	− 3	− 39	− 9	+ 6	− 4
27 ...	+ 3	+ 13	− 45	− 38	+ 3	+ 20	+ 3	+ 8	− 21	+ 11	− 11	− 22
28 ...	+ 12	+ 23	− 14	− 21	+ 6	+ 10	− 2	+ 10	+ 1	− 6	− 8	− 22
29 ...	0		− 23	− 5	+ 6	− 35	+ 6	+ 11	+ 8	− 13	− 21	− 5
30 ...	+ 4		− 7	− 3	+ 14	− 27	+ 5	+ 17	− 27	− 1	− 2	− 10
31 ...	+ 13		− 2		+ 10		+ 8	+ 18		0		− 5
Sums without regard to signs.	231	428	406	295	313	427	335	563	341	366	457	331

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1894 and 1895.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 1	+ 27	−51	−31	−27	+15	+ 33	+ 19	+21	− 5	+14	0
2 ...	+ 3	+ 12	−22	− 3	− 2	+ 5	+ 8	+ 23	+18	− 1	+19	+ 4
3 ...	−32	+ 5	−13	+ 3	+ 7	− 4	− 2	+ 29	**+24**	+ 4	+22	+ 5
4 ...	**−38**	+ 23	−17	+ 8	− 4	− 6	+ 14	+ 33	+22	**+16**	+27	+ 8
5 ...	−20	+ 30	+ 1	+ 4	+ 6	+ 6	+ 12	+ 25	+16	−18	**+38**	+ 4
6 ...	−12	+ 14	+ 9	− 9	+ 9	+13	+ 27	+ 21	+23	+ 4	+31	− 9
7 ...	−10	+ 14	+10	− 4	**+24**	**+20**	**+ 39**	+ 25	+ 9	+ 1	+24	− 7
8 ...	− 4	+ 25	+12	+ 1	+ 6	+20	+ 11	**+ 34**	+12	+ 9	− 3	− 7
9 ...	+10	+ 15	− 3	+13	+ 9	−13	+ 10	+ 24	+21	0	+14	− 9
10 ...	− 7	+ 19	+ 4	+14	+19	**−67**	+ 26	+ 34	+13	+ 5	+17	− 2
11 ...	+ 4	+ 30	+17	+22	+16	−27	+ 29	+ 26	+10	+ 9	+16	+12
12 ...	−12	+ 30	+24	+ 9	+16	− 9	+ 27	+ 24	+10	+14	+19	− 1
13 ...	− 5	+ 28	**+37**	−22	+10	− 2	+ 20	+ 24	+23	+15	**−78**	−12
14 ...	− 4	**+ 37**	+18	− 1	−18	+ 1	+ 29	− 3	−45	− 3	−63	− 9
15 ...	+ 8	+ 25	+ 7	+12	−24	+ 7	+ 32	− 1	**−55**	+ 1	−22	**−32**
16 ...	+15	+ 9	+ 6	+15	−14	+ 6	+ 30	+ 11	−12	**−32**	−28	−28
17 ...	+17	+ 30	+ 7	−29	− 9	+ 2	+ 8	+ 20	+ 1	−22	−13	− 4
18 ...	+14	+ 34	+ 6	**−46**	− 3	0	− 1	+ 24	+ 4	−12	−29	0
19 ...	**+22**	+ 15	+12	−16	+ 1	+ 2	− 7	+ 13	−31	−12	−23	0
20 ...	+21	+ 22	+21	− 7	− 6	+ 6	**−142**	**−230**	−38	− 2	− 1	+ 9
21 ...	+15	− 57	− 2	−11	− 6	−19	− 84	− 69	−17	− 1	+15	− 4
22 ...	+ 5	− 21	−25	−11	− 3	−26	− 36	− 29	−28	+ 6	+17	− 5
23 ...	+ 7	− 73	− 6	− 1	− 2	− 9	− 19	− 15	−10	+ 4	−16	+ 1
24 ...	+ 3	− 60	+ 9	0	+ 4	+ 9	− 13	− 23	− 7	+ 6	−20	− 1
25 ...	+16	**−119**	+ 7	+ 4	+ 1	+ 9	− 23	− 10	− 5	+ 5	0	+ 4
26 ...	− 8	− 46	+ 7	+ 6	+ 9	+14	− 20	− 24	+ 2	−12	+ 7	+12
27 ...	+ 2	− 2	+12	+13	+22	+14	− 6	− 4	+ 3	− 5	+12	**+18**
28 ...	+ 4	− 62	+20	+20	− 9	+ 4	− 5	− 3	+10	+ 4	+ 2	+16
29 ...	+ 2		+25	**+31**	− 7	+ 6	− 2	0	+20	+ 7	+ 1	+10
30 ...	0		−50	+ 4	− 6	+10	+ 2	+ 3	− 3	+ 5	+11	+12
31 ...	− 2		**−84**		**−33**		+ 7	+ 6		− 1		+12
Sums without regard to signs.	323	884	544	370	332	351	724	829	513	241	602	257

Unity = 1γ = ·00001 C. G. S.

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 4	0	+14	+ 1	+ 8	− 8	−12	+11	+21	−20	+ 3	− 3
2 ...	**−27**	−23	+ 4	+ 7	+ 2	−22	− 8	+ 9	+33	− 6	− 6	+ 1
3 ...	−13	+ 4	+ 2	+ 6	0	**−28**	− 2	+11	**+40**	− 3	+ 6	+ 4
4 ...	− 6	+26	+ 6	+14	+ 9	−25	+ 5	+13	−30	−14	+ 2	+ 5
5 ...	+12	+15	+ 7	− 4	+ 1	−15	+11	**+19**	−28	− 8	+ 3	+10
6 ...	−14	−10	+ 3	+ 1	+ 5	−13	**−35**	+ 5	−24	− 1	+15	**+20**
7 ...	+ 5	+ 2	+12	+ 6	−15	−21	+ 4	+ 8	−14	+ 7	+22	+ 9
8 ...	+ 5	− 5	+ 3	+18	−10	− 1	+ 1	+12	− 8	+ 1	+ 7	**−27**
9 ...	− 5	−14	−13	+ 4	− 5	−11	+11	−11	− 2	+ 6	−29	−11
10 ...	− 6	−17	+ 3	+ 8	**−16**	0	+ 9	**−53**	− 4	+20	**−37**	− 9
11 ...	− 2	+ 2	+11	**−42**	−11	−11	+22	−37	+ 4	**+28**	−19	−12
12 ...	+ 4	+12	**+21**	−26	+ 3	− 3	+ 2	−31	+ 3	0	−10	− 5
13 ...	+ 4	+10	−22	− 7	− 9	+ 5	−17	−13	+16	**−33**	−12	+ 2
14 ...	+ 7	0	**−40**	− 7	−16	+ 4	−18	−12	+19	−10	− 2	+ 5
15 ...	+13	−15	−15	− 5	− 8	**+26**	−10	−11	−13	− 3	− 1	− 1
16 ...	− 1	**−27**	−10	−14	+ 4	+22	− 4	−10	−10	+ 4	+ 2	+ 2
17 ...	−16	−12	−15	− 9	− 7	− 6	− 6	+ 4	0	−23	+13	− 2
18 ...	− 3	− 4	− 8	−10	−10	− 1	− 2	−22	+ 5	+ 1	+12	+ 5
19 ...	−17	0	− 7	− 1	+ 7	+ 5	0	− 7	− 2	+ 8	+16	+ 5
20 ...	−13	0	−10	− 7	+ 7	+ 6	0	+13	− 7	+14	+23	+15
21 ...	−11	+ 7	− 6	+ 3	+ 7	+21	+ 1	+ 7	+ 2	+14	+19	+10
22 ...	− 5	+14	− 1	+18	+ 5	+ 8	+ 4	+11	+ 2	+18	**+27**	− 9
23 ...	+ 4	+20	− 4	+ 9	+11	0	+ 4	+17	+ 8	+19	−15	− 9
24 ...	− 2	−25	+14	0	+16	− 3	+ 8	+ 3	+ 7	+21	−33	−25
25 ...	+ 8	− 6	+12	+ 9	+11	+ 7	**+24**	+ 3	− 2	+26	− 5	−15
26 ...	+19	+20	− 3	− 2	+15	+17	+ 5	+ 1	+ 4	+26	+ 5	− 6
27 ...	+16	**+31**	− 5	− 2	**+21**	+26	− 3	+ 7	+ 9	−28	+ 6	− 2
28 ...	**+20**	− 2	+11	+ 5	+12	+19	− 3	+ 9	+10	−26	− 5	+ 2
29 ...	− 3		+19	+ 9	−10	+ 4	− 5	+ 5	+16	−24	− 2	+ 7
30 ...	+ 9		+ 6	**+20**	−13	− 7	+ 1	+15	**−55**	−16	+ 4	+ 6
31 ...	+13		+ 2		−14		+16	+ 9		−10		+11
Sums without regard to signs.	287	323	309	274	288	345	253	399	398	438	361	255

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1896 and 1897.*

Unity = 1γ = ·00001 C. G. S.

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+23	-14	-12	+ 2	+19	- 2	+ 2	+ 8	+ 4	+ 9	+12	+ 9
2 ...	+17	-20	+ 4	0	-73	+ 8	+ 5	-16	+ 9	+ 2	+16	+11
3 ...	-11	-11	+ 2	- 4	**-96**	+10	+ 6	- 9	+13	0	+15	- 6
4 ...	-12	**-23**	- 37	-12	-28	+ 3	- 6	- 3	+ 7	+ 6	+ 5	**-49**
5 ...	-11	-21	- 29	-22	- 1	- 1	- 5	+ 9	+ 7	+11	+ 8	-29
6 ..	- 8	- 7	- 10	-12	+10	- 1	- 3	+13	+ 5	+13	-34	-20
7 ...	-11	+ 1	- 20	+ 4	- 4	+ 3	+ 3	-14	+10	+18	**-45**	-17
8 ..	- 2	- 7	- 10	+ 9	+ 9	+12	- 7	- 1	+20	+ 8	-40	-10
9 ...	**-18**	- 1	+ 1	- 4	+17	-10	0	0	**+24**	- 6	-25	-10
10 ...	-13	+ 3	+ 8	+10	+14	- 9	+12	- 3	+19	- 4	-19	- 3
11 ..	- 4	+ 1	+ 18	+11	+21	- 2	- 7	+ 3	+20	-15	- 9	- 3
12 ...	+ 1	+ 3	- 21	+15	+13	+ 1	**-30**	+ 4	+10	**-57**	- 1	+10
13 ...	- 4	+14	- 4	+15	+18	+10	-10	+ 8	+ 2	-28	- 7	-11
14 ...	+ 1	- 8	- 8	+20	+20	+ 3	- 5	+16	+16	-16	- 8	-17
15 ...	+ 7	- 1	0	+11	+16	-10	- 4	+10	+15	-12	- 7	-11
16 ...	+15	+ 7	+ 6	+21	+23	-16	- 5	+13	- 1	-20	+ 8	- 6
17 ...	- 7	+ 2	+ 9	+11	+ 6	**-17**	- 1	**+24**	- 1	-12	+15	+ 4
18 ...	+ 1	+ 9	+ 19	+ 2	-27	-14	+ 6	0	**-82**	- 5	-11	+11
19 ...	-12	+ 7	+ 20	+13	-22	- 7	+ 6	+11	-32	- 9	- 2	+11
20 ...	-13	+10	+ 4	**+22**	-11	- 4	+10	+ 6	-53	+ 1	+12	+15
21 ...	- 1	+11	+ 18	- 2	- 6	- 5	+ 9	**-50**	-29	+ 1	+ 4	+16
22 ...	0	+ 9	+ 28	-27	- 6	- 1	+ 8	-19	- 9	+ 7	+ 7	**+23**
23 ...	+ 6	+13	+ 24	**-29**	- 4	+ 4	**+20**	-18	-14	+ 2	+12	+ 2
24 ...	+ 4	**+27**	**+ 32**	-22	- 2	+10	- 2	- 7	-18	+10	+13	+10
25 ...	+ 2	+23	+ 7	-19	- 2	+11	-15	- 8	- 1	+14	+20	+14
26 ...	+ 7	+19	- 23	-14	+ 8	+11	- 8	- 1	+ 8	+17	**+24**	+18
27 ...	+ 5	-12	- 17	- 4	+ 4	- 4	- 7	- 1	+ 3	+13	+16	+11
28 ...	+20	-17	- 17	- 2	+22	- 2	- 2	+ 4	+20	+19	+12	+ 7
29 ...	**+39**	-16	- 3	- 4	**+28**	**+16**	+ 8	+11	+14	**+25**	+ 9	+11
30 ...	- 7		+ 8	+ 8	+18	+ 7	- 1	+ 4	+15	+ 7	-15	+10
31 ...	- 3		- 2		+14		+ 9	+ 6		+ 2		+10
Sums without regard to signs	285	317	421	351	562	214	222	300	481	369	431	395

Unity = 1γ = ·00001 C. G. S.

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+13	+ 3	+ 8	- 6	+ 8	0	+ 9	**-26**	+ 4	+ 5	0	+12
2 ...	**-100**	+ 9	+ 3	-15	0	+ 5	+13	-12	+ 7	- 8	- 7	+14
3 ...	- 44	-10	- 8	**+19**	+ 2	-23	+ 4	- 2	+10	- 1	+ 1	+23
4 ...	- 20	-21	**-30**	+ 8	+ 3	-13	+ 3	- 2	+ 3	+ 3	+10	+20
5 ...	- 9	- 9	-26	+ 4	+10	- 2	+ 5	+ 3	-11	+ 3	+ 6	+16
6 ...	- 3	+ 1	-11	- 1	+ 1	+ 3	+11	+ 8	- 3	- 1	- 3	+17
7 ...	+ 10	-17	- 1	+ 1	+ 6	+ 2	+ 4	**+15**	+ 3	0	+ 6	+20
8 ...	+ 3	- 8	-25	+10	+10	+ 5	+ 2	+13	+ 5	+ 5	+ 4	+25
9 -	+ 12	0	-15	+12	+16	+11	+10	+ 7	- 5	**+15**	- 2	**+28**
10 ...	+ 12	- 1	- 4	- 6	+20	+14	**+17**	+ 2	+ 5	- 5	+ 7	+ 5
11 ...	- 11	+ 3	- 7	+13	+ 7	+ 8	+ 1	+ 4	**-21**	-12	+ 8	**-50**
12 ...	- 9	+ 3	0	+18	+17	+16	+ 3	+ 3	-15	-10	+ 9	-31
13 ...	- 12	+ 2	-10	+ 6	**+28**	**+20**	0	- 2	+ 1	- 2	**+12**	-13
14 ...	+ 2	- 5	+ 1	- 5	- 6	+11	+ 7	- 9	-16	+ 3	- 5	- 3
15 ...	- 10	- 2	+ 4	+10	- 6	+12	- 3	+ 2	- 5	+ 5	- 4	+ 1
16 ...	+ 2	+ 5	+10	+ 7	+ 2	- 6	- 4	- 1	- 2	+ 3	+ 1	+ 6
17 ...	- 1	+ 4	+11	+ 2	**-30**	-32	- 3	- 3	+ 8	+ 1	**-26**	+ 5
18 ...	+ 11	+ 9	+ 8	+ 4	0	-17	+ 2	-10	+11	**-22**	-11	+ 1
19 ...	+ 12	+12	+10	+16	- 6	-13	+ 6	- 3	+10	- 7	- 7	+12
20 ...	+ 12	**+19**	+11	**-49**	- 6	- 8	+ 2	-14	+ 1	0	-10	-47
21 ...	+ 16	+ 3	+13	-17	-29	- 3	- 1	- 5	+ 2	+10	- 3	-27
22 ...	+ 21	+ 6	+11	+ 8	-15	- 7	-18	+ 3	+ 1	+13	- 6	-16
23 ...	+ 19	- 1	- 3	-18	-12	- 4	- 7	+ 4	- 9	+ 6	+ 7	- 3
24 ...	+ 10	+ 8	+ 7	-15	-11	- 1	- 2	- 1	-13	+ 9	0	- 5
25 ...	+ 4	+18	+ 6	-10	- 7	+ 4	+ 1	- 1	- 4	+ 7	- 3	- 6
26 ...	+ 11	-10	**+14**	- 8	- 2	+ 8	+ 4	- 7	- 1	+ 6	- 1	+ 2
27 ...	+ 11	**-26**	+14	- 3	+ 5	+ 3	- 1	- 2	+ 1	+ 9	+ 1	+ 7
28 ...	+ 17	- 3	+13	+ 3	+13	+ 3	0	+ 1	**+12**	- 1	+ 1	+18
29 ...	+ 7		- 5	+ 6	+14	+ 2	+ 5	+ 8	+ 8	- 9	+ 6	-19
30 ...	+ 5		- 5	+ 6	-20	+ 6	+ 1	+ 5	+ 5	-10	+10	- 5
31 ...	+ 5		- 4		- 7		**-58**	+ 8		+ 1		-14
Sums without regard to signs.	434	218	298	306	319	262	207	186	202	192	177	471

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1898 and 1899.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	−16	+11	+ 28	+ 6	0	−12	− 3	+12	+25	−10	+ 3	+ 3
2	− 5	+11	− 16	+10	− 4	−14	+ 2	0	+19	− 3	+ 5	+ 5
3	− 4	+ 5	+ 6	+15	+ 2	− 7	+ 4	−14	− 6	+ 3	0	− 2
4	0	+16	+ 17	− 7	−30	− 4	+ 6	− 1	+10	+ 8	− 5	− 1
5	+ 4	+ 7	+ 14	− 1	−18	+ 1	− 3	0	+10	+ 9	+ 2	+14
6	+ 4	− 6	+ 3	− 5	− 9	+ 9	− 4	− 2	+18	+21	+ 6	+17
7	+ 7	+ 4	+ 16	−36	−10	− 7	− 6	+ 3	+37	+ 2	+ 2	− 6
8	+10	+10	+ 17	−16	− 8	− 8	− 6	+ 5	+37	+ 3	+ 9	+ 5
9	+ 9	+10	+ 22	− 9	− 4	− 1	− 3	+10	−62	+ 5	− 9	− 4
10	− 2	+21	+ 21	− 5	+ 2	+ 3	+ 5	+11	−97	− 2	0	− 1
11	−16	−16	− 7	− 3	+ 2	− 3	+ 7	+14	−50	+ 8	+ 1	+ 5
12	− 2	−21	+ 3	−46	−10	− 2	+ 5	+ 9	−25	+10	+10	+15
13	− 2	− 9	+ 9	−16	− 3	0	+ 3	− 4	−11	+ 7	+ 8	+15
14	+ 8	−24	+ 14	−17	+ 4	+ 4	+ 2	+ 8	−25	+ 4	+ 8	−20
15	+ 6	−18	− 64	− 5	− 7	+ 3	+ 2	+16	− 4	+14	+11	−10
16	− 9	−16	− 69	− 3	− 3	+ 1	+ 6	− 3	+13	+ 7	+16	−19
17	−11	−12	− 27	− 2	+ 1	+ 6	+ 4	−21	+ 9	+10	− 5	−17
18	− 9	− 7	− 14	+ 2	+ 9	+12	+10	− 9	+ 3	+10	−11	− 3
19	− 8	+ 2	− 16	+ 7	+11	+ 9	+20	− 4	+ 7	+21	+ 3	− 5
20	− 3	+ 5	− 13	+ 4	+ 8	+ 9	−11	− 4	+14	− 5	+ 9	− 8
21	− 6	− 6	− 6	+10	+ 7	+10	− 1	− 6	+11	− 3	− 8	− 2
22	− 2	− 8	− 2	+13	+18	+22	− 5	− 5	+23	−11	−35	− 6
23	+ 3	+ 3	0	+10	+12	− 1	− 8	− 2	+12	− 4	−17	− 2
24	+10	+ 1	+ 1	+17	+11	+ 6	−10	+ 1	+ 3	+ 4	− 4	+ 2
25	+11	+ 3	− 2	+ 8	+15	+10	−13	+ 2	+ 6	−17	− 4	+ 4
26	+ 5	+11	+ 10	+11	+19	−12	− 7	+ 8	+17	−14	− 8	+ 9
27	+ 5	+11	+ 12	+20	+16	−14	+ 2	0	+19	− 7	− 8	+11
28	− 3	+11	+ 13	+11	− 1	+ 2	− 5	−13	− 9	−11	+ 3	0
29	+ 3		+ 7	+16	+ 1	− 5	− 2	− 3	−12	−34	+ 1	+ 5
30	+12		+ 4	+15	−20	− 7	+ 9	− 2	+ 3	−20	+ 5	+ 4
31	+11		+ 16		−12		+ 4	+10		−12		+ 2
Sums without regard to signs.	206	285	469	346	277	204	178	202	597	299	216	222

Unity = 1γ = ·00001 C. G. S.

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+10	+ 1	− 3	+ 8	− 7	− 7	−25	+13	0	− 4	+ 1	+ 1
2	+ 8	− 1	+ 7	+10	−20	− 8	−19	+15	− 2	− 2	+ 5	− 6
3	− 2	+ 2	+ 3	+12	0	− 9	−29	+ 6	0	− 2	+ 5	− 1
4	− 7	+ 7	+ 7	+ 5	−27	− 4	−20	− 8	0	+ 3	−13	+ 1
5	− 8	+12	+ 10	+ 3	−37	− 2	−12	+ 1	0	+ 6	− 8	+ 3
6	0	+19	+ 15	+11	−12	+ 4	− 5	+ 2	− 2	− 6	− 6	+10
7	+ 4	+23	+ 1	+ 5	− 3	+ 6	0	− 6	+ 1	− 3	+ 1	− 3
8	+ 9	+14	+ 11	+ 8	+ 3	+11	− 5	− 4	+ 7	+ 1	+ 2	−12
9	+11	+ 6	+ 12	+ 5	+ 3	+13	− 1	+ 1	+ 5	+ 4	+ 2	− 7
10	+11	+18	+ 3	+ 3	+ 9	+10	+ 5	− 7	− 3	+ 6	+ 8	+ 1
11	+10	+23	− 1	0	+ 7	+ 3	− 3	− 2	+ 6	+ 5	+ 1	+ 9
12	+ 4	−74	+ 2	+ 2	− 1	+ 4	− 4	+ 5	+ 5	+10	0	+ 4
13	+ 6	−23	− 5	+ 6	+10	− 7	− 7	− 4	− 1	+11	− 6	0
14	+14	−16	+ 4	+10	+14	− 1	+ 1	+ 1	+11	+ 9	+ 1	+ 6
15	+ 5	−10	+ 4	+14	− 3	− 1	+ 8	+ 5	− 2	−15	− 1	+ 9
16	0	− 6	+ 8	+10	−21	+ 5	+ 9	+ 2	− 2	− 9	+ 3	+17
17	+ 2	0	+ 11	+ 6	−14	+ 6	+11	− 1	− 4	−10	+ 8	+ 6
18	− 3	+ 6	+ 11	−32	− 5	+ 6	+ 8	+ 3	−13	− 8	+18	+ 9
19	+ 1	+11	+ 12	−26	− 2	+ 9	+ 9	+13	− 4	+ 2	+10	− 7
20	− 4	+ 5	+ 16	−20	− 9	+ 3	+10	−12	0	+ 3	+ 3	− 4
21	− 1	− 4	+ 6	−13	+ 4	+ 7	+12	−15	− 1	+12	+ 2	− 5
22	+ 5	+ 4	− 32	−11	+ 1	+14	+ 8	− 9	+10	+ 3	− 9	− 5
23	−14	− 1	− 49	− 3	+13	+ 9	+ 9	− 8	+ 8	−10	− 9	− 3
24	− 1	−12	− 31	0	+15	+ 4	+12	− 3	+12	−11	− 7	+ 2
25	0	−12	− 18	− 9	+12	+ 5	0	− 3	+17	− 7	− 5	+ 3
26	− 1	− 5	− 16	0	+ 9	+13	+ 1	− 1	−11	− 6	− 1	+ 2
27	+ 6	+ 8	− 6	+ 5	+ 8	− 2	0	+ 2	−15	− 6	0	− 4
28	− 6	+ 2	− 1	+ 3	+10	− 8	+10	+16	− 7	− 3	+ 3	− 5
29	−26		+ 7	+ 8	+12	−23	+10	+16	−12	+ 4	0	− 7
30	−12		+ 11	− 6	+18	−48	+ 5	− 6	− 3	+10	0	− 3
31	− 9		+ 13		+ 6		+12	−10		+ 5		− 4
Sums without regard to signs.	200	325	336	254	315	252	270	200	164	196	138	159

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1900 and 1901.*

Unity = 1γ = ·00001 C. G. S.

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 7	+ 3	+11	+ 2	−23	− 5	− 2	− 3	+ 2	+ 1	− 6	+ 7
2 ...	+11	+ 3	+ 7	+ 1	+ 3	− 8	**−10**	− 1	+ 4	− 1	− 7	− 3
3 ...	+13	+ 1	+ 7	+ 7	+ 9	**−14**	− 3	+ 5	− 1	+ 7	**− 9**	− 2
4 ...	**+19**	− 5	+ 9	+ 6	+16	− 9	+ 2	+ 3	+ 5	+ 4	+ 1	0
5 ...	−17	**−21**	+16	− 7	**−91**	− 2	+ 5	− 4	− 2	−10	+ 5	− 1
6 ...	− 5	−10	**+21**	0	−44	0	+ 8	+ 1	+ 2	+ 2	+ 1	+ 5
7 ...	− 3	− 2	+12	− 2	−28	0	+ 3	+ 4	0	0	+ 2	+ 1
8 ...	+ 3	+ 9	− 7	− 7	−11	+ 1	+ 2	**−15**	+ 4	− 1	+ 1	− 3
9 ...	+14	− 3	−35	+ 3	− 5	− 1	+ 6	− 9	+ 6	− 5	+ 1	+ 5
10 ...	+ 9	− 6	−15	**−13**	+ 1	− 4	0	− 2	− 2	+ 3	+ 4	**−13**
11 ...	+11	− 9	− 4	− 8	+ 2	− 1	+ 4	+ 7	− 2	+ 4	+ 2	− 4
12 ...	+ 1	− 2	0	− 7	+ 8	+ 1	+ 5	**+ 8**	+ 4	+ 8	+ 1	− 1
13 ...	0	+ 3	**−94**	− 9	− 4	+ 4	− 1	+ 1	**+ 9**	+ 9	− 3	0
14 ...	0	+ 2	−34	− 2	− 8	+ 4	+ 4	− 6	+ 1	+ 6	− 3	+ 5
15 ...	−11	−11	−16	+ 8	+ 7	+ 3	+ 7	+ 8	+ 2	+ 6	− 1	+ 4
16 ...	− 5	− 9	−11	+ 6	+ 6	0	+ 1	+ 3	− 5	+ 7	0	+ 2
17 ...	− 3	0	− 2	+ 6	+ 9	+ 4	+ 4	+ 5	0	+ 8	0	+ 2
18 ...	+ 2	+ 4	+ 5	− 5	+16	+ 6	− 2	− 3	− 2	+ 7	− 5	+ 6
19 ...	− 6	+12	+ 5	− 1	+ 4	+ 6	− 1	+ 2	+ 2	+10	− 2	+ 3
20 ...	−16	**+15**	+10	+ 3	+12	+ 3	− 8	+ 1	+ 4	+ 8	+ 4	+ 2
21 ...	**−23**	− 3	+11	+ 1	+11	+ 4	− 1	− 4	+ 4	0	+ 4	+ 6
22 ...	+ 2	+ 4	+ 9	+ 3	+ 8	+ 6	− 1	+ 2	− 1	+ 2	+ 2	+ 6
23 ...	+ 2	+14	+ 4	0	+14	+ 1	**+ 9**	− 2	− 5	+ 7	**+ 7**	+ 5
24 ...	+ 6	− 2	+ 6	− 9	+13	− 1	− 1	+ 3	− 1	**+11**	− 2	**+10**
25 ...	+ 5	+ 1	+12	+ 2	+12	+ 1	− 7	− 3	0	**−33**	− 6	− 5
26 ...	− 7	+ 3	+ 8	+ 7	+ 9	0	− 8	− 2	+ 6	−13	− 6	+ 2
27 ...	− 8	+ 6	+ 9	+ 3	+14	**+10**	− 5	0	+ 4	−16	− 4	− 6
28 ...	+ 2	+ 3	+21	+ 3	**+19**	− 7	− 4	− 8	**−17**	-13	+ 7	−12
29 ...	+ 4		+14	**+11**	+15	− 5	− 4	− 6	− 6	− 9	− 1	−11
30 ...	+ 9		+ 5	+ 4	+ 4	− 11	− 5	− 1	− 7	−14	+ 2	− 8
31 ...	− 2		+ 6		+ 4		− 1	+ 4		− 9		− 9
Sums without regard to signs.	226	166	426	146	430	122	124	126	110	234	99	149

Unity = 1γ = ·00001 C. G. S.

1901. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 7	+ 4	+ 3	+ 2	+ 6	+ 2	− 4	+ 7	+ 2	+ 1	+ 7	**+19**
2 ...	− 4	**−13**	+ 9	− 7	+ 5	− 6	0	+11	+ 4	+ 4	+ 9	−14
3 ...	− 4	− 6	+ 5	0	+ 1	− 1	+ 7	+ 6	+ 3	+ 3	**+10**	− 7
4 ...	**+ 9**	− 2	+ 3	0	0	+ 1	+ 5	− 5	− 1	+ 8	**−21**	− 3
5 ...	− 4	+ 1	+ 5	+ 3	+ 4	+ 2	− 1	− 7	+ 2	+ 2	− 1	−11
6 ...	− 6	0	+ 6	**+12**	+ 9	+ 9	0	+ 5	+ 4	+ 7	− 4	− 4
7 ...	− 1	+ 1	+ 1	0	+ 7	− 1	− 2	**+16**	+ 2	**+ 9**	− 1	+ 1
8 ...	0	+ 2	+ 4	− 4	**+10**	0	+ 5	− 4	+ 3	− 2	− 3	+ 7
9 ...	+ 4	+ 3	+ 1	− 2	+ 6	− 3	+ 9	+ 5	**+12**	**−15**	− 4	+ 2
10 ...	− 3	+ 1	+ 9	+ 5	− 6	− 3	+ 2	+ 4	−10	− 8	+ 1	− 2
11 ...	− 3	+ 8	+ 5	+ 4	**−14**	− 2	**+10**	+ 2	**−17**	− 6	− 1	+ 3
12 ...	− 5	− 4	+ 5	+ 3	−11	+ 3	**−19**	+ 6	−16	− 2	− 1	+ 4
13 ...	+ 1	− 3	− 7	+ 4	− 8	+ 8	− 5	+ 9	− 8	− 1	+ 1	+ 4
14 ...	+ 6	0	+ 2	− 4	− 6	− 8	0	−12	− 7	− 1	+ 4	+ 5
15 ...	+ 5	+ 5	+12	− 2	− 6	**−17**	+ 2	**−18**	+ 1	+ 1	+ 3	+ 2
16 ...	+ 3	**+11**	**+13**	− 5	− 2	−12	− 5	−14	+ 9	− 2	+ 2	+ 8
17 ...	+ 6	+11	+ 5	− 5	+ 4	− 6	−13	− 8	− 6	0	− 1	+ 5
18 ...	+ 5	+ 9	+ 1	+ 3	+ 4	− 3	− 4	− 7	− 4	0	+ 3	+ 7
19 ...	+ 9	− 9	− 3	+ 4	− 7	+ 3	− 1	− 2	+ 1	+ 6	− 7	+ 5
20 ...	+ 8	− 9	0	+ 4	− 7	+ 5	− 1	+ :	− 1	+ 5	− 6	0
21 ...	0	− 7	+ 4	+ 5	− 4	+ 2	− 1	− 4	0	− 1	− 2	+ 2
22 ...	− 1	− 7	+ 4	+ 2	+ 3	0	− 5	− 4	+ 4	0	− 1	+ 4
23 ...	**−14**	+ 3	+ 8	**−11**	+ 8	+ 1	+ 3	− 2	+ 5	+ 1	+ 4	+ 5
24 ...	−12	− 5	**−40**	−10	− 3	− 1	+ 7	+ 4	0	+ 6	+ 3	+ 9
25 ...	− 6	− 7	−28	+ 4	− 1	− 1	+ 5	+ 7	+ 2	− 4	+ 8	+ 3
26 ...	− 5	+ 1	−14	+ 4	0	− 2	+ 5	− 1	+ 7	−11	+ 3	+ 5
27 ...	+ 3	+ 6	− 6	+ 4	− 4	+ 8	+ 1	− 9	+ 1	+ 2	+ 3	+ 7
28 ...	0	+ 4	− 3	− 6	− 2	**+13**	+ 2	− 3	0	0	+ 1	**−27**
29 ...	+ 2		− 2	− 4	− 2	+ 9	+ 1	+ 4	− 2	− 1	− 2	−16
30 ...	− 7		− 8	+ 4	0	− 5	+ 4	− 2	+ 3	0	+ 2	−13
31 ...	− 1		− 2		+ 6		+ 7	+ 3		+ 5		−10
Sums without regard to signs.	144	142	218	127	156	137	136	192	137	114	119	214

TABLE 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1902 and 1903.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 2	+ 8	+ 3	+ 4	0	− 5	− 3	0	+ 5	− 6	−21	− 2
2	+ 2	+ 6	− 3	+ 5	− 6	− 1	0	+ 4	− 6	+ 5	−13	− 2
3	− 2	0	+ 1	0	+ 2	− 1	+ 5	+ 7	− 2	+ 3	− 3	+ 3
4	0	+ 3	+ 3	0	0	+ 2	− 4	0	− 5	+ 2	0	− 2
5	+ 3	+ 2	+ 7	+ 3	+ 1	+ 3	+ 1	+ 3	+ 2	+ 4	+ 3	+ 4
6	+ 5	+ 8	− 1	+ 2	+ 1	− 3	+ 4	+ 5	+ 5	+ 7	+ 5	− 1
7	+ 5	−10	+ 4	+ 8	− 1	+ 3	+ 5	+ 2	+ 4	+ 9	+ 1	+ 4
8	+ 2	−13	− 8	+17	+ 2	0	+ 2	+ 2	+ 3	+ 6	+ 4	+ 3
9	+ 2	− 6	− 4	+ 6	−21	+ 6	+ 2	+ 4	+ 6	+ 3	+ 8	+ 4
10	0	− 2	− 1	+ 5	−12	+10	+ 3	+ 5	− 1	+ 6	+ 6	− 1
11	− 2	+ 4	+ 9	−51	− 7	+ 7	+ 6	− 7	− 5	− 2	+11	+ 7
12	+ 7	+ 2	− 5	−19	− 1	− 1	− 8	− 3	− 5	− 2	+11	+ 4
13	+ 6	+ 4	− 1	− 8	+ 7	0	− 2	− 3	− 3	+ 2	+ 7	0
14	+ 9	+ 1	− 1	− 9	− 3	− 4	+ 6	+ 1	+ 5	+ 2	+11	+ 1
15	− 7	+ 3	+ 7	+ 1	0	+ 2	+ 7	+ 2	+ 3	+ 2	+ 7	+ 3
16	−23	− 3	− 4	+ 4	+ 3	− 3	− 2	+ 6	0	+ 6	+ 8	+ 2
17	−15	0	− 2	+ 1	+ 6	+ 2	+ 4	+ 3	+ 2	+ 8	+11	+ 1
18	−11	+ 6	− 1	− 1	+ 2	+ 2	+10	− 4	+ 7	+ 9	+11	+ 7
19	− 4	+ 2	+ 5	+ 1	+ 2	+ 2	− 2	+ 4	− 1	+ 2	+ 8	+ 6
20	− 1	− 1	+ 8	− 3	− 1	+ 1	+ 5	+ 5	− 7	+11	+ 9	+ 1
21	+ 1	− 9	+ 4	− 8	+ 1	+ 5	+ 5	−10	− 8	+ 6	+ 5	+ 5
22	+ 2	0	+ 1	− 3	0	−10	+ 6	−26	− 2	+ 7	+ 1	+ 2
23	+ 2	+ 1	+ 6	+ 1	+ 8	− 2	+ 6	−14	− 9	+ 8	− 7	−16
24	− 1	+ 5	−10	− 1	+10	+ 3	−10	− 7	− 1	+ 1	−41	−12
25	+ 3	− 3	− 8	+ 3	+ 4	+ 1	−15	+ 1	0	−14	−27	− 5
26	+ 2	− 4	− 7	+ 8	− 4	0	−12	− 5	0	− 6	−17	− 6
27	+ 3	+ 1	− 4	+ 5	+ 3	− 2	− 8	+ 1	+ 2	− 7	− 1	− 3
28	+ 8	+ 6	0	+10	+ 7	+ 2	− 5	+ 2	+ 2	− 3	− 2	− 5
29	+ 6		+ 1	+11	+ 2	− 8	− 3	+ 3	+ 6	+ 3	+ 1	− 4
30	+ 8		− 1	+ 7	− 7	−12	− 8	+ 3	0	−10	− 1	+ 1
31	+ 7		+5		− 2		− 2	0		−57		+ 4
Sums without regard to signs.	151	113	125	205	126	103	161	142	107	219	261	121

Unity = 1γ = ·00001 C. G. S.

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 7	+ 2	+ 7	+ 9	+ 1	−10	− 4	+ 2	+10	+ 18	−74	+11
2	+10	+ 5	− 4	+ 6	+ 5	−13	− 3	+10	+ 7	+ 5	−42	−13
3	+ 8	+ 1	− 3	+ 6	+10	− 9	+ 1	+11	+11	+ 15	−28	− 5
4	+ 8	+ 6	+ 7	+16	+ 4	− 5	+ 4	+12	+10	+ 22	−16	+ 2
5	− 4	+ 4	− 5	+ 4	− 6	− 2	+ 7	− 2	0	+ 18	− 5	− 3
6	− 4	+ 2	+ 2	−75	−13	0	− 6	+ 5	+ 5	+ 18	− 3	+ 3
7	− 2	+ 5	− 9	−37	− 7	+ 3	+ 1	+13	+ 8	+ 15	+ 6	0
8	+ 6	−15	−12	− 9	− 1	+ 3	+ 5	+ 8	+ 4	+ 7	+ 1	+ 2
9	+ 4	−11	−11	−18	− 1	+ 6	+ 4	+ 3	+ 4	+ 21	+10	+ 7
10	+ 1	− 2	− 4	−14	+ 2	+ 3	− 6	+15	+10	+ 28	− 9	+11
11	− 3	−10	0	− 6	+ 3	+ 7	− 9	+ 3	+ 5	+ 24	− 4	+ 9
12	− 1	+ 3	+ 1	− 3	+ 4	+ 5	− 1	0	− 2	− 16	+ 2	+16
13	+ 4	+ 2	− 5	0	+ 8	+16	+11	+ 4	− 2	− 32	+ 4	−60
14	+ 5	+ 1	− 5	+ 4	0	+15	+ 9	+ 4	0	− 25	+ 7	−45
15	0	+ 2	− 1	− 5	+ 3	0	0	+ 3	+ 3	− 3	+12	−23
16	0	0	0	+ 8	+10	+11	+ 4	+ 5	+ 3	+ 3	+ 5	−10
17	− 2	− 3	+ 1	+ 6	+ 2	+ 3	+ 5	+ 4	+15	+ 6	0	− 4
18	+ 3	0	+ 8	− 1	+ 4	− 2	+ 9	+ 5	+13	+ 7	+ 3	+10
19	− 2	+ 7	+ 4	+ 3	+ 1	+ 3	− 4	+11	−21	+ 7	− 6	+17
20	− 2	+ 7	+ 3	+ 6	+ 9	+ 3	+ 3	+ 5	−16	+ 17	+ 4	− 4
21	− 4	+ 1	+ 3	+ 7	+ 9	+ 2	+ 4	− 4	− 9	+ 19	+ 9	− 2
22	+ 1	−16	+ 5	+10	+ 7	− 7	+ 4	−32	− 7	+ 8	− 2	+ 4
23	− 3	− 4	+ 3	+10	−13	− 6	+ 1	−17	−17	+ 10	0	+ 6
24	+ 1	− 1	+ 4	+11	− 1	−10	+12	− 9	−19	+ 9	+ 7	+13
25	+ 2	− 7	+ 6	+19	− 4	− 3	+10	− 3	− 8	+ 19	+13	+23
26	+ 4	+ 3	+ 2	+13	− 5	+ 1	−11	−33	− 3	− 14	+19	+27
27	−11	+ 4	+ 3	+ 3	− 2	+ 8	− 7	−15	+10	+ 4	+24	+17
28	− 2	+ 9	+ 7	+10	− 8	+ 6	− 6	−10	+12	+ 9	+30	+18
29	+ 1		− 3	+10	− 6	−13	− 8	0	−13	+ 20	+13	+28
30	− 3		+ 3	+12	− 3	−14	− 8	− 4	− 2	+ 24	+20	−13
31	− 5		− 1		+ 2		− 7	− 3		−272		−30
Sums without regard to signs.	113	133	132	341	154	189	174	255	249	715	378	436

TABLES 520.—*Showing the departures of the daily means of Horizontal Force from the mean value of the month for the years 1904 and 1905.*

Unity = 1γ = ·00001 C. G. S.

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	-21	-11	- 5	-42	-11	- 5	+16	+ 8	0	+ 7	- 1	- 6
2 ...	- 7	-17	0	-26	- 1	- 4	+ 5	0	+ 1	+ 6	+ 1	+ 8
3 ...	- 8	- 6	- 1	-13	- 1	0	+ 1	-14	+ 2	+ 7	+12	- 9
4 ...	- 9	+ 1	-20	- 5	+ 6	+11	+ 5	-35	+ 6	+10	-26	- 6
5 ...	- 9	- 7	-20	+ 1	+13	+12	0	-10	+ 9	+ 2	-17	-12
6 ...	- 4	-10	-10	+ 2	+11	+14	- 1	0	+ 1	+ 7	- 9	- 3
7 ...	+ 4	- 6	-10	-10	+12	-10	-25	+ 3	+ 4	-23	- 1	- 3
8 ...	+11	- 8	- 8	- 7	+14	+ 2	-13	+ 2	+ 2	-19	+ 2	+ 5
9 ...	+11	-13	- 7	+ 5	+21	+10	-11	+ 8	- 3	-13	+ 4	- 2
10 ...	- 4	-11	- 1	+ 5	+19	+13	-18	+ 6	- 3	0	+ 7	- 3
11 ...	-10	- 6	+ 4	+ 2	+12	+ 4	- 4	+ 6	- 6	+ 7	+10	+ 3
12 ...	- 6	- 3	- 8	+ 8	- 8	+ 4	- 1	+ 9	+ 1	+ 3	+12	+ 6
13 ...	+ 1	0	+ 2	+ 4	-63	+13	+ 4	+ 2	0	- 1	+13	+10
14 ...	+ 4	0	+ 2	+11	-25	+16	- 1	+ 3	+ 5	- 3	+14	+ 8
15 ...	+11	+ 4	+ 4	+13	- 7	-24	- 8	+10	+13	0	+14	- 5
16 ...	-29	- 3	+ 6	+11	+ 6	-56	- 2	- 4	+ 5	+ 5	-23	- 8
17 ...	- 2	+ 1	+ 7	+16	+ 4	-21	- 1	- 2	0	+ 9	-14	- 1
18 ...	+ 8	- 1	+ 8	- 9	+ 6	-15	+ 3	- 4	+ 2	+15	-17	- 2
19 ...	+11	+ 3	+10	-43	- 6	- 8	+10	- 3	+ 3	+14	- 3	+ 2
20 ...	+13	+ 2	- 1	- 1	- 2	- 7	+12	+13	+12	+16	+ 5	- 1
21 ...	+ 8	+ 7	0	+ 9	+ 3	- 9	+ 8	+ 4	+12	-27	+13	-13
22 ...	- 4	+ 6	+ 9	+ 8	+ 8	+ 3	+10	- 8	+12	-17	+ 7	- 1
23 ...	+ 5	+ 9	+10	+13	+ 8	+11	+ 5	- 8	0	- 7	+ 7	+ 7
24 ...	+ 9	+12	+ 6	+10	-10	+ 8	+ 6	- 2	- 1	+ 2	+12	+ 6
25 ...	+16	+15	+13	+10	0	+ 7	+ 8	+ 1	-47	+15	-24	+17
26 ...	+18	+ 9	-10	- 8	+ 9	+17	+ 8	+ 8	-24	+ 7	-13	- 1
27 ...	+22	+12	- 4	+ 6	+ 7	- 7	- 7	+11	-12	+ 2	- 5	+ 3
28 ...	-10	+11	+ 3	+10	-28	- 6	- 2	+12	- 8	- 3	+ 4	+ 1
29 ...	-14	+ 6	+ 3	+12	- 6	+ 1	+ 2	+ 8	+ 7	+ 3	+16	+ 1
30 ...	- 5		+ 6	+ 2	- 5	+13	- 2	-19	+ 4	- 3	+13	- 2
31 ...	+ 2		+ 7		+ 1		+ 1	-10		- 9		+ 5
Sums without regard to signs.	296	200	205	322	333	331	200	233	205	262	319	160

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+10	+18	+ 6	-31	-15	+ 3	+ 3	+29	+ 1	-15	+26	+ 8
2 ...	+ 8	+ 6	-61	-39	- 8	+ 5	+ 3	-51	+ 3	- 3	+34	+10
3 ...	+11	-58	-44	-16	- 7	+ 8	+ 6	-28	-33	+ 3	+29	+ 8
4 ...	0	-34	-29	-14	- 2	+11	+15	-18	-10	+ 4	+ 2	-23
5 ...	-11	-21	-10	-18	- 6	-15	+ 8	- 5	-13	+ 6	- 2	-10
6 ...	-23	- 7	+ 4	-10	+ 2	- 1	-16	- 4	- 5	-30	+15	- 6
7 ...	- 6	- 9	-34	-10	+ 1	- 1	-12	-25	+ 3	- 8	+19	+ 1
8 ...	0	- 2	-19	- 8	0	+11	-13	-16	+12	- 7	+23	- 1
9 ...	+10	+ 1	-11	- 1	+ 1	+ 8	- 9	+ 2	+19	- 1	+27	+13
10 ...	+ 6	+ 5	0	- 1	+ 2	-30	- 6	+10	+ 6	+ 2	+23	+11
11 ...	-12	+14	+ 3	+ 5	+ 4	-16	- 1	+ 6	+ 3	+ 3	+29	+15
12 ...	- 1	+ 8	- 2	+ 7	+13	-12	+ 1	+20	+ 9	+ 6	-52	+ 6
13 ...	+ 2	- 1	- 4	+ 2	+ 3	+ 2	+ 1	+ 6	+10	+ 1	-20	-31
14 ...	- 7	- 5	- 3	+ 6	+ 3	+ 4	- 1	- 8	+14	+ 2	- 9	- 9
15 ...	-11	+ 3	- 7	- 2	+ 4	- 2	+ 7	- 3	+15	+11	-47	- 2
16 ...	- 4	+ 3	-14	+ 3	+11	+ 3	+13	- 2	+14	+ 8	-79	+ 6
17 ...	-11	+ 2	0	+ 5	+ 5	+ 6	+12	+ 7	+22	+ 2	-25	- 2
18 ...	+ 2	+ 2	+13	+ 8	+ 9	+ 8	+ 7	+12	+ 3	+ 3	-13	+ 1
19 ...	- 4	+ 7	+10	+14	- 5	+13	+ 8	+13	-46	+10	- 2	+ 1
20 ...	+ 3	+19	+10	+ 9	- 5	+14	+ 5	+10	-14	+15	+ 3	-24
21 ...	+ 7	+ 8	+10	+ 3	0	+ 4	+ 2	+ 9	- 7	+ 3	- 9	- 6
22 ...	-12	+ 9	+23	+ 5	+13	-10	- 4	+14	+ 2	+ 5	- 1	+ 2
23 ...	+ 6	- 9	+18	+ 9	+14	-28	+14	+ 9	+ 4	+ 8	- 8	+ 3
24 ...	+10	+16	+ 9	+16	+ 2	-11	-24	+ 2	+ 9	+ 7	+ 1	+ 9
25 ...	0	+12	+14	+18	- 1	- 4	-11	+ 1	+ 9	- 1	+13	+ 7
26 ...	+ 1	+ 7	+15	+ 6	+ 3	+ 2	- 2	+16	-13	- 7	- 1	+ 4
27 ...	+ 7	- 2	+10	+ 6	- 7	+ 4	- 4	+12	-24	+ 9	0	-10
28 ...	+ 7	+19	+18	+12	- 6	+11	- 2	+ 3	- 3	-18	+ 4	+ 7
29 ...	0		+30	+ 2	- 9	+10	- 6	- 7	+ 3	-14	+ 9	- 1
30 ...	- 1		+21	+ 8	- 3	+10	- 2	-14	- 2	- 3	+17	- 3
31 ...	+ 3		+27		- 1		+ 6	- 7		0		+10
Sums without regard to signs.	196	307	479	294	165	267	224	369	331	215	542	250

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1890 and 1891.*

Unity = 1γ = ·00001 C. G. S.

Unity = 1γ = ·00001 C. G. S.

1890. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−10	+ 2	+11	+49	− 9	−19	+ 5	+30	+18	−21	− 1	− 2
2 ...	+ 4	− 4	+ 5	− 4	− 9	−18	− 9	+ 8	+28	−13	−22	− 2
3 ...	+24	+24	−11	−10	+ 5	−18	−15	+20	−11	+17	−17	−10
4 ...	−18	−16	+ 4	− 9	+38	−13	−18	+ 5	0	− 3	+ 2	− 6
5 ...	+ 2	− 2	+ 2	+ 1	+37	−16	− 2	−13	− 2	+36	−16	+19
6 ...	+16	+ 2	− 3	− 3	−11	+26	+19	+ 6	+ 2	−16	− 7	−16
7 ...	−17	+ 3	+18	+ 8	−13	+ 9	+29	+ 8	− 4	−15	+10	− 4
8 ...	−11	+ 3	+13	0	− 8	− 3	+15	+ 1	−23	+32	+35	+15
9 ...	−18	− 3	−10	− 2	+ 9	+ 7	+10	+ 9	−17	+ 1	+ 8	+14
10 ...	+ 5	− 1	− 4	−13	+35	+ 5	+ 3	− 6	−13	+40	− 3	− 7
11 ...	− 4	−15	+21	+ 7	+38	+12	+24	− 4	−10	−13	+ 3	− 1
12 ...	+19	− 1	+13	+ 8	− 2	+ 2	+ 6	+ 9	+34	+ 7	+27	+ 2
13 ...	+20	− 7	0	+ 6	−17	− 7	−13	− 9	− 7	−10	+44	− 3
14 ...	+ 2	−10	− 9	+ 1	−15	− 1	+ 8	− 6	−18	− 7	− 1	−14
15 ...	+17	+ 9	+ 5	−19	−16	+ 1	−14	+24	− 3	+19	+12	+18
16 ...	− 9	− 5	+20	−19	+ 2	+ 5	+13	−13	− 1	−15	+ 8	−10
17 ...	− 6	− 8	+ 3	+ 6	−23	+14	+22	−13	−18	−15	+ 2	+ 1
18 ...	+10	+ 4	− 3	+ 5	− 8	− 5	− 6	−30	− 1	+16	0	−18
19 ...	− 6	+ 4	−27	+ 5	+ 9	+ 6	+ 6	+ 1	+17	+ 1	− 2	+ 3
20 ...	+ 4	+ 6	−10	+ 2	+ 6	− 8	−15	− 1	0	−20	−18	+ 5
21 ...	+13	+ 4	− 2	−14	+10	+22	+ 3	− 5	+22	−11	+ 3	−11
22 ...	− 3	+ 8	+14	−11	−13	+15	+16	−18	− 7	−15	− 2	+13
23 ...	+32	0	−13	−11	− 1	− 1	− 1	− 7	−18	−11	− 1	−16
24 ...	− 8	− 6	+ 3	+ 3	+ 4	− 6	−12	− 9	−17	+43	−18	+ 2
25 ...	− 9	− 4	+ 2	+13	− 4	+ 9	−17	− 8	+61	−17	−11	+17
26 ...	−14	−12	− 1	− 4	−22	− 8	−16	−11	− 8	+ 2	+ 8	+ 1
27 ...	−11	+20	+ 4	+ 3	− 5	+ 5	−13	− 9	+ 2	+24	−16	−12
28 ...	− 7	+ 1	−22	− 1	+ 8	+15	−17	− 1	+14	−10	− 9	+13
29 ...	+10		−22	+12	−10	−11	− 3	+15	+ 1	− 2	−12	− 6
30 ...	−12		− 1	− 8	−12	− 4	− 2	+28	−20	− 7	+ 1	+15
31 ...	−18		− 2		−13		− 6	− 1		− 9		−11
Sums without regard to signs.	359	184	278	257	412	291	358	328	397	468	319	287

1891. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−16	+41	− 9	− 12	− 13	− 10	− 6	−17	−20	+ 4	− 7	− 16
2 ...	+ 7	−14	+115	− 25	0	+ 1	−23	+38	− 7	− 5	− 1	+ 1
3 ...	−19	− 5	+ 31	− 26	+ 10	− 10	+22	+19	−10	− 4	−18	− 18
4 ...	− 9	−28	+ 19	− 17	− 11	+ 4	−21	−21	−10	−21	− 4	− 10
5 ...	− 5	+18	+ 4	− 18	− 30	+ 15	−20	−22	−23	+ 1	− 3	− 7
6 ...	−11	−22	− 25	− 12	+ 54	− 8	+35	− 9	−15	− 2	−11	+ 8
7 ...	− 5	−12	− 32	+ 40	− 23	− 13	+ 8	+15	−20	+20	−26	+ 88
8 ...	−22	−18	− 26	+ 67	− 7	− 19	−23	+16	+12	+15	+22	− 14
9 ...	−18	+53	− 6	− 4	− 15	− 14	− 9	+14	+39	−22	+15	+ 46
10 ...	− 4	−18	− 16	− 8	− 26	− 6	+ 1	+17	0	+ 5	+28	− 15
11 ...	+ 6	+ 2	− 7	− 16	− 15	− 12	−21	+41	+32	− 1	−13	− 18
12 ...	+25	+12	+ 24	+ 5	− 26	− 15	−18	+ 5	− 30	+50	−11	− 32
13 ...	− 4	−14	− 1	− 33	+ 26	+ 4	+ 5	− 2	−11	−21	− 7	− 22
14 ...	+32	+21	− 19	− 13	+ 37	+111	+32	− 7	− 4	− 3	+30	− 22
15 ...	−10	+54	− 13	− 16	+181	− 21	−20	+ 7	+31	− 9	− 9	− 17
16 ...	+90	−17	0	+ 1	+ 52	+ 11	− 4	+25	−18	− 7	− 1	− 7
17 ...	−16	− 3	− 10	+122	− 30	− 16	+66	−22	− 1	−13	+26	− 20
18 ...	+15	− 1	+ 1	+ 6	− 24	+ 23	−12	−21	−28	+ 3	− 9	− 22
19 ...	+ 9	− 9	+ 6	− 12	− 24	− 8	−11	+14	−18	0	−10	+ 24
20 ...	−28	−16	− 24	+ 47	− 32	− 7	− 8	+ 7	+ 4	−16	+73	+ 10
21 ...	−26	−10	− 9	0	− 29	− 8	− 4	− 1	+ 9	− 21	+40	+ 7
22 ...	−21	−25	− 11	− 12	− 17	− 13	− 4	+ 2	−19	−12	− 1	0
23 ...	0	−11	+ 18	0	− 27	+ 7	− 3	−19	+49	+20	−16	− 3
24 ...	+39	+ 8	− 14	0	− 6	+ 1	+55	−18	−27	+22	−15	− 15
25 ...	−13	− 6	+ 2	0	− 22	+ 11	+10	− 4	− 4	−15	−14	− 8
26 ...	+16	+44	+ 6	− 10	− 29	+ 4	+ 8	+ 5	+25	+15	−23	− 11
27 ...	− 7	−23	− 2	− 17	+ 16	+ 9	−22	−28	0	− 8	−17	- 32
28 ...	0	−12	− 4	− 13	+ 83	− 1	− 7	−11	+74	+ 1	−17	− 12
29 ...	−10		− 6	− 6	− 5	− 12	− 4	+20	−18	− 4	− 5	+ 24
30 ...	+10		+ 9	− 9	− 22	0	− 1	−17	− 4	+21	− 6	+120
31 ...	− 7		− 13		− 22		−11	−12		+19		− 17
Sums without regard to signs.	500	517	482	567	914	394	494	476	562	380	478	666

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1892 and 1893.*

Unity = 1γ = ·00001 C. G. S.

1892. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 6	- 18	+ 14	+ 8	+ 66	- 20	- 23	- 15	- 21	- 37	- 6	+ 27
2	- 7	- 27	- 22	+ 5	- 16	+ 45	- 13	- 8	- 10	+ 9	+ 14	- 19
3	+ 7	- 35	- 8	- 18	- 24	+ 52	- 8	+ 32	- 32	- 19	+ 41	+ 5
4	+ 26	- 23	+ 14	- 22	- 18	- 4	- 39	+ 34	- 18	- 16	+ 117	+ 101
5	+ 38	- 44	- 25	- 21	+ 37	- 24	- 29	- 2	- 15	+ 26	- 1	+ 16
6	- 23	- 41	+ 138	+ 1	- 35	- 8	+ 5	+ 3	0	- 33	- 7	+ 6
7	- 45	- 38	+ 11	+ 5	- 18	- 13	- 32	- 22	- 35	- 21	- 18	- 10
8	- 32	- 27	- 14	- 15	+ 22	- 4	- 26	+ 10	- 17	- 15	- 9	+ 6
9	- 41	- 17	- 14	+ 47	- 10	- 6	+ 10	- 29	- 19	+ 2	- 19	- 4
10	- 29	- 16	- 7	0	- 33	- 22	- 31	- 6	- 7	+ 36	- 1	- 19
11	- 17	+ 10	+ 34	- 18	- 20	- 27	- 27	- 7	+ 28	+ 23	- 13	- 27
12	- 18	- 23	+ 66	- 10	- 12	- 19	+ 130	+ 232	- 12	+ 63	- 37	- 4
13	- 9	+ 489	- 9	- 12	- 17	- 23	+ 7	+ 55	+ 15	- 27	- 24	- 14
14	- 5	+ 22	- 23	- 19	- 10	- 15	+ 42	- 21	+ 4	- 20	+ 34	- 7
15	- 26	+ 5	- 2	+ 21	- 34	0	- 20	- 14	+ 12	+ 35	- 1	6
16	+ 27	- 38	- 31	- 16	- 46	- 6	+ 149	- 24	+ 33	+ 31	- 26	- 2
17	+ 37	- 25	- 31	0	+ 83	+ 2	+ 27	- 16	- 22	+ 18	+ 61	- 10
18	+ 5	- 6	- 11	- 20	+ 227	- 20	+ 8	- 26	- 23	+ 59	- 12	- 27
19	+ 1	- 3	- 9	- 28	+ 43	- 42	- 27	- 20	+ 47	- 9	- 2	+ 32
20	+ 15	- 3	- 8	- 20	- 13	- 26	- 43	- 7	+ 61	- 8	- 5	- 15
21	- 16	- 27	+ 13	- 3	- 12	- 15	- 48	- 27	+ 99	+ 7	+ 4	+ 2
22	2	- 43	- 9	- 13	+ 36	- 18	- 9	- 10	+ 5	- 9	+ 7	- 32
23	+ 2	- 22	+ 1	+ 51	- 31	- 24	- 49	- 19	- 34	- 10	- 13	+ 63
24	+ 5	+ 18	+ 38	- 16	- 37	+ 21	- 25	+ 27	- 33	- 3	+ 74	- 21
25	- 23	- 26	- 10	+ 30	- 20	- 13	- 4	+ 1	- 20	- 25	- 11	- 19
26	- 23	+ 38	- 2	+ 107	- 17	- 12	+ 45	- 24	+ 24	+ 7	- 27	- 11
27	- 11	- 4	- 18	- 23	- 25	+ 287	+ 11	- 28	- 7	- 11	- 24	+ 1
28	+ 2	- 53	- 4	- 10	- 21	- 6	+ 24	- 32	+ 24	- 17	- 18	- 12
29	+ 190	- 29	- 38	+ 39	- 14	- 27	+ 24	- 31	- 26	+ 3	- 42	+ 25
30	- 1		- 25	- 26	- 14	- 9	+ 9	- 19	- 9	- 10	- 20	+ 4
31	- 18		+ 3		- 28		- 37	+ 1		- 15		- 20
Sums without regard to signs.	707	1,170	652	624	1,039	810	981	802	712	624	688	567

Unity = 1γ = ·00001 C. G. S.

1893. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 10	- 10	+ 31	- 1	- 9	- 8	- 24	0	- 7	+ 15	+ 59	- 23
2	- 3	+ 25	- 23	+ 1	- 10	+ 17	- 24	- 17	- 46	+ 36	+ 63	- 18
3	+ 20	+ 34	+ 3	- 7	+ 9	- 28	- 5	- 9	- 29	- 5	+ 10	- 1
4	+ 20	+ 34	- 6	+ 8	- 6	+ 17	+ 6	- 11	+ 2	- 18	- 33	- 4
5	+ 59	- 14	- 23	+ 27	+ 28	- 8	+ 19	+ 12	+ 6	+ 46	- 14	+ 82
6	+ 15	- 11	- 24	+ 1	+ 9	+ 4	+ 14	+ 69	- 26	- 11	- 9	0
7	- 20	- 19	- 2	+ 3	+ 29	- 13	- 2	- 12	- 17	+ 7	- 16	- 24
8	+ 9	- 38	- 28	+ 9	+ 16	- 16	+ 5	- 18	+ 1	- 24	+ 10	- 2
9	+ 18	- 17	- 22	- 18	+ 28	+ 23	+ 6	- 31	- 33	- 11	+ 19	- 8
10	- 8	- 37	- 33	+ 8	- 24	- 14	+ 5	- 16	+ 17	+ 56	+ 15	- 11
11	- 32	- 25	- 25	- 12	0	+ 3	- 9	- 6	+ 25	- 28	- 8	- 2
12	- 5	- 9	+ 40	+ 27	- 38	- 15	0	+ 49	+ 17	- 25	+ 12	- 34
13	- 36	+ 40	+ 5	+ 6	- 21	- 8	- 12	- 16	+ 25	+ 17	- 19	- 16
14	- 16	+ 69	+ 22	- 11	+ 2	+ 16	+ 88	- 15	+ 23	- 4	- 17	- 25
15	- 22	+ 32	0	- 3	+ 17	+ 40	+ 26	- 1	- 19	- 19	- 16	- 6
16	- 10	- 19	- 19	- 9	- 13	- 17	+ 1	- 9	- 31	- 28	+ 6	+ 13
17	- 19	+ 31	0	- 1	- 5	- 7	- 4	- 2	+ 5	- 10	- 35	- 6
18	+ 2	+ 6	- 18	- 18	+ 38	+ 33	+ 5	+ 237	- 12	- 29	- 17	+ 6
19	+ 11	- 3	- 3	- 13	+ 5	- 15	- 5	- 18	- 11	- 27	- 14	- 4
20	- 6	- 1	- 14	- 9	+ 1	- 32	- 6	- 28	- 11	- 13	- 7	+ 23
21	+ 26	- 12	- 17	+ 7	- 7	- 6	+ 57	- 33	- 21	- 18	+ 5	- 14
22	+ 21	- 7	- 13	+ 5	- 5	- 17	- 1	+ 6	- 19	- 9	+ 26	- 10
23	- 29	- 23	- 14	- 7	- 13	+ 9	- 4	- 19	- 10	+ 3	- 11	+ 3
24	- 16	+ 14	+ 7	+ 11	- 7	+ 17	- 15	- 9	- 26	- 59	+ 9	+ 95
25	- 6	- 10	+ 68	- 11	+ 18	- 14	- 25	- 27	- 6	+ 53	+ 3	+ 39
26	- 4	- 9	+ 100	+ 67	- 20	- 2	- 32	- 24	+ 113	+ 13	- 15	+ 4
27	- 15	- 22	+ 14	- 17	- 11	+ 9	0	- 22	- 32	+ 18	+ 30	+ 9
28	- 4	- 5	+ 3	- 10	- 17	+ 50	- 5	- 28	- 6	+ 10	- 6	- 2
29	+ 49		- 1	- 30	- 10	+ 15	- 1	- 16	+ 33	+ 3	+ 15	- 21
30	+ 5		- 13	- 17	+ 32	- 22	- 18	0	+ 92	- 17	- 31	- 11
31	- 21		- 6		- 12		- 28	- 12		+ 2		- 17
Sums without regard to signs.	537	576	597	374	460	495	452	772	721	634	550	533

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1894 and 1895.*

Unity = 1γ = ·00001 C. G. S.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	−20	− 40	+ 4	− 13	+46	− 17	− 34	− 13	− 22	−15	− 36	0
2	−15	+ 6	− 2	− 10	−20	− 11	+ 12	− 15	− 22	+ 3	− 33	− 3
3	+28	− 37	− 26	+ 7	− 6	− 9	− 28	− 2	− 16	+ 2	− 4	− 6
4	+10	− 43	+ 2	+ 4	+25	− 19	− 32	− 12	+ 9	+31	− 13	−14
5	+16	− 34	− 15	+ 3	0	− 17	+ 8	+ 7	− 16	+27	− 1	+41
6	+ 6	− 20	+ 8	+ 42	+ 4	− 17	− 15	− 15	− 10	+10	− 6	− 7
7	−24	− 34	− 20	− 5	+20	+ 2	− 15	0	− 5	+ 7	− 23	−13
8	−19	− 19	+ 32	− 34	− 1	− 19	− 29	− 17	− 7	+16	+ 12	+ 3
9	−13	− 27	− 36	− 14	−13	+82	− 14	− 15	− 24	+ 4	− 24	0
10	+ 7	− 55	− 13	+ 5	+11	+19	− 30	− 17	− 2	−14	− 27	+ 3
11	+ 2	− 35	− 12	− 16	+11	−20	18	+ 2	− 31	+15	− 22	−12
12	− 8	− 24	− 19	+ 50	− 9	−19	− 12	− 19	− 16	−10	− 9	+ 3
13	−31	− 53	− 1	− 8	− 5	−15	− 23	+ 8	− 18	+12	+222	+12
14	−11	− 25	+ 45	− 14	−23	−17	− 28	− 4	+167	−12	+ 48	+ 1
15	−11	− 8	+ 13	− 11	−17	−19	− 14	− 26	+ 12	+ 1	− 8	+53
16	− 9	− 20	− 26	− 25	−20	− 1	− 12	− 48	− 9	+41	− 26	+21
17	− 9	− 29	− 14	+140	− 3	+55	+ 3	− 18	− 6	−24	+ 10	−15
18	+ 5	− 9	− 30	0	+ 5	0	+ 1	− 22	+ 29	−16	+ 47	− 6
19	+ 7	+ 34	− 38	− 28	+ 3	+32	+ 8	+105	+ 31	−20	+ 23	+21
20	− 8	+ 3	− 24	− 20	−25	+15	+416	+374	+ 17	−32	− 25	−24
21	+38	+ 49	+ 52	− 16	0	+81	+ 70	− 11	− 15	−11	− 32	+15
22	+31	+ 55	− 8	− 23	+24	− 2	+ 1	− 13	+ 29	−19	− 23	+ 1
23	+27	+ 35	− 9	− 23	− 1	−23	− 26	− 24	− 31	+ 5	+ 49	−19
24	+ 4	− 12	− 6	− 10	−22	−37	− 35	− 33	− 20	+ 5	+ 24	−15
25	− 1	+225	+ 11	− 16	−18	−14	+ 15	− 26	− 16	+17	− 24	−27
26	+41	− 36	− 16	− 20	−16	− 8	− 52	− 32	− 21	−11	− 14	−12
27	− 6	− 43	− 33	− 3	− 9	−11	− 35	− 41	+ 6	+ 6	− 13	−10
28	−13	+183	− 13	− 17	+32	+ 3	− 17	− 21	− 37	−11	− 18	+21
29	− 7		− 9	+ 33	+ 9	− 4	− 25	− 27	− 28	−10	− 18	−12
30	+ 2		+164	+ 31	− 6	− 4	− 31	− 17	+ 81	−12	− 29	− 2
31	−10		+ 40		+36		− 21	− 16		+12		+ 8
Sums without regard to signs.	439	1,193	741	641	440	592	1,080	1,000	753	431	863	400

Unity = 1γ = ·00001 C. G. S.

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+52	+ 30	+20	+10	+16	+ 2	+22	+14	−26	−10	−16	− 17
2	−13	+ 46	−12	−15	− 6	+11	−12	− 2	− 5	−11	+17	+ 3
3	− 2	− 33	−10	− 9	− 7	+ 2	− 7	− 1	+20	+ 1	−16	+ 9
4	−10	− 26	−13	−14	−25	−30	− 6	− 8	+72	+22	−16	+ 26
5	−10	+ 9	+ 3	+37	+16	−11	−21	+20	+ 9	+ 3	0	+ 6
6	+39	+ 6	− 3	−24	−38	− 3	+56	+11	− 3	− 6	−20	+ 8
7	−13	− 2	−14	−10	+ 7	−23	− 3	+ 2	−14	−29	−11	+124
8	−16	− 15	+29	−19	− 6	− 4	+ 1	− 1	−14	−19	+67	+ 43
9	+48	+ 48	−11	+10	− 3	+11	−11	+30	−19	−26	+60	− 3
10	−11	− 12	− 5	− 8	+79	+ 3	+ 4	+40	−19	−36	+36	− 16
11	+22	− 13	−10	+99	−13	− 3	−14	− 9	+23	−22	0	− 22
12	+ 3	− 11	− 5	−14	−11	−11	+42	−15	− 3	+50	−22	− 25
13	+ 3	+ 7	+83	− 5	−24	− 4	−12	− 2	− 5	+26	−24	− 23
14	−10	+ 10	+24	−19	+33	− 4	+24	−15	+22	− 7	−14	− 14
15	−21	+ 2	−26	+21	−22	− 2	+10	−18	+ 5	+23	+12	+ 3
16	+23	+ 14	−13	+ 6	−10	+28	+ 7	−18	− 4	−26	−12	− 18
17	−15	− 30	−21	−31	+ 3	+14	− 7	− 8	−14	+38	− 9	0
18	− 5	− 41	−38	+ 9	+19	+ 3	− 6	+42	−23	−34	−17	− 4
19	−15	− 21	− 9	− 1	−22	+ 8	+ 9	+15	+17	−16	−20	− 4
20	−27	+ 1	− 3	−23	−13	−13	+ 2	+11	+ 2	−11	−15	− 1
21	−31	− 29	− 5	− 6	− 9	− 5	−14	− 6	−15	−14	−19	+ 41
22	−25	− 24	− 6	− 9	− 5	+28	−10	−10	− 3	−24	− 6	+ 2
23	−19	− 19	−20	+80	−20	+40	− 5	+ 3	+ 1	− 3	+79	− 9
24	−10	+126	+ 3	− 1	−22	+16	−20	+10	− 3	−13	+ 9	+ 25
25	− 6	+ 3	+37	−20	− 9	−10	0	−20	−22	− 6	−12	− 17
26	0	− 22	+35	+ 4	− 1	+ 4	+30	−15	− 8	+35	− 3	− 29
27	+11	− 12	+24	−15	− 3	−10	+ 3	− 6	−11	+84	+13	− 29
28	+32	+ 23	0	−11	+42	−13	−25	−11	− 1	+23	−12	− 15
29	+35		−38	−15	+21	−16	− 9	− 6	+33	+ 7	−15	− 10
30	+ 2		+23	−15	+ 9	− 3	−11	−15	+ 4	− 3	−16	− 17
31	−19		− 4		+ 9		−21	+ 1		− 7		− 5
Sums without regard to signs.	548	635	547	560	523	335	424	385	420	635	588	568

TALBE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1896 and 1897.*

Unity = 1γ = ·00001 C. G. S.

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−27	−9	−13	−12	+ 2	−10	−11	+30	− 30	+11	− 2	+ 7
2 ...	− 1	+ 8	+ 1	+24	+183	0	−17	− 3	− 29	−12	− 5	− 6
3 ...	+32	+13	+12	+29	+100	+11	+ 6	+ 4	− 11	− 9	− 6	+60
4 ...	+11	0	+85	−25	− 11	−18	− 9	+ 7	− 6	−20	+16	+49
5 ...	−21	−18	−17	+ 1	− 7	− 9	+ 9	− 4	− 17	−13	+23	+ 1
6 ...	−18	−27	− 1	+ 1	− 10	−18	+17	+37	− 8	−27	+59	+ 4
7 ...	−16	−40	−24	−20	+ 3	−12	0	−10	− 8	−10	+77	+ 6
8 ...	−15	− 8	−27	+17	+ 5	− 3	− 8	+ 8	+ 3	+ 1	+10	−11
9 ...	+55	−27	− 5	− 4	− 18	+44	−13	−16	+ 7	+19	−14	+ 9
10 ...	− 9	−20	−11	− 4	− 13	+ 5	−21	− 5	+ 17	+14	+ 5	− 1
11 ...	−26	− 4	−21	− 3	+ 12	+ 8	+30	−10	+ 11	+49	−14	−20
12 ...	−20	+18	+58	0	+ 9	− 8	−11	− 3	+ 16	+87	−11	−21
13 ...	+18	− 9	+11	− 2	− 17	− 4	− 9	− 7	− 22	−31	−12	+98
14 ...	+21	+65	−15	+12	− 2	+27	+ 8	0	− 15	−18	− 3	−15
15 ...	+ 3	+11	−28	+ 1	− 19	+10	−10	+ 6	+ 11	− 9	+ 5	−11
16 ...	+17	− 3	−30	− 5	+ 9	+74	+13	−18	+ 7	+ 5	+ 5	−16
17 ...	+32	− 3	−11	+29	+ 34	− 4	−18	− 2	+ 15	−16	−16	−14
18 ...	−11	−14	−21	− 6	− 21	+ 1	−13	+ 4	+114	+ 2	+25	− 9
19 ...	+61	− 2	− 8	−13	+ 7	−18	−13	+ 6	− 13	+21	−11	−17
20 ...	+ 9	−20	+64	−13	− 8	− 6	−12	+10	+ 20	− 2	+ 4	− 5
21 ...	− 7	0	− 1	+14	− 6	− 9	−28	+34	− 23	−15	+ 3	−16
22 ...	−28	−31	+ 2	+ 8	− 16	−18	−16	+22	− 4	−15	−16	−21
23 ...	− 5	+ 5	−13	− 2	− 9	−12	−18	+ 1	− 18	0	− 3	+11
24 ...	−31	− 2	−12	− 2	− 40	− 3	+15	+ 1	+ 48	+ 5	+ 2	− 2
25 ...	− 1	+ 7	+49	−18	− 35	− 8	+64	− 7	− 19	− 9	−17	−13
26 ...	−39	+19	+ 6	−30	− 28	+13	+11	−11	− 6	+ 2	−16	− 4
27 ...	− 5	+20	−26	0	− 34	−16	+48	−26	− 24	−20	− 5	+10
28 ...	−22	+21	− 7	+13	− 9	−10	−22	−23	− 24	− 7	−23	−13
29 ...	− 6	+48	−14	+ 6	− 6	− 5	− 8	− 7	+ 18	− 2	−30	− 3
30 ...	+44		−11	− 3	− 11	−11	+18	− 6	− 21	+52	−25	−26
31 ...	+12		+32		− 42		+ 5	− 7		−22		−13
Sums without regard to signs.	623	472	636	317	726	395	501	335	585	525	463	512

Unity = 1γ = ·00001 C. G. S.

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 1	+ 3	+ 5	+ 17	− 2	− 7	−14	+19	+15	+ 6	+34	+ 6
2 ...	+164	+ 5	− 5	+ 35	+21	− 6	− 7	−11	−16	− 3	−14	− 16
3 ...	+ 31	+55	+18	+ 8	− 10	+18	+ 7	+11	+16	− 8	− 4	− 10
4 ...	− 14	− 3	+24	+ 17	−12	+ 3	0	+ 3	+47	−12	+ 1	− 11
5 ...	− 7	−12	− 9	+ 22	0	− 4	−15	− 3	+17	+ 3	+15	− 13
6 ...	− 3	+11	− 7	+ 9	+ 6	− 1	−15	−11	− 9	+ 3	+16	+ 1
7 ...	− 1	+12	+11	− 2	− 8	+ 7	− 7	− 1	− 1	− 4	+12	− 13
8 ...	+ 7	−15	+18	− 21	− 2	+ 6	+ 8	+ 5	+ 5	−18	− 6	0
9 ...	− 5	−23	− 2	− 18	−13	0	−12	+15	− 5	− 9	− 2	− 10
10 ...	− 19	− 7	+ 1	+ 24	+ 2	−24	− 2	− 7	+ 1	+31	− 3	+ 17
11 ...	+ 36	−10	− 7	− 23	− 2	0	+23	− 3	+33	−12	+ 1	+ 84
12 ...	+ 4	− 8	− 9	− 23	0	− 6	−17	+21	−31	− 3	+12	+ 11
13 ...	− 23	−13	−22	− 10	+ 9	− 3	− 7	+17	−20	−21	+ 6	− 23
14 ...	− 23	−12	−11	− 21	+34	− 7	+34	−22	+48	− 1	+35	− 19
15 ...	− 9	−21	−18	− 27	−11	+ 4	− 1	− 2	−16	+19	−11	− 7
16 ...	− 29	−24	−11	0	−11	+37	+ 2	−13	− 9	−22	− 2	− 26
17 ...	− 16	−14	+ 7	− 25	+66	+ 3	− 9	+ 1	+ 3	− 8	+33	− 10
18 ...	− 12	−10	− 3	− 8	−16	−18	+ 5	+ 7	− 1	+ 2	−18	− 14
19 ...	− 11	−17	− 5	+ 10	− 1	−13	− 5	+15	− 2	− 5	−11	− 12
20 ...	− 20	− 1	− 9	+166	−10	+11	0	+ 8	−22	−15	+24	+208
21 ...	− 27	− 9	− 5	− 25	+40	− 1	+ 9	− 2	+ 3	− 9	−27	− 19
22 ...	− 3	+ 3	+ 8	− 17	− 9	+ 7	− 4	− 2	− 8	+20	−10	− 30
23 ...	− 3	+18	0	+ 53	−27	− 8	0	+ 8	−17	+30	− 3	− 18
24 ...	0	+33	− 1	− 13	−22	−11	−10	−20	+	0	+19	− 18
25 ...	− 19	+25	−12	− 32	−17	+ 7	+ 6	−17	−18	+19	−19	− 36
26 ...	− 30	+25	+ 5	− 33	−12	+13	− 8	0	− 7	+18	−14	− 21
27 ...	− 16	+18	+16	− 37	− 9	+12	+10	−19	+12	+10	− 7	− 29
28 ...	− 7	−15	+ 4	− 18	− 5	− 9	− 8	+ 6	− 8	+15	−31	− 18
29 ...	+ 44		+25	+ 8	+ 2	− 4	− 6	+ 4	+ 1	+ 4	−12	+ 13
30 ...	+ 18		− 3	− 17	+40	− 3	+13	−13	− 4	− 9	−18	− 10
31 ...	+ 10		+ 3		−26		+24	+21		−14		+ 36
Sums without regard to signs.	612	422	284	739	445	253	288	307	396	353	420	759

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1898-1899.*

Unity = 1γ = ·00001 C. G. S.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	-11	-17	- 33	-20	+23	- 7	- 5	-13	- 6	- 9	0	- 5
2	-17	+12	+ 40	-13	-18	-22	+ 3	+11	+ 23	+ 1	+ 5	+16
3	-19	- 3	- 15	-13	+11	-11	+20	- 1	- 15	+13	- 7	+20
4	-22	-16	- 18	+10	- 1	-18	+ 1	- 2	- 27	- 14	-16	+10
5	- 6	+ 6	+ 12	-13	- 6	-11	-12	+19	- 11	- 3	-18	+ 9
6	-19	-11	+ 11	+12	+ 6	+41	- 5	+ 2	- 27	-22	-17	+12
7	- 9	-16	- 13	+54	- 6	+95	-13	-13	- 24	+12	+ 9	+14
8	- 2	+11	- 3	-26	-13	-13	+12	-15	+ 3	-19	-14	-17
9	+ 6	- 9	- 10	- 8	- 5	+15	+ 9	- 4	+252	- 1	+ 6	- 5
10	+39	-12	+ 34	-11	+12	+31	0	+14	+ 54	- 3	-21	-13
11	+46	+82	+ 81	- 6	+50	-28	+11	0	- 20	-19	+15	- 7
12	- 6	- 5	- 13	+58	- 9	-32	- 7	- 1	- 11	- 1	+ 4	-11
13	-10	-22	- 12	-18	+ 9	-20	+22	+19	- 15	+23	+ 5	-10
14	-14	+30	+ 5	+35	0	+ 4	-15	-17	+ 13	+ 4	-13	+33
15	+ 8	- 4	+123	+ 1	+18	+24	- 8	-15	- 9	+ 8	+ 2	- 2
16	+28	+ 9	- 6	-12	-15	- 9	-12	+79	- 7	-15	+ 7	+22
17	0	0	- 5	- 5	-14	-10	- 4	+28	- 14	-14	+39	- 4
18	-10	-18	+ 7	+18	- 6	- 6	-12	0	- 22	-25	+21	-16
19	- 3	+ 3	- 11	- 2	- 1	+ 8	+10	- 9	- 23	-10	- 9	+ 7
20	- 5	+15	- 22	-14	- 1	- 7	+ 4	- 3	- 12	+49	+ 1	- 5
21	- 8	+26	- 13	- 5	- 4	- 2	- 4	-17	- 19	- 7	+20	-24
22	- 3	- 5	- 18	- 8	+10	- 9	- 4	+ 4	- 20	+ 3	+38	-31
23	- 5	-22	- 25	+ 6	- 5	+ 6	+ 3	+ 1	+ 9	-21	-16	-17
24	- 2	- 3	- 7	- 1	+ 5	-13	+11	- 1	+ 22	-12	-20	- 4
25	+22	-18	- 23	-11	- 9	0	+22	-24	- 18	+55	-11	- 2
26	+24	- 5	- 3	- 4	- 7	+21	- 7	+10	- 21	-20	+11	-13
27	+15	-14	- 3	-16	+ 1	- 4	+14	0	- 22	- 5	+33	+ 8
28	+ 7	0	- 5	+ 1	- 5	- 8	- 6	+26	- 3	+25	-23	+22
29	- 9		- 9	+ 1	- 4	- 4	- 8	-25	+ 2	+29	+ 1	+17
30	- 1		- 9	+ 6	- 2	-14	- 8	-23	- 26	- 1	-16	+ 7
31	-15		- 32		-17		0	-17		0		- 4
Sums without regard to signs.	391	394	621	408	293	493	272	413	750	443	418	387

Unity = 1γ = ·00001 C. G. S.

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 4	- 12	-17	+21	+22	-15	+14	+ 4	0	- 3	- 1	+ 6
2	- 6	- 7	-24	+20	+14	+ 1	- 4	+ 2	+ 2	- 9	+ 2	+33
3	-10	- 28	+22	- 4	+19	-18	+ 8	+27	-17	- 1	+ 8	+ 5
4	- 9	- 28	-11	+12	0	-28	+12	- 1	-11	+10	+27	- 3
5	-21	- 23	-12	- 4	+36	-20	- 3	+ 5	- 4	- 4	- 8	+11
6	- 2	- 8	+24	-17	-30	-10	+ 1	+ 9	-30	- 2	+ 3	+ 3
7	-21	+ 2	0	+13	+ 1	- 5	+10	- 1	-10	+13	-12	+ 4
8	- 7	- 15	-20	- 9	-11	+ 4	- 9	- 7	+ 7	- 3	0	+16
9	-18	- 18	- 6	+15	- 6	+16	+ 2	- 2	- 4	- 2	-16	- 6
10	+ 2	- 12	+19	+ 4	- 6	+ 6	+39	-15	+13	+ 1	- 4	-19
11	- 2	- 7	-19	+ 8	+ 5	+23	- 8	-13	- 8	- 2	+10	0
12	+ 3	+158	0	+ 5	-21	-16	+ 4	- 8	+14	-15	- 4	+ 6
13	- 2	- 8	0	- 9	-23	-20	- 5	+29	-16	-12	+ 2	-15
14	- 1	- 2	0	+ 9	- 8	- 7	- 3	- 5	-22	- 9	- 6	-21
15	+11	- 12	+ 3	-10	+48	-17	+ 1	- 4	+36	+69	+ 7	-13
16	+13	- 14	- 6	- 6	-25	- 8	+12	-13	-12	-10	-12	-15
17	+31	- 13	+ 4	+ 2	-14	-13	- 6	-10	+ 9	- 6	+11	-14
18	+21	- 11	- 2	+55	-26	+ 2	- 1	+ 2	+20	- 6	0	+13
19	- 4	- 5	-17	+ 2	-23	+12	-16	-10	+ 3	-14	+28	+30
20	+14	+ 9	-13	-10	+ 5	-11	-13	+51	+10	- 5	- 5	0
21	-23	+ 3	+25	-13	-17	-13	+ 2	+15	+ 9	- 9	- 3	+ 9
22	- 5	- 15	+27	-29	-16	+ 3	-14	- 6	0	+13	+47	- 6
23	+10	+ 31	+46	- 4	+11	+36	- 9	- 5	- 2	+26	- 8	+12
24	-16	- 17	-22	-17	+10	-11	-18	- 8	-16	+ 1	-23	-14
25	-17	- 8	- 4	- 9	- 18	-13	+36	0	+19	+ 2	-19	+ 4
26	- 7	+ 19	- 8	- 5	+22	+21	- 2	-14	+40	-12	-11	+ 3
27	+ 7	+ 2	- 7	-10	+ 1	+61	+ 1	-14	-18	0	-14	+17
28	+60	+ 26	+13	-10	-11	+10	- 4	+ 1	-18	- 3	- 7	0
29	+20		- 4	+13	- 9	+ 5	- 1	+31	+ 3	- 6	- 3	- 9
30	-10		+ 3	-12	+ 7	+27	-11	- 7	- 9	+ 1	+ 9	-15
31	- 7		0		+51		- 8	-23		+ 1		- 8
Sums without regard to signs.	384	513	378	357	516	452	277	342	382	270	310	330

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1900-1901.*

Unity = 1γ = ·00001 C. G. S.

Unity = 1γ = ·00001 C. G. S.

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 2	−27	− 2	0	− 4	− 4	− 8	−10	− 4	− 6	+ 4	+ 2
2 ...	+ 2	−11	0	+ 2	− 8	+16	+ 5	0	− 5	− 3	+ 2	+21
3 ...	−10	−13	− 13	−13	− 6	− 7	−17	− 2	− 5	−14	+ 8	− 4
4 ...	+ 2	+34	− 15	− 2	+ 7	+ 7	− 5	+14	− 4	+28	0	+ 2
5 ...	+93	− 7	− 13	− 8	+176	− 9	−21	− 4	+12	−25	+ 2	+ 2
6 ...	−17	−17	− 6	+ 8	− 19	− 2	+ 1	− 8	+ 8	− 1	+ 7	+ 6
7 ...	−20	−16	− 15	−10	− 11	+10	0	+ 2	+ 9	− 7	+ 1	+47
8 ...	−11	− 4	+ 76	−10	+ 6	+ 9	0	+18	−16	−11	+ 7	− 1
9 ...	−28	+11	− 3	− 4	+ 4	− 5	−21	−13	+ 2	− 3	− 5	0
10 ...	+ 4	−29	− 20	− 1	0	−10	+ 4	− 6	+29	−10	− 5	+18
11 ...	−14	+ 7	− 18	−13	− 2	−11	+ 8	− 3	−11	− 6	− 8	− 2
12 ...	− 4	−10	− 22	+ 3	− 15	0	+23	+11	−13	+ 6	+ 7	− 6
13 ...	− 9	+ 8	+117	+13	− 3	+ 8	− 4	+12	+ 8	+ 8	+ 6	− 7
14 ...	−19	+22	− 8	+ 5	− 15	+27	+ 2	+ 1	+ 3	− 4	+10	− 4
15 ...	+18	+31	− 12	+ 7	− 15	+19	+25	+15	+11	0	+ 1	− 6
16 ...	− 6	−11	+ 1	+10	− 16	− 3	+ 7	− 4	−13	+ 3	−19	− 8
17 ...	− 9	+13	− 12	+16	− 8	− 3	− 4	+ 3	− 3	0	−18	− 7
18 ...	− 8	− 6	− 11	+12	− 8	+14	+ 5	+ 1	−11	+ 2	− 4	− 9
19 ...	+39	+ 3	− 11	−11	− 4	− 3	+ 7	− 6	− 4	+13	− 8	− 7
20 ...	+ 4	+22	+ 1	0	− 10	+ 5	+21	− 8	+ 1	+21	+ 3	−10
21 ...	+66	+ 7	0	+ 2	− 3	− 8	0	+ 1	+ 5	−13	+12	− 3
22 ...	+ 6	−15	+ 4	+ 5	− 4	−12	−13	+ 3	− 9	− 2	+ 5	−12
23 ...	− 9	− 8	− 5	+ 7	+ 2	+17	− 3	− 5	−15	−10	− 4	− 2
24 ...	−19	+19	− 16	−20	− 11	−10	+19	− 9	− 2	− 3	+11	+ 5
25 ...	− 4	− 1	+ 1	−23	+ 3	−10	− 4	+20	0	+39	− 1	+ 7
26 ...	+10	− 5	− 9	0	− 12	−10	− 7	+ 8	+ 1	+ 3	−13	− 8
27 ...	0	+12	− 4	+ 5	− 7	− 8	− 1	+ 7	+18	− 4	− 1	+31
28 ...	−12	− 5	+ 4	− 5	+ 4	− 9	+ 6	− 9	+ 3	−14	− 8	− 9
29 ...	−18		+ 18	− 2	− 7	− 8	0	− 7	− 7	− 5	+16	− 5
30 ...	−16		+ 11	+38	+ 1	−13	−16	− 5	+ 5	+11	−10	− 7
31 ...	+ 1		− 7		− 26		−14	− 4		− 1		−10
Sums without regard to signs.	480	374	455	255	417	277	271	219	237	276	206	268

1901. Date.	January.	February.	March.	April.	May.	June.	July.	August.	Septemer.	October.	November.	December.
1 ...	−26	− 9	− 2	+23	0	+10	− 7	− 5	− 9	−13	+ 8	+ 2
2 ...	−10	+59	− 15	+13	+10	− 1	−14	− 4	− 1	− 2	+ 6	+33
3 ...	− 1	− 4	− 1	+15	+ 6	+ 4	− 3	+ 9	+ 6	+10	+ 9	−11
4 ...	+ 5	− 9	− 4	+ 3	−14	+11	+10	+ 5	−14	+ 5	+16	−11
5 ...	+34	−10	− 10	− 2	− 2	− 1	−13	−22	−14	− 6	− 1	+ 9
6 ...	− 5	− 5	− 3	+13	+ 9	0	+ 1	+ 1	− 6	− 4	−15	− 1
7 ...	− 3	−19	+ 6	+25	+12	− 4	−12	− 3	−12	+ 9	− 1	+ 3
8 ...	− 9	− 7	− 5	+ 7	+ 3	+ 4	− 20	+13	−26	+ 5	− 1	+ 6
9 ...	+12	−21	+ 3	−17	+18	−16	+ 8	− 2	− 6	+ 7	+21	+18
10 ...	− 4	−14	− 11	−11	+49	−16	+10	−11	+44	− 9	+ 1	−10
11 ...	− 8	−14	− 6	+12	−15	− 7	+ 3	−17	−13	0	+11	+ 6
12 ...	−12	+33	− 21	+ 1	− 8	−16	− 3	−16	+12	− 5	0	+14
13 ...	−14	− 2	− 5	− 2	−27	+ 1	0	0	− 4	+25	− 4	− 2
14 ...	−14	−12	− 11	+20	− 3	− 5	0	+85	− 6	− 5	− 5	+ 8
15 ...	−12	−14	+ 1	− 2	+13	+11	− 1	+ 7	−13	− 1	−10	− 9
16 ...	−13	− 4	+ 7	+ 2	−11	− 4	− 4	− 3	+20	+ 6	− 5	− 6
17 ...	−15	+ 8	− 11	−10	+ 2	− 1	+15	− 7	+ 8	− 5	− 9	− 4
18 ...	− 4	+ 6	+ 10	−16	+ 3	− 4	+ 1	− 4	− 1	− 4	+ 1	−10
19 ...	− 2	+40	+ 1	−11	− 9	−10	− 1	− 1	+ 7	+ 1	+32	−19
20 ...	+10	+ 8	+ 7	+ 1	−15	+ 8	+ 7	+24	− 9	−12	− 2	−10
21 ...	+22	− 1	− 12	+ 8	−20	+14	− 1	− 4	+ 9	− 4	− 7	−20
22 ...	+50	+16	+ 10	+ 7	− 8	− 1	+ 4	− 8	−11	− 8	−11	−18
23 ...	+24	+22	+ 1	− 4	+ 6	+ 9	+ 3	− 8	+ 8	− 9	− 5	−12
24 ...	+ 1	− 5	+101	−10	0	− 5	+11	+ 5	+ 5	− 7	− 1	− 1
25 ...	+ 3	− 8	− 6	−13	− 2	− 3	+24	−12	− 1	+37	− 2	− 5
26 ...	+ 1	− 9	− 4	−20	− 2	− 5	+ 2	− 9	− 5	−11	− 8	− 6
27 ...	+14	− 6	+ 5	+ 3	− 6	+ 2	− 4	−15	+ 9	− 1	− 3	+13
28 ...	−11	− 7	− 7	−20	+ 5	+ 9	−18	− 3	+ 5	+ 8	+ 2	+65
29 ...	− 8		+ 7	− 8	− 6	+ 8	+ 2	+ 3	+ 8	− 8	−11	− 8
30 ...	+ 6		− 12	0	− 2	0	− 8	−10	+19	− 5	−11	− 6
31 ...	− 1		+ 1		+11		− 6	0		0		−13
Sums without regard to signs.	354	372	306	299	297	190	216	316	311	232	219	359

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1902-1903.*

Unity = 1γ = ·00001 C. G. S.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−15	+ 4	− 5	+ 5	− 4	+ 1	−12	−12	−14	−12	−17	+ 4
2 ...	−13	− 5	−12	−16	−19	+ 2	− 8	+ 5	+19	−10	+ 1	+ 9
3 ...	− 6	+12	−15	− 2	− 8	−12	− 6	− 1	+ 3	− 4	− 4	+ 5
4 ...	−14	− 1	−16	− 8	+ 7	− 5	+ 1	+ 7	−19	− 7	− 4	+ 7
5 ...	−10	+14	−13	−16	0	+ 7	−17	+ 4	− 9	−18	− 8	− 4
6 ...	− 1	−11	−12	− 9	− 9	+ 3	+ 4	− 7	− 5	+ 3	0	+ 5
7 ...	−15	+26	−20	− 4	− 9	− 2	+16	+ 5	+11	+ 7	− 6	−12
8 ...	0	− 2	+ 6	+16	− 6	+12	+11	+ 6	− 4	−15	−15	− 9
9 ...	+ 5	− 7	−11	+19	+56	− 6	−11	− 1	− 7	+ 7	−11	+22
10 ...	− 4	−13	− 6	+23	+13	+ 2	+ 6	+ 6	+10	−15	−11	+ 6
11 ...	−12	+ 1	+10	+72	+10	+ 3	+ 7	−11	−15	+13	−16	− 1
12 ...	−15	+ 9	− 8	−13	− 1	+ 7	+17	− 1	+ 8	−11	− 4	+ 3
13 ...	− 4	+ 5	+11	−16	+ 3	+ 3	− 4	−15	−18	− 9	+20	+19
14 ...	+ 5	− 3	− 8	−13	+10	+ 8	+10	−11	− 1	−11	+16	− 6
15 ...	+26	− 3	+ 6	− 7	−13	− 6	+ 9	−12	−10	+ 2	+ 6	− 1
16 ...	− 5	+14	+ 2	− 6	0	−12	− 8	+ 4	+ 7	− 7	+ 6	+11
17 ...	−13	− 5	− 8	− 9	+10	−12	− 2	− 5	−13	+ 9	− 2	− 7
18 ...	−11	− 2	− 8	−16	+ 1	− 7	+13	− 2	+ 7	+21	− 2	+ 3
19 ...	−19	−19	− 4	−15	− 7	+ 7	− 6	0	+35	− 8	+12	+ 6
20 ...	−10	0	+ 8	+74	− 4	− 4	+ 2	− 3	+19	0	+ 3	− 2
21 ...	−14	+ 6	+24	−11	− 3	0	0	+46	+ 1	−10	− 6	− 7
22 ..	−10	− 2	+ 2	− 2	−15	− 1	−16	−12	− 1	− 3	+11	+ 4
23 ...	+ 5	− 6	+ 8	− 4	− 4	− 5	+11	−17	− 4	− 7	+23	+ 9
24 ...	+43	+ 6	+56	−17	0	+ 1	0	+ 2	− 6	+16	+28	− 3
25 ...	+23	+ 9	+ 8	−13	− 4	+ 7	+ 5	−11	+ 3	+ 2	+ 4	− 8
26 ...	+55	− 8	+11	+ 4	− 2	+ 9	0	− 1	+ 4	− 3	− 2	−13
27 ...	+ 8	− 7	−12	−20	−11	+ 3	+ 3	+14	−14	+ 9	−11	−15
28 ...	+12	− 9	0	− 5	+ 3	− 2	− 9	+ 1	− 2	+ 1	− 9	−10
29 ...	+10		+11	− 4	+18	+10	− 2	+11	+ 7	− 3	−10	− 8
30 ...	0		− 3	+12	− 9	−11	−17	− 8	+ 8	+15	+ 7	− 8
31 ...	0		− 3		− 2		+ 1	+18		+50		+ 1
Sums without regard to signs.	385	210	333	452	261	171	236	261	286	308	274	230

Unity = 1γ = ·00001 C. G. S.

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 8	− 2	+ 7	− 10	+ 6	+61	− 4	− 1	+ 4	− 21	+53	− 3
2 ...	− 7	+ 2	0	− 11	+ 3	−12	− 2	−15	− 8	− 8	+ 7	+ 5
3 ...	− 3	− 5	−18	− 22	+12	− 8	−14	− 5	− 8	− 44	+ 3	− 11
4 ...	+17	−16	− 7	− 21	+21	− 7	− 8	+12	− 8	− 31	− 3	+ 11
5 ...	+30	− 1	+14	+ 16	+14	− 3	− 9	−10	+27	− 24	− 4	− 1
6 ...	−20	−20	− 3	+129	+25	− 6	−12	+ 7	−10	− 20	+20	− 11
7 ...	−18	−17	+12	− 15	− 6	−10	+ 3	−19	0	− 17	+20	+ 15
8 ...	+ 6	+ 3	− 7	− 18	− 4	−17	−12	−11	+15	− 28	−12	− 12
9 ...	− 7	− 3	−19	− 1	+ 1	−26	− 2	−24	− 7	− 24	− 2	− 8
10 ...	− 2	− 3	− 3	− 16	+ 1	−29	+28	−11	+14	− 10	+ 7	− 22
11 ...	− 6	− 9	− 6	− 16	−11	−21	− 20	+16	− 6	− 11	− 5	− 25
12 ...	− 9	− 1	+13	− 5	− 3	+ 2	+ 1	+ 7	0	+ 59	+ 6	− 23
13 ...	− 4	+13	+ 5	0	0	+11	+ 2	− 7	−20	− 23	−11	+180
14 ...	0	+17	−16	− 4	−13	+22	+16	+29	−24	− 23	−10	− 21
15 ...	− 4	+ 6	+ 5	+ 39	− 9	+12	0	+ 1	− 3	− 32	− 9	− 12
16 ...	+25	+10	− 4	− 11	− 6	+ 8	−15	+ 2	−25	− 26	+21	− 32
17 ...	− 8	0	−19	+ 7	+ 9	+ 4	+ 2	−24	−17	− 36	−18	− 12
18 ...	+ 9	− 8	− 6	+ 20	+ 4	−12	+ 9	− 1	+16	− 40	+12	− 17
19 ...	+ 7	0	− 2	− 23	0	+ 1	+ 7	−20	+27	− 29	−12	− 6
20 ...	−13	−14	+ 5	− 15	−14	− 9	+ 1	+ 2	+14	− 21	− 6	+ 44
21 ...	− 4	+ 8	+ 5	− 10	+ 1	− 6	+ 5	+14	− 6	− 28	−22	− 12
22 ...	−17	+ 8	+ 5	− 13	+ 2	− 7	−10	+26	+ 3	− 10	+11	− 14
23 ...	−10	+ 7	+ 6	− 20	+ 1	−16	− 7	+ 6	+39	− 30	+18	− 17
24 ...	+ 5	− 6	+15	− 6	+ 4	− 1	− 5	−14	+ 7	− 31	+ 2	− 24
25 ...	− 8	+ 7	+ 4	+ 14	0	− 4	+18	−10	− 8	− 25	+ 3	− 20
26 ...	+ 4	+ 4	0	+ 33	0	− 3	+48	+82	−15	− 16	−19	− 15
27 ...	+ 4	+ 4	−10	− 16	−14	− 3	+ 9	−23	−16	− 26	−10	− 13
28 ...	+ 9	+15	− 4	− 3	−11	+30	+23	− 4	− 6	− 27	+ 7	− 32
29 ...	− 2		+16	+ 5	− 6	+37	−19	− 9	+28	− 22	−30	+ 26
30 ...	+21		+ 3	− 6	− 2	+12	−20	+22	− 9	− 22	−16	+ 83
31 ...	+10		+10		− 5		−11	−21		+649		+ 2
Sums without regard to signs.	297	213	249	525	210	403	341	455	392	1,415	380	729

TABLE 521.—*Showing the departures of the daily range of Horizontal Force from the mean value of the month for the years 1904-1905.*

Unity = 1γ = ·00001 C. G. S.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 5	+ 4	−16	+88	− 4	−24	+ 5	− 5	−12	0	+ 1	+ 2
2 ...	+ 6	+ 3	− 7	+ 2	−12	−20	−17	+20	− 7	−16	+16	+ 3
3 ...	− 3	− 5	+12	−12	− 5	−13	−15	+43	0	0	− 8	+18
4 ...	−11	+ 4	− 4	− 7	− 2	−14	− 6	+16	+10	−22	+80	− 3
5 ...	+15	+ 3	−13	−13	− 4	− 5	−16	−14	+36	−13	+15	+ 7
6 ...	−17	+11	−28	+ 3	+ 4	+51	+53	+ 3	−12	− 7	−16	− 4
7 ...	+ 8	+ 8	−18	0	+ 7	−12	−15	+22	+ 7	+20	+ 4	+ 3
8 ...	0	+10	−18	−10	+ 1	−26	0	+ 5	− 5	+10	+13	+13
9 ...	− 2	+ 2	−14	− 4	0	−18	−19	− 4	− 2	−23	− 7	+59
10 ...	+ 8	−31	− 9	− 3	+16	−25	−24	+ 6	−13	−12	−10	+ 4
11 ...	−24	−17	+32	− 4	−16	− 6	−14	− 6	+15	− 2	−22	+ 7
12 ...	−23	−18	+ 4	−14	+74	− 5	+ 1	+10	− 1	+ 1	− 9	− 5
13 ...	−25	+ 3	+ 7	− 4	+29	−10	0	+11	−22	+29	−10	−12
14 ...	−18	+ 8	− 3	− 9	−11	0	+42	− 7	−10	− 6	− 5	+ 4
15 ...	−16	+ 7	− 2	+ 2	− 2	+84	− 3	+ 1	− 3	− 9	−13	0
16 ...	+38	+17	+ 9	−24	− 6	+65	−12	+ 3	+34	−10	− 6	+22
17 ...	− 5	+11	− 4	−20	+19	+ 1	+14	− 7	0	− 7	−13	−10
18 ...	− 9	− 6	+21	+83	+12	+ 5	+25	− 9	−11	+ 3	+ 2	+ 3
19 ...	0	−19	+ 4	+24	− 3	+ 2	+ 5	−21	−32	−11	−24	+ 2
20 ...	+ 7	− 7	+30	−17	−19	− 4	+28	−12	−15	− 4	−22	−16
21 ...	+22	−17	− 5	− 9	−20	+ 3	+ 8	+11	− 4	+84	−11	+13
22 ...	+ 2	+ 2	− 2	−10	+ 3	− 1	− 7	− 6	+10	−12	+11	− 4
23 ...	− 5	+ 3	+18	− 5	0	−13	+ 2	−23	− 3	−20	−20	− 8
24 ...	−17	+ 7	− 1	+ 8	+ 1	−11	−10	−26	+15	− 9	−19	−11
25 ...	0	+17	−15	+ 6	−28	− 2	−13	−21	+27	+ 7	+90	−11
26 ...	−14	− 9	+23	−11	−17	− 5	+ 3	+ 7	−17	+ 9	+20	+ 1
27 ...	−15	− 8	−19	−19	+ 3	+24	− 1	−21	− 7	+16	0	−26
28 ...	+77	− 2	− 4	−15	+13	−13	+ 3	− 2	− 8	+27	−17	− 5
29 ...	+14	+19	+20	− 7	− 5	−11	− 3	+15	+12	−20	− 8	− 6
30 ...	+ 7		− 4	+ 1	−25	+ 1	+ 1	+25	+17	0	−13	−18
31 ...	− 4		+ 5		− 4		−14	−14		+ 1		−22
Sums without regard to signs.	419	280	373	436	368	476	379	401	369	412	504	326

Unity = 1γ = ·00001 C. G. S.

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−11	−21	+ 3	+74	+15	−19	−12	−11	− 14	+ 16	− 24	−13
2 ...	−27	+21	+124	+ 4	− 5	−15	+ 8	+77	− 4	+ 3	− 11	+25
3 ...	− 8	+89	− 28	−14	+ 2	+15	−10	−13	+113	− 27	− 18	− 1
4 ...	+ 8	− 5	− 7	− 2	− 3	+50	− 5	−17	+ 11	− 6	+ 22	+75
5 ...	+46	+12	+ 30	+27	− 1	+52	− 2	− 7	0	+ 15	− 40	−22
6 ...	− 4	−22	− 5	− 3	− 9	−29	+43	−13	− 25	+ 38	− 17	−12
7 ...	− 4	− 7	+ 37	−21	+ 9	−11	−23	+ 6	0	− 8	− 21	− 7
8 ...	− 8	−14	− 7	−10	− 7	0	+10	+ 1	− 5	− 4	− 17	− 7
9 ...	−19	− 3	− 2	+10	− 6	+30	+ 4	− 9	0	− 20	− 3	0
10 ...	− 1	− 7	− 6	+ 8	+ 1	+59	−14	−13	+ 16	− 7	− 13	+ 7
11 ...	+31	− 8	− 4	+ 1	+ 8	+10	+ 6	+12	− 12	− 9	− 29	+22
12 ...	+12	+14	− 9	+19	+32	−28	− 6	+ 9	0	− 5	+174	+56
13 ...	− 6	−24	− 17	− 8	+ 5	−17	+ 8	+19	− 4	+ 31	+ 26	+ 7
14 ...	+21	− 2	+ 4	−17	− 6	−14	+ 3	− 2	− 17	− 8	− 6	− 7
15 ...	−34	− 9	− 14	−11	−23	+ 7	+12	−17	− 14	− 16	+136	− 8
16 ...	−19	−22	− 8	−16	−18	−11	+18	+29	− 2	− 3	+ 53	− 3
17 ...	+14	−35	− 23	−19	+17	+ 2	+11	+ 3	− 10	− 1	− 25	− 5
18 ...	+ 8	−27	− 9	−18	− 9	− 2	− 8	−13	+ 66	− 8	− 23	−11
19 ...	− 4	− 8	+ 12	+16	−10	+10	− 7	+ 6	+ 2	− 6	− 18	−20
20 ...	−10	+ 7	+ 1	− 2	− 7	− 21	+ 3	− 7	− 26	+ 3	− 5	+29
21 ...	− 3	+22	− 11	0	− 6	−21	+ 1	+ 2	− 26	+ 3	+ 1	−33
22 ...	+63	− 3	− 15	− 3	+ 2	+15	−15	− 9	− 6	− 7	− 20	−20
23 ...	+ 4	+20	+ 6	−10	+25	+22	− 4	−11	− 33	− 4	+ 3	−33
24 ...	− 3	+ 9	− 20	−14	−15	−15	+32	− 6	− 22	− 9	− 14	−17
25 ...	− 4	+23	− 19	−18	−19	−15	− 8	− 9	− 8	− 1	− 20	− 8
26 ...	− 4	+36	− 16	+ 2	+15	−13	−12	−19	+ 6	− 14	− 15	−10
27 ...	−16	− 2	+ 9	+22	+15	−15	− 2	−15	+ 5	+ 9	− 1	− 4
28 ...	+ 3	−30	− 15	−14	+ 8	−19	− 1	+42	− 9	+100	− 22	+18
29 ...	− 4		+ 21	+ 8	− 7	− 2	−11	+22	+ 7	− 25	− 25	+14
30 ...	−27		− 4	+10	− 2	− 4	− 5	−12	+ 10	− 12	− 28	−10
31 ...	+ 5		− 5		+ 3		−16	−24		− 16		+ 1
Sums without regard to signs.	435	505	495	404	314	545	323	456	474	436	831	507

mean (*vide* table 401) is $\pm 6{\cdot}8\gamma$ for the year 1894, $\pm 3{\cdot}9\gamma$ for the year 1901, and $\pm 4{\cdot}9\gamma$ for the average condition of 11 years. We also know (*vide* table 407) that in the year 1894 the quiet-day mean stands higher than the all-day mean by $11{\cdot}0\gamma$; in 1901 by only $1{\cdot}1\gamma$, and in the average condition of 11 years by $4{\cdot}3\gamma$. It will readily appear thus that the value of the daily mean of quiet days must in the year 1894 fluctuate on the average between the limits $+17{\cdot}8\gamma$ and $+4{\cdot}2\gamma$ above the all-day mean; in the year 1901 between $+5{\cdot}0\gamma$ and $-2{\cdot}8\gamma$ and in the average condition of 11 years, between the limits $+9{\cdot}2\gamma$ and $-0{\cdot}6\gamma$. Thus the zone of quiet days referred to in paragraph 464 though it extends over a much wider limit of daily means in the disturbed years, always lies on the positive side altogether of the mean of all days. In the average condition of 11 years the zone of quiet days is reduced in extent and though the lower limit just reaches the all-day mean the value of the quiet day mean continues to remain positive, that is higher than the all-day mean. In the years of minimum disturbance however the departures of the quiet-day means which are restricted then to quite a narrow zone, cover a region on both sides of the all-day mean. The quiet day mean under these circumstances may hence stand either higher or lower than the all-day mean and thus contain the all-day mean.

534. In table 382 are collected for ready reference the two extreme positive and negative departures of the daily mean occurring in each month. It will be seen that the extreme positive departure in the period considered, namely 12 years, is 40γ, while the negative one is 271γ; that of the 144 days so selected for the extreme negative departures, 114 indicate disturbed conditions and are classed as S or above that denomination, 30 days only being entered as C or Ca. In the positive departures 123 are quiet days denominated as C or Ca, 17 are classed S, and 4 as Sa. It will be noted however that the list does not necessarily include all days of the greatest disturbance, or of the quietest conditions. For the effect of the incidence of a disturbance or of quiet conditions on the daily mean depends upon the commencing hour of a storm which not unusually results in more seriously affecting the next day's mean in the case of disturbances, and the previous day's mean in the case of quiet conditions, rather than that of the exact day itself in each case.

535. The table given below summarises the analysis of the series of the daily-means, showing in different ways the relation which obtains between the two kinds of days—the *quiet* and the *all*-day. The range series is also similarly treated. The data are derived from table 521, so that the relation likewise in the progression relatively of the range and the daily mean during a quiet and an all-day can be readily discerned at a glance :—

Unity = 1γ	Daily means of H.						
Year and period.	Mean departures from their own means.		Differences. Quiet-days less all-days.	Range of movement of quiet-days from mean of all-days.		Position of the median from the mean of all-day.	Year and period.
	Quiet-day.	All-day.		Upper limit.	Lower limit.		
1894	± 6·8	±16·5	+11·0	+17·8	+ 4·2	+ 3·9	1894.
1901	± 3·9	± 5·0	+ 1·1	+ 5·0	− 2·8	+ 1·0	1901.
Average, 1894—1904	± 4·9	± 9·0	+ 4·3	+ 9·2	− 0·6	+ 1·7	Average, 1894—1904
	Daily range of H.						
1894	∓ 8·6	∓ 23·5	−15·2	−23·8	− 6·6	− 10·4	1894.
1901	∓ 6·5	∓ 9·5	− 3·8	−10·3	+ 2·7	− 2·5	1901.
Average, 1894—1904	∓ 7·7	∓ 14·2	− 7·7	−15·4	− 0·0	− 4·1	Average, 1894—1904

The mean all-day range for 1894, 1901 and average of 1894—1904 is 74γ, 42γ and 53γ respectively.

536. The question may be examined in a different way by grouping the departures of the daily means of H shown in table 520, into convenient divisions, each having an upper and a lower limit of departure, instead of treating them as we have done in the discussion above, by dividing the days into two

TABLE 522.—*Showing the frequency of occurrence of days during which the departures of daily means attain certain magnitudes (grouped into convenient divisions) and the total sums of these departures during these days.*

Unity (for intensity figures) = 1γ

Class.	> + 29·5γ		+29·5γ to +19·6γ		+19·5γ to +9·6γ		Central Zone. +9·5γ to 0·0		Central Zone. 0 to −9·5γ		Central Zone. −9·6γ to −19·5γ		−19·6γ to −29·5γ		> −29·5γ		All positive departures.		All negative departures.	
Years.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1890 ...	0	0	1	20	30	378	166	719	127	520	35	447	5	110	1	40	197	1117	168	1117
1891 ...	1	30	13	299	61	811	136	663	87	400	46	648	9	212	12	543	211	1803	154	1803
1892 ...	10	313	32	746	102	1436	86	386	64	313	18	257	22	542	32	1769	230	2881	136	2881
1893 ...	3	96	20	464	94	1310	89	376	80	354	38	520	24	586	17	786	206	2246	159	2246
1894 ...	17	563	45	1061	66	921	91	440	69	282	26	357	23	562	28	1784	219	2985	146	2985
1895 ...	3	104	23	523	55	775	116	563	82	318	54	699	21	522	11	426	197	1965	168	1965
1896 ...	2	71	25	562	80	1078	94	463	84	354	48	657	20	485	13	678	201	2174	165	2174
1897 ...	0	0	9	205	65	845	138	586	93	367	37	486	13	312	10	471	212	1636	153	1636
1898 ...	2	74	11	244	71	915	117	1517	105	476	40	548	9	203	10	523	201	1750	164	1750
1899 ...	0	0	2	46	63	782	141	576	114	491	27	350	11	260	7	303	206	1404	159	1404
1900 ...	0	0	2	42	30	389	178	748	122	453	23	300	4	95	6	331	210	1179	155	1179
1901 ...	0	0	0	0	13	160	189	758	134	465	25	337	3	76	1	40	202	918	163	918
1902 ...	0	0	0	0	12	134	207	783	118	395	20	255	5	118	3	149	219	917	146	917
1903 ...	1	30	11	261	54	708	157	635	97	401	30	404	4	97	11	732	223	1634	142	1634
1904 ...	0	0	2	43	68	860	139	630	101	424	34	437	16	386	6	286	209	1533	157	1533
1905 ...	2	64	12	299	64	642	138	614	85	347	36	478	12	294	16	700	216	1819	149	1819
Average, 1894 to 1904 ...	2	77	12	272	52	688	142	609	102	402	33	439	12	283	10	520	209	1645	156	1645

The data are derived from table 520.

TABLE 523.—*Showing the frequency of occurrence of days during which the departures of the daily ranges attain certain magnitudes (grouped into convenient divisions) and the total sums of these departures during these days.*

Unity (for intensity) = 1γ

Class.	> −39·5γ		−39·5γ to −29·6γ		−29·5γ to −19·6γ		−19·5γ to −9·6γ		−9·5γ to 0·0γ		0·0γ to +9·5γ		+9·6γ to +19·5γ		+19·6γ to +29·5γ		+29·6γ to +39·5γ		> +39·5γ		All positive departures.		All negative departures.	
Years.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1890 ...	0	0	1	30	10	222	90	1265	101	452	90	380	40	580	18	425	10	347	5	237	202	1969	163	1969
1891 ...	0	0	8	251	52	1218	95	1350	84	396	46	203	25	362	18	418	11	376	26	1856	239	3215	126	3215
1892 ...	12	537	26	888	74	1778	79	1164	56	321	39	145	15	201	17	418	17	594	31	3330	247	4688	119	4688
1893 ...	1	46	18	601	41	1008	89	1300	76	395	53	234	32	469	18	444	12	403	25	1800	225	3350	140	3350
1894 ...	8	375	27	909	57	1358	95	1382	53	262	49	214	22	293	13	319	12	396	29	3064	240	4286	125	4286
1895 ...	1	41	10	339	43	1006	96	1320	80	378	51	211	22	288	24	562	14	480	24	1543	230	3084	135	3084
1896 ...	3	122	10	321	41	967	86	1209	88	426	57	271	36	496	12	282	8	261	25	1735	228	3045	138	3045
1897 ...	0	0	8	260	31	729	83	1167	101	483	62	249	41	604	13	299	14	472	12	1015	223	2639	142	2639
1898 ...	0	0	4	128	32	732	88	1255	107	526	54	211	34	446	22	513	9	312	15	1159	231	2641	134	2641
1899 ...	0	0	2	60	22	514	82	1142	107	539	129	252	38	500	20	478	10	339	11	686	213	2255	208	2255
1900 ...	0	0	0	0	12	282	72	948	131	637	94	361	33	460	11	259	6	212	6	575	215	1867	150	1867
1901 ...	0	0	0	0	11	243	69	890	139	602	90	416	32	407	11	250	5	169	8	493	219	1735	146	1735
1902 ...	0	0	0	0	1	20	78	1068	128	615	101	468	39	532	9	215	1	35	8	453	207	1703	158	1703
1903 ...	2	85	8	254	38	894	70	1016	108	555	72	320	34	476	17	413	6	208	10	1387	226	2804	139	2804
1904 ...	0	0	2	63	28	654	80	1154	103	500	82	320	36	517	16	390	5	170	14	974	213	2371	153	2371
1905 ...	0	0	7	238	35	844	80	1184	113	596	56	267	29	404	19	460	7	237	19	1494	235	2862	130	2862
Average, 1894 to 1904 ...	1	57	6	212	29	673	82	1141	104	502	71	299	33	456	15	362	8	278	15	1189	222	2585	143	2585

The data are derived from table 521.

TABLE 524.—*Showing the variations of the daily means and the diurnal range of Horizontal Force for the 27·0-day period.*

Unity = 0·1γ

Days.	Daily means.								Diurnal ranges.							
	1894-1895.	1896-1897.	1898-1899.	1900-1901.	1902-1903.	1904-1905.	Average, 1894 to 1905.	Average, 1894 to 1899.	1894-1895.	1896-1897.	1898-1899.	1900-1901.	1902-1903.	1904-1905.	Average, 1894 to 1905.	Average, 1894 to 1899.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 ...	- 3	+32	+11	+20	+17	+26	+17	+13	- 59	- 31	+45	+20	- 24	+61	+ 2	- 15
2 ...	-11	+50	+ 5	-10	+17	+59	+18	+15	+ 46	- 41	- 9	-10	+ 20	+ 5	+ 2	- 1
3 ...	- 9	+62	+19	-12	+18	+40	+20	+24	+ 35	- 17	-23	+ 1	- 13	-39	- 9	- 2
4 ...	+20	+42	+ 9	+10	+10	+15	+18	+24	- 4	+ 33	-32	-32	+ 11	+48	+ 4	- 1
5 ...	-23	- 7	+20	-10	+ 9	-63	-12	- 3	+ 50	- 11	+ 8	-20	- 35	+81	+12	+ 16
6 ...	-22	-17	-27	+21	+19	-61	-14	-22	- 21	- 30	+56	-30	- 25	+ 1	- 8	+ 2
7 ...	-43	+ 4	- 5	+32	-30	-30	-12	-15	- 12	- 28	-12	+44	+113	+19	+21	- 17
8 ...	-35	- 6	-25	+21	-20	-14	-13	-22	- 81	- 2	+30	+23	- 8	- 3	- 7	- 18
9 ...	-11	+18	- 2	+ 2	-28	+35	+ 2	+ 2	- 55	- 95	-33	+ 5	+ 37	-59	-33	- 61
10 ...	+15	+13	+11	+23	-29	+40	+12	+13	- 85	- 17	-12	-20	+ 21	-24	-23	- 38
11 ...	+58	+23	+48	+35	-27	+ 2	+23	+43	- 51	- 19	-52	+12	- 4	+ 8	-18	- 41
12 ...	-16	+17	+31	+35	-25	+ 3	+ 7	+11	+ 81	- 89	+51	+17	- 24	+22	+10	+ 14
13 ...	+41	+28	+ 4	+33	+ 2	-24	+14	+24	- 36	- 18	+ 1	+12	- 74	+75	- 7	- 18
14 ...	+43	+44	+56	+ 2	+14	+ 7	+28	+48	- 37	- 43	-45	+28	- 44	- 8	-25	- 42
15 ...	+41	+31	+65	+11	+ 6	+10	+27	+46	+ 73	- 30	+31	-33	+ 43	-22	+10	+ 25
16 ...	-37	-31	+22	+11	-20	-10	-11	-15	+133	+127	+39	- 9	- 56	+54	+48	+100
17 ...	+ 7	-12	-19	-13	+ 8	-39	-11	- 8	- 1	+ 82	+14	+12	- 44	-14	+ 8	+ 32
18 ...	+36	-51	-39	-17	+ 4	+ 4	-10	-18	+ 12	+127	+66	-34	- 55	+20	+23	+ 68
19 ...	- 7	-64	-89	- 2	+14	-28	-29	-53	+ 93	+172	+80	-26	- 44	+32	+51	+115
20 ...	-78	-50	-56	- 9	+33	-44	-34	-61	+ 98	+ 87	-76	- 6	- 52	-69	- 3	+ 36
21 ...	-27	-50	-38	-40	+ 5	- 7	-26	-38	- 31	+ 27	-66	+58	+ 22	-84	-12	- 23
22 ...	-20	-43	-22	-72	+15	+ 6	-23	-28	- 65	- 31	-56	+20	+ 5	-36	-27	- 51
23 ...	+ 8	-13	-32	-52	+13	+15	-10	-12	- 71	- 79	28	- 6	- 14	-17	-36	- 59
24 ...	+40	- 8	-29	-42	+30	-14	- 4	+ 1	- 92	- 34	-79	- 3	- 6	+22	-32	- 68
25 ...	+13	0	+49	-16	+25	- 5	+11	+21	+ 16	- 32	- 3	+23	+ 5	+ 2	+ 2	- 6
26 ...	-13	+11	+34	+ 5	-82	+23	- 4	+10	+ 78	- 34	+70	-44	+251	-32	+48	+ 38
27 ...	- 5	-10	+11	+21	- 5	+41	+ 9	- 1	- 20	+ 33	+27	- 8	- 1	-56	- 4	+ 13

TABLE 525.—*Showing the variations of the daily means of Horizontal Force for 27·25 and 27·5 day periods.*

Unity = 0·1γ

Days.	Variations in 27·25 days period.							Variation in 27·5 days period.						
	1894-1895.	1896-1897.	1898-1899.	1900-1901.	1902-1903.	1904-1905.	Average, 1894 to 1905.	1894-1895.	1896-1897.	1898-1899.	1900-1901.	1902-1903.	1904-1905.	Average, 1894 to 1905.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 ...	−75	+ 10	− 29	− 5	+10	− 4	−15	− 8	−77	−24	+23	+ 3	−17	−17
2 ...	−33	+ 54	− 14	−35	+ 7	+10	− 2	+23	−81	−12	+25	+ 1	+ 8	− 6
3 ...	−33	+ 44	− 15	−52	−26	− 3	−14	+38	−11	+10	+14	−43	−14	− 1
4 ...	−20	+ 25	− 30	−35	− 1	−50	−18	+26	−33	+25	−43	−50	+ 7	−11
5 ...	+ 2	+ 20	− 37	−19	−31	+ 9	− 9	−13	−50	+34	−40	−23	+14	−13
6 ...	+48	+ 6	− 10	− 4	−35	+25	+ 5	+14	−13	+51	−71	−25	+56	+ 2
7 ...	+ 5	− 24	+ 11	+18	−27	+ 7	− 2	−39	+12	+60	−31	−12	+35	+ 4
8 ...	+ 6	− 91	+ 17	+22	− 9	− 5	−10	−48	− 4	+ 5	−66	+17	+48	− 8
9 ...	+54	− 79	+ 21	+13	−53	−44	−15	−49	+31	−47	−31	+32	− 6	−12
10 ...	+53	− 56	− 5	+18	−14	−35	− 6	−31	+56	−20	−10	+ 8	−14	− 2
11 ...	+10	− 49	+ 5	+10	+ 7	−15	− 5	− 5	+18	+13	− 9	+19	+15	+ 8
12 ...	−45	− 37	− 2	+15	+16	−38	−15	−49	+14	− 7	+15	+49	+34	+ 9
13 ...	−44	− 36	+ 21	+28	+35	0	+ 1	−25	−38	+ 4	+47	+40	− 5	+16
14 ...	−83	− 20	+ 47	+29	+34	+13	+ 3	−28	+69	+13	+ 2	+40	+ 8	+17
15 ...	−64	− 17	− 27	+35	+13	+ 2	−10	+24	+55	+ 7	+10	−27	−30	+ 6
16 ...	− 7	0	− 89	+15	+10	+38	− 5	+64	+56	− 6	+24	+16	−16	+23
17 ...	−15	+ 2	− 47	+13	+31	+57	+ 7	+48	+20	+13	+25	+19	−18	+18
18 ...	+17	− 4	− 24	+ 5	+33	+14	+ 7	+ 7	+23	− 3	+21	+15	−21	+ 7
19 ...	+28	+ 24	− 7	− 1	+40	+32	+19	−15	+30	+22	+17	− 1	−34	+ 3
20 ...	0	+ 21	+ 18	− 2	−61	+21	0	+ 9	− 9	+46	+17	− 3	+13	+12
21 ...	+53	+ 45	+ 50	+13	+ 4	+11	+29	+62	+25	+33	+ 7	+ 3	− 4	+21
22 ...	+70	+102	+105	+32	+ 1	−22	+48	+43	+50	+ 1	− 3	− 4	+28	+19
23 ...	+43	+ 88	+ 40	−11	+ 4	−30	+22	+45	−39	−57	+12	− 4	−10	− 9
24 ...	+23	+ 10	− 4	−36	+37	−14	+ 3	−54	−33	−28	+15	−29	−37	−28
25 ...	−25	− 4	+ 31	−15	−10	− 9	− 5	−56	−66	−24	+30	−25	−15	−26
26 ...	−16	− 13	+ 14	−19	− 7	+30	− 2	−45	−58	−65	−12	0	−10	−32
27 ...	− 9	− 32	− 28	−45	− 9	+ 8	−19	+ 2	−29	−51	0	−20	−22	−20

main classes, namely, 'quiet' and 'all-days.' Such data are collected in a concise form in table 522 in which are also collected the numerical values indicating the frequency of occurrence of days in each of the eight groups to which the different days have been assigned. It will be seen from the analysis that the law of increase of frequency of occurrence of disturbances, varying directly with the increase in their intensity as indicated by the total magnitudes of the departures, obtains broadly in cases of days about 88 on the average in the year, the departures of whose daily means are greater than 9·5γ on the positive side and 19·5γ on the negative side of the all-day mean (*vide* columns 2 to 7 and 14 to 17 of table 522). This law appears however to be radically different from the one which appears to control the rest of the days, about 277 in the year occupying the central region in the table, that is the days the departures of whose daily means from the mean of the month lie between the limits +9·5γ and −19·5γ (*vide* columns 8 to 13 in table 522) where the frequency and total intensity vary inversely or at least apparently irregularly with each other. In other words if the former days on the average about 88 in the year are omitted from consideration, no trace of the 11-year periodicity can clearly at least be evidenced in the run of the frequency of occurrence and the intensity of disturbance of the remaining 277 days in the year. From a similar analysis* of the range data shown in table 523 and those of the variability of the daily mean of H (*vide* table 549, Chapter XIV) which are taken up for discussion in the next chapter in connection with the 11-year periodicity and its possible relation to that indicated by the sun-spot numbers, it will be seen that some such kind of differentiation of the days can be made with a fair reliance on the correctness of the result. The result there shows that the limit which the departures of the daily mean indicate here as lying between +10γ and −20γ extends as shown by the variability series of H from +10γ to −30γ. And as will appear later the mean variability and mean departure of H are practically equal and have nearly the same intrinsic value, the latter result, which extends over a much longer period, widens the central zone, the days in which apparently do not seem to be affected in frequency and intensity by the 11-year periodicity.

537. The progression of the daily means may now be examined. A glance at tables 61 to 72 and 520 shows that though seemingly irregular in their march from day to day, the daily means are subject to periodic movements, the most conspicuously marked of which of course are those due to the 11-year period and the great secular period. These have been incidentally referred to in the discussion throughout wherever a reference was called forth, but their full discussion is taken up in the next chapter. Of the short period movements however with which we are principally concerned in this chapter, those which are believed to be associated with the rotation period of the sun claim our attention first. The period of rotation of the sun according to Carrington is 27·28 days, and the discussion in this volume, which can be at best but a simple one involving no laborious calculations, may be advantageously directed to ascertain if any period very near to Carrington's value can be definitely traced in the magnetic elements. The data giving the mean daily values of force from 1894 to 1905 which are examined first, the range figures being taken up for discussion later, have been arranged in three series separately for the examination of three periods,† viz., those of 27·00 days, 27·25 days, and 27·50 days. The arrangement of the daily means for the first period in rows of 27 days needs no remark. For the second period the values are similarly arranged in rows of 27 days omitting however the 55th, 164th, 273rd, etc., etc. For the 27·50 days period the days omitted are the 28th, 83rd, 138th, etc., etc..... To prevent the result in each series from being too much vitiated by overlapping and shift in the event of the period adopted not being quite exactly coincident in value with the actual existing period, each result has been restricted to the data of two years only, or roughly to about 27 rotations of the sun. The six resulting curves each containing data of two years for each of the three periods considered are shown in tables 524 and 525 and charted in plates 97 and 99. The examination of these average curves and the averages of 6 and 12 years in each of the three series at once shows that the probability of the real period lying nearer to 27·00 days and its submultiple rather than to either 27·25 days or 27·50 days is clearly greater. If the average result is hence accepted as the most probable approximation to true conditions which actually obtain, it unmistakably indicates that the period of 13·5 days is much more definitely pronounced than one of 27 days. The analysis of the curve shows that the amplitude of the variation of the 13·5-day period is about 2γ which is twice as large as the amplitude of the variation of the 27-day period and the phase angles in both coincide to within a day of each other. The average curve of the first six years 1894 to 1899 indicates this result much more emphatically.

538. In any search for periodicities, if a certain period is previously assumed to exist in the series to be examined and the data are treated accordingly, one is sure to obtain some result exhibiting a variation even of a very small amplitude, of the period sought. It may however be absolutely fortuitous and have no real physical basis. But in the present case as a significant variation is persistently indicated in almost all the individual curves of two years, the evidence so far in favour of the reality of the phenomenon when it is independently supported by other results becomes fairly strong. The absence of definite

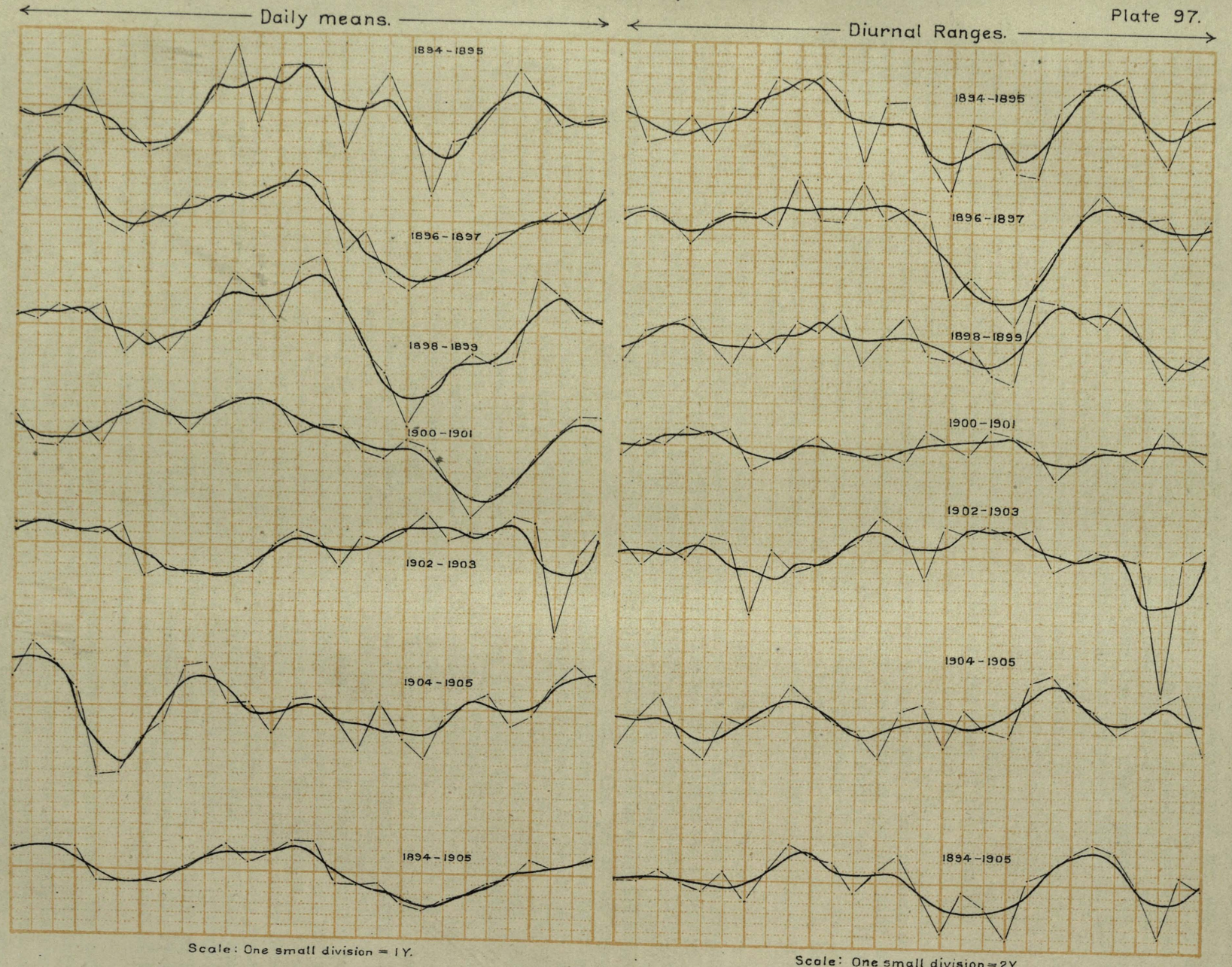
* The sun-spot numbers similarly analysed give markedly different results (see Chapter XIV).

† The period of 26·75 days was also tried for years 1898, 1899, but the curve derived was found to be irregular, no trace of the period being found.

COLABA OBSERVATORY

Variation of 27-day Period

Plate 97.



Scale: One small division = 1 Y.

Scale: One small division = 2 Y.

Scale for Average (1894-1905): One small division = 1 Y.

Thin curve:— Observed curve.

Thick curve: — Observed curve smoothed by taking overlapping means of three adjacent values.

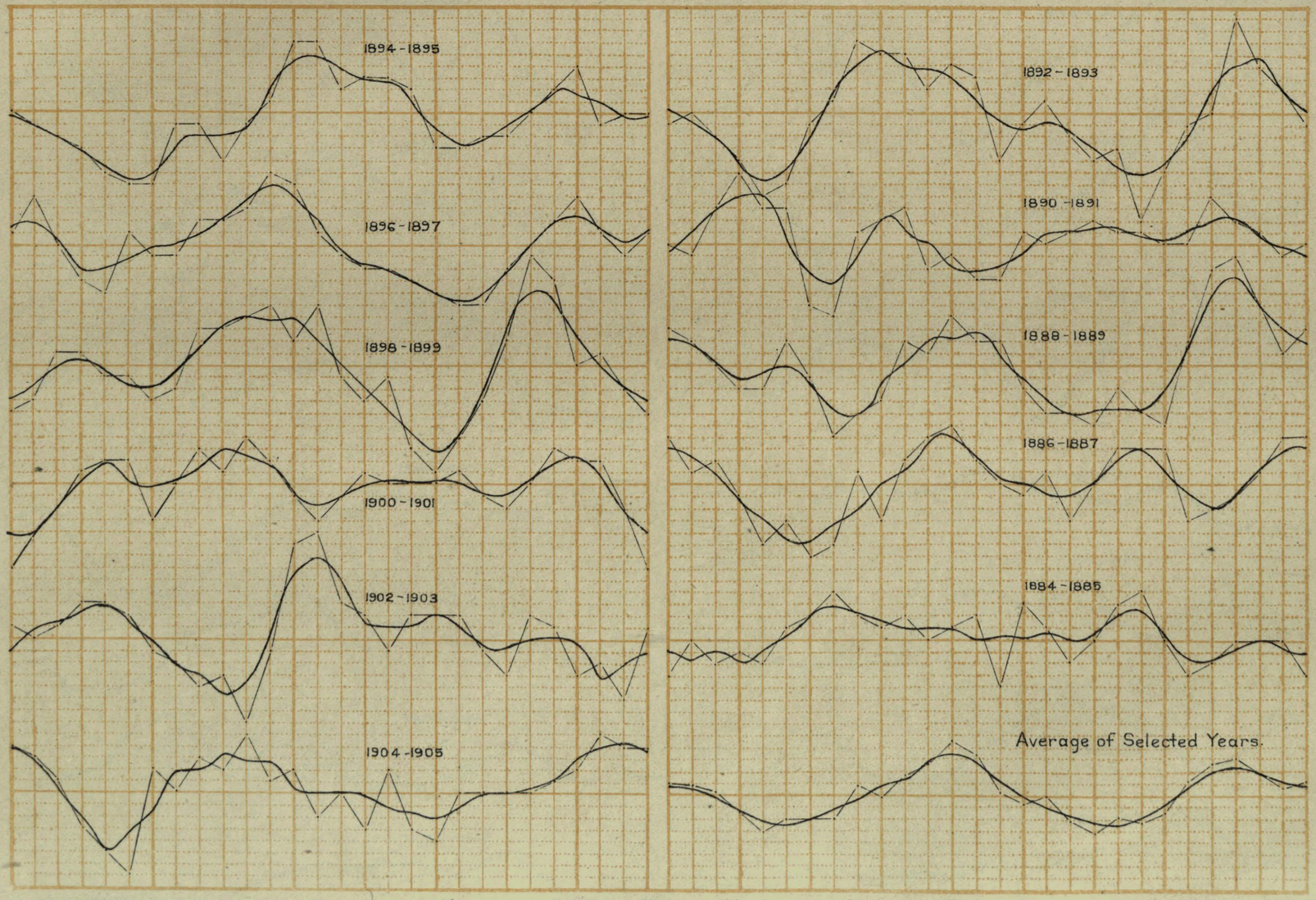
Gov.t Photozinco. Office, Poona, 1910.

COLABA OBSERVATORY

Variation of frequency of Quiet days

27-day Period

Plate 98.



Scale: One small division = 1 day

Thin curve:—Observed curve

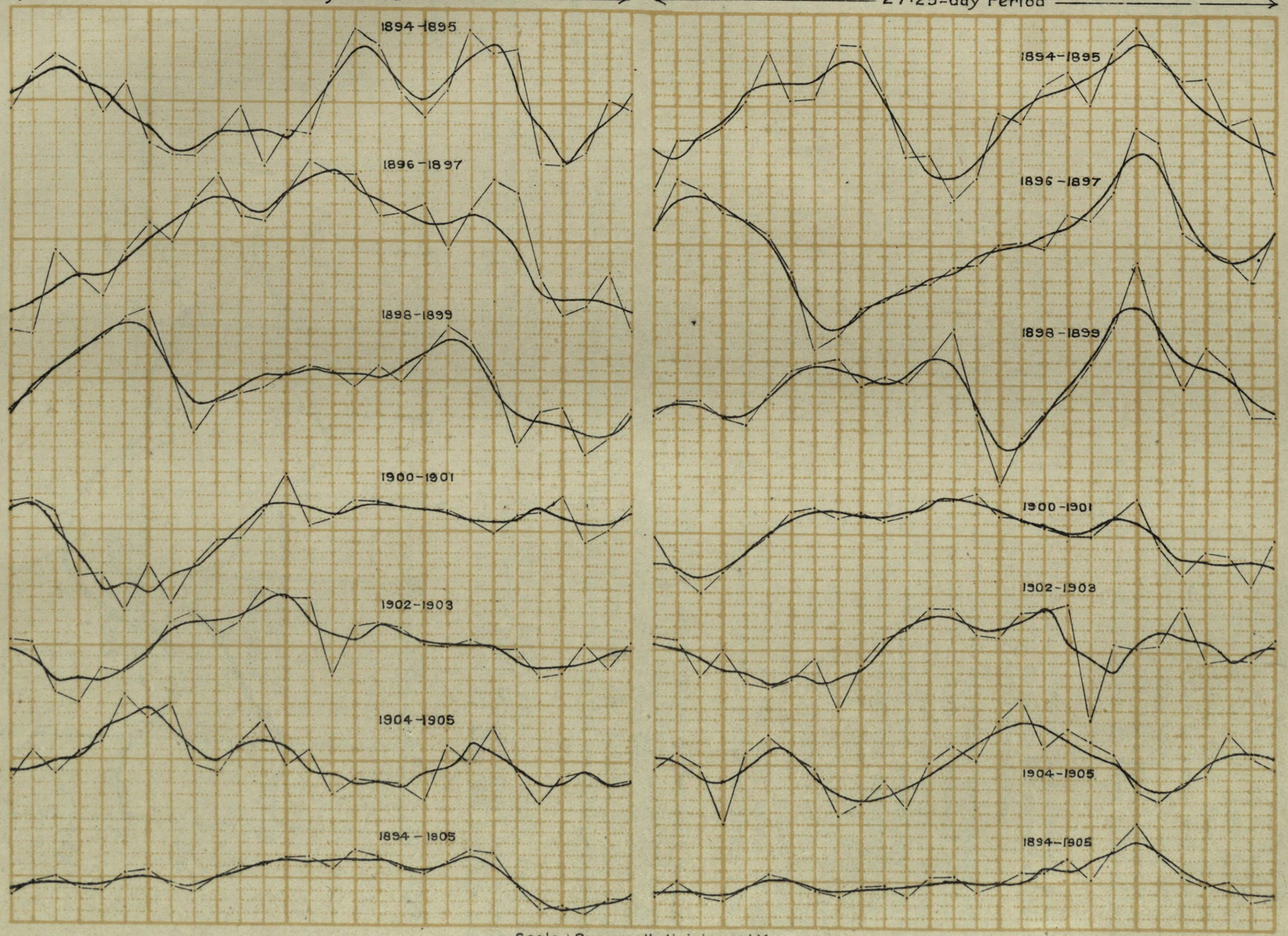
Thick curve:—Observed curve smoothed by taking overlapping means of three adjacent values

Gov^t Protozinco: Office, Poona, 1910.

COLABA OBSERVATORY

Variation of Daily means of H.

Plate 99.



Scale : One small division = 1 Y

Gov.t Photozinco: Office, Poona, 1910

Thin curve :—Observed curve;
Thick curve :—Observed curve smoothed by taking overlapping means of three adjacent values.

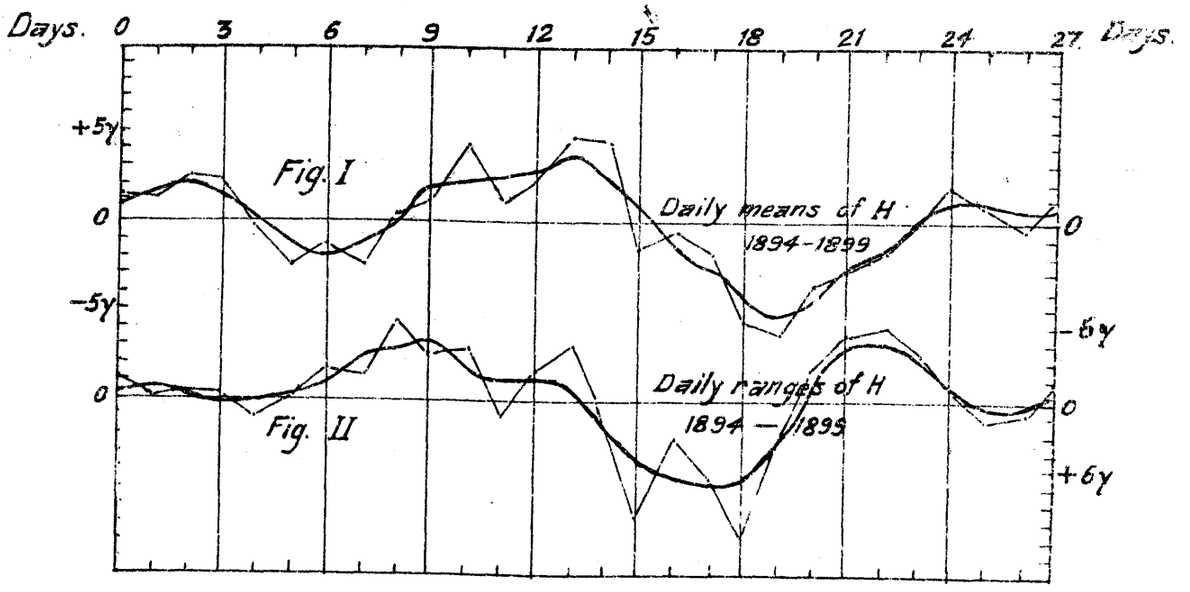
indication of the same in the four years 1900 to 1903 may be explained as partly due to their being the least disturbed years in the 11-year cycle, and partly perhaps to the feeble effects being obliterated by the shift due possibly to the 27-day period adopted not being exactly correct. For, a careful examination of the curves in plate 97 shows that the prominent feature seen in them, *viz.*, the sweep of the principal minimum appearing on the right of the curve in the first three pairs of years appears to shift to a later epoch, that is rightwards, in the curve by about three days in 1900-1901 and again by about 4 days in 1902-1903; and the same may be suspected to move still further away reappearing thus on the extreme left of the curve in the last two years 1904-1905. On the other hand if this shift were real, it would be noticeable in the first three curves of six years where however no such indication is perceptible. These hence may be due purely to irregularities, as from such defects the daily values can scarcely be expected to be altogether free.

539. The question may be examined in a different way by a conveniently easy though perhaps a rough method, which is the more readily adopted as it enables one to utilize the record of the whole period from 1882 to 1905 for examination without any laborious preliminary computation.

All *quiet*-days are duly entered in a form in rows of 27 days in the proper day-column wherever each day occurs, and the number of days so entered in any one day's column is summed up for every two years. The twelve results from 1882 to 1905 so derived in table 526 are charted in plate 98. It will be noticed in the first instance that the curves derived by this method are remarkably similar to the corresponding curves of daily means obtained by the method used in the last paragraph where the actual daily means have been used (*vide* results of 1894-1895, 1896-1897 and 1898-1899, plate 97). It will also be seen that the variation of the period sought is more or less persistently exhibited in at least the majority of the curves during the period of 22 years. The closeness of the accordant results supported by the fact that this period is also similarly exhibited, as will be seen later in the results of the daily ranges of horizontal force, and also though feebly in the daily means of another magnetic element, namely declination, places the reality of the existence of a period of about 13·5 days beyond reasonable doubt.

It will be observed that higher values of force as indicated by the variation of the daily means fall coincident with the peaks of the curve of quiet days where they would naturally be expected to gather in large numbers, indicating quiet conditions, while the lower values of absolute force coinciding with the hollows or minimum turning points of the course of quiet days when they are incident in the smallest possible number clearly connote conditions associated with disturbances. To this we shall presently recur (see paragraph 543).

540. Taking up now the consideration of the daily ranges of force, data of which have been extracted for the purpose of comparison with the daily means, for the years 1894 to 1905*, and collected in table 454, we find that when they are arranged as daily means in rows of 27 days the average result



Thick curve in both figures has been derived by taking overlapping means of 3 days.

* Data for four additional years 1890—1893 have been subsequently included in the table.

TABLE 526.—*Showing the variation in the frequency of occurrence of quiet-days for the 27·0 day period.*

Unity = 1 day.

Days.	1884-1885.	1886-1887.	1888-1889.	1890-1891.	1892-1893.	1894-1895.	1896-1897.	1898-1899.	1900-1901.	1902-1903.	1904-1905.	Average, 1884—1905.	Average, 1884—1905, omitting 1884-1885, 1890-1891 and 1900-1901.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1 ...	− 3	+ 4	+ 3	0	− 1	0	+ 1	− 4	− 7	+ 1	+ 4	− 0·2	+ 1·0
2 ...	0	+ 1	+ 2	− 1	0	− 1	+ 4	− 3	− 4	0	+ 3	+ 0·1	+ 0·7
3 ...	− 2	+ 2	0	+ 3	− 2	− 2	0	+ 1	− 2	+ 1	+ 1	0·0	+ 0·1
4 ...	− 1	− 1	− 2	+ 6	− 4	− 3	− 3	+ 1	+ 1	+ 3	− 3	− 0·5	− 1·5
5 ...	− 2	− 5	− 2	+ 3	− 7	− 5	− 4	− 1	+ 2	+ 3	− 5	− 2·1	− 3·2
6 ...	+ 1	− 3	+ 2	+ 3	− 6	− 6	+ 1	− 1	+ 2	+ 2	− 7	− 1·1	− 2·2
7 ...	+ 2	− 6	− 1	− 5	− 1	− 6	− 1	− 3	− 3	− 1	+ 2	− 2·1	− 2·1
8 ...	+ 4	− 5	− 6	− 6	+ 1	− 1	− 1	− 2	0	− 2	0	− 1·6	− 2·0
9 ...	+ 2	+ 1	− 4	+ 1	+ 6	− 1	+ 2	+ 3	+ 3	− 4	+ 3	+ 1·1	+ 0·7
10 ...	+ 1	− 3	− 3	+ 2	+ 5	− 4	+ 2	+ 3	+ 1	− 3	+ 2	+ 0·3	− 0·1
11 ...	+ 2	+ 2	+ 2	+ 3	+ 5	− 1	+ 3	+ 4	+ 4	− 7	+ 5	+ 2·0	+ 1·6
12 ...	0	+ 4	+ 1	− 2	+ 2	+ 1	+ 6	+ 5	+ 2	− 1	+ 1	+ 1·7	+ 2·4
13 ...	+ 1	+ 5	+ 4	− 1	+ 4	+ 6	+ 5	+ 2	− 1	+ 8	+ 2	+ 3·2	+ 4·5
14 ...	+ 2	+ 2	+ 2	− 3	+ 3	+ 6	+ 1	+ 5	− 3	+ 9	− 2	+ 2·0	+ 3·2
15 ...	− 4	0	+ 2	− 3	− 4	+ 2	− 1	− 1	− 1	+ 3	0	− 0·6	+ 0·1
16 ...	+ 3	− 1	− 2	+ 1	− 1	+ 3	− 2	− 3	+ 1	+ 2	− 3	− 0·2	− 0·9
17 ...	+ 1	+ 1	− 4	0	+ 1	+ 3	− 2	− 1	0	− 1	+ 2	0·0	− 0·1
18 ...	− 2	− 3	− 4	+ 1	− 2	+ 2	− 3	− 7	0	+ 2	− 3	− 1·7	− 2·2
19 ...	0	0	− 5	+ 2	− 4	− 3	− 4	− 9	0	+ 2	− 4	− 2·3	− 3·4
20 ...	+ 3	+ 3	− 2	+ 1	− 3	− 3	− 5	− 6	+ 1	+ 2	0	− 0·8	− 1·7
21 ...	+ 4	+ 3	− 4	+ 1	− 7	− 2	− 5	− 3	− 1	− 1	0	− 1·4	− 2·4
22 ...	0	+ 3	− 5	0	− 5	− 2	− 2	+ 2	− 2	− 3	0	− 1·3	− 1·5
23 ...	− 3	− 3	+ 2	0	− 1	0	0	+ 9	0	+ 2	0	+ 0·6	+ 1·1
24 ...	− 2	− 2	+ 8	+ 4	0	+ 2	+ 2	+ 7	+ 3	+ 1	+ 1	+ 2·2	+ 2·4
25 ...	0	− 1	+ 9	+ 2	+ 8	+ 4	+ 4	0	+ 2	− 3	+ 2	+ 2·5	+ 2·9
26 ...	0	+ 1	+ 5	+ 1	+ 4	− 1	+ 1	+ 1	+ 2	− 2	+ 5	+ 1·5	+ 1·7
27 ...	0	+ 4	+ 1	− 1	+ 2	0	− 1	− 2	− 2	− 5	+ 4	0·0	+ 0·4

of the period indicates precisely the same result (*vide* plate 97). In figures I and II above the two curves respectively of the daily mean and the daily range of force for the period 1894—1899, are charted side by side for ready reference, that of range being drawn reversed; and the similarity in their character and the closely accordant parallel run leave little room for doubt that on the average the daily mean and the daily range progress together uniformly being about equally influenced by the dominant periodic pulse of 13·5 days, and on the whole the range curve lags behind that of the daily mean by about 2 or 3 days. The points where the two curves differ will be referred to presently, but on the average it appears that a change in range of about $\mp 1{\cdot}5\gamma$ corresponds to a change of $\pm 1{\cdot}0\gamma$ in the daily mean (also see table 524).

541. The Fourier analysis of the average curves charted in the above figures, shows that as the phase angles given by the analyses of the two curves have been found to be co-incident in both the 27-day and 13·5-day periods, the amplitudes would alternately co-operate and interfere with one another and give an apparently emphasised fluctuation every 27 days. It is perhaps this 27-day fluctuation as a whole which has been noted by other investigators and mistaken as the dominant period existing in the magnetic traces. We see, however, from the Colaba data that the 13·5-day period is presumably the more effective and significant of the two periods.

542. In plate 97 the six resulting curves of range, each of two years, have been charted with the corresponding curves of the daily mean. From the average results of these curves we find that though on the whole they may appear to progress together in a fairly uniform manner, in the conditions which actually obtain they can be scarcely expected to run concurrently from day to day. Taking up hence the consideration of how the daily mean and the daily range behave dissimilarly in their march from day to day, it becomes apparent from a study of the tables 520 and 521, from paragraph 535 and from what has already been noted in Chapter X on disturbances, that the range curve recovers more quickly from the action of a disturbance, so much so that the range which is suddenly accentuated on the day of the incidence of the disturbance, almost always as rapidly decreases on the following day and becomes even smaller than the usual average range. The daily mean on the other hand takes much longer time to recover from the strain and occasionally two or three or even more days elapse before normal conditions are again established. The range thus usually overshoots in its restitution effects like a spring when the incident force is removed, while the behaviour of the daily mean simulates the action of a body of a very low elasticity when the stress ceases to act. Even in the average conditions as shown by the figures in paragraph 540 do we find that the restitution of the range curve from disturbed to quiet conditions, always occurs at a somewhat more rapid rate than in the daily mean. This is also observed in the individual two-year curves charted in plate 97. If we assume, which in all probability is the case, that the larger disturbances or storms, which are in the main evenly distributed over the twenty-four hours of the day, are thus independent of the position of the sun, their effect on the range and the daily mean would clearly vary and depend upon the hour at which the storms begin and end and the curves hence of the range and daily mean can scarcely run in close accordance. But when all the disturbances including also the restitution effects which follow the position of the sun (*vide* Chapter X, paragraph 443) are considered, the co-incidence in the march of the range and the daily mean which is lacking in the results due to large storms alone, tends to approximate more nearly in the general result, especially if data of a very large number of years are dealt with.

543. In connection with the question incidentally referred to in paragraph 536 in regard to differentiating the days in respect of their disturbed condition, it may perhaps be of interest here to have a cursory examination of the data in table 381, on lines similar to those adopted in paragraph 539, though perhaps such an analysis may well have found a place more pertinently in the chapter on disturbances. Each day being denominated in the table by a distinctive letter, at the bottom of the table are

TABLE 527.—*Showing the frequency of occurrence of days of any particular class in the month and the year and the annual variations of the probability of their occurrence.*

(1883 to 1894.)

Class.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Average number of days in the year.
	Total number of days in each class.												
C ...	248	205	238	237	295	305	310	312	215	238	247	270	141·8
Ca ...	268	240	258	264	246	256	253	238	284	242	236	260	138·4
S ...	100	118	122	117	85	74	82	97	118	150	128	116	59·4
Sa ...	60	46	47	31	48	20	32	31	35	45	39	27	21·0
M ...	2	5	9	5	3	2	4	1	4	6	5	6	2·4
Ma ...	4	4	6	5	4	3	0	1	2	0	3	3	1·6
G and VG ...	0	3	2	1	1	0	1	2	2	1	2	0	0·5
	Ratio of the number of days in each class to the total number of days in the month.												
C ...	·364	·330	·349	·359	·433	·462	·455	·457	·326	·349	·374	·396	·388
Ca ...	·393	·386	·378	·400	·361	·388	·371	·349	·430	·355	·358	·381	·379
S ...	·147	·190	·179	·177	·125	·112	·120	·142	·179	·220	·194	·170	·163
Sa ...	·088	·074	·069	·047	·070	·030	·047	·045	·053	·066	·059	·040	·057
M ...	·003	·008	·013	·008	·004	·003	·006	·001	·006	·009	·008	·009	·006
Ma ...	·006	·006	·009	·008	·006	·005	0	·001	·003	0	·005	·004	·004
G and VG ...	0	·005	·003	·002	·001	0	·001	·002	·003	·001	·003	0	·001
	Annual variations of ratio for each class.												
C ...	− ·024	− ·058	− ·039	− ·029	+ ·045	+ ·074	+ ·067	+ ·069	− ·062	− ·039	− ·014	+ ·008	...
Ca ...	+ ·014	+ ·007	− ·001	+ ·021	− ·018	+ ·009	− ·008	− ·030	+ ·051	− ·024	− ·021	+ ·002	...
S ...	− ·016	+ ·027	+ ·016	+ ·014	− ·038	− ·051	− ·043	− ·021	+ ·016	+ ·057	+ ·031	+ ·007	...
Sa ...	+ ·031	+ ·017	+ ·012	− ·010	+ ·013	− ·027	− ·010	− ·012	− ·004	+ ·009	+ ·002	− ·017	...
M ...	− ·003	+ ·002	+ ·007	+ ·002	− ·002	− ·003	·000	− ·005	·000	+ ·003	+ ·002	+ ·003	...
Ma ...	+ ·002	+ ·002	+ ·005	+ ·004	+ ·002	+ ·001	− ·004	− ·003	− ·001	− ·004	+ ·001	·000	...
G and VG ...	− ·001	+ ·004	+ ·002	+ ·001	·000	− ·001	·000	+ ·001	+ ·002	·000	+ ·002	− ·001	...
C + Ca ...	− ·010	− ·051	− ·040	− ·008	+ ·027	+ ·083	+ ·059	+ ·039	− ·011	− ·063	− ·035	+ ·010	...
S + Sa ...	+ ·015	+ ·044	+ ·028	+ ·004	− ·025	− ·078	− ·053	− ·033	+ ·012	+ ·066	+ ·033	− ·010	...
M to VG ...	− ·002	+ ·008	+ ·014	+ ·007	·000	− ·003	− ·004	− ·007	+ ·001	− ·001	+ ·005	+ ·002	...
Annual Variation of Absolute Force ...	− 15	− 43	− 29	+ 13	+ 18	+ 48	+ 35	+ 8	− 26	+ 1	− 13	+ 1	Unity = 0·1γ
Difference Annual Variation, quiet-day less all-day.	− 1	+ 4	+ 21	+ 3	+ 6	− 14	− 15	− 2	+ 6	− 2	0	− 2	

TABLE 528.—*Showing the departures of the daily means of Declination from the mean value of the month for the years 1894-1895.*

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 1″	−0 21″	+32″	+45″	+33″	+ 6″	−0 40″	−0 3″	−20″	−11″	+11″	+0 9″
2	−11	+0 8	+ 8	+ 7	+ 2	+ 8	0 0	−0 5	− 6	−23	−12	+0 2
3	+23	+0 8	+25	+26	+26	+ 5	−0 5	−0 24	− 8	− 9	−17	−0 3
4	+11	−0 4	+46	−17	+14	+ 3	−0 12	−0 10	+10	−18	−17	−0 8
5	+20	+0 1	+15	−29	− 2	−11	−0 3	−0 17	−15	+10	−29	+0 10
6	− 1	−0 2	+15	+26	− 9	− 1	−0 24	−0 8	−35	+ 1	−14	+0 14
7	+ 6	+0 13	− 3	+ 9	−59	−32	−0 45	+0 6	− 8	+ 6	− 7	−0 3
8	− 1	−0 23	− 3	+ 9	0	−28	−0 2	−0 25	− 9	− 6	+30	+0 7
9	−10	−0 2	+ 3	+ 5	− 5	+39	−0 3	−0 24	−16	+ 6	− 8	+0 2
10	− 1	−0 32	+11	−26	−10	+53	−0 26	−0 5	+ 4	− 7	−14	+0 4
11	−37	−0 30	−13	−31	−28	+23	−0 28	−0 20	− 6	+ 1	−17	−0 8
12	− 4	−0 9	−23	−26	− 2	+11	−0 13	−0 18	+ 4	−18	−15	+0 2
13	−22	−0 37	−39	+19	+10	− 1	−0 2	−0 10	− 8	+ 8	+40	−0 2
14	+ 2	−0 35	−16	+ 3	+33	+13	−0 5	+0 6	− 6	+ 3	+31	−0 12
15	− 8	−0 18	+ 4	− 2	+22	+11	−0 28	+0 9	+44	+ 6	− 1	+0 21
16	− 3	−0 8	− 1	−14	+22	+10	−0 12	−0 8	+13	+ 8	+26	+0 24
17	+ 2	−0 32	−16	+ 9	+29	−20	−0 16	−0 25	+ 3	+12	+12	+0 5
18	+ 8	−0 20	− 6	+10	− 3	+32	−0 3	−0 22	−15	+ 6	+33	+0 4
19	+ 6	+0 6	−13	+10	+ 5	−16	+0 3	+0 11	+24	+ 6	+33	−0 2
20	−15	−0 6	−13	+ 5	+ 3	− 4	+1 9	+2 54	+39	− 1	+ 7	−0 14
21	−10	+1 7	+18	+14	+ 5	+ 3	+1 14	+0 30	+ 8	+ 3	− 7	+0 5
22	+ 9	−0 35	+15	+ 5	+15	+20	+0 21	+0 25	+11	+ 3	−12	+0 9
23	+ 2	+0 13	−15	+ 5	− 9	+11	+0 7	+0 7	+ 4	+12	+26	+1 13
24	+ 1	+0 17	−27	+12	− 2	− 6	+0 3	+0 4	−18	+ 5	+ 5	−0 5
25	+ 6	+1 25	−16	− 7	−31	− 4	+0 50	+0 11	+ 6	+15	−15	−0 24
26	− 1	+0 39	−18	0	−16	−20	+0 15	+0 11	− 4	+10	−12	−0 19
27	+14	+0 13	−42	− 9	−17	−18	+0 29	+0 16	+15	+13	−14	−0 21
28	+ 2	+0 49	−22	−28	− 5	−27	−0 12	+0 1	+ 8	− 7	−10	−0 24
29	− 4		−28	−33	+ 3	−18	+0 7	−0 17	−18	−26	−14	−0 7
30	+ 4		+53	− 9	−16	−27	+0 17	−0 43	− 3	−16	−15	−0 14
31	+ 2		+56		−10		−0 17	−0 22		− 1		−0 12
Sums without regard to signs	247	633	615	450	446	481	591	617	388	277	504	369

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+20″	+ 3″	−13″	+ 4″	+ 9″	+23″	+29″	+14″	− 5″	+16″	+20″	+12″
2	+24	+ 3	−13	− 8	−13	+41	+29	− 3	−19	+ 6	+12	+ 9
3	− 6	− 13	+ 7	0	+11	+18	+17	+23	− 3	+21	− 5	−12
4	+19	− 32	− 8	−15	+ 2	+42	+28	+ 4	+19	+30	− 2	+ 4
5	−19	− 9	−17	+19	+ 1	+15	+12	+ 1	+31	+25	+12	+ 2
6	− 2	+ 13	0	− 7	+11	+39	+28	+ 2	− 1	+27	− 2	+12
7	+ 8	− 1	−20	− 1	− 5	+36	−10	−13	+19	− 1	−11	+ 9
8	− 2	+ 1	+18	− 1	−20	+29	− 3	+ 6	+16	+13	−18	+37
9	0	− 1	+26	+ 9	−10	+ 3	− 5	−10	+ 6	− 6	+ 1	+16
10	+ 3	+ 1	+ 6	+ 4	+ 6	− 6	− 7	+45	+23	−27	0	+ 6
11	0	− 1	− 1	+33	+ 7	− 2	−24	+11	+ 6	−41	+20	+14
12	− 2	− 11	−13	+21	+18	+13	+ 4	+32	+ 2	− 3	+15	−15
13	+ 7	− 21	+28	+ 2	+11	+11	+26	− 8	− 5	−13	+27	+ 2
14	+ 1	− 2	+35	+ 6	− 6	− 6	+35	+23	−17	− 6	− 5	−12
15	−16	+ 36	+ 4	+28	+21	−28	+ 7	+ 4	−19	−13	+13	−17
16	− 9	+ 10	+21	+12	+ 4	−16	− 7	+ 1	+ 2	+14	+ 3	−20
17	+10	− 11	+18	+26	+ 1	+ 8	− 9	+ 6	−10	+33	+ 7	− 7
18	− 2	+ 8	+14	+ 6	+13	+11	−10	+ 2	+ 6	− 1	+15	− 8
19	+ 3	+ 18	− 3	+ 9	+ 1	− 9	−15	−10	0	+ 8	− 2	− 1
20	+ 8	+ 20	+ 2	− 1	− 6	− 2	− 3	+ 7	+14	−15	−19	− 3
21	+ 5	+ 8	0	0	−20	−47	− 7	− 8	− 8	−17	−16	−19
22	−12	+ 8	0	− 8	− 5	−20	− 5	−15	+ 2	−13	−31	+25
23	− 14	+ 3	+ 6	+ 7	− 1	−18	+ 2	−32	−17	− 1	+13	+12
24	− 2	+ 10	−18	− 3	−15	− 1	− 9	−30	−20	+ 4	+ 8	+19
25	− 9	− 11	−32	−19	− 5	−18	−15	−15	−26	− 6	− 7	0
26	−14	− 9	− 1	−13	−10	−32	−17	−18	− 3	−39	−26	−19
27	− 2	− 14	−10	−13	−18	−30	−12	+16	−10	+ 2	−11	− 5
28	−12	− 6	+ 7	−29	−12	−40	− 9	−11	−17	−10	−11	− 5
29	− 6		−25	−32	−27	−21	− 3	−17	−13	+ 2	− 4	−17
30	+25		− 5	−43	+37	+ 1	− 7	− 8	+49	+ 9	− 4	−10
31	0		−15		+21		−34	− 1		+11		−13
Sums without regard to signs.	262	284	386	379	347	586	428	396	388	433	340	362

TABLE 528.—*Showing the departures of the daily means of Declination from the mean value of the month for the years 1896-1897.*

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−10″	+15″	− 4″	+ 7″	−0′ 20″	+ 9″	+14″	+ 4″	+ 1″	−10″	+ 3″	+11″
2 ...	−10	+13	+ 2	+26	+1 5	+11	+16	− 9	0	− 8	− 6	+15
3 ...	+ 7	+ 2	+ 2	+34	+1 22	− 3	+ 2	+13	− 4	+13	+16	+13
4 ...	+34	+42	+43	+45	+0 15	+ 7	+ 7	+ 4	0	− 3	+ 3	+46
5 ...	+15	− 6	−12	+41	+0 13	+ 9	+ 6	−27	− 4	− 6	+ 1	+46
6 ...	+ 5	− 4	− 7	+33	−0 3	+ 2	+32	− 6	+12	− 5	+28	+37
7 ...	+15	−20	+ 8	− 5	+0 11	+ 7	+33	+ 8	− 5	+ 9	+51	+41
8 ...	+21	+ 1	+ 2	+ 5	−0 6	−17	+21	− 9	−12	−17	+58	+11
9 ...	+ 5	− 1	−12	− 5	+0 2	− 1	−18	+15	−14	+ 2	+40	+20
10 ...	+15	+ 1	−14	− 5	+0 2	+23	+ 7	+ 3	−30	− 8	+27	+11
11 ...	+12	− 3	−42	−16	−0 1	+17	+16	−34	− 7	+11	+15	+15
12 ...	+12	+ 4	+12	−16	+0 11	− 5	+26	+ 3	− 9	+40	+ 8	− 3
13 ...	+ 8	−37	− 5	−10	−0 10	+ 4	+ 25	− 1	+ 1	+14	+ 1	+41
14 ...	− 5	+13	− 7	−24	−0 6	+ 4	+13	−21	− 9	+21	+ 1	+ 8
15 ...	−10	+ 2	− 2	−10	−0 6	+11	+ 9	−34	+ 3	+16	− 3	− 3
16 ...	−23	− 8	−11	−14	−0 41	+11	+ 1	−25	+ 1	+14	−18	− 1
17 ...	0	+16	− 7	− 7	−0 10	+12	−11	− 4	− 7	+13	−29	−15
18 ...	+ 2	+ 6	− 2	−31	+0 11	+21	−17	+16	− 9	+ 4	− 3	−25
19 ...	+ 7	−13	− 7	−24	+0 15	+ 7	− 8	+ 6	0	+23	− 4	−23
20 ...	+ 2	−27	+22	−53	+0 9	+ 7	−32	+ 8	+46	+13	+ 3	−23
21 ...	+ 5	−13	− 5	+ 9	+0 18	+ 2	−34	+41	+17	− 1	−10	−23
22 ...	− 2	+ 6	− 4	+ 2	−0 8	− 1	+14	+ 3	+10	− 1	−34	−28
23 ...	−14	+ 2	+ 2	− 2	−0 10	− 5	+ 4	+13	− 5	+ 8	−13	−15
24 ...	−14	−22	+11	+19	−0 3	− 8	+ 6	+ 8	+13	− 6	−13	−16
25 ...	+ 8	− 8	+15	+ 7	−0 4	−20	−11	+18	+ 5	+ 1	−22	−30
26 ...	− 5	− 4	+17	+14	−0 27	−32	−25	+ 8	+20	− 1	−27	−34
27 ...	−12	+ 9	+21	− 2	−0 6	− 3	− 6	+18	+15	−10	−15	+15
28 ...	−12	− 1	+ 7	−16	−0 20	− 8	−20	− 6	−11	−30	−20	−20
29 ...	−19	+25	− 2	0	−0 16	−32	−32	−11	+ 1	−30	−20	−11
30 ...	−28		−11	− 7	−0 30	−15	−24	+ 1	−12	−22	−20	−20
31 ...	+ 3		+19		−0 39		−15	− 8		−30		−30
Sums without regard to signs.	340	324	337	489	520	314	505	385	283	390	512	650

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−0′ 14″	+ 4″	+ 3″	+ 9″	+11″	+17″	+19″	+20″	+ 7″	0″	+25″	+ 1″
2 ...	+1 38	+ 7	+ 3	+ 8	+11	+23	+24	+13	− 1	−11	+19	+10
3 ...	+0 52	+16	+17	− 6	− 1	+17	+ 8	+ 8	+13	−14	+ 7	+ 5
4 ...	+0 38	+16	+22	−23	+ 4	+18	+12	− 4	+ 4	−17	− 8	− 2
5 ...	−0 2	+ 9	+46	− 8	+ 4	+18	+13	− 7	− 3	−14	− 8	+ 6
6 ...	+0 10	+16	+22	− 4	+16	+15	+ 3	− 4	− 6	−14	+ 7	+ 6
7 ...	−0 5	+28	+ 7	− 6	+ 4	+10	+12	−11	+ 6	−26	− 1	+ 8
8 ...	−0 2	+14	+41	−13	+ 6	− 6	+13	−13	+13	−33	− 1	− 4
9 ...	−0 14	− 8	+38	−27	− 3	+ 3	+ 8	−11	− 5	− 4	− 1	−16
10 ...	+0 7	+ 6	+ 3	− 1	+ 1	− 4	0	+12	−13	+22	−15	+15
11 ...	+0 2	− 8	+10	− 6	− 5	+ 3	+13	+ 6	+14	+14	−13	+43
12 ...	+0 10	− 5	− 9	−15	−13	−13	+12	+10	+11	+10	− 8	+41
13 ...	+0 10	−13	+ 2	− 6	−22	−20	+ 1	−16	+21	+14	−12	+25
14 ...	+0 7	+ 2	0	− 1	+ 1	− 9	+17	+ 3	+ 4	+22	+21	+12
15 ...	+0 10	−22	+ 2	−28	+ 2	− 1	− 5	−28	+ 6	+ 2	+25	− 6
16 ...	−0 23	−27	− 2	+ 6	−13	+30	+ 7	− 4	+ 2	+ 5	+13	− 6
17 ...	−0 16	−17	−16	− 6	+ 2	−14	− 4	−25	− 5	+ 3	− 1	−11
18 ...	−0 17	−18	−12	+15	−10	− 4	−19	+10	−10	+10	+ 7	−11
19 ...	−0 4	− 6	−12	− 1	+ 4	+ 4	−12	− 4	− 3	0	+ 6	−19
20 ...	−0 23	−10	−10	+22	+18	− 6	− 5	+15	+ 6	−21	+11	+29
21 ...	−0 11	+13	−17	+13	+ 8	− 2	− 2	+36	−13	−19	− 1	+ 1
22 ...	−0 12	+25	−14	+ 8	+14	−14	+ 3	+13	−17	−17	+ 2	+10
23 ...	−0 9	+11	−10	+37	− 8	− 2	−26	− 7	+ 6	+ 8	− 8	− 4
24 ...	+0 2	− 3	−31	+16	+ 1	− 4	−23	0	+25	0	− 3	+ 3
25 ...	0	−24	−21	+ 4	− 3	− 2	−28	− 4	+16	−12	− 1	− 2
26 ...	−0 4	−11	−22	+ 6	−17	8	−35	−16	−17	− 4	+16	−26
27 ...	−0 21	+25	−17	+ 4	− 6	+ 3	− 7	−11	−15	+14	+ 2	−18
28 ...	−0 43	−18	−17	− 4	− 5	−18	− 5	+13	−27	+29	−13	−26
29 ...	−0 14		−17	−20	+ 4	− 2	+ 1	+ 1	−13	+17	−17	−13
30 ...	−0 2		−21	+22	− 1	−20	−35	0	−15	+15	−39	−21
31 ...	+0 3		+17		+ 8		+27	− 6		+ 7		−25
Sums without regard to signs.	485	382	481	345	226	310	399	331	317	398	311	425

TABLE 528.—*Showing the departures of the daily means of Declination from the mean value of the month for the years 1898-1899.*

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 6″	−33″	−0′ 4″	+ 4″	+ 6″	+28″	+13″	+ 2″	−0′ 15″	−26″	+ 8″	+ 2″
2 ...	− 8	−17	+0 20	+ 4	+16	+34	+23	+15	−0 11	−15	+11	− 9
3 ...	− 9	−19	−0 8	− 1	+16	+30	+10	+ 7	+0 25	− 5	+25	+15
4 ...	− 1	−11	−0 15	−15	+ 9	+16	+13	+29	−0 9	+12	+23	+ 2
5 ...	+ 1	− 2	−0 10	−12	+ 6	+15	+27	+10	−0 8	− 8	+ 8	+ 7
6 ...	+ 8	+ 8	−0 3	−10	− 8	+20	+30	+ 5	−0 15	− 5	+ 1	−14
7 ...	+ 6	−11	−0 8	+ 4	− 3	− 6	+ 3	−14	−0 23	+11	− 8	+ 9
8 ...	+15	+22	+0 1	+ 5	+20	+11	− 6	0	−0 35	− 7	−10	− 2
9 ...	+23	+ 7	−0 8	+12	+15	+32	+ 6	− 5	+1 22	−17	+14	+ 9
10 ...	+20	−21	−0 10	− 1	− 6	+ 1	+11	−28	+1 1	−20	+ 4	+ 2
11 ...	+13	− 2	+0 25	0	− 3	+ 4	−13	−24	+0 15	−13	− 6	+ 9
12 ...	− 4	+ 2	−0 4	+43	+ 9	− 8	− 4	+ 9	+0 10	−13	+11	− 2
13 ...	+ 6	−21	−0 29	− 7	+32	−13	− 9	+15	+0 6	−13	+21	−10
14 ...	+ 6	+15	+0 2	− 3	+ 4	+ 6	+ 6	+10	+0 42	−10	+11	+31
15 ...	− 8	+ 2	+1 4	+ 9	+15	+ 1	−15	− 2	+0 25	+ 6	−13	+17
16 ...	− 1	+24	+1 3	+14	+ 9	+13	−13	+33	+0 8	+ 2	−10	+26
17 ...	+17	+27	+0 23	+16	+ 3	−11	+ 6	+17	+0 4	+12	+14	+24
18 ...	+ 6	+12	+0 18	+12	− 4	+ 6	− 6	+ 5	+0 3	+12	+11	+15
19 ...	+ 5	−17	+0 2	− 7	−13	− 9	− 4	+ 5	−0 4	− 1	−11	+ 7
20 ...	+ 1	−28	+0 8	− 5	−10	+11	+10	− 5	−0 8	+12	−15	+ 7
21 ...	− 6	−11	−0 4	−22	− 3	− 4	− 2	+14	−0 27	+ 9	− 3	− 2
22 ...	+ 3	+ 7	−0 20	+ 2	−15	−25	−13	+ 3	−0 25	+12	+ 8	− 7
23 ...	− 1	− 9	−0 13	+19	−11	−25	−20	−24	−0 18	− 7	+20	− 3
24 ...	−16	+10	−0 23	− 5	− 8	−15	− 8	−14	−0 15	−10	− 3	−10
25 ...	− 8	+ 7	−0 6	− 1	−25	−34	+ 4	− 2	−0 20	+ 7	−13	+ 2
26 ...	− 4	+12	+0 8	− 1	−23	−20	− 9	−16	−0 28	+11	−13	−26
27 ...	− 4	+17	−0 1	−19	−18	− 8	+ 1	−33	−0 21	0	−22	−16
28 ...	+ 8	+17	−0 15	− 3	− 6	−32	−13	− 5	+0 4	+12	−18	−14
29 ...	−11		−0 6	− 8	− 8	−16	−13	− 5	+0 10	+55	−17	−21
30 ...	−13		−0 22	−10	+11	−15	−15	0	−0 8	+ 7	−17	−22
31 ...	−44		−0 27		−10		− 4	− 7		− 7		−24
Sums without regard to signs.	282	391	470	274	345	469	330	363	585	357	369	366

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+22″	−0′ 8″	+18″	−0′ 11″	+39″	+10″	+21″	− 3″	+29″	− 2″	− 7″	+ 6″
2 ...	0	−0 4	− 5	+0 1	+ 8	+17	+18	− 1	+25	−12	+ 3	+ 9
3 ...	+ 3	−0 8	+ 6	+0 1	+11	+ 9	+16	− 5	+25	+ 4	− 4	− 3
4 ...	+13	+0 3	− 6	+0 5	+44	+22	+ 8	+12	+12	+ 9	+21	− 3
5 ...	+20	−0 1	− 8	+0 3	+30	+12	− 1	+14	+10	+19	+15	− 8
6 ...	+13	−0 6	−18	+0 6	+ 4	− 5	− 6	− 5	+13	+ 2	+ 9	− 6
7 ...	−14	−0 28	+ 4	+0 3	+ 9	−17	− 6	+ 4	+17	− 3	+ 7	−10
8 ...	−11	−0 9	−17	+0 6	+16	+ 2	−10	− 3	+12	− 3	+21	+18
9 ...	−16	−0 15	−15	+0 12	+ 8	− 2	+ 3	+ 5	+10	−10	+10	+ 6
10 ...	− 4	−0 4	− 8	+0 12	+ 2	+ 2	−11	−10	+12	− 8	+ 3	+11
11 ...	−14	−0 32	+ 9	+0 10	−18	+10	+ 9	−15	+ 8	− 7	−14	+ 6
12 ...	+ 6	+1 10	+ 9	+0 8	+ 6	− 5	− 4	+ 2	+13	− 3	−16	+25
13 ...	− 7	+0 22	+11	−0 11	−18	+12	− 3	−19	+12	+ 5	−16	+11
14 ...	−23	+0 35	− 5	−0 9	−11	+ 5	−22	−13	+ 6	−19	+22	− 1
15 ...	+ 3	+0 8	− 1	−0 28	+16	− 3	−15	−27	+ 8	+16	+17	− 8
16 ...	+18	−0 1	−22	−0 6	+ 4	−14	−10	− 8	+12	+ 9	+ 5	− 8
17 ...	0	−0 4	−20	−0 6	+ 6	− 3	+ 4	+ 5	+17	+26	− 7	− 1
18 ...	− 6	−0 20	−13	+1 7	+14	+17	−10	−12	+12	+12	− 9	+ 3
19 ...	+ 6	−0 8	− 8	+0 31	+ 9	+ 4	−11	−26	+ 8	− 8	− 4	+16
20 ...	− 2	+0 3	−11	+0 17	+ 6	− 3	−11	+18	+24	− 7	− 2	+ 4
21 ...	+ 6	−0 1	+ 9	0	−13	− 3	− 6	+16	+18	−14	− 5	+ 6
22 ...	+ 3	−0 4	− 1	0	− 8	− 5	+11	+ 2	+ 1	− 2	− 2	− 4
23 ...	− 4	+0 15	+59	−0 9	−15	−15	− 8	+ 9	−13	+ 7	0	+ 3
24 ...	− 9	+0 4	+25	−0 18	−20	−19	−11	+12	− 4	+10	+ 7	− 6
25 ...	+ 3	+0 10	+35	0	− 4	− 2	+ 4	− 3	−17	+31	− 9	−20
26 ...	− 2	+0 10	+23	−0 11	−22	−15	+′3	+11	− 1	+12	+ 5	−22
27 ...	−14	−0 11	+ 4	−0 16	−15	−22	+18	+11	+13	+17	− 4	−11
28 ...	− 4	−0 4	− 5	−0 23	−11	−15	+16	−13	+ 8	− 2	− 9	+ 6
29 ...	+17		− 5	−0 35	−18	+ 9	+ 3	+ 4	+15	−19	− 4	−13
30 ...	+ 3		−20	−0 13	− 6	+ 5	+ 9	+19	+13	−31	−19	+ 3
31 ...	−13		−17		−39		+ 1	+ 5		−17		+ 4
Sums without regard to signs.	279	348	417	378	450	284	289	312	388	346	276	261

TABLE 528.—*Showing the departures of the daily means of Declination from the mean value of the month for the years 1900-1901.*

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+16″	+13″	− 13″	− 2″	+32″	+ 5″	+14″	+17″	+14″	− 15″	+22″	− 4″
2 ...	+ 2	− 8	− 2	+17	+ 6	+19	+14	0	+12	− 2	+19	+ 3
3 ...	+ 7	− 3	− 9	− 1	+ 6	+10	+19	+17	+ 9	−14	+10	+13
4 ...	−10	+13	− 20	−13	−15	−14	+ 7	+ 8	+ 4	−19	+ 9	+18
5 ...	+16	+20	− 21	+ 6	+47	− 6	+23	+ 3	+11	+14	− 5	+15
6 ...	+ 6	+23	− 4	−11	+35	0	+21	+ 8	0	− 9	+ 7	− 2
7 ...	+13	+11	− 29	+ 8	+32	− 7	+ 7	−19	+ 7	0	− 7	+ 8
8 ...	+ 2	−16	+ 15	+ 1	+15	+ 1	+ 7	+ 6	− 5	+16	− 2	+ 5
9 ...	−25	+ 1	+ 22	− 1	− 6	−19	− 5	+13	− 7	+10	+ 3	− 7
10 ...	−11	+ 6	+ 9	+ 3	− 1	+17	+12	0	− 1	+ 9	− 5	+ 3
11 ...	−13	+ 1	+ 15	+ 8	+11	+ 1	+ 2	0	− 1	0	− 2	+ 1
12 ...	− 5	+15	+ 22	+ 3	−16	− 6	−17	+20	+ 7	− 7	+ 9	+ 5
13 ...	+20	− 3	+1′ 45″	+ 3	− 4	0	− 9	−16	−10	−10	+ 3	+ 3
14 ...	+16	+10	+ 23	− 2	+ 4	− 2	− 3	+ 6	+ 7	+22	− 2	− 2
15 ...	+26	+10	+ 21	− 9	+13	− 7	−15	− 2	+ 7	+ 2	−19	− 7
16 ...	− 3	+16	0	+ 1	−11	+ 8	− 5	0	− 5	− 3	− 5	− 6
17 ...	+ 1	+10	− 7	+ 3	+ 1	+ 5	+ 2	− 7	−19	+ 2	− 5	− 9
18 ...	−11	− 4	+ 5	+10	−22	+ 3	+ 2	+ 3	−19	+12	+ 2	−25
19 ...	+18	− 8	+ 3	+ 6	− 4	−26	+ 9	+ 6	−20	+21	0	+ 3
20 ...	+ 7	−25	− 10	−16	−13	0	+ 9	+10	−29	+ 9	− 9	− 9
21 ...	+13	− 8	− 16	− 1	−16	+13	+ 2	+ 1	−22	+16	− 5	−23
22 ...	−13	−21	− 22	+ 8	− 3	− 6	+ 4	+ 3	+ 5	− 2	−10	0
23 ...	−13	−23	− 12	+18	− 6	+ 3	− 3	+ 6	− 7	−15	0	+ 1
24 ...	−20	−15	− 14	+ 6	−11	− 6	− 7	−16	− 8	−41	+ 7	− 4
25 ...	−20	−20	− 16	− 6	−16	−11	− 5	− 9	+19	+ 2	+ 5	− 6
26 ...	−17	− 6	− 9	−18	−15	+12	− 7	−12	+16	−12	0	−18
27 ...	− 8	+13	0	+18	− 8	− 6	− 5	− 9	− 3	+ 5	−10	+ 3
28 ...	−15	− 9	− 17	− 6	− 9	+ 5	−15	+ 1	+ 7	+ 3	− 7	+ 8
29 ...	+ 7		− 16	−16	−18	+ 1	−14	− 2	+12	+ 7	+ 5	+10
30 ...	− 5		+ 2	−16	− 1	+19	−21	−25	+11	+ 5	0	+ 3
31 ...	+ 4		− 13		− 9		−19	−14		−10		+12
Sums without regard to signs.	363	331	492	237	406	238	304	259	304	314	194	236

1901. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 7″	+12″	−18″	+12′	+21″	+ 7″	+24″	+14″	−37″	− 1″	+21″	−13″
2 ...	+15	+20	−24	+11	+13	+ 8	+14	− 3	−14	− 3	0	+16
3 ...	+13	+20	− 6	0	+ 6	+20	+ 3	−20	−11	− 6	+ 8	+25
4 ...	−16	+15	− 5	− 4	+ 7	− 5	+12	−14	−44	−14	+22	+14
5 ...	+ 7	+11	−16	0	+17	−15	+ 7	+ 1	−20	+ 7	+ 2	+16
6 ...	+ 5	− 5	−11	+ 5	+15	−15	+ 5	− 2	−18	+ 5	− 4	+ 1
7 ...	+ 4	− 1	− 9	+ 2	+18	+20	+11	− 3	−15	−22	− 3	− 9
8 ...	−18	+16	−21	+11	−11	+ 8	+14	0	−14	−14	− 6	−11
9 ...	−11	+12	− 7	+13	−17	− 6	− 6	+16	−25	+ 3	−14	− 7
10 ...	+ 7	− 3	− 1	0	−18	+10	+ 6	+ 6	− 5	+ 3	− 2	− 3
11 ...	+ 7	−16	− 4	−16	+ 8	+ 9	+ 5	+ 6	+20	− 5	− 5	− 9
12 ...	+15	0	− 7	− 2	+ 4	+11	+15	−16	+ 8	−10	−14	+ 2
13 ...	−10	0	+ 1	+ 2	− 2	−10	−13	+ 2	+33	−12	−21	+ 4
14 ...	+ 3	−12	− 8	+ 8	+ 2	+ 4	−13	− 6	+14	− 7	− 7	− 1
15 ...	−10	−18	−14	+11	+ 2	+25	+ 9	+14	+10	−18	− 7	− 9
16 ...	0	−10	− 8	−17	+ 6	+15	+ 1	+12	− 5	−16	+ 7	+11
17 ...	− 6	− 7	+10	+ 1	+ 5	+ 3	+ 7	− 4	+ 7	+ 5	+ 6	+ 1
18 ...	−12	−18	+16	+ 8	+ 4	− 5	+14	+ 5	+27	+ 1	− 3	− 3
19 ...	−27	−12	+15	− 3	+17	+ 3	− 3	+ 1	+22	+ 5	− 1	− 7
20 ...	− 2	+17	+ 9	−10	− 2	−19	− 5	− 1	+26	− 4	+ 1	0
21 ...	− 5	+ 1	+11	− 9	−14	− 9	− 1	+ 3	+17	+14	− 1	−10
22 ...	0	+ 2	+10	+ 2	− 8	− 2	− 2	− 4	+20	+ 2	+25	− 5
23 ...	+10	−10	− 5	+10	− 5	+16	−28	+16	+12	+ 3	+14	−12
24 ...	+10	− 8	+55	+ 5	+ 3	− 2	−12	− 2	+19	− 2	+12	+ 1
25 ...	+11	−11	+11	+ 1	−17	+ 1	−23	− 3	+15	+21	+ 9	+ 1
26 ...	+ 6	+ 1	+19	+ 7	−19	+ 1	− 4	+ 5	+ 4	+24	− 5	+ 7
27 ...	− 9	+ 7	+ 7	0	+ 3	−27	− 1	+ 3	0	0	− 9	−16
28 ...	0	− 1	+ 7	− 7	− 9	−11	−14	− 5	+ 1	+13	− 7	+20
29 ...	− 6		0	−13	− 8	−23	− 8	−13	−17	+12	− 5	−18
30 ...	+ 3		− 5	−20	− 7	−14	− 9	+ 5	−24	+17	− 7	+ 5
31 ...	+15		+ 6		−18		−10	+ 2		0		+14
Sums without regard to signs.	270	266	346	210	306	324	299	207	504	269	248	271

TABLE 528.—*Showing the departure of the daily means of Declination from the mean value of the month for the years 1902-1903.*

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+24″	− 2″	− 2″	− 2″	+ 7″	+30″	+13″	+24″	+11″	− 5″	+22″	− 2″
2	+16	− 6	+ 9	− 1	+15	+12	−11	+20	+15	−22	+19	− 4
3	+11	+ 2	− 3	− 2	+18	+15	− 4	+ 1	− 4	+ 5	− 1	−11
4	+15	+14	− 9	− 2	+15	+ 9	− 2	+23	+ 6	−11	−16	0
5	+19	+ 5	− 6	−13	0	− 1	+12	+ 8	− 2	−12	+ 2	+25
6	+27	−11	+16	− 1	+ 4	− 8	+14	+12	+ 2	−11	+ 5	+ 4
7	+16	+11	+12	−11	+ 9	0	− 8	− 9	− 1	−16	+20	− 5
8	+26	+ 8	+ 6	−26	+ 6	+ 3	−19	− 3	− 8	− 9	+16	+ 5
9	+21	+ 5	− 9	−13	+44	+ 3	− 9	− 9	− 6	− 1	−19	+ 4
10	+19	− 7	+ 4	+ 1	+ 4	−22	+ 3	+10	+19	− 14	− 8	+ 6
11	+17	0	−19	+18	+13	−24	− 8	+ 7	+ 6	+14	− 2	−11
12	+ 8	− 4	− 2	+ 8	+ 2	−17	+ 8	+ 6	+ 7	+14	−10	−16
13	+17	0	− 8	− 6	+ 4	0	− 2	− 7	+ 7	− 1	− 8	− 5
14	+11	− 4	− 3	− 9	+ 4	+14	−10	+ 4	−15	+ 1	− 8	−13
15	− 2	−10	− 4	−10	− 4	− 6	+ 8	+ 3	+16	− 1	− 7	−17
16	+ 1	+14	+ 3	− 2	+ 8	+ 2	− 2	−29	− 6	− 6	− 1	+13
17	−16	+12	+ 2	− 2	−13	− 6	+10	−14	−29	−23	+ 7	+ 6
18	−13	− 2	− 9	− 6	−13	− 2	+ 2	− 5	− 4	−20	+ 4	+12
19	−16	− 6	− 5	+15	− 8	+ 9	+ 5	−32	− 6	− 9	+17	+15
20	− 1	− 7	−17	+23	− 6	+ 4	−19	−15	0	−17	+14	+ 9
21	−35	− 4	− 9	+12	−12	+13	− 6	−17	− 3	−13	+ 7	+ 1
22	−13	− 2	+ 2	+ 8	+ 9	+ 6	+ 6	+ 9	+ 3	− 4	−27	−11
23	−42	+10	− 1	0	−18	− 4	− 9	+12	+ 8	+10	+ 3	+24
24	−18	+ 5	+12	+ 4	−15	− 5	− 1	+ 3	− 3	+23	+17	+15
25	−16	− 3	+ 1	+ 6	−16	+19	+15	0	+12	+30	+ 8	+ 3
26	− 9	+ 9	+11	+17	+ 9	− 5	+12	+ 4	0	+17	− 6	− 9
27	−12	− 8	0	+ 2	−32	− 2	+14	+ 1	− 1	+ 8	+ 3	− 7
28	− 4	− 5	− 4	− 4	−23	+ 2	+ 4	+16	+ 1	− 2	−17	− 4
29	−18		+ 5	− 7	− 2	− 5	−11	− 3	−23	+14	−22	− 8
30	−14		+ 9	− 4	− 1	−29	+ 5	− 5	−14	+10	−13	−11
31	−28		+ 5		−13		− 2	0		− 1		− 6
Sums without regard to signs.	505	176	207	235	347	277	254	311	238	344	329	282

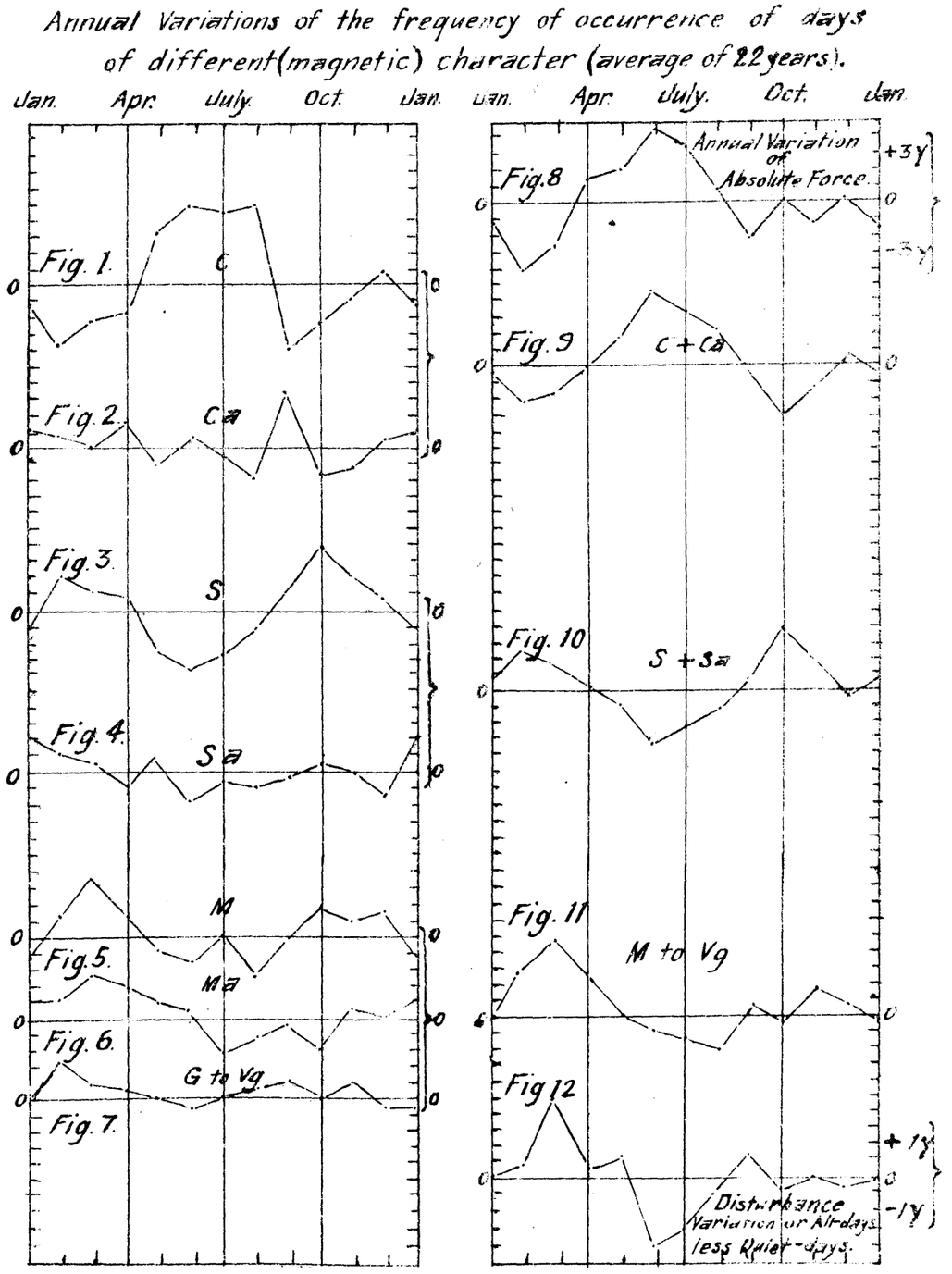
1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 1″	− 2″	+ 3″	−33″	+21″	− 5″	+25″	+ 4″	+13″	−26″	+46″	+17″
2	− 1	+13	+12	−25	+ 9	+28	+25	− 1	+ 9	−21	+34	+26
3	+ 3	+25	0	+ 5	+17	+14	+20	+ 6	− 2	−24	+38	+21
4	− 3	+11	− 2	−14	+18	+13	+ 2	+ 6	−10	−27	+23	+13
5	+ 7	− 4	+ 2	−22	+22	+10	+ 1	+15	−17	−29	+17	+ 5
6	+16	−20	+ 8	+21	− 1	+14	+12	+ 4	− 4	−13	+8	+ 2
7	+31	−11	+11	+35	0	+11	− 8	+ 2	−15	−17	+ 8	+ 1
8	+18	+17	0	+18	− 3	− 2	−10	+28	− 7	−24	0	+ 4
9	+ 3	+15	− 4	+18	+10	− 5	+ 8	+11	−19	−18	− 4	+ 6
10	+ 9	+16	+ 7	+17	+10	+ 9	− 2	+ 3	−10	−34	+12	+ 3
11	+21	− 5	+ 8	− 1	+ 5	+ 6	−14	− 9	+ 1	−30	+ 4	− 4
12	+ 3	0	−13	+10	+ 1	− 1	− 7	− 1	+23	+ 1	− 6	− 1
13	− 3	− 6	− 2	+12	+ 3	−35	+ 3	+ 2	− 4	+27	− 9	+59
14	+ 3	0	− 8	− 2	0	−25	+11	− 2	+ 5	+22	0	+35
15	−16	+ 2	+21	+20	+12	+ 1	+ 3	−25	+ 6	+ 8	− 5	+20
16	− 1	− 1	+15	− 1	−20	− 5	−13	−17	− 7	− 1	− 6	+ 2
17	−17	− 8	+20	+ 9	−17	− 5	− 6	−13	− 8	− 1	− 5	− 6
18	− 5	−27	−17	+14	−14	−22	− 1	−15	− 4	+ 5	−16	−11
19	−12	−13	−16	+12	− 1	−10	−10	−13	+15	+ 4	+11	−25
20	0	−12	−10	+14	− 9	− 1	− 5	+ 7	− 3	−13	+ 6	+ 6
21	− 6	−13	− 9	+ 3	−11	+16	+ 8	−10	+13	− 7	− 8	+ 5
22	+ 1	0	+ 5	−12	−13	+18	+16	+13	+ 5	−10	+10	− 2
23	− 3	− 6	− 9	− 9	− 9	− 9	+10	+ 7	− 8	+ 8	+ 6	−15
24	+ 6	− 7	+12	−19	− 3	−11	− 3	− 3	+ 6	+ 8	− 5	−17
25	+ 3	− 3	+ 8	−12	+10	+ 4	−24	− 2	+ 3	−21	−19	−25
26	− 4	+ 9	+ 2	− 7	− 4	− 8	− 7	+21	+14	+20	−19	−29
27	−10	+11	− 6	−13	− 7	−20	− 4	− 7	− 7	+ 2	−36	−34
28	−10	+11	− 6	−16	− 6	−11	+ 1	− 6	− 4	+ 1	−38	−30
29	−15		+10	− 6	+10	+ 8	− 7	− 1	+13	+10	−26	−40
30	−10		−13	−24	−16	+16	−15	− 7	+ 4	−31	−25	+ 8
31	−10		−14		− 5		− 7	− 5		+3′ 39″		+ 1
Sums without regard to signs.	251	268	273	424	287	343	288	267	259	682	450	473

TABLE 528.—*Showing the departure of the daily means of Declination from the mean value of the month for the years 1904-1905.*

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 8″	+20′	− 2′	+32″	+ 3″	+19″	−42″	− 7″	− 7″	−13″	+10″	+16″
2	− 3	+25	− 3	+16	− 1	+41	0	−15	−11	+ 9	+10	+ 9
3	+10	+ 2	+12	+14	+ 3	+27	+ 2	+15	+ 4	0	+ 3	+25
4	+10	−16	+24	− 3	− 6	− 1	+ 2	+ 8	−14	−23	+35	+18
5	+25	− 2	+14	+ 9	−18	− 2	+16	+ 4	−15	−19	+19	+23
6	+ 2	+ 9	+17	+ 8	−44	+ 5	+13	−35	−11	−24	+12	+14
7	−13	+ 9	+14	+31	−23	+17	+36	+ 6	−10	+ 6	− 2	+ 8
8	−25	+16	+12	+ 9	−13	+14	+30	+25	−19	+ 4	− 1	− 5
9	−13	+23	+ 3	− 1	−11	− 7	+25	+34	−11	+ 9	− 1	− 6
10	+ 3	+15	−16	+ 7	−13	−10	+24	+ 4	−17	− 5	+ 9	− 5
11	+29	+19	−32	+16	+15	+ 1	+32	0	− 4	−17	+ 4	+11
12	0	+29	+ 5	−11	+20	+ 1	+51	− 4	− 3	−13	+ 7	− 8
13	+16	+12	+ 3	− 5	+39	+ 8	+21	− 9	−20	+ 2	+ 4	−16
14	+ 2	+23	− 9	0	+31	− 7	+18	− 6	−11	+20	+ 5	− 4
15	−13	−16	+12	+ 6	+15	−13	0	+ 6	−28	− 3	− 4	− 4
16	+23	−17	+ 5	− 3	− 4	− 0	− 2	+19	+ 7	− 6	+26	−10
17	+ 9	− 3	− 3	−13	− 1	+ 8	+33	+14	+ 1	+ 6	+15	−15
18	− 8	− 1	+ 7	− 1	+11	+16	+ 3	+ 2	+ 9	− 9	+14	− 6
19	−22	−21	− 1	−10	+12	+ 3	− 7	+21	+ 7	−23	− 6	− 6
20	− 7	−14	+12	+47	− 9	+ 4	−38	+13	− 9	−31	−15	+ 6
21	− 9	−14	+11	− 9	+ 9	+ 9	−19	−29	+ 6	+14	−34	+14
22	+ 3	−21	+ 3	−21	− 5	− 9	−23	+ 6	+17	+11	−20	− 8
23	+ 6	−11	−16	−16	− 6	− 9	−28	+ 6	+18	+11	−14	+ 5
24	− 3	− 5	− 7	−30	+22	− 2	−24	− 6	+ 2	− 8	−32	− 1
25	−11	−21	−18	−32	+ 4	− 3	−12	− 1	+37	+25	−15	−21
26	+ 4	−20	+ 5	+ 2	+15	−33	−26	+ 4	+10	+11	+ 5	− 2
27	− 9	−10	0	−13	−12	−24	−13	+ 2	+17	+11	− 8	+ 7
28	− 4	− 4	− 5	− 3	+ 8	+ 2	−10	−36	+25	+25	− 6	−12
29	+26	+ 6	− 3	−17	−28	−12	− 7	−31	+10	+ 2	−26	− 6
30	− 9		−27	− 4	+ 1	−28	−13	+ 4	+21	− 5	− 6	− 6
31	−37		−31		− 1		−17	0		+25		−16
Sums without regard to signs.	362	404	332	389	403	335	597	372	381	390	368	313

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 6″	− 6″	+ 1″	+17″	+21″	+20°	+ 7″	− 1″	− 3″	+13″	−24″	+ 7″
2	−12	−19	+26	+19	+11	+20	+10	+33	− 6	+ 8	−14	+19
3	−18	+37	+24	−12	− 4	+ 8	+15	+15	− 9	+ 3	−15	+ 7
4	− 5	+38	+ 8	+ 9	−12	+15	− 5	+ 7	− 4	+ 9	+17	+27
5	+ 1	+39	+ 1	+11	− 4	+41	+20	− 4	−13	+ 6	+11	+12
6	+13	−14	−22	+ 1	−21	+23	−18	− 8	−21	0	− 6	+ 7
7	+ 1	− 4	+ 6	+ 3	−27	+18	+22	+16	− 8	+ 6	−15	− 2
8	8	−36	+ 2	+ 1	−16	+16	− 9	+29	+ 7	+ 6	−14	+ 5
9	−36	+ 1	+ 4	+ 6	− 7	+12	+25	+16	− 3	+13	−13	− 6
10	−12	−37	− 6	+23	0	+24	+ 9	− 1	+23	+ 7	− 4	−21
11	− 2	+11	−12	+10	+ 2	+17	− 8	+13	0	− 2	−12	−27
12	+ 5	− 1	+ 9	− 2	−19	− 6	− 5	−17	+ 9	−16	+59	−29
13	+ 8	+11	+14	−25	−13	− 4	+10	0	+ 2	+ 5	+16	+24
14	+23	− 5	+19	− 6	+21	− 1	+ 7	+14	−24	+ 3	+ 9	0
15	+ 5	+11	+14	− 4	+25	+ 8	+ 7	− 2	−19	−10	+16	−21
16	+12	+ 7	+12	−20	+14	− 1	−11	− 4	−22	−14	+40	−12
17	+ 5	−14	+ 1	− 8	− 2	− 4	+ 1	−22	− 8	−14	+11	+11
18	+14	− 5	+ 3	− 8	+ 4	− 5	+ 2	−18	− 4	−22	+10	+ 9
19	− 3	− 7	− 7	−12	+25	−18	− 9	−12	+11	−10	+19	+14
20	0	− 6	−13	−16	+27	−18	−29	− 8	− 6	− 9	+ 3	+15
21	+ 3	−19	+ 6	+24	+15	−22	−43	−20	+13	+ 9	0	+ 9
22	+29	−23	− 2	−12	− 4	+ 1	+ 5	−24	− 5	+ 5	−18	−10
23	−18	+29	− 9	−10	−21	− 3	−21	−39	−23	0	+17	− 4
24	− 9	− 2	−19	− 4	+ 2	− 6	− 4	−12	+ 3	− 6	0	− 6
25	+ 1	+ 5	− 1	+17	+ 2	−12	−15	+18	+ 5	+ 6	−21	−11
26	+14	+12	− 3	+15	+12	−20	+16	0	+17	+10	−34	−17
27	− 7	+18	+33	+ 9	+10	−33	− 9	+ 3	+17	−11	− 9	+ 5
28	+ 9	−14	− 4	+ 6	−23	−28	+ 4	−13	+17	+13	−11	− 3
29	0		−41	−16	−15	−26	−15	+11	+26	+ 9	− 8	+24
30	+ 1		−26	− 3	−18	−22	+31	+22	+33	0	−13	+ 5
31	−14		−31		+ 8		+ 9	+18		− 8		−18
Sums without regard to signs.	294	431	379	329	405	452	401	420	361	253	459	387

collected the number of days in each class for each month and for the average year. Such twenty-two monthly sums for the 22 years considered, are added up and the results so derived divided by the total number of days in 22 months appear separately in table 527.



These ratios roughly furnish the average frequency of occurrence from month to month of any particular kind of day and the annual variation of these frequency numbers shown in the table supply some useful information and are charted in figures 1 to 7 above. It will be seen that the character of these annual variations making all allowance for the personal equation involved in the selection and classification of days are different for each class. The variation of days of small disturbance classed as S (see figure 3) is practically the same as the one indicated by calm days classed as C (see figure 1) but it is inverted. On the other hand the variation of days of larger disturbances classed as M to Vg (see figures 5 to 7) including the intermediate class Ma, though fairly similar amongst themselves

differ typically from that of the S days. This difference is fairly distinct as a pronouncedly higher maximum is indicated in the latter during the September equinox while in the former class the disturbance days show a tendency to crowd more about the vernal equinox.

It will be noticed further that the character of the intermediate curves derived from days which are denominated Ca and Sa (see figures 2 and 4) especially the former, clearly indicate sharp lines of division. The magnitude of both these variations is small relatively to either that of C or S days (see figures 1 and 3) and it appears as if the days classed as Ca (see figure 2) partly belong to class C and partly to S, each having a distinctly opposite tendency in its annual march. Similarly the curve of Sa (see figure 4) appears to be built up of days partly belonging to class S and partly to class M. The progression of the curves of days of larger disturbances M to Vg including Ma (see figures 5 to 7) on the other hand show that they are fairly similar and may be taken together to represent but one class of phenomenon. Combining in the first instance the curves representing C and Ca, S and Sa, and M to Vg, we obtain three characteristic curves of annual variations shown in figures 9, 10 and 11. The exactly inverse results in curves of C and Ca (figure 9) and S and Sa (figure 10) must follow necessarily as a result of the treatment adopted as they make up among themselves the bulk of the days in the year, and as the number of days to which the third curve (figure 11) owes its derivation, is very small. Out of 365 days, on the average of 22 years dealt with, C + Ca give 280 days, S + Sa contribute 80, leaving only 5 days for the third curve. But the closely accordant parallelism simulated by the curve in figure 9 or by figure 10 inverted, to the curve of the annual variation of absolute force of H which is charted for ready reference in figure 8 above is noteworthy, as it furnishes yet another link in the chain of evidence in regard to the reality of the existence of the annual variation of absolute force, referred to in paragraph 303. It obviously also emphasises what has already been referred to more than once, *viz.*, that quiet conditions are as much associated with high daily means of force and smaller amplitude of variations, as the disturbed conditions are with the lower values of absolute force and accentuated amplitudes of variations. We have seen this to obtain in the diurnal variations; we have seen it disclosed in the run of the magnetic traces from day to day in the 13·5 day and 27·0 day periods (*vide* paragraph 539); it has been indicated in the secular march as referred to in Chapter I, and now we find it clearly evidenced in the annual march of absolute force.

The variation in figuge 11 is however of a somewhat different character. It is of course small but it will be seen nevertheless that it fairly simulates the curve in figure 12 reproduced above from paragraph 468, Chapter XI, which shows the difference annual variation of quiet and all-days, or what may be called disturbance annual variation of absolute force.

544. Referring in passing to the general distribution of the days in the Colaba record as averaged for the 22 years it will be seen from table 527 that out of every 100 days, 39 days may be taken as *absolutely* calm; 54 days of small disturbance which are made up of days denominated as Ca and S, and 7 days of large disturbances made up of days classed as Sa to Vg. This mode of grouping practically corresponds to the division 0, 1 and 2 adopted by the International Committee of Terrestrial Magnetism and it remains to be seen how far correctly this is in agreement with the average distribution of days derived from the results of all reporting observatories.

545. Recurring after the digression, to the consideration of some other periods which may possibly influence the march of the daily mean of horizontal force, we have already seen that the values indicate distinct annual and semi-annual pulses. These have been already referred to. The period hence for which the data may most appropriately be examined next, is that discovered by Chandler in the variation of our latitudes. If the axis of our earth is subject as shown by him, to the small precessional movement of about 427 days, or 432 days derived from the mean curvature of the path of the pole, which is about 305° per year on the average of 14 years from 1891 to 1905 as suggested by Dr. Knott; if the pear shaped form of our earth as suggested by the researches of Jeans and Sollas, is being gradually moulded in the process of evolution, nearer and nearer to the stable spheroid form; and again if as shown by Milne these precessional movements when they attain their maximum departures from the mean which indicate a corresponding minute change in the effective rigidity of the earth as a whole, also show a parallel and concurrent phenomenon in the increased rate of evolutionary adjustment in the crust of the earth or frequency of earthquakes, it is not inconceivable that the enormous strains periodically so produced by these precessional movements and the consequent yielding and readjustment of vast regions of the earth, may result in inducing a minute periodic movement in the absolute value of force which is presumably directly dependent upon the condition of the earth as a magnet.

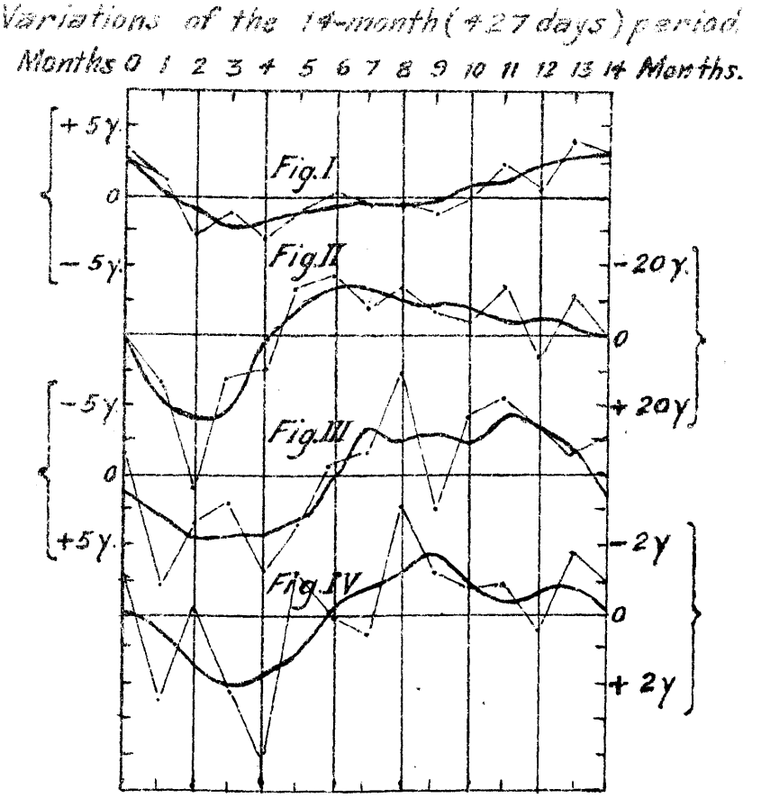
546. Assuming hence that the existence of such periodic movements is not improbable in the magnetic curves, the monthly means of absolute values in table 240 were arranged with 14 mean monthly values in one line and in order to eliminate the annual period which would otherwise vitiate the resulting curve, the data of a period of 28 years 1878 to 1905 which is a common multiple of

Variations of the 14-month (427-day) period derived from monthly mean values of daily means and ranges of H.

Unity = 1γ

	Months.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Absolute H. F. corrected for secular change: January 1878 to December 1905.	+3·4	+1·2	−2·9	−1·2	−2·9	−1·3	+0·1	−0·9	−0·6	−1·0	+0·1	+2·3	+0·5	+3·8
2	Summed differences (variability) of daily means of H. January 1878 to December 1905.	− 1	+14	+45	+12	+10	−13	−17	− 8	−13	− 7	− 4	−13	+ 6	−12
3	Summed ranges of H. F. diurnal variations: January 1871 to December 1905.	−2·2	+7·7	+3·9	+2·0	+7·2	+3·7	−0·8	−1·9	−7·3	+2·6	−4·0	−5·4	−3·2	−1·6
4	Non-periodic diurnal ranges of H. F. January 1892 to December 1905.	−1·0	+2·6	−0·1	+2·0	+4·3	−1·1	+0·1	+0·7	−3·0	−1·1	−0·8	−0·8	+0·5	−1·8

12 and 14 month period, were dealt with. The result shown in the table above in row 1 is also charted below in figure I with other similarly derived results for other magnetic curves, from which it will be seen that a variation of the period may so far be strongly suspected to exist. The amplitude of the movement is 7γ which is almost equal to that of the annual variation which is 9γ, and one is forced to infer that if the annual variation of absolute force is recognised as a true phenomenon, the 14-month period also in all probability connotes a genuine phenomenon too.



547. When examining the series of summed ranges (periodic) of H given in table 261, for this 14-month period, we find from the result shown in row 3 of the above table, which is charted as figure III above, that though not quite so pronouncedly exhibited as in the absolute values, the period is so far

definitely and clearly disclosed by the curve. The amplitude however is only 15γ which is less than one-eighth of the amplitude of the annual variation of summed ranges discussed in paragraph 355. This is clearly unsatisfactory. Any way to remove the doubt thus raised the non-periodic ranges shown in table 455, as also the variability figures of H in table 385, were separately treated for the same period. The results so derived are shown in rows 2 and 4 of the table above referred to, and are charted respectively in figures II and IV above, both of which unmistakably indicate the influence of this period also. In the non-periodic range curve the amplitude of the 14-month variation is shown to be 6γ as against the 16γ of the annual variation; but in the variability curve it is as much as 62γ as against 57γ of the annual variation. Thus it will be seen that the influence of this period is more perceptible in the absolute values and their variability figures than in the ranges periodic or aperiodic; it is also relatively more pronounced in the non-periodic parts of the ranges, and of the absolute values (variability) than in the respective periodic phenomena. It is worthy of note also that while the aunual variations of absolute force, of the summed differences of the daily means (variability), and of the summed ranges of the diurnal variations of H (see paragraphs 543, 436 and 355), are all dissimilar in character, the 14-month variations indicated by these elements are all remarkably of the same type (see figures I to IV above).

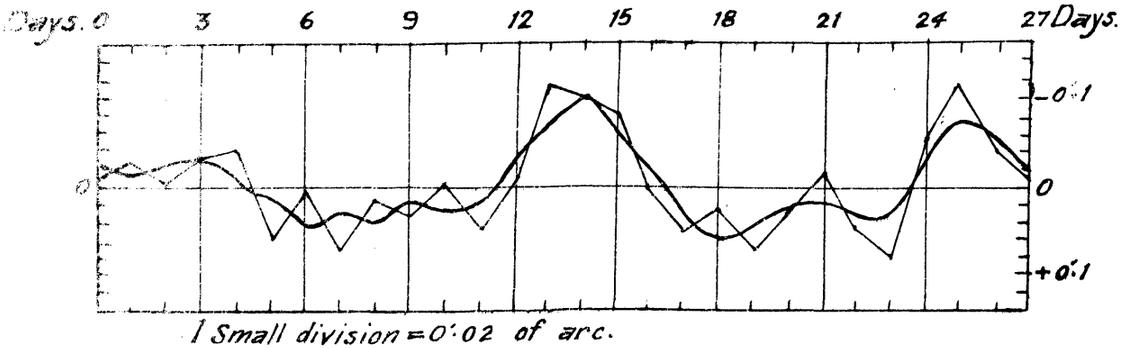
Assuming thus that a period of about 427 days does in all probability exist in the magnetic curves as shown above in the results of the absolute values and in the mean variability of the daily mean of H, it is obvious that it must operate as effectively on the absolute values of H as the annual variation, and 'interference' must result complicating the 11-year period fluctuations which we have noted in paragraph 302 do appear to influence the annual variations. This may be borne in mind when considering the secular progression of the annual variation of force during the years of maximum and minimum spot epochs as it would be partly vitiated by the 14-month period.

2.—Daily Means of Declination.

548. As already remarked elsewhere the declination traces at Colaba are little influenced even during the greatest of storms and under the circumstance any examination in detail of the data on lines referred to in the last section can scarcely be of much advantage though full data have been given in tables 528, 528A, the necessary results may be secured if desired. Hence data of two years 1898 and 1899 only, which in the examination of the H results, have shown the best indications of the influence of

Days.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
1898-1899 ...	-1	-2	-1	-3	-4	+6	0	+8	+2	+3	0	+5	0	-11	-10	-8	+1	+5	+5	+7	+3	-1	+5	+8	-5	-11	-4

the 13·5 and 27-day periods, have been dealt with here. The data in tables 118 and 119, which give the daily means of declination for these two years, have been treated exactly in the manner referred to in paragraph 537. The result given in the above table after being corrected for secular change is also charted below for ready reference. It will appear from the curve that though the amplitude of the movement is small, about 0″·2, the run of the curve is clearly definite and when compared with those shown in



1 Small division = 0″·02 of arc.
Thick curve = Smoothed curve (overlapping means of 3 days).

paragraph 540, it is closely accordant. When therefore along with other evidence we find that an element like declination, which at Colaba is not seriously perturbed by the heaviest storms, exhibits however feebly, the influence of these periodicities, notably that of the 13·5-day period, we are forced to conclude that the result is not merely fortuitous but that in all probability we are dealing with a real phenomenon.

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1894-1895.*

Unity = 1 second of arc.

1894. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+10	− 34	−38	− 53	+28	+ 6	− 17	+ 34	+10	− 19	+10	0
2	− 10	+ 29	− 24	− 38	− 31	+ 2	+40	− 2	+14	− 12	− 23	− 7
3	+34	0	+17	+19	+24	− 3	− 5	− 19	− 2	+14	− 5	− 5
4	− 12	− 12	+21	− 43	− 12	− 2	− 7	+ 14	+18	− 9	0	− 5
5	+ 9	+ 5	− 31	− 12	− 16	− 14	+ 9	− 7	− 25	+28	− 12	+18
6	− 21	− 3	0	+55	− 7	+10	− 21	+ 9	− 20	− 9	+15	+ 4
7	+ 7	+ 15	− 18	− 17	− 50	− 31	− 21	+ 14	+27	+ 5	+ 7	− 17
8	− 7	− 36	0	0	+59	+4	+43	− 31	− 1	− 12	+37	+10
9	− 9	+ 21	+ 6	− 4	− 5	+67	− 1	+ 1	− 7	+12	− 38	− 5
10	+ 9	− 30	+ 8	− 31	− 5	+14	− 23	+ 19	+20	− 13	− 6	+ 2
11	− 36	+ 2	− 24	− 5	− 18	− 30	− 2	− 15	− 10	+ 8	− 3	− 12
12	+33	+ 21	− 10	+ 5	+26	− 12	+15	+ 2	+10	− 19	+ 2	+10
13	− 18	− 28	− 16	+45	+12	− 12	+11	+ 8	− 12	+26	+55	− 4
14	+24	+ 2	+23	− 16	+23	+14	− 3	+ 16	+ 2	− 5	− 9	− 10
15	− 10	+ 17	+20	− 5	− 11	− 2	− 23	+ 3	+50	+ 3	− 32	+33
16	+ 5	+ 10	− 5	− 12	0	− 1	+16	− 17	− 31	+ 2	+27	+ 3
17	+ 5	− 24	− 15	+23	+ 7	− 30	− 4	− 17	− 10	+ 4	− 14	− 19
18	+ 6	+ 12	+10	+ 1	− 32	+52	+13	+ 3	− 18	− 6	+21	− 1
19	− 2	+ 26	− 7	0	+ 8	− 48	+ 6	+ 33	+39	0	0	− 6
20	− 21	− 12	0	− 5	− 2	+12	+66	+163	+15	− 7	− 26	− 12
21	+ 5	+ 73	+31	+ 9	+ 2	+7	+ 5	−144	− 31	+ 4	− 14	+19
22	+19	−102	− 3	− 9	+10	+17	− 53	− 5	+ 3	0	− 5	+ 4
23	− 7	+ 48	− 30	0	− 24	− 9	− 14	− 18	− 7	+ 9	+38	+64
24	− 1	+ 4	− 12	+ 7	+ 7	− 17	− 4	− 3	− 22	− 7	− 21	−78
25	+ 5	+ 68	+11	− 19	− 29	+ 2	+47	+ 7	+24	+10	− 20	− 19
26	− 7	− 46	− 2	+ 7	+15	− 16	− 35	0	− 10	− 5	+ 3	+ 5
27	+15	− 26	− 24	− 9	− 1	+ 2	+14	+ 5	+19	+ 3	− 2	− 2
28	− 12	+ 36	+20	− 19	+12	− 9	− 41	− 15	− 7	− 20	+ 4	− 3
29	− 6		− 6	− 5	+ 8	+ 9	+19	− 18	− 26	− 19	− 4	+17
30	+ 8		+81	+24	− 19	− 9	+10	− 26	+ 15	+10	− 1	− 7
31	− 2		+ 3		+ 6		− 34	+ 21		+15		+ 2
Sums without regard to signs	375	742	516	497	509	463	622	689	505	315	454	403

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+ 9	− 1	− 29	− 11	+33	− 11	+12	+27	− 3	− 39	+24	− 13
2	+ 4	0	0	− 12	− 22	+18	0	− 17	− 14	− 10	− 8	− 3
3	− 30	− 16	+20	+ 8	+24	− 23	− 12	+26	+16	+15	− 17	− 21
4	+25	− 19	− 15	− 15	− 9	+24	+11	− 19	+22	+ 9	+ 3	+16
5	− 38	+23	− 9	+34	− 1	− 27	− 16	− 3	+12	− 5	+14	− 2
6	+17	+22	+17	− 26	+10	+24	+16	+ 1	− 32	+ 2	− 14	+10
7	+10	− 14	− 20	+ 6	− 16	− 3	− 38	− 15	+20	− 28	− 9	− 3
8	− 10	+ 2	+38	0	− 15	− 7	+ 7	+19	− 3	+14	− 7	+28
9	+ 2	− 2	+ 8	+10	+10	− 26	− 2	− 16	− 10	− 19	+19	− 21
10	+ 3	+ 2	− 20	− 5	+16	− 9	− 2	+55	+17	− 21	− 1	− 10
11	− 3	− 2	− 7	+29	+ 1	+ 4	− 17	− 34	− 17	− 14	+20	+ 8
12	− 2	− 10	− 12	− 12	+11	+15	+28	+21	− 4	+38	− 5	− 29
13	+ 9	− 10	+41	− 19	− 7	− 2	+22	− 40	− 7	− 10	+12	+17
14	− 6	+19	+ 7	+ 4	− 17	− 17	+ 9	+31	− 12	+ 7	− 32	− 14
15	− 17	+38	− 31	+22	+27	− 22	− 28	− 19	− 2	− 7	+18	− 5
16	+ 7	− 26	+17	− 16	− 17	+12	− 14	− 3	+21	+27	− 10	− 3
17	+19	− 21	− 3	+14	− 3	+24	− 2	+ 5	− 12	+19	+ 4	+13
18	− 12	+19	− 4	− 20	+12	+ 3	− 1	− 4	+16	− 34	+ 8	− 1
19	+ 5	+10	− 17	+ 3	− 12	− 20	− 5	− 12	− 6	+ 9	− 17	+ 7
20	+ 5	+ 2	+ 5	− 10	− 7	+ 7	+12	+17	+14	− 23	− 17	− 2
21	− 3	− 12	− 2	+ 1	− 14	− 45	− 4	− 15	− 22	− 2	+ 3	− 16
22	− 17	0	0	− 8	+15	+27	+ 2	− 7	+10	+ 4	− 15	+44
23	− 2	− 5	+ 6	+15	+ 4	+ 2	+ 7	− 17	− 19	+12	+44	− 13
24	+12	+ 7	− 24	− 10	− 14	+17	− 11	+ 2	− 3	+ 5	− 5	+ 7
25	− 7	− 21	− 14	− 16	+10	− 17	− 6	+15	− 6	− 10	− 15	− 19
26	− 5	+ 2	+31	+ 6	− 5	− 14	− 2	− 3	+23	− 33	− 19	− 19
27	+12	− 5	− 9	0	− 8	+ 2	+ 5	+34	− 7	+41	+15	+14
28	− 10	+ 8	+17	− 16	+ 6	− 10	+ 3	− 27	− 7	− 12	0	0
29	+ 6		− 32	− 3	− 15	+19	+ 6	− 6	+ 4	+12	+ 7	− 12
30	+31		+20	− 11	+64	+ 22	− 4	+ 9	+62	+ 7	0	+ 7
31	− 25		− 10		− 16		− 27	+ 7		+ 2		− 3
Sums without regard to signs.	363	318	485	362	441	473	331	526	423	490	382	380

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1896-1897.*

Unity = 1 second of arc.

1896. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−18	+ 4	−41	−34	+ 6	0	+23	+ 9	+62	−23	+10	+10
2 ...	0	− 2	+ 6	+19	+85	+ 2	+ 2	−13	− 1	+ 2	− 9	+ 4
3 ...	+17	−11	0	+ 8	+17	−14	−14	+22	− 4	+21	+22	− 2
4 ...	+27	+40	+41	+11	−67	+10	+ 5	− 9	+ 4	−16	−13	+33
5 ...	−19	−48	−55	− 4	− 2	+ 2	− 1	−31	− 4	− 3	− 2	0
6 ...	−10	+ 2	+ 5	− 8	−16	− 7	+26	+21	+16	+ 1	+27	− 9
7 ...	+10	−16	+15	−38	+14	+ 5	+ 1	+14	−17	+14	+23	+ 4
8 ...	+ 6	+21	− 6	+10	−17	−24	−12	−17	− 7	−26	+ 7	−30
9 ...	−16	− 2	−14	−10	+ 8	+16	−39	+24	− 2	+19	−18	+ 9
10 ...	+10	+ 2	− 2	0	0	+24	+25	−12	−16	−10	−13	− 9
11 ...	− 3	− 4	−28	−11	− 3	− 6	+ 9	−37	+23	+19	−12	+ 4
12 ...	0	+ 7	+54	0	+12	−22	+10	+37	− 2	+29	− 7	−18
13 ...	− 4	−41	−17	+ 6	−21	+ 9	− 1	− 4	+10	−26	− 7	+44
14 ...	−13	+50	− 2	−14	+ 4	0	−12	−20	−10	+ 7	0	−33
15 ...	− 5	−11	+ 5	+14	0	+ 7	− 4	−13	+12	− 5	− 4	−11
16 ...	−13	−10	− 9	− 4	−35	0	− 8	+ 9	− 2	− 2	−15	+ 2
17 ...	+23	+24	+ 4	+ 7	+31	+ 1	−12	+21	− 8	− 1	−11	−14
18 ...	+ 2	−10	+ 5	−24	+21	+ 9	− 6	+20	− 2	− 9	+26	−10
19 ...	+ 5	−19	− 5	+ 7	+ 4	−14	+ 9	−10	+ 9	+19	− 1	+ 2
20 ...	− 5	−14	+29	−29	− 6	0	−24	+ 2	+46	−10	+ 7	0
21 ...	+ 3	+14	−27	+62	+ 9	− 5	− 2	+33	−29	−14	−13	0
22 ...	− 7	+19	+ 1	− 7	−26	− 3	+48	−38	− 7	0	−24	− 5
23 ...	−12	− 4	+ 6	− 4	− 2	− 4	−10	+10	−15	+ 9	+21	+13
24 ...	0	−24	−13	+21	+ 7	− 3	+ 2	− 5	+18	−14	0	− 1
25 ...	+22	+14	+26	−12	− 1	−12	−17	+10	− 8	+ 7	− 9	−14
26 ...	−13	+ 4	+ 2	+ 7	−23	−12	−14	−10	+15	− 2	− 5	− 4
27 ...	− 7	+13	+ 4	−16	+21	+29	+19	+10	− 5	− 9	+12	+49
28 ...	0	−10	−14	−14	−14	− 5	−14	−24	−26	−20	− 5	−35
29 ...	− 7	+26	− 9	+16	+ 4	−24	−12	− 5	+12	0	0	+ 9
30 ...	− 9		− 9	− 7	−14	+17	+ 8	+12	−13	+ 8	0	− 9
31 ...	+31		+30		− 9		+ 9	− 9		− 8		−10
Sums without regard to signs.	317	466	484	424	499	286	398	511	405	353	323	397

1897. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 4	−16	+33	−18	−36	−17	+33	−48	+14	+12	−12	+42
2 ...	+112	+ 3	0	− 1	0	+ 6	+ 5	− 7	− 8	−11	− 6	+ 9
3 ...	− 46	+ 9	+14	−14	−12	− 6	−16	− 5	+14	− 3	−12	− 5
4 ...	− 14	0	+ 5	−17	+ 5	+ 1	+ 4	−12	− 9	− 3	−15	− 7
5 ...	− 40	− 7	+24	+15	0	0	+ 1	− 3	− 7	+ 3	0	+ 8
6 ...	+ 12	+ 7	−24	+ 4	+12	− 3	−10	+ 3	− 3	0	+15	0
7 ...	− 15	+12	−15	− 2	−12	− 5	+ 9	− 7	+12	−12	− 8	+ 2
8 ...	+ 3	−14	+34	− 7	+ 2	−16	+ 1	− 2	+ 7	− 7	0	−12
9 ...	− 12	−22	− 3	−14	− 9	+ 9	− 5	+ 2	−18	+29	0	−12
10 ...	+ 21	+14	−35	+26	+ 4	− 7	− 8	+23	− 8	+26	−14	+31
11 ...	− 5	−14	+ 7	− 5	− 6	+ 7	+13	− 6	+27	− 8	+ 2	+28
12 ...	+ 8	+ 3	−19	− 9	− 8	−16	− 1	+ 4	− 3	− 4	+ 5	− 2
13 ...	0	− 8	+11	+ 9	− 9	− 7	−11	−26	+10	+ 4	− 4	−16
14 ...	− 3	+15	− 2	+ 5	+23	+11	+16	+19	−17	+ 8	+33	−13
15 ...	+ 3	−24	+ 2	−27	+ 1	+ 8	−22	−31	+ 2	−20	+ 4	−18
16 ...	− 33	− 5	− 4	+34	−15	+31	+12	+24	− 4	+ 3	−12	0
17 ...	+ 7	+10	−14	−12	+15	−44	−11	−21	− 7	− 2	−14	− 5
18 ...	− 1	− 1	+ 4	+21	−12	+10	−15	+35	− 5	+ 7	+ 8	0
19 ...	+ 13	+12	0	−16	+14	+ 8	+ 7	−14	+ 7	−10	− 1	− 8
20 ...	− 19	− 4	+ 2	+23	+14	−10	+ 7	+19	+ 9	−21	+ 5	+48
21 ...	+ 12	+23	− 7	− 9	−10	+ 4	+ 3	+21	−19	+ 2	−12	−28
22 ...	− 1	+12	+ 3	− 5	+ 6	−12	+ 5	−23	− 4	+ 2	+ 3	+ 9
23 ...	+ 3	−14	+ 4	+29	−22	+12	−29	−20	+23	+25	−10	−14
24 ...	+ 11	−14	−21	−21	+ 9	− 2	+ 3	+ 7	+19	− 8	+ 5	+ 7
25 ...	− 2	−21	+10	−12	− 4	+ 2	− 5	− 4	− 9	−12	+ 2	− 5
26 ...	− 4	+13	− 1	+ 2	−14	− 6	− 7	−12	−33	+ 8	+17	−24
27 ...	− 17	+36	+ 5	− 2	+11	+11	+28	+ 5	+ 2	+18	−14	+ 8
28 ...	− 22	−43	0	− 8	+ 1	−21	+ 2	+24	−12	+15	−15	− 8
29 ...	+ 29		0	−16	+ 9	+16	+ 6	−12	+14	−12	− 4	+13
30 ...	+ 12		− 4	+42	− 5	−18	−36	− 1	− 2	− 2	−22	− 8
31 ...	+ 5		+38		+ 9		+62	− 6		− 8		− 4
Sums without regard to signs.	489	376	345	425	309	326	393	446	328	305	274	394

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1898-1899.*

Unity = 1 second of arc.

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	-16	+ 8	- 6	-26	- 8	+45	+ 7	+ 4	- 14	-39	- 9	-25
2 ...	- 2	+16	+24	0	+10	+ 6	+10	+13	+ 4	+11	+ 3	-11
3 ...	- 1	- 2	-28	- 5	0	- 4	-13	- 8	+ 36	+10	+14	+24
4 ...	+ 8	+ 8	- 7	-14	- 7	-14	+ 3	+22	- 34	+17	- 2	-13
5 ...	+ 2	+ 9	+ 5	+ 3	- 3	- 1	+14	-19	+ 1	-20	-15	+ 5
6 ...	+ 7	+10	+ 7	+ 2	-14	+ 5	+ 3	- 5	- 7	+ 3	- 7	-21
7 ...	- 2	-19	- 5	+14	+ 5	-26	-27	-19	- 8	+16	- 9	+23
8 ...	+ 9	+33	+ 9	+ 1	+23	+17	- 9	+14	- 12	-18	- 2	-11
9 ...	+ 8	-15	- 9	+ 7	- 5	+21	+12	- 5	+117	-10	+24	+11
10 ...	- 3	-28	- 2	-13	-21	-31	+ 5	-23	- 21	- 3	-10	- 7
11 ...	- 7	+19	+35	+ 1	+ 3	+ 3	-24	+ 4	- 46	+ 7	-10	+ 7
12 ...	-17	+ 4	-29	+43	+12	-12	+ 9	+33	- 5	0	+17	-11
13 ...	+10	-23	-25	-50	+23	- 5	- 5	+ 6	- 4	0	+10	- 8
14 ...	0	+36	+31	+ 4	-28	+19	+15	- 5	+ 36	+ 3	-10	+41
15 ...	-14	-13	+62	+12	+11	- 5	-21	-12	- 17	+16	-24	-14
16 ...	+ 7	+22	- 1	+ 5	- 6	+12	+ 2	+35	- 17	- 4	+ 3	+ 9
17 ...	+18	+ 3	-40	+ 2	- 6	-24	+19	-16	- 4	+10	+24	- 2
18 ...	-11	-15	- 5	- 4	- 7	+17	-12	-12	- 1	0	- 3	- 9
19 ...	- 1	-29	-16	-19	- 9	-15	+ 2	0	- 7	-13	-22	- 8
20 ...	- 4	-11	+ 6	+ 2	+ 3	+20	+14	-10	- 4	+13	- 4	0
21 ...	- 7	+17	-12	-17	+ 7	-15	-12	+19	- 19	- 3	+12	- 9
22 ...	+ 9	+18	-16	+24	-12	-21	-11	-11	+ 2	+ 3	+11	- 5
23 ...	- 4	-16	+ 7	+17	+ 4	0	- 7	-27	+ 7	-19	+12	+ 4
24 ...	-15	+19	-10	-24	+ 3	+10	+12	+10	+ 3	- 3	-23	- 7
25 ...	+ 8	- 3	+17	+ 4	-17	-19	+12	+12	- 5	+17	-10	+12
26 ...	+ 4	+ 5	+14	0	+ 2	+14	-13	-14	- 8	+ 4	0	-28
27 ...	0	+ 5	- 9	-18	+ 5	+12	+10	-17	+ 7	-11	- 9	+10
28 ...	+12	0	-14	+16	+12	-24	-14	+28	+ 25	+12	+ 4	+ 2
29 ...	-19		+ 9	- 5	- 2	+16	0	0	+ 6	+43	+ 1	- 7
30 ...	- 2		-16	- 2	+19	+ 1	- 2	+ 5	- 18	-48	0	- 1
31 ...	-31		- 5		-21		+11	- 7		-14		- 2
Sums without regard to signs.	258	406	481	354	308	434	330	415	495	390	304	347

1899. Date.	January.	February.	March.	April	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+41	+ 1	- 5	- 5	+47	+37	-12	-22	-11	+25	-20	+ 5
2 ...	-22	+ 4	-23	+12	-31	+ 7	- 3	+ 2	- 4	-10	+10	+ 3
3 ...	+ 3	- 4	+11	0	+ 3	- 8	- 2	- 4	0	+16	- 7	-12
4 ...	+10	+ 11	-12	+ 4	+33	+13	- 8	+17	-13	+ 5	+25	0
5 ...	+ 7	- 4	- 2	- 2	-14	-10	- 9	+ 2	- 2	+10	- 6	- 5
6 ...	- 7	- 5	-10	+ 3	-26	-17	- 5	-19	+ 3	-17	- 6	+ 2
7 ...	-27	- 22	+22	- 3	+ 5	-12	0	+ 9	+ 4	- 5	- 2	- 4
8 ...	+ 3	+ 19	-21	+ 3	+ 7	+19	- 4	- 7	- 5	0	+14	+28
9 ...	- 5	- 6	+ 2	+ 6	- 8	- 4	+13	+ 8	- 2	- 7	-11	-12
10 ...	+12	+ 11	+ 7	0	- 6	+ 4	-14	-15	+ 2	+ 2	- 7	+ 5
11 ...	-10	- 28	+17	- 2	-20	+ 8	+20	- 5	- 4	+ 1	-17	- 5
12 ...	+20	+102	0	- 2	+24	-15	-13	+17	+ 5	+ 4	- 2	+19
13 ...	-13	- 48	+ 2	-19	-24	+17	+ 1	-21	- 1	+ 8	0	-14
14 ...	-16	+ 13	-16	+ 2	+ 7	- 7	-19	+ 6	- 6	-24	+38	-12
15 ...	+26	- 27	+ 4	-19	+27	- 8	+ 7	-14	+ 2	+35	- 5	- 7
16 ...	+15	- 9	-21	+22	-12	-11	+ 5	+19	+ 4	- 7	-12	0
17 ...	-18	- 3	+ 2	0	+ 2	+11	+14	+13	+ 5	+17	-12	+ 7
18 ...	- 6	- 16	+ 7	+73	+ 8	+20	-14	-17	- 5	-14	- 2	+ 4
19 ...	+12	+ 12	+ 5	-36	- 5	-13	- 1	-14	- 4	-20	+ 5	+13
20 ...	- 8	+ 11	- 3	-14	- 3	- 7	0	+44	+16	+ 1	+ 2	-12
21 ...	+ 8	- 4	+20	-17	-19	0	+ 5	- 2	- 6	- 7	- 3	+ 2
22 ...	- 3	- 3	-10	0	+ 5	- 2	+17	-14	-17	+12	+ 3	-10
23 ...	- 7	+ 19	+60	- 9	- 7	-10	-19	+ 7	-14	+ 9	+ 2	+ 7
24 ...	- 5	- 11	-34	- 9	- 5	- 4	- 3	+ 3	+ 9	+ 3	+ 7	- 9
25 ...	+12	+ 6	+10	+18	+16	+17	+15	-15	-13	+21	-16	-14
26 ...	- 5	0	-12	-11	-18	-13	- 1	+14	+16	-19	+14	- 2
27 ...	-12	- 21	-19	- 5	+ 7	- 7	+15	0	+14	+ 5	- 9	+11
28 ...	+10	+ 7	- 9	- 7	+ 4	+ 7	- 2	-24	- 5	-19	- 5	+17
29 ...	+21		0	-12	- 7	+24	-13	+17	+ 7	-17	+ 5	-19
30 ...	-14		-15	+22	+12	- 4	+ 6	+15	- 2	-12	-15	+16
31 ...	-16		+ 3		-33		- 8	-14		+14		+ 1
Sums without regard to signs.	394	427	384	337	445	336	268	400	201	366	282	277

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1900-1901.*

Unity = 1 second of arc.

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+47	+12	− 39	−18	+50	−13	− 4	+23	− 5	−25	+28	−26
2 ...	−14	−21	+ 11	+19	−26	+14	0	−17	− 2	+13	− 3	+ 7
3 ...	+ 5	+ 5	− 7	−18	0	− 9	+ 5	+17	− 3	−12	− 9	+10
4 ...	−17	+16	− 11	−12	−21	−24	−12	− 9	− 5	− 5	− 1	+ 5
5 ...	+26	+ 7	− 1	+19	+62	+ 8	+16	− 5	+ 7	+33	−14	− 3
6 ...	−10	+ 3	+ 17	−17	−12	+ 6	− 2	+ 5	−11	−23	+12	−17
7 ...	+ 7	−12	− 25	+19	− 3	− 7	−14	−27	+ 7	+ 9	−14	+10
8 ...	−11	−27	+ 44	− 7	−17	+ 8	0	+25	−12	+16	+ 5	− 3
9 ...	−27	+17	+ 7	− 2	−21	−20	−12	+ 7	− 2	− 6	+ 5	−12
10 ...	+14	+ 5	− 13	+ 4	+ 5	+36	+17	−13	+ 6	− 1	− 8	+10
11 ...	− 2	− 5	+ 6	+ 5	+12	−16	−10	0	0	− 9	+ 3	− 2
12 ...	+ 8	+14	+ 7	− 5	−27	− 7	−19	+20	+ 8	− 7	+11	+ 4
13 ...	+25	−18	+ 83	0	+12	+ 6	+ 8	−36	−17	− 3	− 6	− 2
14 ...	− 4	+13	− 82	− 5	+ 8	− 2	+ 6	+22	+17	+32	− 5	− 5
15 ...	+10	0	− 2	− 7	+ 9	− 5	−12	− 8	0	−20	−17	− 5
16 ...	−29	+ 6	− 21	+10	−24	+15	+10	+ 2	−12	− 5	+14	+ 1
17 ...	+ 4	− 6	− 7	+ 2	+12	− 3	+ 7	− 7	−14	+ 5	0	− 3
18 ...	−12	−14	+ 12	+ 7	−23	− 2	0	+10	0	+10	+ 7	−16
19 ...	+29	− 4	− 2	− 4	+18	−29	+ 7	+ 3	− 1	+ 9	− 2	+28
20 ...	−11	−17	− 13	−22	− 9	+26	0	+ 4	− 9	−12	− 9	−12
21 ...	+ 6	+17	− 6	+15	− 3	+13	− 7	− 9	+ 7	+ 7	+ 4	−14
22 ...	−26	−13	− 6	+ 9	+13	−19	+ 2	+ 2	+27	−18	− 5	+23
23 ...	0	− 2	+ 10	+10	− 3	+ 9	− 7	+ 3	−12	−13	+10	+ 1
24 ...	− 7	+ 8	− 2	−12	− 5	− 9	− 4	−22	− 1	−26	+ 7	− 5
25 ...	0	− 5	− 2	−12	− 5	− 5	+ 2	+ 7	+27	+43	− 2	− 2
26 ...	+ 3	+14	+ 7	−12	+ 1	+23	− 2	− 3	− 3	−14	− 5	−12
27 ...	+ 9	+19	+ 9	+36	+ 7	−18	+ 2	+ 3	−19	+17	−10	+21
28 ...	− 7	−22	− 17	−24	− 1	+11	−10	+10	+10	− 2	+ 3	+ 5
29 ...	+22		+ 1	−10	− 9	− 4	+ 1	− 3	+ 5	+ 4	+12	+ 2
30 ...	−12		+ 18	0	+17	+18	− 7	−23	− 1	− 2	− 5	− 7
31 ...	+ 9		− 15		− 8		+ 2	+11		−15		+ 9
Sums without regard to signs.	413	322	503	342	443	385	207	356	250	416	236	282

1901. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−46	− 5	− 54	+12	+31	+16	+27	+10	−53	+18	+24	−20
2 ...	+22	+ 8	− 6	− 1	− 8	+ 1	−10	−17	+23	− 2	−21	+29
3 ...	− 2	0	+ 18	−11	− 7	+12	−11	−17	+ 3	− 3	+ 8	+ 9
4 ...	−29	− 5	+ 1	− 4	+ 1	−25	+ 9	+ 6	−33	− 8	+14	−11
5 ...	+23	− 4	− 11	+ 4	+10	−10	− 5	+15	+24	+21	−20	+ 2
6 ...	− 2	−16	+ 5	+ 5	− 2	0	− 2	− 3	+ 2	− 2	− 6	−15
7 ...	− 1	+ 4	+ 2	− 3	+ 3	+35	+ 6	− 1	+ 3	−27	+ 1	−10
8 ...	−22	+17	− 12	+ 9	−29	−12	+ 3	+ 3	+ 1	+ 8	− 3	− 2
9 ...	+ 7	− 4	+ 14	+ 2	− 6	−14	−20	+16	−11	+17	− 8	+ 4
10 ...	+18	−15	+ 6	−13	− 1	+16	+12	−10	+20	0	+12	+ 4
11 ...	0	−13	− 3	−16	+26	− 1	− 1	0	+25	− 8	− 3	− 6
12 ...	+ 8	+16	− 3	+14	− 4	+ 2	+10	−22	−12	− 5	− 9	+11
13 ...	−25	0	+ 8	+ 4	− 6	−21	−28	+18	+25	− 2	− 7	+ 2
14 ...	+13	−12	− 9	+ 6	+ 4	+14	0	− 8	−19	+ 5	+14	− 5
15 ...	−13	− 6	− 6	+ 3	0	+21	+22	+20	− 4	−11	0	− 8
16 ...	+10	+ 8	+ 6	−28	+ 4	−10	− 8	− 2	−15	+ 2	+14	+20
17 ...	− 6	+ 3	+ 18	+18	− 1	−12	+ 6	−16	+12	+21	− 1	−10
18 ...	− 6	−11	+ 6	+ 7	− 1	− 8	+ 7	+ 9	+20	− 4	− 9	− 4
19 ...	−15	+ 6	− 1	−11	+13	+ 8	−17	− 4	− 5	+ 4	+ 2	− 4
20 ...	+25	+29	− 6	− 7	−19	−22	− 2	− 2	+ 4	− 9	+ 2	+ 7
21 ...	− 3	−16	+ 2	+ 1	−12	+10	+ 4	+ 4	− 9	+18	− 2	−10
22 ...	+ 5	+ 1	− 1	+11	+ 6	+ 7	− 1	− 7	+ 3	−12	+26	+ 5
23 ...	+10	−12	− 15	+ 8	+ 3	+18	−26	+20	− 8	+ 1	−11	− 7
24 ...	0	+ 2	+ 60	− 5	+ 8	−18	+16	−18	+ 7	− 5	− 2	+13
25 ...	+ 1	− 3	− 44	− 4	−20	+ 3	−11	− 1	− 4	+23	− 3	0
26 ...	− 5	+12	+ 8	+ 6	− 2	0	+19	+ 8	−11	+ 3	−14	+ 6
27 ...	−15	+ 6	− 12	− 7	+22	−28	+ 3	− 2	− 4	−24	− 4	−23
28 ...	+ 9	− 8	0	− 7	−12	+16	−13	− 8	+ 1	+13	+ 2	+36
29 ...	− 6		− 7	− 6	+ 1	−12	+ 6	− 8	−18	− 1	+ 2	−38
30 ...	+ 9		− 5	− 7	+ 1	+ 9	− 1	+18	− 7	+ 5	− 2	+23
31 ...	+12		+ 11		−11		− 1	− 3		−17		+ 9
Sums without regard to signs.	368	242	360	240	274	381	307	296	386	299	246	353

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1902-1903.*

Unity = 1 second of arc.

1902. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	− 9	+21	− 10	−18	−11	+14	+34	+ 5	+13	− 7	−66	− 4
2	− 8	− 4	+ 11	+ 1	+ 8	−18	−24	− 4	+ 4	−17	− 3	− 6
3	− 5	+ 8	− 12	− 1	+ 3	+ 3	+ 7	−19	−19	+27	−20	− 7
4	+ 4	+12	− 6	0	− 3	− 6	+ 2	+22	+10	−16	−15	+11
5	+ 4	− 9	+ 3	−11	−15	−10	+14	−15	− 8	− 1	+18	+25
6	+ 8	−16	+ 22	+12	+ 4	− 7	+ 2	+ 4	+ 4	+ 1	+ 3	−21
7	−11	+22	− 4	−10	+ 5	+ 8	−22	−21	− 3	− 5	+15	− 9
8	+10	− 3	− 6	−15	− 3	+ 3	−11	+ 6	− 7	+ 7	− 4	+10
9	− 5	− 3	− 15	+13	+38	0	+10	− 6	+ 2	+ 8	−35	− 1
10	− 2	−12	+ 13	+14	−40	−25	+12	+19	+25	−13	+11	+ 2
11	− 2	+ 7	− 23	+17	+ 9	− 2	−11	− 3	−13	−28	+ 6	−17
12	− 9	− 4	+ 17	−10	−11	+ 7	+16	− 1	+ 1	0	− 8	− 5
13	+ 9	+ 4	− 6	− 2	+ 2	+17	−10	−13	0	−15	+ 2	+11
14	− 6	− 4	+ 5	−15	0	+14	− 8	+11	−22	+ 2	0	− 8
15	−13	− 6	− 1	− 1	− 8	−20	+18	− 1	+31	− 2	+ 1	− 4
16	+ 3	+24	+ 7	+ 8	+12	+ 8	−10	−32	−22	− 5	+ 6	+30
17	−17	− 2	− 1	0	−21	− 8	+12	+15	−23	−17	+ 8	− 7
18	+ 3	−14	− 11	− 4	0	+ 4	− 8	+ 9	+25	+ 3	− 3	+ 6
19	− 3	− 4	+ 4	+21	+ 5	+11	+ 3	−27	− 2	+11	+13	+ 3
20	+15	− 1	− 12	+ 8	+ 2	− 5	−24	+17	+ 6	− 8	− 3	− 6
21	−34	+ 3	+ 8	−11	− 6	+ 9	+13	− 2	− 3	+ 4	− 7	− 8
22	+22	+ 2	+ 11	− 4	+21	− 7	+12	+26	+ 6	+ 9	−34	−12
23	−29	+12	− 3	− 8	−27	−10	−15	+ 3	+ 5	+14	+30	+35
24	+24	− 5	+ 13	+ 4	+ 3	− 1	+ 8	− 9	−11	+13	+14	− 9
25	+ 2	− 8	− 11	+ 2	− 1	+24	+16	− 3	+15	+ 7	− 9	−12
26	+ 7	+12	+ 10	+11	+25	−24	− 3	+ 4	−12	−13	−14	−12
27	− 3	−17	− 11	−15	−41	+ 3	+ 2	− 3	− 1	− 9	+ 9	+ 2
28	+ 8	+ 3	− 4	− 6	+ 9	+ 4	−10	+15	+ 2	−10	−20	+ 3
29	−14		+ 9	− 3	+21	− 7	−15	−19	−24	+16	− 5	− 4
30	+ 4		+ 4	+ 3	+ 1	−24	+16	− 2	+ 9	− 4	+ 9	− 3
31	−14		− 4		−12		− 7	+ 5		+49		+ 5
Sums without regard to signs.	307	242	277	248	367	303	375	341	328	341	391	298

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1	+65	−29	+ 6	−59	+ 6	+ 7	+34	+ 6	−14	− 15	−191	+22
2	− 2	+15	+ 9	+ 8	−12	+33	0	− 5	− 4	+ 5	− 12	+ 9
3	+ 4	+12	− 12	+30	+ 8	−14	− 5	+ 7	−11	− 3	+ 4	− 5
4	− 6	−14	− 2	−19	+ 1	− 1	−18	0	− 8	− 3	− 15	− 8
5	+10	−15	+ 4	− 8	+ 4	− 3	− 1	+ 9	− 7	− 2	− 6	− 8
6	+ 9	−16	+ 6	+43	−23	+ 4	+11	−11	+13	+ 16	− 9	− 3
7	+15	+ 9	+ 3	+14	+ 1	− 3	−20	− 2	−11	− 4	0	− 1
8	−13	+28	− 11	−17	− 3	−13	− 2	+26	+ 8	− 7	− 8	+ 3
9	−15	− 2	− 4	0	+13	− 3	+18	−17	−12	+ 6	− 4	+ 2
10	+ 6	+ 1	+ 11	− 1	0	+14	−10	− 8	+ 9	− 16	+ 16	− 3
11	+12	−21	+ 1	−18	− 5	− 3	−12	−12	+11	+ 4	− 8	− 7
12	−18	+ 5	− 21	+11	− 4	− 7	+ 7	+ 8	+22	+ 31	− 10	+ 3
13	− 6	− 6	+ 11	+ 2	+ 2	−34	+10	+ 3	−27	+ 26	− 3	+60
14	+ 6	+ 6	− 6	−14	− 3	+10	+ 8	− 4	+ 9	− 5	+ 9	−24
15	−19	+ 2	+ 29	+22	+12	+26	− 8	−23	+ 1	− 14	− 5	−15
16	+15	− 3	− 6	−21	−32	− 6	−16	+ 8	−13	− 9	− 1	−18
17	−16	− 7	+ 5	+10	+ 3	0	+ 7	+ 4	− 1	0	+ 1	− 8
18	+12	−19	− 37	+ 5	+ 3	−17	+ 5	− 2	+ 4	+ 6	− 11	− 5
19	− 7	+14	+ 1	− 2	+13	+12	− 9	+ 2	+19	− 1	+ 27	−14
20	+12	+ 1	+ 6	+ 2	− 8	+ 9	+ 5	−20	−18	− 17	− 5	+31
21	− 6	− 1	+ 1	−11	− 2	+17	+13	−18	+16	+ 6	− 14	− 1
22	+ 7	+13	+ 14	−15	− 2	+ 2	+ 8	+24	− 8	− 3	+ 18	− 7
23	− 4	− 6	− 14	+ 3	+ 4	−27	− 6	− 6	−13	+ 18	− 4	−13
24	+ 9	− 1	+ 21	−10	+ 6	− 2	−13	−10	+14	0	− 11	− 2
25	− 3	+ 4	− 4	+ 7	+13	+15	−21	+ 1	− 3	− 29	− 14	− 8
26	− 7	+12	− 6	+ 5	−14	−12	+17	+23	+11	+ 41	0	− 4
27	− 6	+ 2	− 8	− 6	− 3	−12	+ 3	−28	−21	− 18	− 17	− 5
28	0	0	0	− 3	+ 1	+ 9	+ 5	+ 1	+ 3	− 1	− 2	+ 4
29	− 5		+ 16	+10	+16	+19	− 8	+ 5	+17	+ 9	+ 12	−10
30	+ 5		− 23	−18	−26	+ 8	− 8	− 6	− 9	− 41	+ 1	+48
31	0		− 1		+11		+ 8	+ 2		+250		− 7
Sums without regard to signs.	320	264	299	394	254	342	316	301	337	606	438	358

TABLE 528A.—*Showing the difference of the daily mean of Declination for each day from that of the preceding day for the years 1904-1905.*

Unity = 1 second of arc.

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+11	+32	+ 4	+41	- 28	+14	- 11	- 13	- 31	- 34	- 38	+40
2 ...	- 11	+ 5	- 1	- 16	- 4	+22	+42	- 8	- 4	+22	0	- 7
3 ...	+13	- 23	+ 15	- 2	+ 4	- 14	+ 2	+30	+15	- 9	- 7	+16
4 ...	0	- 18	+ 12	- 17	- 9	- 28	0	- 7	- 18	- 23	+32	- 7
5 ...	+15	+14	- 10	+12	- 12	- 1	+14	- 4	- 1	+ 4	- 16	+ 5
6 ...	- 23	+11	+ 3	- 1	- 26	+ 7	- 3	- 39	+ 4	- 5	- 7	- 9
7 ...	- 15	0	- 3	+23	+21	- 12	+23	+41	+ 1	+30	- 14	- 6
8 ...	- 12	+ 7	- 2	- 22	+10	- 3	- 6	+19	- 9	- 2	+ 1	- 13
9 ...	+12	+ 7	- 9	- 10	+ 2	- 21	- 5	+ 9	+ 8	+ 5	0	- 1
10 ...	+16	- 8	- 19	+ 8	- 2	- 3	- 1	- 30	- 6	- 14	+10	+ 1
11 ...	+26	+ 4	- 16	+ 9	+28	+11	+ 8	- 4	+13	- 12	- 5	+16
12 ...	- 29	+10	+ 37	- 27	+ 5	0	+19	- 4	+ 1	+ 4	+ 3	- 19
13 ...	+16	- 17	- 2	+ 6	+19	+ 7	- 30	- 5	- 17	+15	- 3	- 8
14 ...	- 14	+11	- 12	+ 5	- 8	- 15	- 3	+ 3	+ 9	+18	+ 1	+12
15 ...	- 15	- 39	+ 21	+ 6	- 16	- 6	- 18	+12	- 17	- 23	- 9	0
16 ...	+36	- 1	- 7	- 9	- 19	+13	- 2	+13	+35	- 3	+30	- 6
17 ...	- 14	+14	- 8	- 10	+ 3	+ 8	+35	- 5	- 6	+12	- 11	- 5
18 ...	- 17	+ 2	+ 10	+12	+12	+ 8	- 30	- 12	+ 8	- 15	- 1	+ 9
19 ...	- 14	- 20	- 8	- 9	+ 1	- 13	- 20	+19	- 2	- 14	- 20	0
20 ...	+15	+ 7	+ 13	+57	- 21	+ 1	- 21	- 8	- 16	- 8	- 9	+12
21 ...	- 2	0	- 1	- 56	+18	+ 5	+19	- 42	+15	+45	- 19	+ 8
22 ...	+12	- 7	- 8	- 12	- 14	- 18	- 4	+35	+11	- 3	+14	- 22
23 ...	+ 3	+10	- 19	+ 5	- 1	0	- 5	0	+ 1	0	+ 6	+13
24 ...	- 9	+ 6	+ 9	- 14	+28	+ 7	+ 4	- 12	- 16	- 19	- 18	- 6
25 ...	- 8	- 16	- 11	- 2	- 18	- 1	+12	+ 5	+35	+33	+17	- 20
26 ...	+15	+ 1	+ 23	+34	+11	- 30	- 14	+ 5	- 27	- 14	+20	+19
27 ...	- 13	+10	- 5	- 15	- 27	+ 9	+13	- 2	+ 7	0	- 13	+ 9
28 ...	+ 5	+ 6	- 5	+10	+20	+26	+ 3	- 38	+ 8	+14	+ 2	- 19
29 ...	+30	+10	+ 2	- 14	- 36	- 14	+ 3	+ 5	- 15	- 23	- 20	+ 6
30 ...	- 35		- 24	+13	+29	- 16	- 6	+35	+11	- 7	+20	0
31 ...	- 28		- 4		- 2		- 4	- 4		+30		- 10
Sums without regard to signs.	484	316	323	477	454	333	380	468	367	460	366	324

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	- 12	0	+ 13	+65	- 2	+42	- 20	+10	- 24	- 30	- 30	+17
2 ...	- 6	- 13	+ 25	+ 2	- 10	0	+ 3	+34	- 3	- 5	+10	+12
3 ...	- 6	+56	- 2	- 31	- 15	- 12	+ 5	- 18	- 3	- 5	- 1	- 12
4 ...	+13	+ 1	- 16	+21	- 8	+ 7	- 20	- 8	+ 5	+ 6	+32	+20
5 ...	+ 6	+ 1	- 7	+ 2	+ 8	+26	+25	- 11	- 9	- 3	- 6	- 15
6 ...	+12	- 53	- 23	- 10	- 17	- 18	- 38	- 4	- 8	- 6	- 17	- 5
7 ...	- 12	+10	+ 28	+ 2	- 6	- 5	+40	+24	+13	+ 6	- 9	- 9
8 ...	- 9	- 32	- 4	- 2	+11	- 2	- 31	+13	+15	0	+ 1	+ 7
9 ...	- 28	+37	+ 2	+ 5	+ 9	- 4	+34	- 13	- 10	+ 7	+ 1	- 11
10 ...	+24	- 38	- 10	+17	+ 7	+12	- 16	- 17	+26	- 6	+ 9	- 15
11 ...	+10	+48	- 6	- 13	+ 2	- 7	- 17	+14	- 23	- 9	- 8	- 6
12 ...	+ 7	- 12	+ 21	- 12	- 21	- 23	+ 3	- 30	+ 9	- 14	+71	- 2
13 ...	+ 3	+12	+ 5	- 23	+ 6	+ 2	+15	+17	- 7	+21	- 43	+53
14 ...	+15	- 16	+ 5	+19	+34	+ 3	- 3	+14	- 26	- 2	- 7	- 24
15 ...	- 18	+16	- 5	+ 2	+ 4	+ 9	0	- 16	+ 5	- 13	+ 7	- 21
16 ...	+ 7	- 4	- 2	- 16	- 11	- 9	- 18	- 2	- 3	- 4	+24	+ 9
17 ...	- 7	- 21	- 11	+12	- 16	- 3	+12	- 18	+14	0	- 29	+23
18 ...	+ 9	+ 9	+ 2	0	+ 6	- 1	+ 1	+ 4	+ 4	- 8	- 1	- 2
19 ...	- 17	- 2	- 10	- 4	+21	- 13	- 11	+ 6	+15	+12	+ 9	+ 5
20 ...	+ 3	+ 1	- 6	- 4	+ 2	0	- 20	+ 4	- 17	+ 1	- 16	+ 1
21 ...	+ 3	- 13	+ 19	+40	- 12	- 4	- 14	- 12	+19	+18	- 3	- 6
22 ...	+26	- 4	- 8	- 36	- 19	+23	+48	- 4	- 18	- 4	- 18	- 19
23 ...	- 47	+52	- 7	+ 2	- 17	- 4	- 26	- 15	- 18	- 5	+35	+ 6
24 ...	+ 9	- 31	- 10	+ 6	+23	- 3	+17	+27	+26	- 6	- 17	- 2
25 ...	+10	+ 7	+ 18	+21	0	- 6	- 11	+30	+ 2	+12	- 21	- 5
26 ...	+13	+ 7	- 2	- 2	+10	- 8	+31	- 18	+12	+ 4	- 13	- 6
27 ...	- 21	+ 6	+ 36	- 6	- 2	- 13	- 25	+ 3	0	- 21	+25	+22
28 ...	+16	- 32	- 37	- 3	- 33	+ 5	+13	- 16	0	+24	- 2	- 8
29 ...	- 9		- 37	- 22	+ 8	+ 2	- 19	+24	+ 9	- 4	+ 3	+27
30 ...	+ 1		+ 15	+13	- 3	+ 4	+46	+11	+ 7	- 9	- 5	- 19
31 ...	- 15		- 5		+26		- 22	- 4		- 8		- 23
Sums without regard to signs.	394	534	397	413	369	270	604	441	350	273	473	412

CHAPTER XIV.

Relation of Terrestrial Magnetism to Solar Spots and Meteorological Phenomenon.

1.—Relation to Solar Spots.

549. The question for which the Colaba data next require a detailed examination, refers to the relation which is supposed to exist between terrestrial magnetism and solar disturbances. The progression in the activity of the sun is made manifest to us visibly in several different ways, *viz.*, by spots, faculæ, prominences, the condition generally of the chromosphere, and glimpses of the corona revealed to us just for a while during the total eclipses. To this may be added the Zeeman effect in the peculiar vortex movements about the regions of the spots indicating the existence of a magnetic field in the neighbourhood of spots first observed by Hale during heavy disturbances. As the data of the various kinds of solar phenomena which are thus available, are neither perfect nor complete the spot numbers published by Wolf and Wolfer * have been used to which the discussion is in the main restricted.

In the intercomparison of the phenomena, the use of the magnetic data as a correct indicator of the progression of the magnetic activity in its hourly, daily, monthly and secular march, is admittedly proper. The sun-spot data on the other hand can scarcely claim to represent with equal precision, the growth and decline of the energy in the sun, as neither the area nor the number of the spots which are both superficial factors and useful in a way, can be regarded as fully effective in measuring wholly the activity in the sun. The data obviously lack that completeness which is so essential in all material intended for critical comparison, and this should not be lost sight of when the phenomenon comes to be examined and analysed in comparison with that presented by the fuller and much more exact magnetic data. And if the theory of the cathode radiations lately advanced to explain the relation of magnetic storms with the peculiar emanations in well defined streams, ejected from some active regions of the spots as they traverse the central meridian of the sun, is in the right direction of solution of this very complex phenomenon, the discussion in regard to the number and area merely of the spot in its formation or decay can scarcely be of much utility in establishing the parallelism we seek between the two phenomena.

550. The data examined here, some of which have been specially derived for this chapter, are detailed below. (1) The departures of the monthly means of the absolute value of H from the corresponding mean values of the theoretical curve referred to in Chapter I, paragraph 295, for the period 1872 to 1905, are collected in table 529, and the overlapping means of twelve such consecutive monthly differences treated in the usual way for the elimination of the annual variation are given in table 530. These data are charted in plate 100 respectively as thin and thick curve in figure 2. Figure 1 in the same plate denotes the curve of absolute force derived from the Grubb's variation magnetometer as shown in Chapter III, Part I, of the volume, less the theoretical curve referred to above. These are given in tables

* Astronomische Mitteilungen : Viertelgahrsschrift der Naturforschenden Gesellschaft in Zurich Jahrgang, XLVII, 1902.

TABLE 529.—*Showing the departures of the mean monthly and annual absolute values of Horizontal Force shown in table 240 from the theoretical curve.**

Unity = 0·1γ = ·000001 C. G. S.

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1872 ...	−440	−646	−320	+ 17	−118	+ 12	−128	−340	−222	−325	−316	−266	−258
1873 ...	− 553	−374	−332	− 88	+ 28	−146	− 2	− 13	−255	− 79	−205	− 75	−174
1874 ...	+ 2	−231	−291	−104	− 80	− 39	− 1	+132	+ 35	+165	− 28	+ 63	− 31
1875 ...	+ 2	−157	+ 50	+226	+211	+233	+263	+122	+ 37	+329	+323	+119	+146
1876 ...	+ 17	+ 36	+ 87	+234	+351	+324	+259	+304	+316	+276	+234	+138	+215
1877 ...	+199	+239	+247	+250	+123	+ 54	+147	+160	+117	+184	+244	+167	+178
1878 ...	+208	+159	+276	+181	+ 34	+121	+351	+361	+267	+231	+256	+247	+224
1879 ...	+215	+304	+283	+370	+248	+324	+370	+308	+102	+185	+ 72	+ 49	+236
1880 ...	+221	+281	+ 86	+357	+150	+107	+136	−256	−121	−184	−174	− 67	+ 45
1881 ...	− 42	− 85	−105	−205	− 40	− 48	+ 8	− 36	−188	−124	−230	−248	−112
1882 ...	− 286	−298	−177	−509	−488	−331	−304	−377	−246	−386	−695	−543	−387
1883 ...	−318	−338	−371	−200	− 95	− 71	−188	− 18	− 10	+ 24	+ 99	+ 76	−117
1884 ...	+153	+ 24	+ 53	+266	+358	+352	+250	+296	+183	+101	+105	+181	+193
1885 ...	+123	+ 19	+ 85	+ 99	+ 82	+105	+130	+ 18	+ 73	+115	+120	+ 77	+ 87
1886 ...	− 66	+ 67	+141	+ 78	+ 14	+127	+ 10	+ 36	− 47	−118	−242	−294	− 24
1887 ...	− 66	+ 91	− 72	−127	− 5	− 64	− 53	− 73	− 43	− 9	+ 48	− 36	− 34
1888 ...	−100	+ 62	+ 58	+ 63	+ 22	+ 75	+ 67	− 19	+ 43	+ 57	−105	+ 27	+ 21
1889 ...	+ 17	+ 22	− 29	+ 36	+ 42	+ 6	+116	+ 98	+ 69	+108	+ 41	+ 37	+ 47
1890 ...	+ 63	+ 33	+ 87	+ 70	+ 71	+117	+154	+172	− 22	− 44	+ 9	+ 45	+ 63
1891 ...	+123	+ 3	−108	−155	−167	− 55	− 45	− 61	−163	−155	− 79	− 8	− 72
1892 ...	− 296	−383	−444	−209	−419	−405	−491	−386	−170	−174	+ 2	+ 24	−279
1893 ...	−147	− 86	−127	− 94	+ 15	− 93	−183	−287	−161	−160	−252	−197	−148
1894 ...	−310	−454	−368	−221	− 43	−184	−388	−355	−416	−103	−205	−129	−265
1895 ...	−241	−279	−182	−139	+ 62	− 81	−138	− 65	− 89	+ 37	+ 13	+175	− 77
1896 ...	+115	− 90	+ 49	+ 80	+ 21	+222	+ 85	+ 92	+ 23	+143	+199	+220	+ 97
1897 ...	+135	+143	+164	− 4	+120	+221	+314	+138	+211	+140	+147	+ 48	+148
1898 ...	+ 94	+160	+ 24	− 34	+ 38	+ 83	+ 43	+ 70	−195	− 12	+ 37	+267	+ 48
1899 ...	+210	+ 9	− 5	+ 99	+156	+164	+ 75	+115	+ 55	+ 88	+193	+236	+116
1900 ...	+132	+ 78	+117	+208	− 61	+185	+152	+173	+273	+221	+306	+171	+163
1901 ...	+223	+131	+153	+223	+211	+278	+197	+212	+156	+ 93	+219	+ 88	+182
1902 ...	+ 86	+169	+169	+112	+ 94	+178	+159	+113	+ 2	+ 69	+131	+ 99	+115
1903 ...	+127	+155	+ 84	− 30	− 4	+157	+148	− 16	− 64	− 93	−169	−218	+ 6
1904 ...	+ 36	− 44	− 81	−274	−171	−157	−143	−112	−126	−275	−208	− 76	−136
1905 ...	−195	−222	−150	−257	−134	−104	−100	−154	−167	−169	−222	− 12	−157

* The monthly values of the theoretical curve are obtained from the annual values given in column 5, table 239, by the process of simple interpolation.

TABLE 530.—*Showing the smoothed values of the departures in table 529 obtained by taking overlapping means of twelve consecutive monthly values and reducing them finally to the mean of the month.*

Unity = 0·1γ = ·000001 C. G. S.

Years.	Months.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1872 ...	...	...	...	...	...	...	−262	−255	−244	−249	−248	−248
1873 ...	−250	−231	−218	−210	−195	−182	−151	−122	−114	−113	−118	−118
1874 ...	−114	−108	− 90	− 68	− 50	− 37	− 31	− 28	− 11	+ 17	+ 43	+ 66
1875 ...	+ 89	+ 99	+ 99	+106	+127	+144	+147	+156	+165	+167	+173	+183
1876 ...	+186	+194	+213	+222	+216	+214	+222	+238	+253	+260	+251	+231
1877 ...	+215	+205	+190	+178	+174	+176	+178	+175	+173	+171	+164	+163
1878 ...	+174	+191	+206	+215	+217	221	+224	+231	+237	+245	+262	+279
1879 ...	+289	+287	+278	+269	+260	+244	+236	+235	+226	+217	+213	+200
1880 ...	+181	+147	+115	+ 90	+ 64	+ 49	+ 34	+ 7	− 16	− 47	− 78	− 92
1881 ...	−104	−101	− 94	− 94	− 94	−104	−122	−141	−153	−168	−200	−230
1882 ...	−255	−282	−299	−312	−342	−374	−388	−391	−401	−396	−366	−339
1883 ...	−324	−304	−279	−252	−202	−143	− 97	− 63	− 30	+ 6	+ 45	+ 81
1884 ...	+117	+149	+170	+181	+184	+189	+192	+191	+192	+186	+167	+146
1885 ...	+131	+114	+ 98	+ 94	+ 95	+ 91	+ 79	+ 73	+ 77	+ 79	+ 75	+ 73
1886 ...	+ 69	+ 65	+ 61	+ 46	+ 21	− 9	− 24	− 23	− 31	− 48	− 58	− 67
1887 ...	− 77	− 84	− 89	− 84	− 68	− 45	− 35	− 38	− 33	− 20	− 11	− 4
1888 ...	+ 6	+ 13	+ 19	+ 25	+ 22	+ 18	+ 26	+ 29	+ 23	+ 19	+ 18	+ 16
1889 ...	+ 16	+ 22	+ 28	+ 32	+ 40	+ 46	+ 49	+ 51	+ 56	+ 62	+ 65	+ 71
1890 ...	+ 77	+ 82	+ 81	+ 71	+ 63	+ 62	+ 65	+ 66	+ 57	+ 39	+ 20	+ 3
1891 ...	− 12	− 30	− 45	− 56	− 64	− 70	− 89	−123	−154	−170	−182	−207
1892 ...	−240	−272	−286	−288	−285	−280	−273	−254	−229	−211	−188	−157
1893 ...	−131	−114	−109	−108	−118	−138	−154	−176	−202	−217	−225	−231
1894 ...	−243	−255	−268	−276	−272	−267	−262	−251	−236	−225	−217	−209
1895 ...	−194	−172	−146	−126	−112	− 90	− 62	− 40	− 22	− 3	+ 4	+ 14
1896 ...	+ 36	+ 52	+ 63	+ 72	+ 85	+ 95	+ 97	+108	+122	+123	+124	+128
1897 ...	+137	+149	+159	+167	+164	+155	+146	+145	+140	+133	+128	+119
1898 ...	+102	+ 88	+ 68	+ 45	+ 34	+ 39	+ 53	+ 51	+ 44	+ 48	+ 58	+ 66
1899 ...	+ 71	+ 75	+ 87	+101	+112	+117	+113	+112	+120	+130	+126	+117
1900 ...	+121	+127	+139	+153	+163	+165	+166	+172	+176	+178	+190	+206
1901 ...	+211	+215	+212	+201	+192	+185	+176	+172	+174	+170	+161	+152
1902 ...	+146	+140	+129	+122	+117	+114	+116	+117	+113	+104	+ 94	+ 89
1903 ...	+ 88	+ 82	+ 74	+ 64	+ 45	+ 19	+ 2	− 9	− 24	− 41	− 59	− 79
1904 ...	− 104	− 120	− 126	− 136	− 146	− 142	− 145	− 162	− 173	− 175	− 172	− 169

TABLE 531.—*Showing the departures from the theoretical curve* of the mean monthly and annual values of Horizontal Force shown in table 108 derived from the Grubb's H. F. Magnetometer.*

Unity = 1γ = ·00001 C. G. S.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
1875 ...	-16	-20	-29	-12	- 6	+ 4	- 1	+ 5	- 6	+ 3	+ 6	+ 6	- 5
1876 ...	+10	+ 5	+ 8	+17	+21	+26	+24	+23	+20	+20	+19	+16	+17
1877 ...	+15	+18	+18	+20	+15	+20	+28	+32	+31	+28	+21	+20	+22
1878 ...	+21	+18	+27	+28	+26	+24	+35	+30	24	+22	+17	+17	+24
1879 ...	+27	+32	+23	+25	+17	+15	+19	+19	+12	+19	+18	+16	+20
1880 ...	+12	+21	+12	+20	+15	+20	+17	- 6	+ 6	+ 8	- 3	- 9	+ 9
1881 ...	+ 1	-15	+ 1	+ 4	+ 8	+ 8	+ 7	+12	- 6	+ 2	- 7	- 5	+ 1
1882 ...	- 5	-13	- 3	-30	-23	-24	-15	-26	- 9	-30	-53	-45	-23
1883 ...	-28	-28	-25	-21	-12	-12	-19	-10	-27	-16	-18	- 5	-18
1884 ...	0	- 5	- 8	- 3	0	+ 7	+ 3	+12	+ 9	+ 3	+ 1	+ 8	+ 2
1885 ...	- 6	+ 8	+ 8	+12	- 3	+ 3	+19	+ 9	+ 4	+16	+20	+29	+10
1886 ...	+ 8	+20	+17	+ 7	+ 5	+10	+ 4	+ 5	+10	+ 1	- 2	- 2	+ 7
1887 ...	- 6	- 1	+ 1	0	+ 5	+ 8	+ 9	+ 5	- 1	+ 5	+ 6	+ 6	+ 3
1888 ...	-10	- 3	+ 2	+ 5	+ 7	+10	+13	+12	+ 9	+14	+10	+17	+ 7
1889 ...	+19	+18	+10	+17	+13	+14	+11	+11	+ 7	+11	+ 6	+ 8	+12
1890 ...	+11	+17	+16	+17	+15	+18	+17	+12	+ 9	+ 5	+ 4	+ 8	+12
1891 ...	+11	+ 9	+ 5	- 5	-15	+ 4	+ 5	0	-14	- 4	+ 4	+ 8	+ 1
1892 ...	- 7	-30	-32	-15	-24	-14	-29	-25	-17	-27	- 8	-23	-21
1893 ...	-16	-17	-12	- 6	+ 1	- 6	-11	-19	-17	-14	-16	- 9	-12
1894 ...	-14	-31	-22	-21	- 5	-15	-32	-32	-35	-16	-27	-15	-22
1895 ...	-15	-23	-14	-12	- 3	- 2	- 5	- 2	- 4	-14	-15	0	- 9
1896 ...	- 9	-16	-12	- 3	-11	+ 4	- 1	-13	-11	- 4	+ 1	0	- 6
1897 ...	- 7	- 1	- 1	-15	- 6	+13	+22	+15	+18	+21	+24	+15	+ 8
1898 ...	+20	+16	+ 3	+12	+15	+14	+14	+ 6	-19	+ 5	+11	+10	+ 9
1899 ...	+ 9	- 2	- 2	+ 3	+ 2	+ 7	- 1	+13	+ 9	+12	+11	+12	+ 6
1900 ...	+15	+17	+ 5	+13	+ 7	+27	+26	+22	+21	+26	+30	+30	+20
1901 ...	+24	+30	+25	+27	+32	+28	+23	+21	+18	+19	+24	+26	+25
1902 ...	+17	+18	+17	+13	+22	+23	+21	+22	+16	+19	+17	+14	+18
1903 ...	+14	+19	+17	+14	+12	+ 8	+ 3	- 2	- 4	- 9	-37	-27	+ 1
1904 ...	-25	-15	- 3	-12	-13	- 8	- 4	0	0	- 4	- 3	0	- 7
1905 ...	-15	-13	-11	- 8	- 4	0	- 2	- 9	-12	- 1	-20	- 5	- 8

* The monthly values of the theoretical curve are obtained from the annual values given in column 5, table 239, by the process of simple interpolation.

TABLE 532.—*Showing the smoothed values of the departures in table 531 obtained by taking overlapping means of twelve consecutive monthly values and reducing them finally to the proper epoch.*

Unity = 0·1γ = ·000001 C. G. S.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1875 ...	...	...	...	...	...	...	- 44	- 22	+ 3	+ 30	+ 53	+ 74
1876 ...	+ 93	+111	+130	+148	+160	+170	+176	+183	+193	+198	+197	+192
1877 ...	+191	+197	+205	+213	+217	+220	+224	+227	+230	+237	+245	+251
1878 ...	+256	+258	+254	+249	+245	+242	+243	+251	+255	+253	+248	+240
1879 ...	+230	+218	+209	+203	+202	+202	+195	+184	+175	+169	+166	+167
1880 ...	+168	+157	+144	+157	+123	+104	+ 89	+ 70	+ 50	+ 39	+ 29	+ 22
1881 ...	+ 12	+ 15	+ 18	+ 10	+ 6	+ 6	+ 5	+ 4	+ 3	- 12	- 39	- 65
1882 ...	- 88	-113	-130	-145	-177	-213	-239	-255	-271	-276	-267	-258
1883 ...	-255	-250	-250	-252	-232	-200	-172	-151	-134	-119	-107	- 94
1884 ...	- 77	- 59	- 35	- 12	+ 4	+ 17	+ 19	+ 22	+ 35	+ 48	+ 53	+ 50
1885 ...	+ 55	+ 60	+ 57	+ 60	+ 74	+ 90	+105	+116	+124	+126	+127	+134
1886 ...	+130	+122	+123	+119	+104	+ 82	+ 63	+ 48	+ 33	+ 24	+ 21	+ 20
1887 ...	+ 21	- 23	+ 18	+ 15	+ 20	+ 27	+ 29	+ 26	+ 26	+ 29	+ 31	+ 33
1888 ...	+ 35	+ 40	+ 47	+155	+ 60	+ 67	+ 84	+104	+116	+125	+132	+136
1889 ...	+137	+136	+135	+133	+130	+124	+117	+113	+115	+118	+119	+121
1890 ...	+128	+128	+130	+ 28	+125	+124	+124	+120	+112	+ 99	+ 77	+ 59
1891 ...	+ 48	+ 38	+ 23	+110	+ 7	+ 7	0	- 24	- 56	- 76	- 83	- 94
1892 ...	-116	-141	-153	-163	-178	-196	-213	-211	-197	-185	-171	-157
1893 ...	-146	-136	-134	-228	-126	-124	-117	-122	-132	-143	-151	-158
1894 ...	-170	-184	-197	-106	-211	-218	-221	-218	-211	-204	-200	-193
1895 ...	-177	-153	-128	- 14	-108	- 97	- 88	- 83	- 79	- 74	- 74	- 74
1896 ...	- 70	- 73	- 81	- 80	- 69	- 62	- 61	- 54	- 43	- 44	- 47	- 41
1897 ...	- 27	- 6	+ 17	+ 39	+ 59	+ 75	+ 93	+111	+120	+133	+153	+162
1898 ...	+159	+152	+132	+110	+ 98	+ 91	+ 84	+ 72	+ 63	+ 57	+ 47	+ 39
1899 ...	+ 30	+ 27	+ 41	+ 56	+ 59	+ 60	+ 63	+ 74	+ 84	+ 91	+ 98	+108
1900 ...	+128	+143	+152	+162	+176	+191	+203	+212	+225	+240	+256	+267
1901 ...	+266	+264	+263	+259	+253	+249	+244	+237	+228	+219	+209	+203
1902 ...	+200	+199	+199	+198	+195	+187	+181	+180	+181	+181	+177	+167
1903 ...	+153	+136	+117	+ 97	+ 63	+ 24	- 9	- 40	- 62	- 81	-102	-120
1904 ...	-129	-131	-129	-125	-109	- 83	- 68	- 80	- 99	-100	- 95	- 88

TABLE 533.—*Showing the sums without regard to sign, of the departures of the daily means of H given in table 520 for each month and the average year from 1890 to 1905.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1890 ...	168	152	176	123	147	162	176	249	244	270	195	173	186
1891 ...	231	239	254	326	465	179	308	300	420	283	303	299	301
1892 ...	400	658	576	532	654	564	538	428	277	416	335	385	480
1893 ...	231	428	406	295	313	427	335	563	341	366	457	331	374
1894 ...	323	884	544	370	332	351	724	829	513	241	602	257	497
1895 ...	287	323	309	274	288	345	253	399	398	438	361	255	327
1896 ...	285	317	421	351	562	214	222	300	481	369	431	395	362
1897 ...	434	218	298	306	319	262	207	186	202	192	177	471	273
1898 ...	206	285	469	346	277	204	178	202	597	299	216	222	292
1899 ...	200	325	336	254	315	252	270	200	164	196	138	159	234
1900 ...	226	166	426	146	430	122	124	126	110	234	99	149	196
1901 ...	144	142	218	127	156	137	136	192	137	114	119	214	153
1902 ...	151	113	125	205	126	103	161	142	107	219	261	121	153
1903 ...	113	133	132	341	154	189	174	255	249	715	378	436	272
1904 ...	296	200	205	322	333	331	200	233	205	262	319	160	255
1905 ...	196	307	479	294	165	267	224	369	331	215	542	250	303
Means, 1894-1904.	242	282	317	277	299	228	241	279	288	298	282	258	274

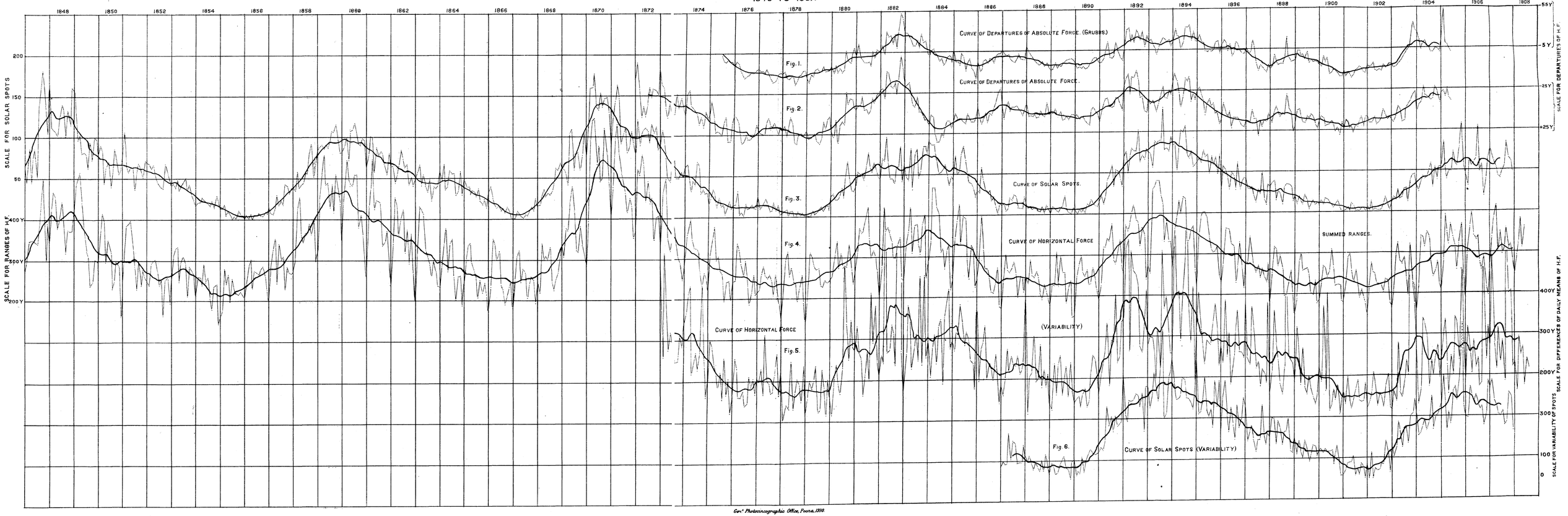
TABLE 534.—*Showing the smoothed values of the sums in table 533 obtained by taking overlapping means of twelve consecutive monthly mean values and reducing them finally to the proper epoch.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1890 ...	...	...	...	...	...	...	188	195	202	213	235	249	...
1891 ...	255	263	272	280	285	295	308	332	363	385	401	425	322
1892 ...	451	466	465	464	471	476	473	455	440	423	399	379	447
1893 ...	364	362	370	371	374	376	378	401	426	435	438	436	394
1894 ...	449	476	495	497	498	500	495	471	438	424	418	416	465
1895 ...	396	359	336	339	338	327	327	327	331	339	354	359	344
1896 ...	353	348	347	348	348	356	368	370	361	354	342	334	352
1897 ...	335	330	313	294	276	269	263	256	266	275	275	270	285
1898 ...	267	266	283	304	310	302	291	293	289	279	277	281	287
1899 ...	287	290	272	250	242	236	235	229	226	225	226	225	245
1900 ...	214	205	199	199	199	196	193	189	179	169	157	146	187
1901 ...	147	151	155	151	147	150	153	152	147	146	148	146	149
1902 ...	146	144	141	144	155	157	151	150	151	157	164	169	152
1903 ...	173	178	189	215	241	259	280	290	296	298	305	318	253
1904 ...	325	326	323	302	280	266	251	251	267	278	270	260	283
1905 ...	258	265	276	279	286	299	...	...	...	...	...	...	...

SOLAR SPOT AND MAGNETIC DATA
1846 TO 1907.

PLATE 100.



Govt. Photozincographic Office, Poona, 1910.

531 and 532. (2) The departures of the daily means from the mean of the month for the period 1890—1905, have already appeared in table 520. The monthly totals of these departures summed up without regard to signs are collected in table 533, while their smoothed means* are shown in table 534. These latter results are charted in plate 101 in figure 6. While data in (1) may be regarded as representing the smoothed periodic progression of the absolute phenomenon as given by the departures of the observed from the theoretical curve, the data in (2) allow the incidence of the aperiodic portion of the effects on the absolute values to be indicated more emphatically. (3) As the period covered by the data in (2) extends over only 16 years from 1890 to 1905, and as for the purposes of comparison with similar solar data, an equivalent but longer series may be of advantage, the differences of the daily means of H from one day to the next which are already available in table 381 for the period 1872 to 1905, are summed up without regard to signs for each month and year in order to secure the monthly and the yearly mean difference or the mean diurnal variability of the daily mean of H. These appear in table 385 and their smoothed means shown in table 535 are used in the comparison instead of the data in (2). The results are charted in thin and thick curve respectively in figure 5, plate 100. The thick curve is also charted in plate 101 as figure 5, and it will be readily seen from the run of the curves in figures 5 and 6 in that plate that as the two curves run fairly parallel, data (3) may be substituted equally effectively for data (2), enabling thus the period of comparison to be extended backwards to the year 1872. We have thus the secular progression of the absolute phenomenon presented in different ways, by (1), and (2) or (3).

Dealing with the data connected with the diurnal variations we have (4) the summed ranges of H which furnish the secular progression of the element as affecting the periodic ranges. The data and their smoothed values are shown respectively in tables 261 and 536 which from the year 1848 to 1905 appear charted in plate 100, figure 4, as thin and thick curve respectively. The latter curve is also shown in plate 101, figure 2. We have also (5) giving the sums of the departures of the daily ranges of H from the mean value of the month. The data and their smoothed values are shown in tables 537 and 538 and the results appear charted in figure 7, plate 101. It will be seen that while data (4) indicate the secular progression of the periodic ranges, those in (5) represent similarly the progression of the aperiodic ranges where the disturbance effects are brought out more effectively emphasised. We have also (6) and (7) giving the summed ranges of D and V in tables 300 and 342 while their smoothed numbers appear in tables 539 and 540. These are shown charted in figures 3 and 4 in plate 101.

With reference to the sun-spot data, in tables 541 and 542 will be found Wolfer's spot numbers and their smoothed values respectively which are charted in figure 3, plate 100, and in figure 1, plate 101. The other spot data which are restricted to the period 1887—1905 are derived and treated exactly as have been the magnetic data (3). The differences of the consecutive daily spot numbers from one day to the next have been derived and collected in table 543 and the numbers summed up irrespective of the algebraic signs, for each month. These numbers, which, if divided by the number of days in the month, represent the mean diurnal variability of spots, appear in table 544, and their smoothed values appear in table 545. The data are charted in plate 100, figure 6. Thus while the spot data in figure 3 show the smooth periodic phenomenon of solar spot numbers, the curve in figure 6 may be taken to indicate the variability of spot numbers which like data (3) allows the disturbance effects to be exhibited prominently accentuated. (8) The secular progression of the annual variation of absolute force from year to year also needs an examination. For this purpose the absolute mean values of H shown in table 240, are smoothed down in the usual way for the elimination of the annual variation; these smoothed numbers are shown in table 546. The difference of the numbers in the above two series gives us the running annual variation from month to month and the sums of the 12 monthly values without regard to signs shown in column 14 of table 547 may be taken as a measure of the effects of the 11-year secular disturbance on the annual variation of absolute force. The result appears charted in figure 5 in the next paragraph. It will be observed that the magnetic data throughout are affected by a strongly marked seasonal variation. The spot series on the other hand does not show any specifically marked variation at least such as may be safely admitted as a true physical phenomenon (see result of spot numbers grouped into three 11-year cycles shown in the last four rows of table 541). The elimination hence of the annual variation from the data allows of the examination of the parallelism between the two series to be made under better comparable conditions.

551. Before taking up the examination of the data enumerated above in detail, it may perhaps be of interest incidentally to ascertain how far the classification employed in table 381 which gives the character of each day, is helpful in indicating in a rough way at least the general parallelism which is supposed to obtain between the two phenomena. The number of days classed as C and Ca, S and Sa,

* Whenever smoothed means are referred to in this chapter, it should be understood unless otherwise explained, that the process consists in taking the running means of 12 consecutive monthly values and the mean of two such means is entered in the proper position in the monthly columns. This operation eliminates the annual variation completely.

TABLE 535.—*Showing the smoothed values of the summed differences of daily means of H shown in table 385 obtained by taking overlapping means of twelve consecutive monthly values, and reducing them eventually to the proper epoch.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1872 ...							519	502	481	481	476	470	
1873 ...	452	416	385	355	331	324	318	317	317	314	313	307	346
1874 ...	303	301	300	309	316	308	297	289	281	267	259	257	291
1875 ...	253	248	244	231	217	213	210	206	202	196	190	188	216
1876 ...	184	180	178	177	178	180	184	183	181	181	187	195	182
1877 ...	198	201	201	201	204	207	207	204	195	190	181	176	197
1878 ...	175	172	173	173	167	165	164	162	167	172	177	179	170
1879 ...	179	178	178	178	176	174	174	174	172	175	178	175	176
1880 ...	176	195	215	223	235	248	257	270	281	284	284	285	246
1881 ...	289	278	268	273	276	276	272	266	262	278	300	307	279
1882 ...	311	318	316	321	356	380	379	377	383	376	361	359	353
1883 ...	359	355	361	356	321	301	306	309	302	296	294	297	321
1884 ...	301	300	293	298	306	306	307	309	313	315	321	327	308
1885 ...	324	327	330	319	302	291	290	290	285	283	279	271	299
1886 ...	264	259	251	247	247	244	235	226	222	218	213	210	236
1887 ...	212	212	215	216	214	218	230	237	236	233	235	236	224
1888 ...	232	233	232	229	227	225	213	203	205	203	198	198	216
1889 ...	199	193	192	191	190	191	190	191	189	184	180	173	189
1890 ...	168	165	162	166	171	169	168	171	177	186	199	206	176
1891 ...	213	226	240	247	247	256	272	293	318	331	338	357	278
1892 ...	375	388	388	384	388	394	395	384	364	354	341	322	373
1893 ...	307	301	308	317	322	315	308	320	338	349	358	366	326
1894 ...	381	399	406	401	402	404	403	397	384	374	367	360	390
1895 ...	346	320	302	305	304	301	300	292	288	290	292	290	302
1896 ...	284	284	286	283	276	274	279	284	278	277	282	284	281
1897 ...	285	279	268	259	254	256	253	242	246	248	241	236	256
1898 ...	231	230	242	255	259	255	250	256	255	246	243	243	247
1899 ...	243	242	228	212	203	195	193	189	190	195	199	203	208
1900 ...	200	197	194	194	195	193	190	185	176	168	155	144	183
1901 ...	147	149	150	148	147	150	150	149	147	149	154	156	150
1902 ...	155	153	150	151	156	156	153	154	154	157	159	159	155
1903 ...	161	166	173	194	220	240	257	261	261	265	274	287	230
1904 ...	293	292	292	278	257	243	235	241	256	258	246	237	261
1905 ...	236	242	252	257	264	275	276	274	271	267	271	276	263
1906 ...	276	271	258	263	266	259	264	275	283	284	286	288	273
1907 ...	290	293	308	318	320	323	317	301	288	290	290	285	302

TABLE 536.—*Showing the smoothed values of the summed ranges of H shown in table 261 obtained by taking overlapping means of twelve consecutive monthly values and reducing them to the mean of the month.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1847 ...	303	309	319	337	346	351	361	370	380	390	395	399	355
1848 ...	405	411	408	398	396	398	400	406	410	414	419	420	407
1849 ...	414	405	397	388	380	374	366	355	347	339	328	321	368
1850 ...	320	316	314	316	317	311	302	298	294	293	297	301	307
1851 ...	299	297	299	299	296	300	305	302	295	287	280	273	294
1852 ...	268	267	263	258	257	254	251	255	259	262	261	260	260
1853 ...	263	268	271	275	277	280	281	278	273	266	264	263	272
1854 ...	259	254	249	246	242	236	228	223	220	221	220	217	235
1855 ...	215	216	219	219	218	216	218	223	226	229	230	232	222
1856 ...	236	238	241	247	251	257	261	262	265	269	271	274	256
1857 ...	278	282	281	279	280	282	286	290	295	304	313	318	291
1858 ...	321	326	335	345	353	360	363	371	381	389	398	409	363
1859 ...	417	425	431	438	447	455	462	463	464	463	461	461	449
1860 ...	464	468	468	462	454	441	429	425	422	421	420	416	441
1861 ...	413	406	400	395	393	396	398	393	388	383	376	371	393
1862 ...	367	362	361	360	358	356	353	350	348	347	349	348	355
1863 ...	340	334	328	324	320	315	315	316	311	305	297	292	316
1864 ...	295	295	291	287	285	283	281	282	283	281	281	278	285
1865 ...	272	266	266	266	264	264	262	257	255	255	256	258	262
1866 ...	259	259	257	254	253	254	256	256	255	252	249	245	254
1867 ...	245	245	246	250	253	252	252	254	254	254	256	260	252
1868 ...	263	267	268	267	268	273	282	289	295	299	307	320	283
1869 ...	331	338	345	354	362	365	363	365	377	397	417	427	370
1870 ...	436	450	464	482	501	518	530	538	542	542	538	533	506
1871 ...	529	524	519	508	495	484	477	477	475	467	462	457	489
1872 ...	464	462	461	457	451	451	451	446	443	439	430	417	448
1873 ...	406	398	391	385	378	367	359	353	344	336	332	332	365
1874 ...	330	326	321	315	311	311	308	303	300	298	295	292	309
1875 ...	289	285	279	276	276	273	272	270	267	265	262	260	273
1876 ...	259	259	258	257	256	257	256	254	250	245	243	241	253
1877 ...	239	238	239	242	241	238	234	231	232	235	237	238	237
1878 ...	238	237	236	234	235	237	237	238	239	239	240	241	238
1879 ...	242	243	244	246	246	248	254	259	260	261	262	263	252
1880 ...	265	267	271	277	282	283	283	286	291	295	299	307	284
1881 ...	317	325	329	329	330	332	331	327	328	331	331	330	328
1882 ...	324	319	317	317	320	321	321	325	325	325	324	323	322
1883 ...	325	328	330	332	337	339	341	342	347	354	360	366	342
1884 ...	364	361	359	355	349	344	342	341	337	332	327	323	344
1885 ...	326	329	327	326	326	325	326	323	321	317	310	302	321
1886 ...	291	281	276	271	265	262	257	251	245	240	237	237	259
1887 ...	238	242	243	244	244	244	249	252	251	250	249	248	246
1888 ...	246	243	240	239	236	234	231	228	225	224	226	226	233
1889 ...	228	231	232	232	233	232	229	228	231	233	234	233	231
1890 ...	231	231	232	236	238	240	244	245	246	249	253	260	242
1891 ...	268	275	280	283	288	294	300	309	317	321	326	332	299
1892 ...	336	340	346	350	353	352	351	351	355	363	370	375	354
1893 ...	380	385	387	388	388	391	395	395	393	388	384	379	388
1894 ...	377	373	369	368	368	367	363	360	359	358	357	355	364
1895 ...	349	344	342	338	334	331	331	329	325	322	318	314	331
1896 ...	310	305	300	300	299	296	297	299	298	295	289	282	297
1897 ...	278	276	276	273	268	268	267	262	260	259	259	260	267
1898 ...	262	260	255	251	252	250	245	241	237	235	234	228	246
1899 ...	222	224	226	225	222	220	221	225	226	224	222	226	224
1900 ...	232	234	236	238	238	238	238	238	239	241	242	242	238
1901 ...	239	235	233	231	229	228	226	224	222	220	218	217	227
1902 ...	215	214	214	216	218	220	221	221	222	226	230	233	221
1903 ...	238	241	242	245	248	250	251	252	254	256	258	263	250
1904 ...	269	272	276	275	275	277	279	283	288	291	292	293	281
1905 ...	294	295	297	300	307	311	322	321	320	320	322	321	311
1906 ...	318	316	314	312	304	294	295	299	301	302	301	301	305
1907 ...	300	299	305	310	315	323	326	323	318	314	313	314	313
1908 ...	317	320	314	308	306	301	298	294	293	294	296	295	303

TABLE 537.—*Showing the sums without regard to sign of the departures of the daily ranges of H given in table 521 for each month and the average year from 1890 to 1905.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1890 ...	359	184	278	257	412	291	358	328	397	468	319	287	328
1891 ...	500	517	482	567	914	394	494	476	562	380	478	666	536
1892 ...	707	1170	652	624	1039	810	981	802	712	624	688	567	781
1893 ...	537	576	597	374	460	495	452	772	721	634	550	533	558
1894 ...	439	1193	741	641	440	592	1080	1000	753	431	863	400	714
1895 ...	548	635	547	560	523	335	424	385	420	635	588	568	514
1896 ...	623	472	636	317	726	395	501	335	585	525	463	512	507
1897 ...	612	422	284	739	445	253	288	307	396	353	420	759	440
1898 ...	391	394	621	408	293	493	272	413	750	443	418	387	440
1899 ...	384	513	378	357	516	452	277	342	382	270	310	330	376
1900 ...	480	374	455	255	417	277	271	219	237	276	206	268	311
1901 ...	354	372	306	299	297	190	216	316	311	232	219	359	289
1902 ...	385	210	333	452	261	171	236	261	286	308	274	230	284
1903 ...	297	213	249	525	210	403	341	455	392	1415	380	729	467
1904 ...	419	280	373	436	368	476	379	401	369	412	504	326	395
1905 ...	435	505	495	404	314	545	323	456	474	436	831	507	477
Mean, 1894 to 1904.	448	462	448	454	409	367	390	403	444	482	422	443	431

TABLE 538.—*Showing the smoothed values of the sums in table 537 obtained by taking overlapping means of twelve cosecutive monthly values and reducing them to the proper epoch.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.											
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1890 ...	...	...	...	...	...	...	334	354	376	397	431	456
1891 ...	466	478	491	494	497	520	544	580	614	624	631	654
1892 ...	691	725	745	762	781	785	774	742	715	702	668	631
1893 ...	596	572	571	572	567	559	554	576	608	625	635	638
1894 ...	668	704	715	707	712	719	718	700	669	657	657	650
1895 ...	612	559	520	514	511	507	517	513	510	504	502	513
1896 ...	519	520	525	527	517	509	507	504	487	490	496	479
1897 ...	464	454	445	430	421	429	430	420	433	433	413	417
1898 ...	426	430	449	467	471	455	440	445	439	427	434	442
1899 ...	440	438	419	397	385	378	380	378	375	374	366	354
1900 ...	347	342	331	325	320	313	306	301	294	290	287	278
1901 ...	272	274	281	282	281	285	290	285	279	287	291	289
1902 ...	289	288	285	287	292	289	280	277	273	273	274	281
1903 ...	295	308	320	371	421	446	472	480	488	489	492	502
1904 ...	506	506	503	460	423	412	396	406	420	424	420	421
1905 ...	421	421	428	434	448	469	...	...	...	...	...	...

TABLE 539.—*Showing the smoothed values of the summed ranges of D shown in table 300 obtained by taking overlapping means of twelve consecutive monthly values and reducing them to the proper epoch.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1848 ...	165	169	172	172	172	172	172	175	178	179	180	181	174
1849 ...	181	179	178	176	175	174	172	169	167	166	165	166	172
1850 ...	167	166	165	166	166	166	168	167	165	163	160	157	165
1851 ...	156	155	153	151	150	150	150	149	151	153	156	158	153
1852 ...	158	159	159	158	158	160	162	162	160	160	159	159	159
1853 ...	161	163	167	168	167	167	167	168	168	166	166	164	166
1854 ...	160	157	154	153	154	152	151	150	150	151	151	149	153
1855 ...	148	147	146	147	148	148	148	148	147	147	144	143	147
1856 ...	143	144	144	143	142	141	141	140	141	140	142	143	142
1857 ...	143	142	143	145	146	145	145	145	146	151	153	154	146
1858 ...	157	161	163	164	164	165	165	167	169	172	176	179	167
1859 ...	180	179	179	181	181	183	184	184	184	182	178	177	181
1860 ...	179	184	187	187	187	184	182	182	181	180	180	179	183
1861 ...	179	176	173	172	171	172	172	172	172	171	170	168	172
1862 ...	165	161	157	154	152	152	152	149	147	145	145	145	152
1863 ...	144	145	145	144	146	148	149	150	151	152	153	155	148
1864 ...	156	156	157	157	156	154	157	160	162	161	160	158	158
1865 ...	155	153	152	151	153	154	152	149	148	147	145	144	150
1866 ...	143	140	138	139	140	141	143	143	141	141	140	141	141
1867 ...	142	145	146	144	143	142	139	138	138	141	143	144	142
1868 ...	145	145	147	149	147	144	144	146	146	146	146	149	146
1869 ...	153	157	159	161	162	163	162	163	167	170	174	176	164
1870 ...	177	181	186	190	193	194	195	194	194	197	197	197	191
1871 ...	196	195	194	192	191	190	190	192	193	192	192	191	192
1872 ...	189	187	186	186	184	184	184	182	180	180	178	176	183
1873 ...	174	173	170	167	165	164	162	161	160	156	152	149	163
1874 ...	147	143	141	140	140	140	140	140	139	136	134	135	140
1875 ...	134	133	132	131	131	131	130	128	127	127	126	125	130
1876 ...	126	127	128	128	128	128	128	128	128	129	129	129	128
1877 ...	129	132	133	133	133	133	133	134	135	135	135	134	133
1878 ...	131	126	122	121	120	121	122	122	121	119	118	120	122
1879 ...	121	124	126	126	127	127	127	127	129	131	132	131	127
1880 ...	132	132	132	132	132	131	132	133	134	134	136	140	133
1881 ...	142	145	147	150	151	151	149	148	149	150	150	150	148
1882 ...	148	145	142	139	140	140	141	142	141	140	140	140	141
1883 ...	142	143	144	146	146	145	145	147	150	153	154	154	147
1884 ...	153	155	158	157	157	158	159	156	152	149	148	148	154
1885 ...	149	150	150	149	149	149	148	150	151	150	150	150	150
1886 ...	148	145	142	143	145	146	147	146	145	145	145	144	145
1887 ...	143	145	146	145	144	143	143	143	143	142	140	139	143
1888 ...	139	137	135	133	133	132	131	130	130	130	132	131	133
1889 ...	129	127	128	128	128	127	127	127	127	125	124	124	127
1890 ...	124	125	126	127	127	126	127	127	128	129	131	134	128
1891 ...	135	136	138	140	140	140	139	140	141	143	145	147	140
1892 ...	150	153	155	155	155	155	156	157	159	160	160	161	156
1893 ...	161	160	161	162	162	162	162	161	160	158	158	156	160
1894 ...	155	153	151	150	151	151	151	151	151	152	154	156	152
1895 ...	158	159	159	157	156	155	154	153	151	148	146	143	153
1896 ...	138	136	134	133	133	134	135	135	136	136	135	134	135
1897 ...	134	134	134	134	134	134	134	134	132	131	131	132	133
1898 ...	132	131	132	132	133	133	134	135	136	137	136	135	134
1899 ...	133	133	131	129	128	127	126	124	123	123	121	118	126
1900 ...	118	118	121	123	124	126	126	126	127	126	125	126	124
1901 ...	126	125	124	122	121	119	119	118	118	118	117	116	120
1902 ...	116	117	118	118	120	121	120	120	120	121	123	126	120
1903 ...	128	129	130	131	132	133	133	134	135	137	138	138	133
1904 ...	139	140	140	139	137	137	137	139	141	141	142	142	139

TABLE 540.—*Showing the smoothed values of the summed ranges of V shown in table 342 obtained by taking overlapping means of twelve consecutive monthly values and reducing them to the proper epoch.*

Unity = 1γ = ·00001 C. G. S.

Years.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1874 ...	102	100	100	101	101	100	101	103	103	102	101	101	101
1875 ...	100	98	97	97	97	97	96	95	95	95	95	96	96
1876 ...	97	99	101	103	106	108	109	110	111	114	117	118	108
1877 ...	118	118	118	116	113	113	115	115	114	114	112	110	115
1878 ...	110	109	106	106	107	107	105	104	103	100	98	99	104
1879 ...	100	100	100	99	99	99	97	95	94	93	92	91	97
1880 ...	90	91	93	94	95	94	96	98	100	103	106	110	97
1881 ...	113	114	114	116	117	117	116	116	117	118	119	119	116
1882 ...	118	117	114	111	110	111	112	112	110	109	110	110	112
1883 ...	110	110	110	111	112	114	115	117	121	122	120	119	115
1884 ...	122	127	130	130	130	131	129	127	125	122	120	119	126
1885 ...	118	116	114	112	110	108	108	107	104	103	103	101	109
1886 ...	99	98	96	96	96	95	95	94	95	96	98	101	97
1887 ...	104	107	109	109	109	110	109	110	111	112	111	109	109
1888 ...	109	109	108	108	108	107	107	106	106	107	108	107	107
1889 ...	104	102	100	100	101	101	102	102	101	98	95	95	100
1890 ...	95	97	99	100	100	100	101	103	105	108	110	113	103
1891 ...	114	114	114	114	115	117	118	119	120	119	118	118	117
1892 ...	119	122	124	125	127	127	126	126	126	126	126	127	125
1893 ...	128	127	127	127	126	126	126	124	123	123	121	119	125
1894 ...	119	117	116	117	116	117	119	121	122	123	126	130	120
1895 ...	132	133	133	131	130	130	129	126	123	122	121	118	127
1896 ...	115	114	112	111	111	110	110	113	114	113	113	113	112
1897 ...	112	112	112	113	112	110	108	105	104	103	102	101	108
1898 ...	102	102	103	104	104	105	107	110	112	112	112	111	107
1899 ...	110	108	105	104	104	104	104	102	102	104	105	105	105
1900 ...	106	107	107	108	109	108	105	102	100	98	96	95	103
1901 ...	94	92	90	89	88	89	91	94	95	96	97	97	93
1902 ...	99	101	102	104	104	103	102	101	100	100	101	103	102
1903 ...	105	106	107	107	109	110	111	113	114	115	115	114	110
1904 ...	112	112	112	112	113	113	113	115	118	119	121	123	115

TABLE 541.—*Showing the observed sun-spot relative numbers as published in the Astronomische Mitteilungen by Wolf and Wolfer.*

Year.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1847 ...	62·6	44·9	85·7	44·7	75·4	85·3	52·2	140·6	161·2	180·4	138·9	109·6	98·5
1848 ...	159·1	111·8	108·9	107·1	102·2	123·8	139·2	132·5	100·3	132·4	114·6	159·9	124·3
1849 ...	156·7	131·7	96·5	102·5	80·6	81·2	78·0	61·3	93·7	71·5	99·7	97·0	95·9
1850 ...	78·0	89·4	82·6	44·1	61·6	70·0	39·1	61·6	86·2	71·0	54·8	60·0	66·5
1851 ...	75·5	105·4	64·6	56·5	62·6	63·2	36·1	57·4	67·9	62·5	50·9	71·4	64·5
1852 ...	68·4	67·5	61·2	65·4	54·9	46·9	42·0	39·7	37·5	67·3	54·3	45·4	54·2
1853 ...	41·1	42·9	37·7	47·6	34·7	40·0	45·9	50·4	33·5	42·3	28·8	23·4	39·0
1854 ...	15·4	20·0	20·7	26·4	24·0	21·1	18·7	15·8	22·4	12·7	28·2	21·4	20·6
1855 ...	12·3	11·4	17·4	4·4	9·1	5·3	0·4	3·1	0·0	9·7	4·2	3·1	6·7
1856 ...	0·5	4·9	0·4	6·5	0·0	5·0	4·6	5·9	4·4	4·5	7·7	7·2	4·3
1857 ...	13·7	7·4	5·2	11·1	29·2	16·0	22·2	16·9	42·4	40·6	31·4	37·2	22·8
1858 ...	39·0	34·9	57·5	38·3	41·4	44·5	56·7	55·3	80·1	91·2	51·9	66·9	54·8
1859 ...	83·7	87·6	90·3	85·7	91·0	87·1	95·2	106·8	105·8	114·6	97·2	81·0	93·8
1860 ...	81·5	88·0	98·9	71·4	107·1	108·6	116·7	100·3	92·2	90·1	97·9	95·6	95·7
1861 ...	62·3	77·8	101·0	98·5	56·8	87·8	78·0	82·5	79·9	67·2	53·7	80·5	77·2
1862 ...	63·1	64·5	43·6	53·7	64·4	84·0	73·4	62·5	66·6	42·0	50·6	40·9	59·1
1863 ...	48·3	56·7	66·4	40·6	53·8	40·8	32·7	48·1	22·0	39·9	37·7	41·2	44·0
1864 ...	57·7	47·1	66·3	35·8	40·6	57·8	54·7	54·8	28·5	33·9	57·6	28·6	47·0
1865 ...	48·7	39·3	39·5	29·4	34·5	33·6	26·8	37·8	21·6	17·1	24·6	12·8	30·5
1866 ...	31·6	38·4	24·6	17·6	12·9	16·5	9·3	12·7	7·3	14·1	9·0	1·5	16·3
1867 ...	0·0	0·7	9·2	5·1	2·9	1·5	5·0	4·9	9·8	13·5	9·3	25·2	7·3
1868 ...	15·6	15·8	26·5	36·6	26·7	31·1	28·6	34·4	43·8	61·7	59·1	67·6	37·3
1869 ...	60·9	59·3	52·7	41·0	104·0	108·4	59·2	79·6	80·6	59·4	77·4	104·3	73·9
1870 ...	77·3	114·9	159·4	160·0	176·0	135·6	132·4	153·8	136·0	146·4	147·5	130·0	139·1
1871 ...	88·3	125·3	143·2	162·4	145·5	91·7	103·0	110·0	80·3	89·0	105·4	90·3	111·2
1872 ...	79·5	120·1	88·4	102·1	107·6	109·9	105·5	92·9	114·6	103·5	112·0	83·9	101·7
1873 ...	86·7	107·0	98·3	76·2	47·9	44·8	66·9	68·2	47·5	47·4	55·4	49·2	66·3
1874 ...	60·8	64·2	46·4	32·0	44·6	38·2	67·8	61·3	28·0	34·3	28·9	29·3	44·7
1875 ...	14·6	22·2	33·8	29·1	11·5	23·9	12·5	14·6	2·4	12·7	17·7	9·9	17·1
1876 ...	14·3	15·0	31·2	2·3	5·1	1·6	15·2	8·8	9·9	14·3	9·9	8·2	11·3
1877 ...	24·4	8·7	11·7	15·8	21·2	13·4	5·9	6·3	16·4	6·7	14·5	2·3	12·3
1878 ...	3·3	6·0	7·8	0·1	5·8	6·4	0·1	0·0	5·3	1·1	4·1	0·5	3·4
1879 ...	0·8	0·6	0·0	6·2	2·4	4·8	7·5	10·7	6·1	12·3	12·9	7·2	6·0
1880 ...	24·0	27·5	19·5	19·3	23·5	34·1	21·9	48·1	66·0	43·0	30·7	29·6	32·3
1881 ...	36·4	53·2	51·5	51·7	43·5	60·5	76·9	58·0	53·2	64·0	54·8	47·3	54·3
1882 ...	45·0	69·3	67·5	95·8	64·1	45·2	45·4	40·4	57·7	59·2	84·4	41·8	59·7
1883 ...	60·6	46·9	42·8	82·1	32·1	76·5	80·6	46·0	52·6	83·8	84·5	75·9	63·7
1884 ...	91·5	86·9	86·8	76·1	66·5	51·2	53·1	55·8	61·9	47·8	36·6	47·2	63·5
1885 ...	42·8	71·8	49·8	55·0	73·0	83·7	66·5	50·0	39·6	38·7	33·3	21·7	52·2
1886 ...	29·9	25·9	57·3	43·7	30·7	27·1	30·3	16·9	21·4	8·6	0·3	12·4	25·4
1887 ...	10·3	13·2	4·2	6·9	20·0	15·7	23·3	21·4	7·4	6·6	6·9	20·7	13·1
1888 ...	12·7	7·1	7·8	5·1	7·0	7·1	3·1	2·8	8·8	2·1	10·7	6·7	6·8
1889 ...	0·8	8·5	7·0	4·3	2·4	6·4	9·7	20·6	6·5	2·1	0·2	6·7	6·3
1890 ...	5·3	0·6	5·1	1·6	4·8	1·3	11·6	8·5	17·2	11·2	9·6	7·8	7·1
1891 ...	13·5	22·2	10·4	20·5	41·1	43·3	58·8	33·2	53·8	51·5	41·9	32·2	35·6
1892 ...	69·1	75·6	49·9	69·6	79·6	76·3	76·8	101·4	62·8	70·5	65·4	78·6	73·0
1893 ...	75·0	73·0	65·7	88·1	84·7	88·2	88·8	129·2	77·9	79·7	75·1	93·8	84·9
1894 ...	83·2	84·6	52·3	81·6	101·2	98·9	106·0	70·3	65·9	75·5	56·6	60·0	78·0
1895 ...	63·3	67·2	61·0	76·9	67·5	71·5	47·8	68·9	57·7	67·9	47·2	70·7	64·0
1896 ...	29·0	57·4	52·0	43·8	27·7	49·0	45·0	27·2	61·3	28·4	38·0	42·6	41·8
1897 ...	40·6	29·4	29·1	31·0	20·0	11·3	27·6	21·8	48·1	14·3	8·4	33·3	26·2
1898 ...	30·2	36·4	38·3	14·5	25·8	22·3	9·0	31·4	34·8	34·4	30·9	12·6	26·7
1899 ...	19·5	9·2	18·1	14·2	7·7	20·5	13·5	2·9	8·4	13·0	7·8	10·5	12·1
1900 ...	9·4	13·6	8·6	16·0	15·2	12·1	8·3	4·3	8·3	12·9	4·5	0·3	9·5
1901 ...	0·2	2·4	4·5	0·0	10·2	5·8	0·7	1·0	0·6	3·7	3·8	0·0	2·7
1902 ...	5·2	0·0	12·4	0·0	2·8	1·4	0·9	2·3	7·6	16·3	10·3	1·1	5·0
1903 ...	8·3	17·0	13·5	26·1	14·6	16·3	27·9	28·8	11·1	38·9	44·5	45·6	24·4
1904 ...	31·6	24·5	37·2	43·0	39·5	41·9	50·6	58·2	30·1	54·2	38·0	54·6	41·9
1905 ...	54·8	85·8	56·5	39·3	48·0	49·0	73·0	58·8	55·0	78·7	107·2	55·5	63·5
1906 ...	45·5	31·3	64·5	55·3	57·7	63·2	103·3	47·7	56·1	17·8	38·9	64·7	53·8
1907 ...	76·4	108·2	60·7	52·6	43·0	40·4	49·7	54·3	85·0	65·4	61·5	47·3	62·0
Annual Inequalities. 1872 to 1882	−1·8	+7·7	+4·3	+1·9	−2·9	−2·4	+1·5	0·0	−0·2	−1·0	+1·5	−9·1	37·2
Annual Inequalities. 1883 to 1893	−1·8	0·0	−4·0	+2·0	+1·0	+4·6	+6·5	+5·0	−1·9	−2·6	−6·1	−2·5	39·2
Annual Inequalities. 1894 to 1904	−1·1	+0·9	−0·4	+1·4	0·0	+1·7	+0·5	−1·4	+0·2	+2·5	−3·8	−0·1	30·2
Annual Inequalities. 1872 to 1904	−1·5	+2·9	0·0	+1·8	−0·6	+1·3	+2·8	+1·2	−0·6	−0·3	−2·8	−3·9	35·5

TABLE 542.—*Showing the smoothed values of the sun-spot numbers as published in the Astronomische Mitteilungen by Wolf and Wolfer.*

Year.	Month.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1847 ...	66·0	69·8	75·6	83·1	91·5	96·6	102·5	109·3	113·0	116·6	120·3	123·0	97·3
1848 ...	128·3	131·6	128·7	124·2	121·1	122·2	124·2	124·9	125·3	124·6	123·5	120·8	125·0
1849 ...	116·5	110·9	107·7	104·9	101·7	98·5	92·6	87·5	85·2	82·2	79·0	77·7	95·4
1850 ...	75·6	74·0	73·7	73·4	71·5	68·1	66·4	67·0	66·9	66·7	67·2	67·0	69·8
1851 ...	66·6	66·3	65·4	64·2	63·7	64·0	64·2	62·3	60·6	60·8	60·9	59·9	63·2
1852 ...	59·5	59·0	57·0	55·9	56·2	55·3	53·1	50·9	48·9	47·2	45·6	44·5	52·8
1853 ...	44·3	45·0	45·2	44·0	41·9	39·9	38·0	35·9	34·3	32·7	31·3	30·1	38·6
1854 ...	28·2	25·6	23·7	22·0	20·8	20·7	20·4	20·0	19·5	18·4	16·9	15·6	21·0
1855 ...	14·2	12·9	11·4	10·4	9·2	7·5	6·2	5·4	4·5	3·8	3·6	3·2	7·7
1856 ...	3·3	3·6	3·9	3·9	3·8	4·1	4·9	5·5	5·8	6·2	7·6	9·3	5·2
1857 ...	10·5	11·7	13·7	16·8	19·3	21·5	23·8	26·0	29·4	32·7	34·3	36·0	23·0
1858 ...	38·6	41·7	44·8	48·5	51·5	53·6	56·7	60·7	64·3	67·6	71·7	75·5	56·3
1859 ...	78·9	82·6	85·9	87·9	90·8	93·2	93·7	93·7	94·0	93·8	93·9	95·4	90·3
1860 ...	97·2	97·9	97·0	95·4	94·4	95·1	94·9	93·7	93·3	94·5	93·6	90·6	94·8
1861 ...	88·1	85·8	84·5	83·1	80·3	77·8	77·2	76·7	73·7	69·5	67·9	68·1	77·7
1862 ...	67·7	66·7	65·3	63·7	62·5	60·8	58·5	57·6	58·2	58·6	57·6	55·4	61·1
1863 ...	51·9	49·6	47·1	45·2	44·5	44·0	44·4	44·4	44·0	43·8	43·0	43·2	45·4
1864 ...	44·8	46·0	46·6	46·6	47·2	47·5	46·6	45·9	44·4	43·1	42·5	41·3	45·2
1865 ...	39·1	37·2	36·2	35·2	33·2	31·1	29·8	29·0	28·4	27·2	25·9	24·2	31·4
1866 ...	22·8	21·0	19·4	18·7	17·9	16·8	15·0	12·1	9·9	8·7	7·8	6·7	14·7
1867 ...	5·9	5·4	5·2	5·3	5·3	6·3	7·9	9·2	10·5	12·6	14·9	17·1	8·8
1868 ...	19·3	21·5	24·2	27·6	31·7	35·5	39·2	42·9	45·8	47·1	50·5	56·9	36·9
1869 ...	61·4	64·6	68·0	69·4	70·1	72·4	74·6	77·6	84·3	93·8	101·7	105·8	78·6
1870 ...	110·0	116·2	121·6	127·5	134·0	138·0	139·6	140·5	140·2	139·6	138·5	135·4	131·8
1871 ...	132·3	129·3	125·1	120·4	116·3	112·9	110·8	110·3	107·8	103·0	98·9	98·0	113·8
1872 ...	98·9	98·3	99·0	101·0	101·9	101·9	102·0	101·7	101·6	100·9	97·4	92·2	99·7
1873 ...	87·8	85·2	81·4	76·2	71·5	67·7	65·2	62·4	58·4	54·4	52·4	52·0	67·9
1874 ...	51·8	51·5	50·4	49·1	47·4	45·5	42·7	39·1	36·8	36·1	34·6	32·7	43·1
1875 ...	29·8	25·5	22·5	20·5	19·2	17·9	17·1	16·8	16·3	15·1	13·7	12·5	18·9
1876 ...	11·7	11·6	11·7	12·0	11·8	11·4	11·7	11·9	10·8	10·6	11·8	13·0	11·7
1877 ...	13·1	12·6	12·7	12·7	12·6	12·5	11·4	10·4	10·1	9·3	8·0	7·1	11·0
1878 ...	6·6	6·0	5·3	4·6	4·0	3·5	3·3	3·9	2·4	2·3	2·4	2·2	3·9
1879 ...	2·5	3·2	3·7	4·2	5·0	5·7	6·9	9·0	10·9	12·3	13·7	15·8	7·7
1880 ...	17·7	19·8	23·9	27·6	29·7	31·3	32·8	34·4	36·8	39·5	41·6	43·6	31·6
1881 ...	47·0	49·7	49·6	49·9	51·8	53·5	54·6	55·6	57·0	59·5	62·2	62·4	54·4
1882 ...	60·4	58·4	57·9	57·8	58·9	59·9	60·3	60·0	58·1	56·5	54·6	54·5	58·1
1883 ...	57·3	59·0	59·0	59·8	60·9	62·3	65·0	67·9	71·4	73·0	74·2	74·6	65·4
1884 ...	72·4	71·7	72·4	71·3	67·8	64·6	61·4	58·8	56·6	54·2	53·6	55·2	63·3
1885 ...	57·1	57·4	56·2	54·9	54·4	53·2	51·6	49·2	47·6	47·4	45·2	41·1	51·3
1886 ...	37·2	34·3	32·2	30·2	27·5	25·8	24·6	23·2	20·5	16·7	14·7	13·8	25·1
1887 ...	13·1	13·0	12·6	11·9	12·1	12·7	13·2	13·0	12·9	13·0	12·4	11·5	12·6
1888 ...	10·3	8·6	7·9	7·8	7·8	7·3	6·3	5·8	5·8	5·8	5·6	5·3	7·0
1889 ...	5·6	6·6	7·2	7·1	6·7	6·3	6·5	6·3	5·9	5·7	5·7	5·6	6·3
1890 ...	5·5	5·0	5·0	5·8	6·6	7·0	7·4	8·6	9·8	10·8	13·1	16·5	8·4
1891 ...	20·5	23·5	26·0	29·2	32·2	34·6	37·9	42·5	46·3	50·0	53·7	56·5	37·7
1892 ...	58·4	62·0	65·2	66·4	68·1	71·0	73·2	73·4	73·9	75·3	76·3	77·0	70·0
1893 ...	78·0	79·7	81·5	82·5	83·3	84·3	85·3	86·1	86·0	85·2	85·6	86·7	83·7
1894 ...	87·9	86·2	83·2	82·5	81·6	79·4	77·2	75·6	75·3	75·4	73·8	71·3	79·1
1895 ...	67·7	65·2	64·8	64·2	63·5	63·5	62·5	60·7	59·9	58·2	55·1	52·5	61·5
1896 ...	51·5	49·6	48·0	46·5	44·5	43·0	42·3	41·6	39·5	38·0	37·1	35·2	43·1
1897 ...	32·9	32·0	31·2	30·1	28·3	26·6	25·8	25·7	26·3	26·0	25·6	26·3	28·1
1898 ...	26·0	25·6	25·4	25·7	27·5	27·6	26·3	24·7	22·7	21·9	21·1	20·3	24·6
1899 ...	20·4	19·4	17·1	15·1	13·2	12·2	11·7	11·5	11·2	10·9	11·3	11·3	13·8
1900 ...	10·7	10·5	10·6	10·6	10·4	9·9	9·1	8·2	7·6	6·8	5·9	5·4	8·8
1901 ...	4·8	4·4	3·9	3·2	2·8	2·8	2·9	3·1	3·3	3·6	3·3	2·8	3·4
1902 ...	2·6	2·7	3·0	3·8	4·6	4·9	5·1	6·0	6·7	7·9	9·4	10·5	5·6
1903 ...	12·3	14·5	15·7	16·8	19·2	22·5	25·3	26·6	27·9	29·6	31·3	33·4	22·9
1904 ...	35·4	37·6	39·7	41·1	41·4	41·5	42·9	46·4	49·8	50·4	50·6	51·3	44·0
1905 ...	52·5	53·5	54·5	56·6	60·5	63·4	63·1	60·4	58·4	59·4	60·5	61·5	58·7
1906 ...	63·4	64·2	63·7	61·3	55·9	53·4	55·1	59·6	62·6	62·4	61·6	60·0	60·3

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1887. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...		− 6	− 4	− 4	−24	+ 4	+ 2	+15	0	+ 3	0	0
2 ...	− 5	− 1	− 4	−11	+14	− 7	+ 2	+ 3	+ 3	+ 3	− 4	0
3 ...	− 1	+10	− 3	0	+ 2	0	+ 9	+ 4	+ 3	+ 3	0	+ 9
4 ...	− 6	0	− 3	− 3	+ 1	− 5	− 3	− 5	− 6	− 9	0	+ 4
5 ...	− 3	− 4	0	0	+12	+ 2	+ 8	+ 1	+ 3	+ 3	+ 6	+ 8
6 ...	+ 3	−12	0	0	− 3	+10	+14	+ 1	+ 1	− 3	+ 5	+ 4
7 ...	0	−11	0	0	− 6	0	+12	−13	− 4	0	+ 1	− 1
8 ...	− 8	0	0	0	+17	− 3	+ 1	−11	0	0	0	+ 7
9 ...	− 2	0	0	0	+ 3	+ 4	−13	− 8	0	0	+ 1	− 4
10 ...	− 1	0	+ 3	0	+ 6	+ 4	−10	− 4	+ 3	0	− 1	+ 2
11 ...	+ 2	0	0	0	−22	+ 9	− 6	−18	+ 2	0	+ 2	+13
12 ...	− 2	0	0	0	−12	− 3	− 4	0	− 5	0	+ 1	− 3
13 ...	0	0	− 3	0	+ 3	−12	− 3	0	+ 3	0	+18	−22
14 ...	0	0	0	+ 1	− 4	− 1	0	+16	+ 4	+ 2	− 8	− 1
15 ...	0	0	0	+ 2	+ 9	− 1	− 7	+17	+16	− 2	− 3	+11
16 ...	0	0	0	0	+ 5	− 1	− 4	−10	− 2	+ 6	−18	− 3
17 ...	0	+11	0	0	+ 2	+ 2	+ 1	+10	+ 3	− 2	0	+ 1
18 ...	+ 3	+11	+ 8	− 3	− 1	+ 4	−10	− 5	− 2	+ 8	− 1	+ 4
19 ...	0	+ 1	+10	+18	+ 7	+ 1	− 3	+ 5	− 1	+ 2	0	− 2
20 ...	− 3	+ 2	− 3	+ 2	− 8	+ 1	0	0	− 1	+ 7	+10	− 3
21 ...	+12	− 4	0	− 8	− 3	− 2	0	−17	− 1	+ 2	−13	+11
22 ...	0	+ 9	− 6	+ 1	−18	0	0	0	− 1	− 1	0	+ 4
23 ...	+ 1	− 2	+ 1	− 1	− 7	− 5	+17	−16	0	0	0	− 9
24 ...	+ 5	− 3	− 7	0	0	−12	+ 1	0	−18	− 8	0	+ 6
25 ...	+ 2	−10	− 3	0	0	+ 1	+ 2	0	0	+ 5	0	−18
26 ...	+ 3	+ 1	+ 4	+ 4	0	− 1	+10	0	0	−12	0	0
27 ...	− 3	0	− 1	− 9	0	+10	+ 9	0	0	+ 1	0	−18
28 ...	− 1	− 2	− 3	+ 5	+10	+ 2	−13	+ 3	+ 3	− 5	0	0
29 ...	+ 4		0	+ 5	+18	0	− 8	− 3	− 3	− 1	0	+ 3
30 ...	0		0	+10	−14	− 1	− 5	0	0	− 2	0	0
31 ...	+ 1		+18		0		+22	0		+ 4		+ 8
Sums without regard to signs.	71	100	84	87	231	108	199	185	88	94	92	179

1888. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	− 6	0	+ 3	0	0	0	+ 3	− 1	0	0	+ 1
2 ...	+ 1	+ 1	− 3	0	0	0	0	+ 2	− 9	0	0	+ 2
3 ...	− 1	−10	0	− 3	0	− 2	0	− 1	+ 7	+ 3	0	0
4 ...	+ 4	+ 1	0	+ 8	0	0	0	− 2	− 2	− 3	0	0
5 ...	− 3	− 1	0	+ 2	0	0	0	− 2	+ 5	0	+ 7	− 4
6 ...	0	0	0	−10	0	0	+ 6	0	− 1	0	+ 3	− 2
7 ...	− 9	+ 2	0	0	0	0	0	0	− 3	0	− 1	− 5
8 ...	+ 9	− 2	0	0	0	+ 2	− 4	+ 4	− 1	0	+12	0
9 ...	− 1	0	+ 3	0	0	+13	− 2	0	+ 1	0	−12	− 3
10 ...	+ 8	0	+10	0	0	+ 2	+ 2	− 4	−11	0	+ 6	− 2
11 ...	+ 5	+ 6	+11	0	+ 2	0	+ 3	0	− 1	0	+ 4	− 1
12 ...	− 4	− 6	+15	0	+11	0	− 2	+ 3	+ 8	+ 3	+ 1	0
13 ...	− 4	0	−21	0	+ 6	− 4	+ 6	+ 1	+ 1	− 3	+16	0
14 ...	+ 2	0	0	0	0	+ 9	+ 7	− 4	− 5	0	−10	0
15 ...	− 3	0	0	+ 2	+ 4	− 5	+ 3	0	− 6	0	−10	+ 4
16 ...	0	0	− 1	+ 1	+ 2	0	− 5	0	− 3	0	− 2	+17
17 ...	+ 3	0	− 1	0	− 3	−17	− 9	0	0	0	− 3	− 6
18 ...	0	+ 7	0	0	− 1	+ 3	− 3	0	0	0	+ 3	+ 1
19 ...	+ 3	+ 6	− 2	0	− 6	+ 1	− 2	0	0	0	− 1	− 2
20 ...	+15	+ 1	−11	− 2	+ 3	− 1	0	0	0	0	− 2	− 1
21 ...	0	+ 5	+ 2	+ 2	− 3	− 3	0	0	+ 4	+ 2	+ 5	− 1
22 ...	−21	+ 8	− 5	+ 3	− 2	0	0	0	0	+ 1	−10	−10
23 ...	− 6	− 3	+18	+ 5	− 2	0	0	0	+ 8	− 3	− 4	− 2
24 ...	− 9	− 4	− 6	+ 3	−11	+ 3	0	0	− 1	+ 3	− 2	+ 2
25 ...	0	− 3	− 9	+13	0	+ 5	0	0	− 5	+11	0	− 2
26 ...	0	− 5	− 2	− 4	0	+ 7	0	0	+ 6	0	0	0
27 ...	0	− 5	+ 1	− 4	0	− 1	+ 2	0	− 9	− 2	+ 3	0
28 ...	0	+ 7	− 2	−13	0	+ 1	0	0	0	− 8	+11	0
29 ...	0	−11	0	− 1	0	− 8	− 2	+17	− 1	+ 2	+ 2	0
30 ...	0		0	− 5	0	− 7	+ 2	+ 2	− 2	− 6	− 2	+ 2
31 ...	+15		0		+ 2		− 2	+ 2		0		− 2
Sums without regard to signs.	126	100	123	84	58	94	62	47	101	50	132	72

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1889. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	+11	0	+ 4	0	0	− 1	− 5	− 2	− 1	0	0
2 ...	0	+ 9	− 6	+ 8	0	0	− 3	0	+ 2	0	0	0
3 ...	0	0	− 2	+ 4	0	0	0	+ 1	− 1	− 8	0	0
4 ...	0	− 2	− 3	− 4	0	0	0	+ 7	− 8	+ 3	0	0
5 ...	0	0	+ 3	+ 1	+ 4	0	0	− 2	+ 3	− 6	0	0
6 ...	0	− 2	+10	0	+ 9	0	0	− 3	+ 2	0	0	0
7 ...	0	−16	− 1	0	+ 1	0	0	− 2	0	0	0	0
8 ...	0	0	0	0	0	0	0	− 1	− 2	0	+ 3	0
9 ...	+ 2	0	0	0	0	0	0	+16	−10	+ 6	− 3	0
10 ...	− 2	0	0	− 4	− 4	0	0	+10	0	+ 2	0	0
11 ...	0	0	+ 4	− 5	−10	0	0	−11	0	− 6	0	0
12 ...	0	0	+ 6	0	0	0	+ 7	+ 1	0	− 2	0	+ 6
13 ..	0	0	− 2	0	0	0	0	+ 2	0	0	0	− 6
14 ...	0	0	+ 5	− 4	0	0	+ 9	− 1	0	0	+ 1	0
15 ...	0	0	− 7	0	0	+ 4	+ 3	− 4	0	0	0	0
16 ...	+15	0	− 1	0	0	− 4	+ 2	+ 1	0	+ 4	− 1	0
17 ...	− 7	0	−11	0	0	+16	− 2	−11	0	+ 3	0	0
18 ...	− 8	0	− 6	0	0	+ 2	0	− 8	+ 3	− 4	0	+ 6
19 ...	0	0	0	0	0	+ 3	+ 2	−10	− 3	− 3	0	+ 9
20 ...	0	0	0	0	0	0	+ 1	− 8	0	0	0	+ 2
21 ...	0	0	0	0	0	− 1	− 5	0	0	0	0	+ 6
22 ...	0	+14	0	0	0	−11	− 5	0	0	0	0	−12
23 ...	0	+ 3	0	0	0	+12	0	0	+ 3	0	0	−11
24 ...	0	+ 9	0	0	0	− 1	0	0	+ 4	+ 3	0	+ 4
25 ...	0	− 5	0	0	0	− 7	− 9	0	+ 6	− 3	0	+13
26 ...	0	+ 1	0	0	0	0	+ 2	0	+ 5	0	0	+ 3
27 ...	0	+ 3	0	0	+ 5	0	− 5	0	− 1	0	0	0
28 ...	0	−14	0	0	− 5	−13	+18	+16	0	0	0	+ 4
29 ...	0		0	0	0	0	+ 3	0	− 8	0	0	− 2
30 ...	0		0	0	0	+ 4	−11	0	+ 3	0	0	− 8
31 ...	0		0		0		+18	0		0		− 4
Sums without regard to signs.	34	89	67	34	38	78	106	120	66	54	8	96

1890. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 2	− 2	0	0	−12	0	0	+ 3	+ 7	−11	−11	− 7
2 ...	0	−12	− 3	0	− 2	0	0	− 3	− 4	−10	0	0
3 ...	− 5	0	+ 3	0	0	0	0	− 9	+ 9	− 1	0	+ 5
4 ...	+ 5	0	+11	0	0	0	+ 2	+ 1	−15	− 3	0	−16
5 ...	0	0	0	0	0	+ 3	+12	+ 5	− 1	0	0	0
6 ...	+ 5	0	− 4	0	0	+ 2	+ 3	− 8	+ 5	+ 6	0	0
7 ...	−17	0	+ 4	0	0	+ 5	+ 2	− 1	−10	− 3	0	0
8 ...	0	0	+ 1	0	0	+ 3	+ 9	− 4	− 3	0	+14	+ 2
9 ...	0	0	+ 1	0	+ 3	−13	+ 2	− 2	+ 2	− 3	+ 4	− 1
10 ...	0	0	+ 2	0	+12	+ 5	0	+ 2	− 2	0	− 7	0
11 ...	0	0	− 1	+ 4	+ 3	− 3	−13	0	0	+ 8	+ 7	+ 1
12 ...	+ 1	0	− 2	+ 3	0	− 2	− 3	− 2	0	− 5	− 3	− 2
13 ...	− 1	0	− 3	− 1	−11	0	0	0	−16	− 3	+ 3	+17
14 ...	0	+ 3	− 8	− 4	− 7	0	− 9	0	− 2	+ 3	− 8	+ 4
15 ...	0	− 3	− 1	+ 1	0	0	− 5	+ 2	+ 5	− 1	− 8	+ 1
16 ...	+ 4	0	− 3	0	0	0	0	− 2	+ 1	− 2	− 2	+ 4
17 ...	+ 3	0	0	− 3	+10	0	0	0	+ 3	0	0	−16
18 ...	− 7	0	0	0	+ 6	0	0	0	+11	0	+ 3	+12
19 ...	+20	0	0	0	+ 8	0	0	0	− 2	0	− 3	− 3
20 ...	0	0	0	0	−16	0	0	0	−12	+20	0	+ 2
21 ...	− 2	0	0	0	+ 4	0	0	0	− 3	+ 4	0	−18
22 ...	−14	0	0	0	− 6	0	+ 5	0	− 1	+ 2	+18	0
23 ...	− 4	0	0	0	− 4	0	+10	0	− 2	+ 9	− 6	+ 1
24 ...	0	0	0	0	0	+ 2	0	0	+12	− 8	+ 9	− 4
25 ...	0	0	0	+ 2	− 2	− 2	0	+24	+ 6	+ 1	+ 7	+ 6
26 ...	0	0	0	− 2	+ 5	0	+ 1	−24	0	+ 6	− 8	+ 1
27 ...	0	0	0	0	− 5	0	0	+24	+ 6	− 8	+ 2	− 2
28 ...	0	+ 3	0	+ 3	0	0	0	+ 3	− 4	+ 1	− 3	0
29 ...	0		0	+ 1	0	0	+10	+ 2	− 1	− 2	+ 1	+ 1
30 ...	+ 4		0	+10	0	0	+ 2	+ 7	+ 6	−10	− 2	− 6
31 ...	+10		0		0		− 10	− 6		− 4		+ 2
Sums without regard to signs.	104	23	47	34	116	40	98	134	151	134	129	134

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1891. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 1	+ 8	0	+ 8	− 9	+ 3	+ 5	+ 1	+11	+ 6	+13	+ 2
2 ...	− 3	−16	−13	0	+ 4	+ 9	−12	+10	+20	+ 3	−16	− 7
3 ...	0	− 8	− 4	− 3	−13	0	−11	+ 7	+21	+ 9	+ 5	− 4
4 ...	0	− 3	+ 6	0	+ 7	−14	−21	+19	+ 8	+18	+10	+ 2
5 ...	0	+ 3	+ 3	+ 1	− 5	−16	− 5	+16	+37	−14	−10	+ 2
6 ...	0	0	+ 5	− 1	+ 6	− 4	+ 4	− 9	−16	− 2	+11	+ 8
7 ...	+ 4	− 3	+ 3	0	− 4	+ 1	+12	+ 1	− 1	+16	+ 2	+ 2
8 ...	0	0	− 3	− 5	+11	− 2	+ 8	− 4	−10	− 3	− 2	+ 4
9 ...	− 4	+ 4	0	+ 7	− 6	+ 6	+19	− 5	−18	+ 1	−15	− 8
10 ...	0	+17	−10	− 2	+ 5	+11	+11	+ 6	− 8	−25	+ 5	− 8
11 ...	0	+ 9	+12	−16	+12	+ 2	+ 5	− 3	−14	0	− 9	− 3
12 ...	0	− 8	−10	+ 5	+ 6	+ 3	+ 2	− 1	− 1	−18	− 2	−15
13 ...	0	+ 2	+ 3	+ 2	+11	+ 3	+14	− 4	−11	− 7	−18	+11
14 ...	0	+12	+ 6	+14	− 4	+13	+ 9	− 1	− 1	− 2	+ 7	+18
15 ...	+ 3	0	− 3	− 1	− 5	+ 4	− 6	− 1	− 6	+ 2	− 2	− 3
16 ...	+ 9	− 1	0	+ 3	−20	+ 9	−26	+ 1	+10	+13	+11	+ 5
17 ...	0	− 1	+ 7	− 1	+ 4	+21	− 8	+ 1	+12	− 9	+ 9	−31
18 ...	+10	−14	+ 7	+ 5	+12	−24	− 4	− 8	− 5	− 1	+ 8	+33
19 ...	+18	+15	− 1	−12	− 3	− 8	+ 8	−32	+ 6	− 7	+17	+ 1
20 ...	−11	+ 1	−11	−15	+16	−22	+ 6	− 4	+ 4	− 4	+ 8	− 2
21 ...	−10	0	− 7	+13	+19	+24	0	+ 1	−22	− 2	+ 5	+14
22 ...	− 2	+ 2	+ 7	+16	−20	+15	−21	+10	−18	+ 7	−11	+15
23 ...	0	− 5	− 3	− 7	+16	− 2	+ 2	− 4	0	+14	− 8	− 1
24 ...	+ 3	0	0	+18	−18	−11	−17	+ 7	0	+ 1	+ 2	−17
25 ...	0	+ 7	− 8	− 7	+17	+ 8	−30	+17	+ 8	−18	+ 8	−10
26 ...	+11	−14	− 3	− 7	−27	+ 5	+ 4	−11	− 1	− 5	−35	+10
27 ...	+15	− 8	0	+12	+28	+ 3	+ 8	−10	− 7	+15	+ 5	− 5
28 ...	−12	− 1	0	+ 3	−13	+12	+ 2	−13	+21	−14	− 2	+15
29 ...	+ 4		0	− 3	−28	− 6	+ 6	+16	− 1	+ 6	+ 7	+ 5
30 ...	− 9		+11	− 6	+ 7	− 6	−22	+12	+14	− 9	−15	+11
31 ...	−10		0		− 3		− 1	− 5		+11		−12
Sums without regard to signs.	139	162	146	193	359	267	309	240	312	262	278	284

1892. Date.	January.	Febr uary.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+28	− 4	+ 3	−15	−17	−10	+ 9	+ 9	−10	+ 1	− 2	− 1
2 ...	+24	− 8	− 5	+ 3	+24	−14	+ 9	+11	+16	0	+ 2	+ 9
3 ...	− 2	+ 6	− 2	− 7	+10	−15	+ 1	− 5	−15	+12	0	+14
4 ...	−32	−16	+11	+ 3	−16	−16	+26	0	+ 7	+12	−10	+ 6
5 ...	+ 2	+26	+ 4	− 8	+20	−33	+ 7	−17	−14	+ 5	− 1	+22
6 ...	−31	−10	+ 3	+21	−35	+ 1	− 7	−30	−24	−42	−26	−23
7 ...	+ 7	− 7	− 3	0	+25	+15	+17	− 4	+46	−14	− 9	−56
8 ...	+ 1	+ 3	− 6	+ 5	−19	+ 3	+42	+ 6	−45	− 3	− 1	+31
9 ...	−21	+ 2	+ 8	0	−11	+ 7	+ 1	+ 7	+38	0	+ 4	+ 4
10 ...	+ 7	+13	+ 8	− 4	− 4	+ 4	− 2	+16	− 2	−11	0	+ 4
11 ...	−22	+24	+ 9	+10	+ 4	+ 3	−12	0	+16	−25	− 4	−22
12 ...	+ 4	+10	+ 6	+14	− 3	− 3	−30	+21	− 6	− 4	−16	+10
13 ...	− 5	+ 7	−15	−21	0	+16	+ 8	+ 2	− 2	+ 4	+15	−45
14 ...	+25	− 2	+11	−13	+14	−21	− 6	+ 1	+ 7	+34	− 5	−14
15 ...	+37	+12	−10	− 4	+ 6	− 4	−19	+15	− 2	−12	+ 5	+ 4
16 ...	+11	− 2	− 7	− 4	− 1	+23	− 7	0	−25	−31	+ 7	−15
17 ...	−12	−12	+28	+19	−11	+18	+31	−31	− 3	+15	+ 3	− 1
18 ...	+24	− 5	−13	+13	− 4	−13	+11	+ 6	+ 2	+19	+ 3	−16
19 ...	+12	−22	−14	+ 7	+13	+39	+ 4	−14	+12	− 1	+ 1	+ 1
20 ...	− 6	+ 9	+20	+21	+ 1	− 4	−40	−10	+ 8	+12	− 6	− 6
21 ...	+ 7	−21	+14	+21	+10	+ 6	−27	+37	− 6	+ 1	−17	+23
22 ...	−33	−12	+ 5	+11	+ 7	− 7	− 6	− 8	+ 2	+ 8	+25	+ 8
23 ...	+16	−23	+ 9	+42	+14	+ 2	+14	+ 2	0	+ 6	+10	+ 2
24 ...	−11	+12	+ 2	+ 3	+14	−28	+12	−46	+ 7	−40	+ 6	+42
25 ...	−12	−21	+14	−31	−23	+ 6	+24	−13	+ 7	− 8	− 8	+ 8
26 ...	−11	−17	− 1	−34	+13	−14	+12	−31	+ 8	−24	− 5	−12
27 ...	−15	+ 6	− 5	− 7	+23	− 5	− 2	+24	+14	0	+16	+ 3
28 ...	− 1	− 6	−25	+11	+ 8	−16	+ 2	+17	− 2	+32	+ 5	+ 5
29 ...	+17	0	+ 5	−26	−14	−10	+14	−17	+ 5	+23	+24	−14
30 ...	−31		−26	− 8	+10	−33	− 4	+ 5	+ 5	+19	− 4	−10
31 ...	+42		+ 3		− 8		+12	− 5		+ 2		+14
Sums without regard to signs.	509	318	295	386	382	389	418	410	356	420	240	445

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs*

1893. Date.	January.	February.	March.	April.	May.	June.	July.	August	September.	October.	November.	December.
1 ...	+39	+15	+15	+21	− 8	−14	−28	−20	− 9	+ 2	+ 3	+ 3
2 ...	−33	−27	− 9	0	−11	+ 9	− 6	+11	+11	+ 2	− 2	− 1
3 ...	−13	− 8	−28	+12	−29	+30	0	+37	+ 3	− 3	−26	+ 4
4 ...	+16	−48	+ 6	−27	+29	+ 7	+26	+28	+ 3	−20	+13	+ 2
5 ...	− 3	+27	+ 2	+ 1	− 7	+19	+13	+18	+10	+23	− 8	− 2
6 ...	−21	−16	−23	− 1	−38	+ 8	+ 6	+13	− 2	−12	+13	−30
7 ...	+ 9	0	+13	+25	+ 2	+ 5	+39	+32	+ 4	+ 6	+ 1	+10
8 ...	−27	− 3	+19	−14	− 8	−30	+ 7	+21	− 1	+ 1	+15	−19
9 ...	− 9	+39	−19	+21	− 6	− 7	+38	−23	−24	− 7	+ 9	−15
10 ...	+ 1	− 9	+ 8	− 6	+ 5	−30	+21	+46	− 3	+10	+22	+17
11 ...	−10	− 6	−17	+14	− 9	− 9	−14	−58	− 5	−11	+17	+ 9
12 ...	+ 1	+13	− 8	+16	+ 2	−16	−26	−22	+ 4	+ 3	+21	+ 2
13 ...	− 5	+19	+ 6	− 7	0	+ 9	+31	−40	+ 1	− 6	−15	+23
14 ...	− 7	− 5	+ 7	− 6	−10	+ 2	−78	−14	− 1	+13	− 7	+ 2
15 ...	+14	+ 7	−10	− 2	−10	+ 8	−11	−17	− 7	+25	+37	−10
16 ...	+ 5	− 3	− 9	− 2	+10	+13	−11	−13	−21	− 4	−22	+25
17 ...	+ 6	−23	− 2	−51	− 9	0	+11	+16	+32	−15	−21	+15
18 ...	+21	− 8	+ 1	+31	+26	−35	−33	+45	−27	− 2	+31	0
19 ...	+ 4	+11	+24	+ 8	−38	−17	− 4	+25	− 3	+15	−21	− 1
20 ...	+ 8	−11	+13	+23	− 6	− 4	+ 3	+15	+15	+19	+14	−33
21 ...	−10	+12	+ 3	−17	+16	+ 3	+ 1	− 7	−12	+ 9	−25	+97
22 ...	+ 1	− 4	−15	+10	−15	+28	−10	−10	+23	− 1	−32	−27
23 ...	− 8	+ 2	+ 3	+56	+22	+ 6	+ 6	+18	− 1	+ 7	− 5	+ 7
24 ...	+41	− 4	+21	−38	+17	− 4	− 5	−10	+23	− 9	+31	+41
25 ...	+15	+ 6	+14	+33	+39	+16	− 3	−49	+10	− 4	−10	−37
26 ...	+34	+15	+ 7	−33	− 4	− 1	− 6	−20	− 9	−31	−26	+18
27 ...	−30	− 5	− 9	+ 2	+ 5	−22	+15	−41	−28	+ 4	− 5	−14
28 ...	+21	− 5	+30	+ 9	+ 9	+13	−10	+ 9	− 4	+ 9	+10	−21
29 ...	− 9		−15	− 1	+ 7	− 9	−18	+23	0	−29	−16	+23
30 ...	−18		−12	+30	−17	+ 9	−12	−14	+ 4	− 5	+21	+11
31 ...	−15		−54		−19		+51	+11		−13		+10
Sums without regard to signs.	454	351	422	517	433	383	543	726	300	320	499	529

1894. Date.	Ja nuary.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−33	+12	−10	0	− 1	−21	+16	+14	− 8	+ 2	− 6	+48
2 ...	−70	− 6	−24	− 2	+12	−17	− 2	+56	+ 6	+11	+ 6	−13
3 ...	−16	− 2	−26	−11	− 6	+30	+11	−27	− 6	0	+22	+ 3
4 ...	+ 4	+11	+22	+13	+15	+20	−25	+19	− 9	+ 9	− 5	+22
5 ...	+ 4	+22	+ 9	−17	− 4	+ 7	+21	−13	+ 9	+34	+ 6	−10
6 ...	+17	+17	−10	+18	− 5	−16	+45	0	+29	+17	+27	+22
7 ...	−17	−17	− 9	+13	−15	+ 7	0	− 2	+ 4	+17	−25	− 9
8 ...	−16	− 1	+22	−26	+17	−23	−15	+15	+ 3	− 4	+ 6	−16
9 ...	+ 7	+20	− 1	+ 9	− 1	+23	+20	−18	+27	− 1	−11	−36
10 ...	− 7	−28	+18	− 6	−24	+14	−20	−13	−11	− 1	+ 6	+ 3
11 ...	+38	+36	+ 9	−20	− 7	−17	+24	+ 3	+18	−45	− 6	− 1
12 ...	− 8	−36	−15	− 4	+ 8	− 7	−16	− 8	− 1	+ 4	+ 7	−19
13 ...	− 4	+29	− 13	−12	− 3	+32	+26	− 4	+ 4	0	−14	0
14 ...	+20	−34	+18	+ 4	+30	+ 9	−44	+ 4	−37	−10	− 4	+ 2
15 ...	+ 1	+ 5	+ 2	− 7	+28	−24	+16	+ 8	+18	− 9	−21	+ 3
16 ...	+ 1	+ 8	−32	−26	− 1	+40	+29	+28	− 6	−31	−13	+ 5
17 ...	+18	− 2	−20	− 6	− 2	−22	−10	− 5	−18	−32	+ 8	−14
18 ...	−13	+20	+ 4	+ 3	+14	+ 4	− 8	+ 1	−29	+ 7	+16	+21
19 ...	+25	0	0	+11	+44	+ 2	−25	−18	−10	− 3	0	+ 4
20 ...	+8	+21	+11	+ 6	−27	−30	−10	0	0	+20	+ 4	−12
21 ...	−33	+16	− 5	+15	−18	−20	+ 5	− 5	− 4	+10	+ 7	+29
22 ...	− 6	−10	0	+21	−27	0	0	−14	+16	+11	+ 6	−15
23 ...	−27	−44	−16	+29	− 8	−17	+10	−11	− 2	−19	−15	+ 6
24 ...	+25	+ 3	+10	+ 2	−17	− 6	−12	−29	+11	+ 5	+20	− 4
25 ...	+52	+23	+ 9	−38	−23	−19	−34	−16	−29	+12	−21	− 2
26 ...	− 8	−32	+17	+22	0	+14	− 2	+17	− 3	−15	+10	+13
27 ...	−36	+14	− 2	+ 5	+ 4	−14	0	+14	0	− 2	+17	−15
28 ...	− 8	− 6	+33	−13	+16	+ 1	−20	+ 6	+22	+14	−17	+11
29 ...	−23		+ 6	+16	0	+32	+ 4	− 8	−24	+ 3	− 3	−24
30 ...	−35		+ 8	−18	− 9	−11	+ 1	+11	+31	+ 6	−15	+ 9
31 ...	+11		+ 9		+23		−14	+10		−22		+23
Sums without regard to signs.	591	475	390	393	409	499	485	397	395	376	344	414

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1895. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−37	+11	+11	+11	− 4	+11	+ 2	+27	+ 1	+ 4	+10	+ 2
2 ...	+ 4	+ 9	−29	+22	+16	+ 5	−16	+20	+10	+23	−13	+16
3 ...	+10	−23	− 9	−16	−40	−17	+ 4	+18	+ 1	−21	− 8	+26
4 ...	+27	− 2	−16	−10	−27	− 4	+ 4	+ 1	−12	−33	− 9	−20
5 ...	+ 1	−20	+18	+15	0	+15	− 9	+ 5	+12	+17	0	+13
6 ...	−32	−15	−12	− 9	− 9	+19	+ 1	+31	+ 4	− 1	−30	+ 6
7 ...	+29	+12	+ 1	−14	+23	− 12	+15	− 7	0	−36	−10	− 2
8 ...	−33	−23	+14	+12	− 3	0	+18	− 8	0	−15	− 3	+24
9 ...	+24	+ 7	+ 1	+ 7	− 9	+11	+17	−29	− 4	−16	−20	+19
10 ...	+12	− 2	+ 4	+11	+ 7	− 8	−10	0	− 6	−19	−17	−25
11 ...	−12	− 3	0	+ 4	−12	−10	− 4	−14	−22	0	+ 8	+33
12 ...	−14	− 1	−22	− 4	+43	−15	− 6	+ 7	+14	+32	− 1	+ 6
13 ...	−25	− 3	+20	− 4	−12	+13	+ 3	−22	+19	−14	+18	− 5
14 ...	− 8	+ 9	−20	−26	+ 8	0	− 3	−14	+ 3	+ 4	− 8	−17
15 ...	+20	− 5	+11	− 1	−25	+35	−21	+ 2	+ 8	− 9	+43	−23
16 ...	−14	+ 2	+21	+10	− 5	+12	−10	− 6	+10	− 3	+ 8	+12
17 ...	+ 7	+22	−21	+ 7	+ 7	−33	+ 8	+11	−18	−14	−13	− 9
18 ...	+16	+ 8	−20	25	+ 3	− 9	−17	+ 4	−14	0	−10	+24
19 ...	+ 8	−15	+17	+ 8	+19	− 7	−23	−13	+ 1	+ 9	+ 4	−23
20 ...	−21	+ 3	− 2	+ 7	−16	+ 6	+ 8	+ 5	+ 3	+ 4	+ 6	−12
21	+30	0	+ 5	+34	+29	−17	+ 4	+ 1	0	+24	−13	+20
22 ...	− 7	− 5	− 1	−17	− 2	+ 4	− 1	−25	0	+15	+27	−10
23 ...	+34	+ 7	0	+13	+29	+13	+12	0	+ 3	− 7	−23	+18
24 ...	−24	+30	−21	+ 8	+52	+ 2	−12	+22	+ 8	+45	0	+11
25 ...	+10	−18	+ 6	+ 3	− 6	− 8	−18	− 2	− 9	− 5	+ 2	−23
26 ...	− 4	+ 2	+ 5	+38	−11	−14	0	−19	+46	−23	−12	+19
27 ...	+45	+33	0	−33	−18	+ 6	+16	+15	+ 4	+25	+ 6	−18
28 ...	− 7	−28	− 5	− 6	−10	+ 1	+21	−11	+ 3	+ 2	− 2	−16
29 ...	+22		− 6	−11	−13	+15	− 3	− 1	− 3	−12	+ 3	−17
30 ...	−20		+ 2	− 5	−21	−13	−12	+ 1	+16	+28	−29	+ 1
31 ...	−23		+10		−16		+ 9	0		−19		+10
Sums without regard to signs.	580	318	330	391	495	335	307	341	254	479	356	480

1896. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 5	+10	+ 4	−17	− 2	+ 7	+ 4	0	− 1	−10	+ 5	− 2
2 ...	−14	− 4	−23	+28	− 4	+ 4	+ 6	+ 8	−22	− 2	− 8	+18
3 ...	+ 3	+ 1	+44	−19	+ 3	+ 1	11	+ 1	− 6	+ 3	+11	− 1
4 ...	− 3	0	−24	+20	+ 1	−28	+ 8	− 2	− 3	− 7	+11	−14
5 ...	+16	− 5	−12	−20	+ 6	− 2	+ 6	− 2	+10	−10	− 8	+33
6 ...	+ 4	− 1	− 5	−17	−10	+ 1	− 1	− 5	− 6	+14	− 7	− 7
7 ...	−20	− 8	−18	−11	− 5	− 7	+10	−10	+14	− 7	+12	− 4
8 ...	+ 1	+20	− 1	− 9	+14	− 8	−11	0	+16	+ 9	+ 6	− 9
9 ...	−20	−30	−20	+ 3	−13	+24	− 1	+13	+25	− 9	+19	+16
10 ...	− 9	0	+ 7	−14	− 4	+19	0	+10	+ 5	+14	+13	−12
11 ...	0	− 6	−21	+ 1	+ 8	+16	− 1	− 7	+13	+ 4	+ 1	−18
12 ...	+ 4	+ 8	+10	−25	− 4	+ 3	− 5	+ 4	+18	+ 1	+10	+ 3
13 ...	+22	+ 9	0	− 9	+ 8	+10	+34	+ 6	−20	− 6	− 5	− 4
14 ...	−26	+21	+ 8	− 5	− 9	−30	+15	− 1	+11	+ 8	+14	− 3
15 ...	+ 7	−26	+13	− 7	− 6	+11	−29	+ 4	0	− 7	−47	+12
16 ...	− 1	−11	−33	0	−14	−14	+ 1	+16	+13	+ 4	− 4	−29
17 ...	+ 1	−15	0	0	+14	− 3	+ 8	− 6	− 8	+19	+ 4	+34
18 ...	− 1	+ 5	+15	+13	+ 2	−13	+ 9	− 3	+ 7	+18	−16	− 3
19 ...	+ 8	+13	+ 5	0	+ 1	−24	+10	+12	−29	+ 7	−14	+14
20 ...	0	+20	+20	+18	+10	− 2	− 6	− 8	+16	−19	− 5	−22
21 ...	+ 1	+ 5	−17	+ 6	− 3	+10	+ 5	− 4	−23	− 4	+22	+31
22 ...	− 8	+42	+16	+ 2	+ 2	+24	−31	+ 4	−25	+11	− 4	−16
23 ...	+11	+24	+12	+ 2	−10	+16	+ 4	0	− 8	− 9	− 2	− 9
24 ...	− 5	−14	+18	−11	− 5	+15	−17	− 7	+ 8	− 1	− 3	− 9
25 ...	0	−31	− 7	+13	+ 6	−12	0	− 2	−20	− 6	− 8	+14
26 ...	+15	+30	−11	+ 3	+16	+ 2	− 4	− 6	−11	− 7	+ 9	− 4
27 ...	+17	−18	−35	− 2	+14	−17	−14	+ 1	−10	+ 2	− 2	0
28 ...	+ 3	+ 6	+11	− 3	+20	−12	0	− 3	+11	− 7	+ 3	+ 9
29 ...	− 9	− 9	− 5	−19	− 6	−11	+ 1	+ 8	+ 1	−13	− 8	− 2
30 ...	+ 4		+32	+ 9	0	+ 1	− 8	+29	0	+ 9	+13	+12
31 ...	− 1		+33		−12		− 2	−10		− 6		−29
Sums without regard to signs.	239	392	480	306	232	347	262	192	360	253	294	393

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1897. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+22	+ 9	- 4	0	+14	0	- 1	- 7	+ 9	- 5	- 4	- 4
2 ...	- 8	+ 8	0	+15	0	- 4	+ 4	- 2	+ 9	+ 8	+ 7	+ 1
3 ...	-18	0	+ 3	+ 1	+14	+ 1	+ 5	+ 1	+26	-15	- 7	- 4
4 ...	+34	+ 8	+ 4	- 3	0	+ 3	-14	- 4	- 9	+15	- 2	+28
5 ...	- 9	-22	+ 4	- 5	+ 8	- 3	0	- 2	+23	+ 5	0	- 5
6 ...	- 4	+ 4	+ 1	+18	-26	- 7	- 1	+13	-10	-20	+ 1	+ 2
7 ...	+18	-21	- 8	+11	+ 1	0	+10	+ 2	- 9	+ 6	+ 2	+10
8 ...	-17	0	-17	0	+ 1	- 7	+15	- 2	+16	- 8	- 1	+ 5
9 ...	+ 9	-24	+16	+17	-10	0	- 6	+12	+14	-11	- 2	- 9
10 ...	0	+ 8	0	- 5	- 2	0	- 4	- 5	-30	+ 6	- 7	-13
11 ...	-18	0	-24	-25	- 9	0	- 8	- 8	-18	+ 5	0	+23
12 ...	- 4	- 7	- 6	+ 4	+ 2	+10	- 4	+15	0	-11	0	-10
13 ...	+15	- 3	+ 2	-16	-13	+ 9	+ 4	-13	-13	+13	+17	- 8
14 ...	- 9	+ 1	-11	-14	0	0	+14	+ 9	- 3	-15	- 9	+ 5
15 ...	+ 4	+ 3	+22	-17	0	- 4	+ 1	-20	-19	+10	- 8	- 4
16 ...	- 1	- 7	+ 8	+ 2	0	- 6	- 3	- 4	- 1	- 6	0	+ 5
17 ...	+ 2	+ 9	+ 4	- 7	0	- 2	-12	- 2	- 3	0	+ 9	-14
18 ...	- 9	- 5	-21	0	0	- 7	- 5	- 7	+27	- 1	- 2	- 3
19 ...	+11	- 4	- 7	+16	+ 8	0	- 2	+ 2	+13	-10	0	- 9
20 ...	-10	0	+ 3	- 5	+ 5	+ 7	+ 5	- 1	- 4	+16	+11	-20
21 ...	+ 4	0	-16	0	+13	+ 6	+10	0	+17	+ 4	- 2	- 1
22 ...	- 5	+ 1	+ 13	-11	- 8	+14	+ 6	+11	-18	-10	-16	0
23 ...	+15	+ 8	- 6	- 7	+ 5	-13	-11	- 5	+12	- 2	0	0
24 ...	-17	+10	+12	0	-12	+ 2	+ 6	+ 3	0	+ 1	0	0
25 ...	-10	+ 8	+ 2	+ 7	+12	0	+ 6	- 1	- 9	- 9	+11	- 7
26 ...	- 5	+ 6	0	+ 7	- 9	0	- 7	+ 6	- 5	0	+ 5	+ 9
27 ...	-13	+ 6	- 4	-14	+ 6	- 9	- 6	+ 1	+ 9	0	- 9	+11
28 ...	+14	+ 1	+14	+ 7	+ 4	+ 6	+ 6	-15	- 6	0	+ 6	- 4
29 ...	+ 4		0	+18	0	+ 6	+ 2	+ 6	+ 9	0	- 5	- 1
30 ...	-10		+ 2	- 5	- 4	+ 4	- 6	+ 3	-18	0	+24	+ 8
31 ...	+35		- 2		- 3		+ 4	+ 8		+13		+ 1
Sums without regard to signs.	354	183	236	257	189	130	188	190	359	225	167	224

1898. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 4	0	- 1	- 5	+ 9	-15	-15	+ 2	+ 6	+10	+24	- 8
2 ...	- 5	0	- 6	+ 6	-11	+12	-14	+11	- 9	-17	- 4	+ 7
3 ...	+ 7	0	+22	+ 2	-15	+ 1	0	- 4	+ 3	+ 6	- 1	+ 1
4 ...	+ 4	+21	+ 8	- 6	+12	-19	0	- 2	+ 1	+25	+ 3	- 1
5 ...	- 2	- 1	+ 8	+ 2	-17	- 8	0	- 6	+23	+ 4	+ 7	- 1
6 ...	- 6	+15	- 9	+13	+ 8	+ 9	0	+ 5	- 2	-19	+ 1	- 1
7 ...	+ 2	+ 2	+19	+ 3	+19	- 1	0	-14	+22	+ 4	- 5	+ 7
8 ...	-15	- 9	+12	+ 4	+ 5	- 2	0	- 4	-11	-10	-15	- 3
9 ...	+12	+22	+14	- 6	+ 7	-21	0	+ 3	+ 4	- 6	- 1	- 3
10 ...	- 6	+ 3	- 1	+13	-27	+10	+ 8	- 5	+ 5	-11	+ 2	- 4
11 ...	- 6	- 7	- 3	-21	+ 4	- 2	- 8	0	+ 6	- 7	-17	- 7
12 ...	+ 2	+ 8	- 4	- 3	- 3	- 1	0	+20	+ 6	+ 9	- 3	- 1
13 ...	+ 2	+10	+ 4	+ 1	+19	0	+15	- 9	- 3	-11	- 8	- 2
14 ...	+ 6	-16	+11	-17	- 9	+ 6	-15	- 8	-13	+ 2	- 8	- 1
15 ...	+ 1	+22	-21	+ 9	- 1	+ 7	+ 8	- 1	- 3	+ 3	- 3	- 7
16 ...	+12	0	-15	- 9	- 2	+ 4	+ 3	-11	-13	+ 5	0	+10
17 ...	+11	-13	-18	0	-11	+ 1	- 3	+ 4	+ 1	-12	- 3	- 1
18 ...	+14	+34	-17	0	- 2	+ 9	- 1	-17	- 2	- 1	+ 3	+ 6
19 ...	+ 4	-23	-12	0	- 1	+ 4	+ 2	- 8	-11	+17	+ 1	+ 1
20 ...	-20	-22	-14	0	+ 7	-25	+ 2	- 8	-13	-24	- 2	- 8
21 ...	+ 3	-30	0	0	+ 8	- 3	0	+ 8	- 3	+ 1	- 2	- 1
22 ...	0	0	+22	0	- 3	0	+ 8	+ 9	+13	- 1	+ 1	0
23 ...	+ 3	+13	-22	0	-10	+12	- 4	0	- 7	+12	- 3	- 7
24 ...	- 3	-12	0	+ 8	0	- 7	+ 2	-10	+ 4	+ 5	+ 2	0
25 ...	+ 4	- 1	+ 7	0	+ 8	+16	+ 2	- 7	- 9	+ 1	+ 4	0
26 ...	-27	+ 8	+ 2	+ 6	+ 4	+13	- 2	+20	+ 6	+ 9	- 1	0
27 ...	- 2	- 4	0	+ 5	+ 1	-13	-10	0	- 5	+22	0	0
28 ...	- 4	+ 3	- 1	+17	- 7	+ 5	0	+ 6	+20	- 1	+ 3	0
29 ...	- 9		- 1	+ 3	-16	-13	+ 3	-18	+ 6	+10	+ 2	+14
30 ...	- 2		- 7	- 8	+13	+ 6	+ 5	0	+ 3	-25	+ 6	+15
31 ...	- 8		+14		+24		+37	+ 8		0		-11
Sums without regard to signs.	206	299	295	167	283	245	167	228	233	290	135	128

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1899. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	− 7	+ 7	+ 3	+ 3	− 1	+ 2	+ 1	− 3	− 7	− 1	−11	+ 3
2 ...	+23	+ 9	+ 4	− 5	0	− 9	−11	+11	0	− 8	− 1	0
3 ...	−11	− 2	+ 5	+ 8	0	+ 7	+13	−11	+ 7	− 7	− 7	− 3
4 ...	+ 3	− 2	−14	− 3	0	0	+ 3	0	0	0	0	+ 6
5 ...	+ 7	− 5	−11	0	0	+ 5	− 2	0	0	0	0	− 1
6 ...	+25	+ 2	0	− 3	− 7	+ 2	− 2	0	− 7	0	0	+ 1
7 ...	−19	−12	0	− 3	0	+ 1	− 8	0	0	0	0	+ 1
8 ...	0	+10	0	− 7	0	+ 8	+ 3	0	0	0	0	+ 3
9 ...	+ 6	− 7	+ 7	+ 9	0	+ 3	+ 2	0	0	+ 7	0	−10
10 ...	−22	− 1	+ 7	+ 6	0	− 3	− 2	0	0	0	0	− 7
11 ...	+ 3	− 4	− 7	+14	0	+ 4	+ 9	0	0	+ 8	+13	+ 7
12 ...	− 5	− 8	0	− 6	+ 7	+10	− 4	0	0	− 7	− 6	+ 5
13 ...	− 4	0	+ 2	+ 6	0	− 6	− 2	0	+ 5	− 8	+18	0
14 ...	− 2	+ 7	− 1	−13	− 6	− 3	− 7	0	+ 9	0	−18	+12
15 ...	+ 2	− 7	+ 8	0	+ 6	+ 5	+ 2	0	− 8	0	+ 7	+ 8
16 ...	− 1	0	+11	+ 1	+ 9	− 6	− 4	0	− 6	0	+ 4	− 2
17 ...	− 1	0	+ 7	− 4	−16	+ 4	−14	0	0	0	+ 5	− 3
18 ...	− 8	0	− 2	+ 2	+14	− 5	0	0	+ 7	0	− 3	− 2
19 ...	+ 2	+ 7	+10	− 1	+ 1	− 4	0	0	+ 1	0	− 1	− 3
20 ...	− 9	0	− 5	− 4	+10	− 7	0	0	− 1	0	− 9	−22
21 ...	0	− 5	+ 6	+ 5	−14	−15	0	0	0	0	− 9	0
22 ...	+ 4	+ 6	+ 9	− 2	− 1	+ 2	0	0	0	0	− 1	0
23 ...	+10	− 1	−24	+ 7	0	+ 5		0	0	+15	+ 7	+ 2
24 ...	− 4	− 7	−11	− 6	+ 3	+ 3	0	0	− 5	+ 4	− 2	− 2
25 ...	+ 3	0	+ 5	0	− 1	+ 6	0	+ 7	+ 7	+17	+ 7	0
26 ...	+ 1	0	+ 4	+ 2	− 1	+10	+13	+13	+20	+13	− 1	0
27 ...	+ 3	0	− 3	+ 3	0	+11	− 1	0	+ 6	+19	−11	0
28 ...	− 3	+13	− 9	− 8	− 1	− 4	− 5	− 7	+ 2	− 6	+11	+ 7
29 ...	− 1		− 7	− 2	− 2	+14	+16	−13	− 3	−10	− 2	+ 1
30 ...	+ 4		+ 1	− 1	0	−24	− 9	+13	−18	− 28	− 2	0
31 ...	− 4		+ 2		− 1		−11	− 6		− 5		− 1
Sums without regard to signs.	197	122	185	134	101	188	144	84	119	163	156	112

1900. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	0	0	−13	−11	− 3	−20	0	+ 8	0	+ 1	0
2 ...	0	− 3	+ 7	+ 1	+11	− 9	− 1	0	+ 6	+ 7	+13	0
3 ...	− 5	− 1	+ 5	+ 1	+ 1	0	+ 7	0	+ 3	− 7	−14	0
4 ...	− 2	+36	+ 4	− 2	−13	−10	− 5	0	− 1	0	0	0
5 ...	0	− 6	− 7	+ 2	− 4	− 1	− 9	0	+ 3	0	0	0
6 ...	0	+12	+28	− 6	−10	− 1	0	0	+10	0	0	0
7 ...	0	− 6	− 7	+ 6	−15	0	0	+ 5	− 8	+ 9	0	0
8 ...	0	− 4	−13	− 5	− 9	0	0	+ 4	+ 1	+ 8	0	0
9 ...	0	+13	+ 3	0	− 1	0	0	+ 4	0	− 4	0	0
10 ...	0	−22	− 7	− 1	0	0	0	+ 6	+ 1	+ 8	0	0
11 ...	0	−11	− 6	0	0	0	0	+ 6	− 16	− 7	0	0
12 ...	+13	+ 5	− 7	+ 3	0	0	0	+ 1	+ 8	− 5	0	0
13 ...	+18	−17	0	0	0	0	0	− 7	− 8	− 2	+ 7	0
14 ...	− 4	− 1	0	− 3	+ 9	+ 3	+ 7	−12	− 7	− 7	+ 1	0
15 ...	−11	+ 1	0	0	+ 1	+ 6	+11	− 7	+ 8	0	− 1	0
16 ...	+ 7	− 7	0	− 7	−10	+ 6	+ 4	0	− 1	+10	0	0
17 ...	−10	0	0	0	0	+ 2	− 6	0	− 7	+ 5	+ 5	0
18 ...	− 4	0	0	0	0	+ 7	+ 6	0	0	+ 9	− 1	0
19 ...	− 2	0	0	+ 7	+ 2	+ 1	+ 8	0	0	+ 4	+ 8	0
20 ...	0	0	0	0	− 1	+ 4	−10	0	0	+ 3	− 9	0
21 ...	− 7	0	0	0	+ 9	+10	− 4	0	0	+ 4	+ 4	0
22 ...	0	0	0	0	+ 4	−10	+ 9	0	0	+ 1	− 4	0
23 ...	+ 7	0	0	+ 8	+ 1	− 9	−11	0	0	− 5	− 3	0
24 ...	+ 3	0	0	+ 2	0	− 1	+ 2	0	+ 7	−12	+ 1	0
25 ...	+ 2	0	+ 7	+18	− 1	− 2	− 9	0	− 7	+ 5	− 8	0
26 ...	+13	0	+ 3	− 4	− 1	− 9	0	0	0	−15	0	+ 7
27 ...	− 8	0	− 3	+ 8	+14	− 8	− 7	0	+ 7	0	0	− 5
28 ...	+ 1	0	+ 1	+13	− 2	+ 9	0	+ 1	− 7	+ 5	0	− 2
29 ...	− 6		+ 9	+16	−13	+15	0	− 1	0	− 2	0	0
30 ...	+ 4		+ 8	−17	+14	+ 4	0	+ 8	0	− 5	0	
31 ...	− 5		− 1		− 2		0	− 8		− 7		0
Sums without regard to signs.	132	145	126	143	159	130	136	70	124	156	80	14

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1901. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	0	0	0	0	−10	0	0	0	0	− 4	0
2 ...	0	0	0	0	0	+15	0	+10	0	0	− 8	0
3 ...	0	+ 7	+14	0	0	− 8	0	− 3	0	0	0	0
4 ...	0	0	+ 4	0	0	− 7	0	− 7	0	0	0	0
5 ...	0	+ 1	+ 6	0	0	0	0	0	0	0	0	0
6 ...	0	+ 6	− 4	0	6	0	0	0	0	0	0	0
7 ...	0	− 4	−12	0	0	0	0	0	0	+ 7	0	0
8 ...	0	− 3	+11	0	0	0	0	0	0	0	0	0
9 ...	0	0	+ 2	0	0	0	0	0	0	+ 2	0	0
10 ...	0	− 7	− 7	0	0	0	0	0	0	+ 5	0	0
11 ...	0	0	−14	0	0	0	0	0	+ 8	− 4	0	0
12 ...	0	+ 7	0	0	0	0	0	0	+ 1	+10	0	0
13 ...	0	− 7	0	0	0	0	0	0	− 9	−20	+ 8	0
14 ...	+ 7	0	0	0	0	+ 7	0	0	0	0	− 1	0
15 ...	− 7	0	0	0	0	+ 3	0	0	0	0	0	0
16 ...	0	0	0	0	0	− 2	0	0	0	0	+ 4	0
17 ...	0	0	0	0	0	+ 1	0	0	0	0	− 4	0
18 ...	0	0	0	0	0	− 1	0	0	0	0	+ 1	0
19 ...	0	0	0	0	+ 9	+ 8	0	0	0	0	+ 2	0
20 ...	0	0	0	0	+11	− 7	0	0	0	0	− 3	0
21 ...	0	0	0	0	+ 5	− 1	0	0	0	0	0	0
22 ...	0	0	0	0	+14	0	+ 7	0	0	0	0	0
23 ...	0	0	0	0	− 3	+ 8	0	+ 7	0	0	+ 4	0
24 ...	0	0	0	0	+ 3	+ 6	0	− 7	0	0	− 2	0
25 ...	0	0	0	0	−13	− 5	− 7	+ 7	0	0	− 1	0
26 ...	0	0	0	0	+ 2	− 3	0	− 7	0	0	− 8	0
27 ...	0	0	9	0	+ 1	−14	0	0	0	0	0	0
28 ...	0	0	0	0	− 9	0	0	0	0	+11	0	0
29 ...	0		0	0	− 1	0	0	0	0	− 1	0	0
30 ...	0		0	0	− 3	0	0	0	0	+ 6	0	0
31 ...	0		0		− 6		0	0		− 4		0
Sums without regard to signs.	14	42	74	0	80	106	14	48	18	70	50	0

1902. Date.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	0	0	0	0	+ 6	0	0	0	− 3	− 7	0
2 ...	0	0	+10	0	0	− 7	0	0	0	+ 1	0	0
3 ...	0	0	+15	0	0	0	+ 8	0	0	− 1	0	0
4 ...	0	0	+ 2	0	0	0	− 1	0	0	− 7	0	0
5 ...	+15	0	+20	0	+ 7	− 7	− 7	0	0	+23	0	0
6 ...	− 1	0	+ 3	0	− 7	0	0	0	0	+ 7	0	0
7 ...	+ 2	0	+ 6	0	0	0	+13	+ 7	0	− 1	0	0
8 ...	− 3	0	− 9	0	0	0	−13	+ 1	0	0	0	0
9 ...	+ 4	0	−16	0	0	0	0	− 8	0	+ 3	0	0
10 ...	+ 8	0	− 9	0	0	0	0	0	0	−13	0	0
11 ...	− 3	0	− 1	0	0	0	0	0	0	− 1	0	0
12 ...	− 8	0	− 4	0	0	0	0	0	0	− 7	0	0
13 ...	− 1	0	0	0	0	0	0	0	0	− 3	0	0
14 ...	+ 3	0	− 9	0	0	0	0	+ 7	0	− 1	+10	0
15 ...	− 9	0	− 8	0	0	0	0	0	0	0	+16	0
16 ...	− 7	0	+ 7	0	0	0	0	+ 1	0	+ 6	− 6	+13
17 ...	0	0	− 7	0	0	0	0	+ 3	0	−13	− 7	− 3
18 ...	0	0	0	0	0	0	0	− 4	0	0	+ 8	0
19 ...	0	0	0	0	0	0	0	− 7	+12	0	+ 3	−10
20 ...	0	0	0	0	0	0	0	0	+ 5	+ 8	+ 8	0
21 ...	0	0	0	0	+ 9	0	0	0	+ 3	− 1	+ 8	0
22 ...	0	0	0	0	− 9	0	0	0	+ 8	+10	− 7	0
23 ...	0	0	0	0	+ 8	+ 8	0	0	+ 1	+11	− 7	0
24 ...	0	0	0	0	0	− 8	0	+ 8	+ 1	− 3	+ 6	0
25 ...	0	0	0	0	− 1	0	0	− 8	−16	+12	−13	0
26 ...	0	0	0	0	0	0	0	0	+ 9	+ 2	− 6	0
27 ...	0	0	0	0	0	0	0	0	− 4	−17	−13	0
28 ...	0	0	0	0	+ 3	0	0	0	− 4	+ 6	0	0
29 ...	0		0	0	− 2	0	0	+ 7	− 4	− 5	0	0
30 ...	0		0	0	0	0	0	− 7	− 1	− 7	0	0
31 ...	0		0	0	0		0	0		− 9		0
Sums without regard to signs.	64	0	126	0	46	36	42	68	68	181	125	26

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespectie of their algebraic signs.*

1903. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	0	- 2	0	- 1	-16	0	+17	+11	- 5	0	+ 9	+16
2 ...	0	+ 2	- 2	-11	- 4	0	+ 1	0	0	0	+ 2	- 7
3 ...	+ 5	- 3	- 2	-17	-28	+ 5	+ 2	- 1	0	+ 5	0	+58
4 ...	+11	- 1	- 13	+ 4	+ 2	- 1	-11	- 1	0	+ 7	+ 4	-13
5 ...	- 8	- 1	+ 1	- 4	-21	+ 4	+ 1	+ 1	+ 8	+18	+45	-12
6 ...	+ 2	+ 1	- 8	+ 6	-14	- 1	- 2	- 4	- 8	+12	- 8	+ 2
7 ...	+ 5	0	0	+ 1	+ 7	- 7	+18	+10	0	+ 7	-14	+24
8 ...	- 8	- 1	0	+ 1	- 7	0	+24	+11	0	+24	+ 6	- 1
9 ...	0	+15	+ 7	-11	0	+ 8	- 3	+22	+20	+10	- 2	+14
10 ...	- 7	+ 7	- 7	+ 3	0	+ 5	+12	+12	- 4	+13	-37	-18
11 ...	+ 7	+ 3	0	+11	0	+ 1	0	-11	- 3	-13	+25	-27
12 ...	0	- 4	0	-11	+ 7	- 6	0	+30	- 4	-29	+ 3	- 6
13 ...	- 7	- 3	+ 17	-11	+ 1	+ 4	-22	-22	+ 2	+11	-41	- 9
14 ...	0	- 8	- 7	- 3	- 1	0	-14	- 1	+ 7	- 2	- 5	+ 5
15 ...	0	- 5	+ 4	- 1	0	+ 2	+12	- 2	+20	-21	-21	+ 2
16 ...	0	+ 4	- 14	- 7	+ 2	- 1	0	- 6	- 2	- 7	+ 3	- 4
17 ...	0	+ 1	0	0	- 2	- 1	- 4	+ 3	-19	+ 1	-10	+15
18 ...	+ 7	- 1	0	+13	0	+ 7	- 2	-50	-10	-26	- 2	- 3
19 ...	+ 6	+ 9	0	+ 4	+ 1	+15	-10	+10	0	-11	0	-16
20 ...	- 3	- 5	0	- 3	+ 9	+24	+ 3	-11	- 7	+ 7	+ 4	-12
21 ...	0	- 6	+ 7	- 7	+ 6	0	- 5	+ 6	0	+ 6	- 2	+ 9
22 ...	+ 7	- 2	+ 9	+15	- 5	-13	-10	+ 2	0	- 4	+ 2	- 9
23 ...	+ 8	+ 1	+ 1	- 6	-10	+ 1	+ 7	- 2	+ 9	- 9	- 7	- 1
24 ...	-15	+ 9	+ 5	+ 3	0	-12	+15	+ 1	+ 5	0	+15	- 4
25 ...	+ 4	+ 3	- 5	+ 6	+17	-11	- 3	+ 2	+10	+10	- 7	- 7
26 ...	- 7	- 6	- 2	+21	- 3	- 4	+11	-10	- 6	+ 2	+ 6	- 4
27 ...	- 7	+ 1	+ 1	+19	-15	- 4	- 8	+ 3	+ 6	+ 9	+10	-11
28 ...	+16	+ 4	+ 13	-13	+22	- 7	+ 2	0	- 4	- 7	-16	+25
29 ...	- 1		+ 16	-15	-16	- 8	+ 1	+ 1	- 3	+ 7	+ 6	+ 9
30 ...	+ 3		+ 9	-44	- 6	0	-10	- 2	- 9	+18	- 2	+10
31 ...	- 6		- 3		- 7		-15	- 4		+ 7		-28
Sums without regard to signs.	150	108	153	272	229	152	245	252	171	303	314	381

1904. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+44	+ 8	- 7	-17	- 9	- 8	- 2	-13	+ 8	- 1	-32	- 6
2 ...	-13	+ 2	+ 9	+ 3	+13	+ 2	+ 1	+ 9	-25	0	- 8	-21
3 ...	- 2	- 2	- 1	+12	-13	- 1	+10	-19	-13	- 3	-15	0
4 ...	-13	+14	+ 5	- 8	- 2	+ 8	-14	+22	-22	0	- 2	0
5 ...	0	+ 3	- 3	+ 6	+ 2	+ 8	- 2	+ 5	+ 2	+16	+ 7	+15
6 ...	- 4	+ 5	+ 3	-28	+ 3	+ 9	+ 9	- 1	0	+ 1	+20	0
7 ...	- 3	- 8	+ 3	- 3	-23	0	- 6	-20	- 1	+15	-14	+37
8 ...	+ 3	+ 4	+ 6	+13	+35	+ 1	+ 1	+27	+ 6	+12	-16	+13
9 ...	0	+23	+ 1	+ 5	- 5	-18	-19	- 8	- 3	+ 1	- 3	+ 4
10 ...	-12	-12	+ 1	+ 8	- 3	+17	+15	+11	+15	- 9	+ 1	+14
11 ...	- 8	- 4	- 11	+ 3	+ 5	0	- 3	+ 3	- 6	+ 6	+11	+18
12 ...	+ 6	- 1	- 10	+ 6	-19	+ 2	0	- 3	- 6	0	- 9	- 4
13 ...	0	- 3	- 4	+ 1	+ 8	+17	+ 4	0	+ 5	+ 7	+10	- 5
14 ...	+10	-10	+ 15	- 9	0	+23	+ 4	-13	+ 1	-20	- 4	- 5
15 ...	- 7	- 4	+ 1	- 4	+ 2	-23	+23	-10	-15	-10	+12	- 9
16 ...	+ 6	- 7	- 9	+ 6	+ 3	- 9	+26	- 4	+10	+ 9	+ 4	-16
17 ...	+13	+ 4	+ 8	+ 2	-24	- 3	+ 7	-21	- 3	-12	- 4	0
18 ...	+15	- 4	+ 7	- 1	+ 1	+ 3	- 5	+ 9	+10	- 6	+15	-27
19 ...	-11	+18	+ 15	+11	-12	+ 1	+ 5	+10	+ 9	+18	-14	- 9
20 ...	- 9	+ 4	+ 22	-13	+ 6	+ 1	-16	- 3	+ 1	+ 6	+ 9	-17
21 ...	+ 6	+ 9	- 13	+12	- 7	0	-32	-11	+ 1	- 8	- 4	- 1
22 ...	+37	-16	+ 7	+22	- 2	- 9	+10	+14	+25	+ 5	- 3	- 3
23 ...	-11	+12	- 3	+ 6	+ 8	+10	+13	+ 6	+ 3	-11	+32	+12
24 ...	+ 8	- 3	- 2	- 4	- 8	-12	- 8	+24	-12	- 8	- 9	+ 3
25 ...	-28	- 6	+ 4	+ 2	+13	+ 2	- 2	+20	-12	+35	- 1	-15
26 ...	- 9	+ 6	- 10	-21	- 8	-20	- 6	+33	- 1	+ 1	+ 6	+19
27 ...	-10	- 2	- 1	- 9	+ 8	- 4	- 9	- 5	- 6	+13	- 8	-28
28 ...	- 7	- 3	+ 5	+ 7	+11	- 3	+ 4	+11	- 6	+10	- 5	+ 5
29 ...	- 8	- 9	+ 11	+ 6	-14	+ 9	+11	0	- 5	-38	+12	+ 5
30 ...	- 1		- 20	0	+ 8	+11	- 2	-24	+ 5	+ 9	-17	- 3
31 ...	- 8		- 3		-10		- 5	-37		+10		+17
Sums without regard to signs.	312	206	220	248	285	234	274	396	237	300	307	331

TABLE 543.—*Showing the differences of consecutive sun-spot numbers from one day to the next published in the volumes of the Astronomische Mitteilungen with their monthly sums irrespective of their algebraic signs.*

1905. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	−10	+ 4	+ 13	− 2	+11	+ 5	− 9	− 8	−11	+ 5	+10	−37
2 ...	−10	+21	+ 21	+ 7	−20	− 9	+ 7	+17	−24	+ 4	−14	+13
3 ...	−10	+12	+ 10	−12	+ 6	+24	− 7	+ 3	+34	+28	+50	− 9
4 ...	+ 4	+33	+ 17	+10	− 4	−12	+24	+22	−18	− 9	−23	− 9
5 ...	+ 5	−27	+ 11	−16	−14	+18	− 5	+11	+ 4	−13	− 9	+ 1
6 ...	−19	+59	− 33	− 5	− 5	− 4	− 7	+28	− 6	+20	+13	−16
7 ...	+48	−50	− 11	+ 1	+25	+ 6	−10	−15	− 3	+ 5	− 9	+ 9
8 ...	+12	+ 9	+ 17	− 8	+19	0	+ 8	+19	+11	−18	− 1	− 4
9 ...	−13	+13	+ 3	+ 4	+18	− 8	+ 9	+ 3	−17	−26	+19	+ 7
10 ...	+15	0	− 39	+ 4	+ 6	+ 5	+26	− 2	+14	− 2	+60	−32
11 ...	+22	−25	− 27	+18	−10	−20	+11	−20	− 6	− 5	+24	0
12 ...	−10	+27	− 10	+ 6	+ 3	− 4	+42	−32	+ 6	− 7	−51	+25
13 ...	+ 4	−37	− 7	+ 5	+ 3	+ 6	+ 2	+ 8	+12	− 8	+36	− 6
14 ...	+ 3	+ 8	− 13	+ 2	− 8	+12	+ 2	− 2	− 2	− 7	− 9	−21
15 ...	− 2	−43	+ 7	− 9	+ 1	+ 1	+ 6	− 8	+10	− 3	−15	+14
16 ...	+ 8	+ 9	+ 5	+ 2	− 5	− 3	− 8	−16	−13	+44	−90	−11
17 ...	− 9	− 8	+ 7	− 3	+14	0	−21	+26	−15	+ 9	+32	− 2
18 ...	+12	− 1	+ 15	−14	− 6	0	−21	−10	+15	+27	+20	+21
19 ...	+ 8	− 1	− 2	−12	−10	−21	0	+27	−17	+23	−40	+ 2
20 ...	− 6	−13	− 7	+ 3	−18	− 6	+38	−15	−24	−58	+24	+ 6
21 ...	−13	− 3	+ 20	− 3	−14	+ 3	− 4	+ 9	−19	+27	−13	+13
22 ...	−19	+ 8	+ 5	+ 1	−11	+20	− 7	+ 9	− 6	−14	+17	−13
23 ...	−13	− 9	− 9	− 2	−14	+10	−49	+ 2	+ 3	−27	+12	−14
24 ...	−21	+19	+ 4	+18	−12	− 9	−40	−14	+ 3	−11	− 5	+28
25 ...	+27	+ 6	+ 1	+11	+15	+24	+ 2	−18	+18	− 2	+45	− 7
26 ...	−18	+10	− 17	+ 3	+ 8	+ 1	−24	− 7	− 8	− 1	−26	0
27 ...	− 1	+ 9	+ 9	7	+ 8	− 1	− 7	−11	+22	−12	−12	−16
28 ...	+16	−32	+ 9	+ 8	− 1	−10	− 7	+ 7	+16	+13	+38	− 9
29 ...	0		+ 4	−24	−14	−17	+ 6	+14	+18	+17	− 9	+ 4
30 ...	+ 6		− 10	+14	+12	+ 5	+ 8	−14	− 4	−23	−26	+ 1
31 ...	+ 1		− 3		+ 5		+ 8	+47		+11		− 7
Sums without regard to signs.	365	496	366	234	320	264	425	444	379	479	752	357

1906. Date.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
1 ...	+ 6	+31	− 20	+32	− 9	+ 9	−55	−39	− 4	+ 3	+ 2	+39
2 ...	− 9	−29	+ 24	− 4	+ 9	+ 3	− 3	− 8	−23	− 1	− 7	−22
3 ...	− 4	− 1	+ 25	−42	−15	+18	+11	+ 1	− 9	+ 4	+11	−18
4 ...	−14	− 6	− 11	−12	+ 1	−14	+ 8	−15	+ 1	+19	− 3	+ 6
5 ...	+ 3	− 4	− 2	−14	− 6	+ 2	− 3	−12	−18	− 9	− 5	− 7
6 ...	+ 6	+13	+ 18	+19	0	+28	− 3	−12	+10	−26	0	−25
7 ...	+10	−25	− 4	+17	+23	−42	−24	+ 6	+30	+12	− 5	+ 7
8 ...	−10	− 5	+ 10	0	+ 2	+ 4	− 2	+ 7	− 8	+10	+12	+22
9 ...	+ 6	+10	+ 18	−19	−18	+ 1	− 4	+ 7	+ 1	−12	+ 5	− 8
10 ...	− 5	− 2	+ 1	0	+ 2	− 9	+ 4	+ 4	−23	0	+17	−15
11 ...	0	− 6	− 5	+ 1	+ 3	−12	−17	+ 4	+21	−10	− 2	+ 5
12 ...	+ 5	0	− 13	− 6	+ 3	− 9	−18	+ 3	− 8	− 8	+24	+25
13 ...	+14	+ 8	− 2	−16	+20	− 6	− 7	+12	− 3	− 1	+10	−10
14 ...	− 2	+ 8	+ 16	7	+42	− 7	+ 8	− 7	− 5	+ 8	+12	+33
15 ...	−10	−14	+ 10	+ 3	− 30	+ 1	+21	−17	+31	+ 2	−37	− 1
16 ...	0	0	− 12	+23	+ 1	− 4	+ 9	+21	−12	−10	+ 1	−22
17 ...	−14	+12	0	− 12	−31	− 7	+ 6	−13	+ 4	− 7	−32	+25
18 ...	−16	+ 6	+ 12	−20	− 14	+ 1	+11	−11	0	0	+ 1	+ 9
19 ...	0	+ 9	+ 14	+ 2	+ 4	− 2	− 1	+ 7	−13	0	+ 2	− 8
20 ...	+ 7	−14	+ 23	− 3	+ 2	+21	− 2	+ 7	+ 2	+ 8	−16	+30
21 ...	+33	+25	+ 50	− 6	− 6	+28	−15	+ 7	− 9	+ 7	+ 1	0
22 ...	+ 5	+10	− 33	− 3	− 1	−21	+15	+14	+ 1	+ 2	+ 3	−28
23 ...	+27	−10	− 7	− 3	+14	− 8	− 8	− 3	+ 3	−10	+18	−10
24 ...	+ 7	− 4	− 1	+ 5	+20	+ 9	+ 5	+10	−27	+17	+13	−11
25 ...	+ 2	+ 2	+ 30	+27	+25	+25	−33	+14	+13	− 2	+13	−33
26 ...	+13	−12	− 19	+36	+ 4	+20	− 7	− 2	− 7	−10	+ 7	+25
27 ...	− 1	− 8	− 2	−24	+11	+ 6	− 8	+ 2	+ 6	−12	+20	+ 2
28 ...	−11	+14	− 21	+ 6	−23	+34	+ 9	−10	−11	+22	−18	+10
29 ...	−28		− 22	−24	− 8	+17	+10	+35	+18	− 9	−11	+ 2
30 ...	+ 2		+ 17	+ 9	− 7	+34	+12	+ 2	−24	− 5	− 5	− 5
31 ...	−28		0		−11		− 6	−17		+11	-	+ 8
Sums without regard to signs.	298	288	442	395	365	402	345	329	345	257	313	471

TABLE 544.—*Showing the sums without regard to sign of the consecutive differences of the daily sun-spot numbers shown in table 543.*

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1887 ...	71	100	84	87	231	108	199	185	88	94	92	179	126
1888 ...	126	100	123	84	58	94	62	47	101	50	132	72	87
1889 ...	34	89	67	34	38	78	106	120	66	54	8	96	66
1890 ...	104	23	47	34	116	40	98	134	151	134	129	134	95
1891 ...	139	162	146	193	359	267	309	240	312	262	278	284	246
1892 ...	509	318	295	386	382	389	418	410	356	420	240	445	381
1893 ...	454	351	422	517	433	383	543	726	300	320	499	529	456
1894 ...	591	475	390	393	409	499	485	397	395	376	344	414	431
1895 ...	580	318	330	391	495	335	307	341	254	479	356	480	389
1896 ...	239	392	480	306	232	347	262	192	360	253	294	393	312
1897 ...	354	183	236	257	189	130	188	190	359	225	167	224	225
1898 ...	206	299	295	167	283	245	167	228	233	290	135	128	223
1899 ...	197	122	185	134	101	188	144	84	119	163	156	112	142
1900 ...	132	145	126	143	159	130	136	70	124	156	80	14	118
1901 ...	14	42	74	0	80	106	14	48	18	70	50	0	43
1902 ...	64	0	126	0	46	36	42	68	68	181	125	26	65
1903 ...	150	108	153	272	229	152	245	252	171	303	314	381	227
1904 ...	312	206	220	248	285	234	274	396	237	300	307	331	279
1905 ...	365	496	366	234	320	264	425	444	379	479	752	357	407
1906 ...	298	288	442	395	365	402	345	329	345	257	313	471	354
1907 ...	431	475	370	352	308	298	323	258	269	412	394	229	343
Means ...	256	223	236	220	244	225	242	246	224	251	246	252	239

TABLE 545.—*Showing the smoothed values of the summed differences of daily suns-pot numbers shown in table 544 obtained by taking overlapping means of twelve consecutive monthly values and reducing them finally to the mean of the month.*

Date.	Months.												Year
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1887 ...							128	131	132	134	127	119	
1888 ...	112	101	96	95	94	91	83	79	76	72	69	67	86
1889 ...	69	74	75	74	69	65	69	69	65	64	67	69	69
1890 ...	67	67	71	78	87	93	96	104	114	124	141	161	100
1891 ...	179	192	203	215	227	239	261	283	296	310	319	325	254
1892 ...	334	346	355	363	368	374	378	377	384	394	402	404	373
1893 ...	409	427	438	432	438	452	462	473	476	470	464	468	451
1894 ...	470	454	444	450	446	435	430	423	414	411	415	412	434
1895 ...	397	387	379	378	382	386	374	363	373	375	361	350	375
1896 ...	349	341	339	334	322	316	317	313	294	282	278	268	313
1897 ...	255	252	252	251	244	232	219	217	224	223	224	232	235
1898 ...	236	237	233	231	232	227	222	214	202	197	188	178	216
1899 ...	175	168	157	147	142	142	139	138	136	134	136	136	146
1900 ...	134	133	133	132	129	122	113	103	97	89	80	76	112
1901 ...	69	63	58	50	45	43	45	45	46	48	46	42	50
1902 ...	40	42	45	52	60	64	68	76	82	95	113	126	72
1903 ...	139	155	167	177	190	212	234	245	252	254	255	260	212
1904 ...	265	273	281	284	283	281	281	296	314	319	320	323	293
1905 ...	330	339	347	360	386	406	404	392	387	397	405	413	380
1906 ...	415	407	401	390	363	349	359	373	378	373	368	362	378
1907 ...	357	353	347	350	360	353							

TABLE 546.—*Showing the smoothed values of the mean monthly absolute Horizontal Force given in table 240 obtained by taking overlapping means of twelve consecutive monthly values and reducing them to the mean of the month.*

370000+ Unity = 0·1γ = ·000001 C. G. S.

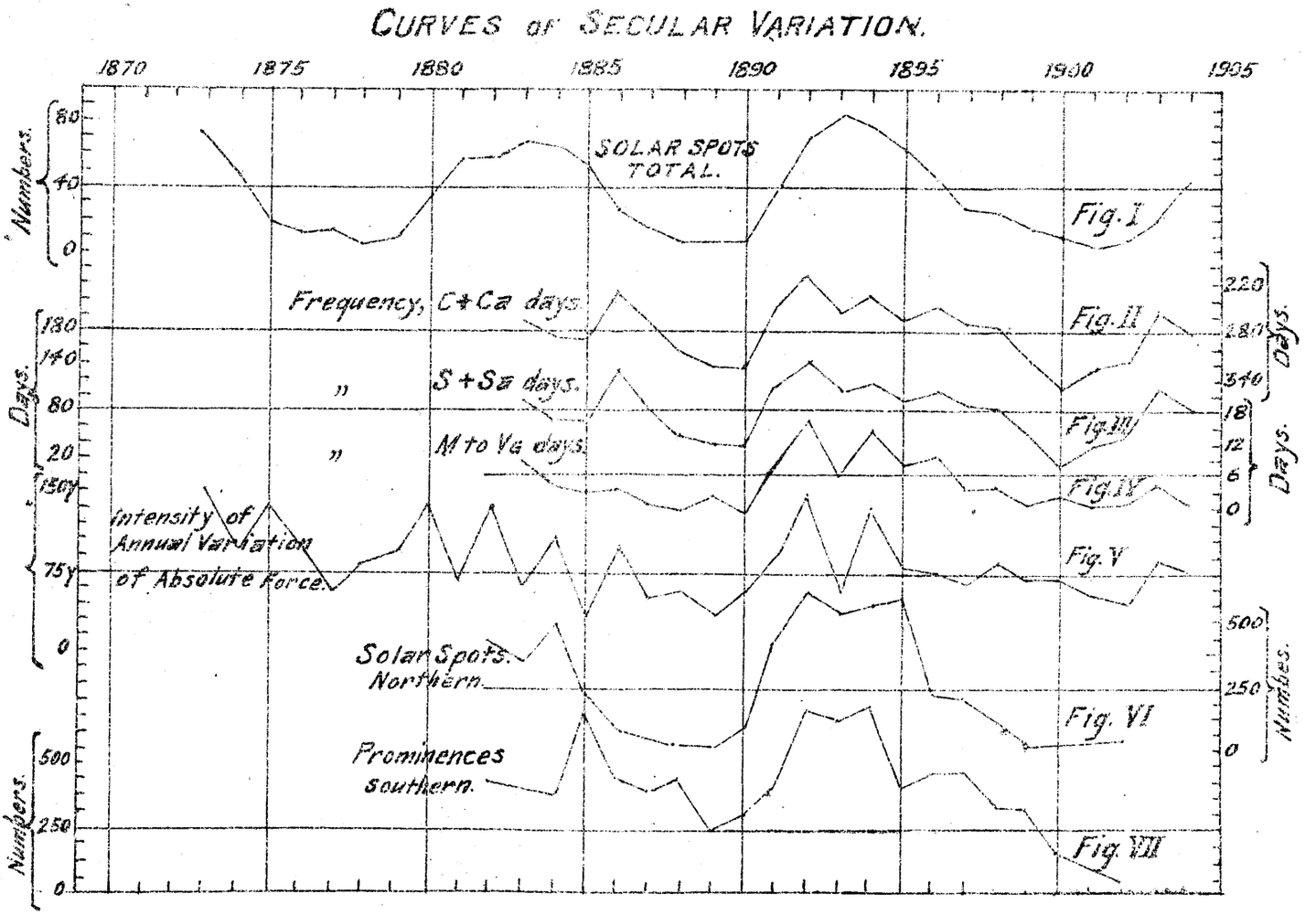
Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
	Months.											
1872	2245	2251	2255	2258	2267	2278	2282	2301	2325	2333	2348	2360
1873	2371	2403	2427	2448	2476	2501	2544	2586	2607	2620	2627	2640
1874	2657	2675	2706	2740	2770	2795	2813	2828	2857	2897	2935	2970
1875	3004	3026	3038	3056	3089	3118	3132	3153	3174	3188	3205	3227
1876	3242	3261	3292	3312	3318	3326	3346	3374	3400	3418	3420	3410
1877	3405	3405	3402	3400	3407	3419	3431	3439	3447	3456	3459	3468
1878	3489	3516	3541	3560	3572	3586	3599	3616	3632	3650	3677	3704
1879	3724	3732	3733	3734	3734	3727	3728	3736	3736	3736	3740	3735
1880	3725	3700	3676	3659	3642	3635	3628	3610	3595	3572	3549	3543
1881	3540	3552	3566	3574	3583	3581	3572	3561	3558	3550	3527	3505
1882	3489	3470	3461	3456	3433	3409	3403	3408	3405	3417	3453	3487
1883	3509	3536	3567	3601	3657	3723	3775	3816	3856	3900	3945	3988
1884	4030	4068	4096	4114	4123	4134	4144	4149	4156	4156	4144	4128
1885	4119	4108	4097	4099	4106	4108	4102	4102	4112	4120	4122	4125
1886	4127	4128	4130	4121	4101	4076	4066	4073	4070	4058	4054	4050
1887	4044	4042	4042	4052	4073	4101	4115	4117	4125	4143	4157	4168
1888	4183	4194	4204	4214	4215	4215	4226	4233	4231	4230	4233	4235
1889	4237	4247	4257	4263	4275	4285	4290	4296	4304	4314	4320	4329
1890	4339	4347	4349	4342	4338	4340	4345	4349	4343	4328	4311	4297
1891	4284	4268	4255	4247	4241	4237	4219	4188	4160	4145	4134	4111
1892	4080	4049	4036	4037	4041	4047	4056	4076	4102	4121	4145	4177
1893	4204	4222	4227	4229	4220	4201	4186	4165	4140	4125	4119	4113
1894	4102	4091	4078	4071	4076	4081	4087	4097	4113	4124	4132	4141
1895	4155	4178	4204	4223	4238	4260	4287	4310	4327	4346	4354	4364
1896	4386	4402	4413	4422	4434	4443	4446	4456	4469	4470	4470	4473
1897	4482	4493	4501	4508	4505	4494	4484	4482	4475	4467	4461	4450
1898	4431	4415	4394	4369	4356	4359	4370	4366	4357	4359	4367	4373
1899	4375	4376	4386	4398	4406	4408	4401	4398	4404	4411	4404	4393
1900	4395	4398	4407	4419	4426	4424	4422	4425	4425	4423	4431	4443
1901	4444	4443	4436	4422	4409	4398	4385	4378	4376	4369	4356	4343
1902	4334	4325	4311	4300	4291	4284	4282	4279	4271	4257	4242	4232
1903	4226	4215	4202	4187	4163	4132	4110	4093	4073	4051	4029	4004
1904	3974	3952	3941	3925	3911	3910	3900	3878	3862	3854	3851	3849

TABLE 547.—*Differences between the observed mean monthly values of absolute Horizontal Force given in table 240 and the smoothed values given in table 546: Showing the annual variation of absolute force for each of the years 1872 to 1904.*

Unity = 0·1γ = ·000001 C. G. S.

Years.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Sum without regard to signs.
	Months.												
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1872	−223	−431	− 85	+264	+134	+267	+136	− 82	+ 24	− 74	− 68	− 17	1795
1873	− 303	− 143	− 113	+123	+223	+ 37	+150	+110	− 141	+ 35	− 86	+ 44	1508
1874	+116	− 122	− 201	− 35	− 29	0	+ 32	+161	+ 47	+149	− 71	− 3	966
1875	− 86	− 256	− 49	+121	+ 84	+ 89	+117	− 34	− 128	+162	+150	− 64	1340
1876	− 169	− 158	− 126	+ 13	+135	+112	+ 38	+ 66	+ 63	+ 16	− 17	− 92	1005
1877	− 16	+ 35	+ 57	+ 73	− 50	− 120	− 29	− 14	− 55	+ 13	+ 80	+ 4	546
1878	+ 34	− 32	+ 70	− 34	− 183	− 100	+127	+130	+ 30	− 14	− 6	− 32	792
1879	− 74	+ 17	+ 5	+101	− 11	+ 82	+136	+ 75	− 123	− 32	− 140	− 150	946
1880	+ 40	+134	− 29	+267	+ 86	+ 58	+102	− 263	− 105	− 137	− 95	+ 26	1342
1881	+ 62	+ 16	− 10	− 110	+ 55	+ 57	+130	+106	− 35	+ 45	− 29	− 17	672
1882	− 31	− 15	+123	− 196	− 143	+ 46	+ 86	+ 15	+156	+ 10	− 328	− 203	1352
1883	+ 6	− 34	− 91	+ 52	+108	+ 73	− 90	+ 46	+ 21	+ 17	+ 54	− 5	597
1884	+ 36	− 124	− 116	+ 85	+175	+165	+ 59	+106	− 8	− 85	− 63	+ 35	1057
1885	− 8	− 95	− 12	+ 5	− 13	+ 14	+ 51	− 55	− 4	+ 35	+ 44	+ 4	340
1886	− 135	+ 3	+ 81	+ 32	− 6	+138	+ 36	+ 60	− 15	− 69	− 184	− 227	986
1887	+ 12	+176	+ 18	− 42	+ 64	− 18	− 16	− 34	− 8	+ 13	+ 60	− 31	492
1888	− 106	+ 49	+ 39	+ 39	+ 1	+ 58	+ 43	− 47	+ 20	+ 39	− 123	+ 10	574
1889	+ 2	0	− 58	+ 5	+ 2	− 41	+ 68	+ 47	+ 13	+ 46	− 24	− 34	340
1890	− 14	− 49	+ 6	0	+ 8	+ 55	+ 90	+107	− 79	− 83	− 11	+ 42	544
1891	+135	+ 34	− 62	− 98	−102	+ 17	+ 47	+ 63	− 9	+ 16	+104	+200	887
1892	− 55	−110	−156	+ 80	−133	−123	−217	−131	+ 60	+ 38	+191	+182	1476
1893	− 16	+ 28	− 17	+ 15	+134	+ 46	− 29	−111	+ 41	+ 58	− 27	+ 35	557
1894	− 67	−199	− 99	+ 56	+230	+ 85	−125	−102	−179	+123	+ 13	+ 80	1358
1895	− 46	−107	− 36	− 12	+174	+ 9	− 75	− 25	− 66	+ 41	+ 9	+161	761
1896	+ 79	−142	− 14	+ 8	− 63	+129	− 11	− 15	− 98	+ 20	+ 75	+ 92	746
1897	− 2	− 6	+ 6	−170	− 44	+ 67	+169	− 6	+ 72	+ 7	+ 19	− 71	639
1898	− 8	+ 73	− 44	− 79	+ 5	+ 45	− 8	+ 20	−238	− 60	− 21	+200	801
1899	+139	− 66	− 92	− 3	+ 44	+ 47	− 37	+ 3	− 65	− 42	+ 68	+119	725
1900	+ 11	− 49	− 21	+ 55	−223	+ 22	− 12	+ 2	+ 98	+ 43	+116	− 35	687
1901	+ 12	− 83	− 58	+ 21	+ 18	+ 92	+ 20	+ 39	− 18	− 78	+ 58	− 63	560
1902	− 60	+ 29	+ 40	− 10	− 22	+ 66	+ 45	− 3	−111	− 35	+ 37	+ 10	468
1903	+ 39	+ 73	+ 10	− 94	− 49	+138	+146	− 6	− 39	− 51	−110	−139	894
1904	+140	+ 77	+ 46	−136	− 24	− 14	+ 4	+ 51	+ 47	− 99	− 35	+ 93	766
Sums without regard to signs.	2282	2955	1990	2434	2775	2430	2481	2135	2216	1785	2516	2520	28519

and M to Vg which are tabulated for each month, are grouped in three divisions. The annual totals of the frequency of these days shown in table 548 are charted in figures II, III and IV below, while in figure I appear the annual means of solar spot numbers.



It will be readily seen that the general run of the curves so derived from the classification, is similar among themselves and parallel to the spot curve. Figure II, which is drawn inverted for convenience of comparison, shows how in the first group of days which are all nearly quiet the frequency waxes and wanes as the spot numbers. In the moderately disturbed days denominated S and Sa their frequency as represented by the curve in figure III runs also parallel to the spot curve. This follows as a matter of course from the treatment adopted, as figure III is nearly complementary to figure II since the number of days in the year of the largest disturbances M to Vg as shown in figure IV is not very large. The parallelism of all the three curves to the spot curve apart from the minor irregularities, is so far suggestive. But while the general run may be regarded as apparently satisfactory, the minor fluctuations indicated so persistently by the magnetic curves, have no corresponding movements in the solar spot curve, which thus need a passing reference. They faithfully show, as will be seen later, the true secular change depending upon the intensity of disturbances of some particular character incident during the year and are not merely the result of the process of selective treatment adopted in the classification of days, or to other fortuitous cause. The relative increase in activity, for example, in the number of smaller disturbances S and Sa for the years 1886 and 1903 as shown in figure III which have their complementary defects in the quiet-days curve in figure II draws our attention first, especially as both are not indicated in figure I, and the former in figure IV. Nor have they any corresponding echo as will be presently seen, in the curve of the absolute values of force. They are however clearly exhibited in the curve of secular change of the annual variation of absolute force, shown in table 547, the result of which appears charted above in figure V. It cannot be hence that in the classification of days for the year some of the Ca days have been overestimated, as may at first sight seem to be the case, and classed as S days. Such a large error is obviously not possible considering that even the finer movements which are shown by the two-

year oscillations about the year 1892, 1893, 1894, and which, as will be seen presently, are a correct indication of a true phenomenon, are clearly brought out by the classification. The prevalence of such biennial movements,* it may be incidentally remarked, while somewhat common in the magnetic curves, (*vide* figure V above and figures 4 and 4*a*, plate 104) is not either definitely pronounced or regularly incident in the spot numbers, faculæ, or prominences, though occasionally movements like those noticed about the years 1892, 1893, 1894 are discerned when either the spot numbers of the northern half of the sun or the prominences of the southern half are especially requisitioned (see figures† VI and VII above) for the purpose.

TABLE 548.—*Showing the frequency of occurrence of days in each class denoting the magnetic character of the day for each of the years 1883 to 1904.*

Years.	Class denoting the magnetic character of the day.										
	C.	Ca.	S.	Sa.	M.	Ma.	G.	V. G.	C and Ca.	S. and Sa.	M. to V. G.
1883 ...	117	154	56	30	5	1	2	0	271	86	8
1884 ...	104	189	51	18	4	0	0	0	293	69	4
1885 ...	121	171	52	18	2	1	0	0	292	70	3
1886 ...	68	163	116	15	1	1	1	0	231	131	3
1887 ...	122	148	85	9	1	0	0	0	270	94	1
1888 ...	138	172	50	6	0	0	0	0	310	56	0
1889 ...	133	189	37	4	2	0	0	0	322	41	2
1890 ...	148	178	37	2	0	0	0	0	326	39	0
1891 ...	134	112	90	21	5	3	0	0	246	111	8
1892 ...	79	131	102	38	9	4	2	1	210	140	16
1893 ...	131	124	82	22	5	1	0	0	255	104	6
1894 ...	91	143	67	49	2	7	4	2	234	116	15
1895 ...	114	149	50	44	5	3	0	0	263	94	8
1896 ...	133	119	48	56	5	4	1	0	252	104	10
1897 ...	160	111	61	29	0	4	0	0	271	90	4
1898 ...	138	140	56	27	2	1	1	0	278	83	4
1899 ...	156	160	19	29	0	1	0	0	316	48	1
1900 ...	232	118	5	8	0	2	0	0	350	13	2
1901 ...	253	72	27	12	1	0	0	0	325	39	1
1902 ...	232	86	40	6	0	1	0	0	318	46	1
1903 ...	153	98	102	8	2	1	0	1	251	110	4
1904 ...	162	118	74	11	1	0	0	0	280	85	1
Average ...	142	138	59	21	2·4	1·6	0·5	0·2	280	80	4·6

552. In the last chapter on daily means while referring to some features which differentiate certain days of the year from the rest by the incidence of the disturbance effects on them, which reduces the daily mean by more than 30γ or increases it by more than 10γ from the condition of the previous day, it was pointed out that such days follow in respect of both frequency and intensity of disturbance, the law of the 11-year period, to which the remainder of the days in the year, do not seem so readily to conform

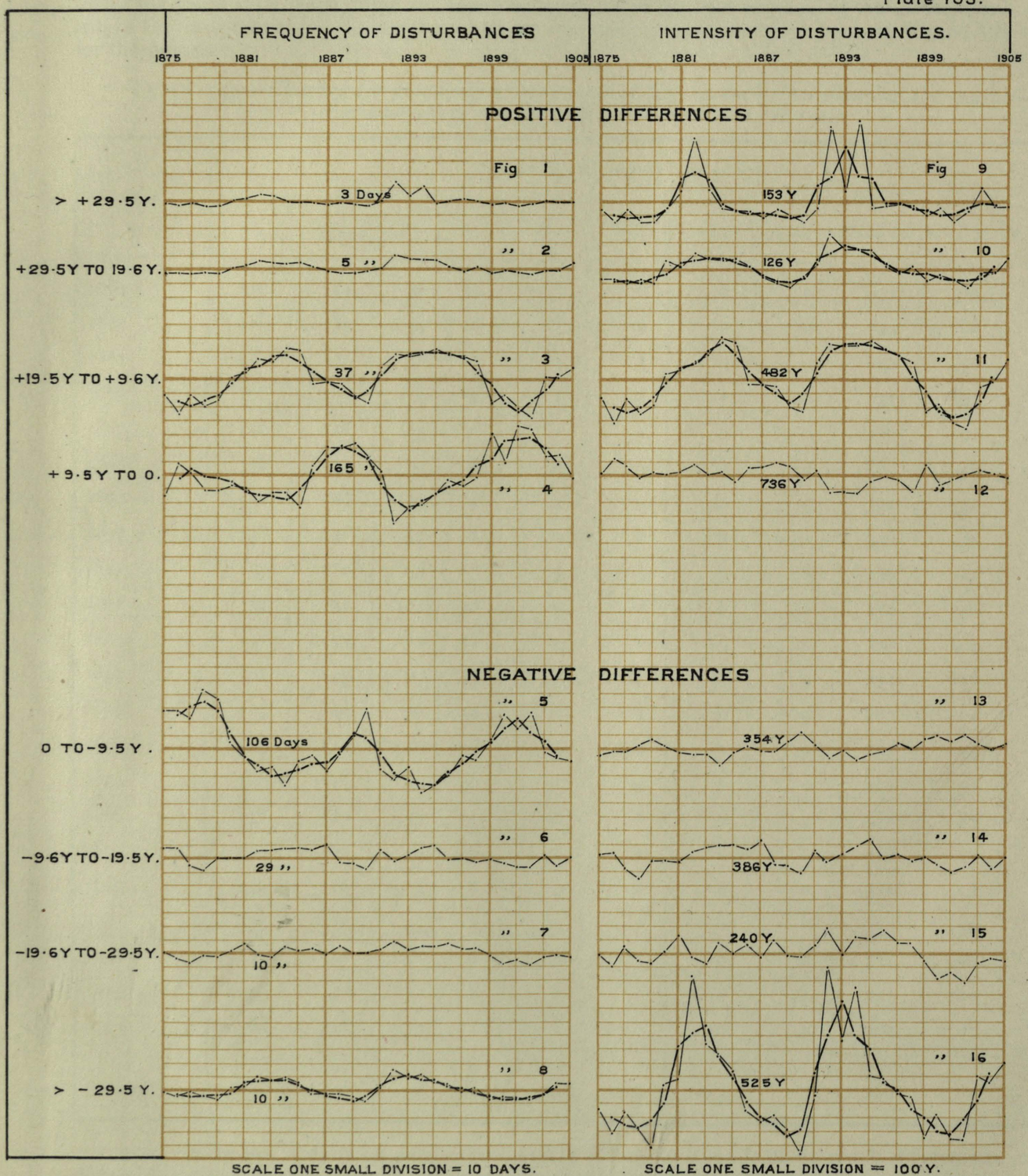
* Such parallel and closely accordant pulses are noted also to affect the temperature and vapour pressure curves at Colaba (*see* paragraph 578).

† Taken from the monthly Notices of the Royal Astronomical Society, Volume LXV, No. 1.

COLABA OBSERVATORY

Secular variation curves of frequency and intensity of days of disturbances of different magnitudes.

Plate 103.



SCALE ONE SMALL DIVISION = 10 DAYS. SCALE ONE SMALL DIVISION = 100 Y.

Thin Curve = Observed Curves.

Thick " = Smoothed means, 3 Consecutive Years

Govt. Photozinco. Office, Poona, 1910.

(*see* paragraph 536). In examining this question the differences of the daily means of H duly analysed and collected in tables 549 and 550 are advisedly considered here, for in paragraph 550 we have seen that these data are as equally appropriate for the discussion as the data in tables 522 and 523 which have already been referred to (*see* last row and last column of tables 385 and 400); and as they relate moreover to a longer period their use distinctly concedes an advantage. From table 549 we find that the frequency of occurrence of days the daily means of which are disturbed by more than 30γ on the negative side and 10γ on the positive, is clearly affected by the 11-year period (*see* columns 2, 4, 6 and 16). The frequency of other days (*see* columns 12 and 14) does not apparently show this influence at all while that of the days the disturbances of which lie between the limits +10γ and −10γ (*see* columns 8 and 10) indicates an inverse variation of this periodicity. Referring to the intensity numbers of the average disturbance characteristic of each group shown in table 550, it is apparent from the treatment adopted that the probable errors are inconveniently large and at best the data can be regarded as approximately correct. The values thus are not strictly comparable to each other, as they happen to be derived from unequal number of days which vary from a single day in one case, to over a hundred days in another. Nevertheless the uncertainty is not such as to preclude certain inferences, namely that the 11-year period seems clearly to influence (*see* columns 2 and 9, table 550) only those groups, both positive and negative, whose magnitudes are greater than 30γ,* while in none of the other divisions any marked increase from the lower to the upper limiting value of each class, is at least apparently indicated, corresponding to the change of conditions from the minimum to maximum spot epoch. From the data in the two tables hence we may with fair reason conclude (1) that disturbances greater than ±30γ have both their frequency of occurrence and intensity of incidence controlled by the 11-year law (*vide* columns 2 and 16, table 549, and columns 2 and 9, table 550); (2) that the positive disturbances which lie between the limits 30γ and 10γ have their frequency alone subject to the law of the 11-year period (*see* columns 4 and 6, table 549) and (3) that the days of disturbance the magnitudes of which lie in the central region between the limits +10γ and −30γ have neither their frequency, nor their intensity, markedly at least varying directly with the sun-spot period (*see* columns 8, 10, 12 and 14, table 549, and columns 5, 6, 7 and 8, table 550). These last constitute some 310 days in the year on the average, which if considered by themselves without the other 55 days which are subject as described above to the 11-year law, we should have from year to year a constant mean total intensity of disturbance of H, practically free from the periodicity indicating any relation to the sun-spot period (*see* last row, table 549). The data in table 550 serve further to show how on the average, the negative movements which apparently constitute the real disturbance, are invariably greater in magnitude than the corresponding positive ones which have all along been regarded in the discussion as restitution effects. The average intensity of the negative disturbances is 10·5γ as against 7·5γ of the positive. The results collected in table 549 giving the frequency and the total intensity or weighted frequency of the different groups of disturbances are charted in plate 103 for examination. It will be seen that the run of the frequency curves in figures 4 and 5 is clearly inverse to that of the others. It will also be observed that curves in figures 1, 2 and 3, which represent the frequency of occurrence of days of the larger positive disturbances, vary almost directly with the frequency curves of the days of the heavier negative disturbances represented by figure 8. Passing on to the total intensity curves we find that figures 12, 13, 14 and 15 do not seem to be affected by the 11-year disturbance, while curves in figures 9, 10, 11 and 16 unmistakably indicate the influence of this periodicity. It appears also when the frequency curves (see figures 1, 2, 3 and 8) are examined in comparison with the weighted curves, figures 9, 10, 11 and 16, that both the frequency and intensity can scarcely vary indirectly with each other, while these two factors in case of the smaller disturbances whether positive or negative (see figures 4, 5, 6 and 7 and figures 12, 13, 14 and 15) apparently vary inversly or irregularly. If the result of the analysis is thus accepted as indicating a true differentiating phenomenon we may infer that −30γ and not −50γ as arbitrarily assumed in Chapter X, paragraph 435, for the selection of the larger disturbances, is the best possible approximation to the limit of the magnitude of disturbances, above which alone they conform to the law of the 11-year periodicity both in point of frequency of occurrence and intensity of disturbance. It will also appear from columns 16, 17, 22 and 23 of table 549 that a maximum of the effects of the incidence of this periodicity is secured when the limit of −30γ is reached, which is reduced either way by raising or lowering this limiting value.

At any rate no arbitrary selection or personal equation is involved in the separation of the disturbances so differentiated, the limit being fixed thus at −30γ, and the data so secured become most appropriately useful for the purpose of direct examination and comparison with the sun-spot numbers which indicate about the same periodicity. From table 381, therefore, the dates of all such disturbances which indicate a fall in the daily mean of 30γ and upwards are separated and listed in table 551 for convenience of comparison with the numbers showing the growth and decay of sun-spots (*vide* table 543) as measured by the differences of consecutive spot numbers from one day to the next. To this comparison we shall presently refer.

* The fractions in the limiting values of the different groups are conveniently replaced by the nearest whole number.

TABLE 549.—*Showing the frequency of occurrence of days on which the consecutive differences of daily means attain certain magnitudes grouped into convenient divisions and the total sums of the intensities of these departures during these days.*

Unity (for intensity figures) = 1γ.

	Positive Movements.						Central Zone.						Negative Movements.									
Class.	>+29·5γ.		+29·5γ to +19·6γ.		+19·5γ to +9·6γ.		+9·5γ to 0·0γ.		0·0γ to −9·5γ.		−9·6γ to −19·5γ.		−19·6γ to −29·5γ		>−29·5γ		All positive differences.		All negative differences.		>−49·5γ.	
Years.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1875 ...	2	85	2	49	25	340	149	753	133	286	36	418	10	222	8	372	178	1228	187	1298	3	217
1876 ...	0	0	2	56	12	158	173	870	132	332	36	434	6	133	5	212	187	1083	179	1110	2	102
1877 ...	2	76	1	24	26	341	164	800	127	329	23	306	13	283	8	346	193	1244	172	1265	2	114
1878 ...	0	0	2	50	17	221	164	713	149	380	20	229	8	178	5	250	183	984	182	1037	3	178
1879 ...	0	0	1	22	22	284	163	748	141	406	29	368	7	158	2	92	186	1053	179	1024	1	55
1880 ...	3	108	5	132	37	528	158	736	111	362	29	368	11	249	11	560	203	1504	162	1539	5	343
1881 ...	4	231	6	127	42	542	156	744	99	325	29	365	17	372	12	617	208	1644	157	1679	3	302
1882 ...	8	616	10	241	51	615	145	819	88	305	34	427	9	212	20	1357	214	2291	151	2101	9	945
1883 ...	6	235	9	203	49	671	151	736	91	318	35	472	7	162	17	845	215	1845	150	1797	6	469
1884 ...	2	100	8	195	59	795	151	773	77	234	36	495	14	329	19	790	220	1863	146	1848	3	206
1885 ...	2	72	9	206	57	763	140	686	95	331	36	490	11	249	15	663	208	1727	157	1733	4	276
1886 ...	2	70	6	144	33	433	170	796	99	359	35	467	13	304	7	365	211	1443	154	1495	3	222
1887 ...	1	36	3	72	35	437	184	800	87	336	39	523	9	210	7	276	223	1345	142	1345	0	0
1888 ...	2	91	1	25	33	415	184	845	100	338	25	325	14	344	7	327	220	1376	146	1334	1	73
1889 ...	1	34	0	0	23	279	187	819	115	394	24	316	10	238	5	217	211	1132	154	1165	2	115
1890 ...	0	0	3	67	20	241	176	705	134	471	21	267	10	222	1	40	199	1013	166	1000	0	0
1891 ...	3	106	5	129	45	608	165	767	89	371	34	439	13	309	11	476	218	1610	147	1595	4	229
1892 ...	17	695	16	385	56	748	129	604	81	277	26	353	17	420	24	1412	218	2432	148	2462	16	1144
1893 ...	6	224	12	279	54	730	142	616	91	339	30	409	11	235	19	886	214	1849	151	1869	5	324
1894 ...	14	746	12	273	55	741	143	597	71	258	36	482	14	352	20	1265	224	2357	141	2357	10	922
1895 ...	2	87	11	263	58	764	151	686	77	307	38	519	14	341	14	633	222	1800	143	1800	4	245
1896 ...	3	149	6	140	54	693	160	729	85	338	28	368	17	400	13	605	223	1711	143	1711	3	229
1897 ...	4	152	4	92	53	659	154	693	99	387	29	402	13	319	9	488	215	1596	150	1596	5	351
1898 ...	3	119	6	128	50	617	161	614	97	351	25	352	13	310	10	465	220	1478	145	1478	2	177
1899 ...	1	51	2	45	20	240	194	823	110	431	28	384	7	171	3	173	217	1159	148	1159	1	97
1900 ...	2	107	4	91	25	302	173	664	130	454	24	326	2	49	5	335	204	1164	161	1164	3	255
1901 ...	0	0	2	41	14	168	200	712	119	408	22	275	4	92	4	146	216	921	149	921	0	0
1902 ...	2	74	0	0	10	114	196	736	131	462	22	302	1	23	3	137	208	924	157	924	1	56
1903 ...	3	259	4	96	38	414	177	772	102	366	30	388	7	159	8	628	218	1541	147	1541	3	450
1904 ...	3	115	4	97	38	462	179	742	97	335	22	305	9	209	14	567	224	1416	142	1416	2	124
1905 ...	3	118	10	224	45	622	161	711	95	392	29	377	7	172	15	734	219	1675	146	1675	5	361
Average ...	3	153	5	126	37	482	165	736	106	354	29	386	10	240	10	525	210	1497	155	1498	5·3	277

The total intensity figures are corrected for instrumental change.

TABLE 550.—*Showing the numerical values of the intensity of the average disturbance characteristic of each group in the consecutive differences of daily means of H or total intensity numbers divided by frequency in table 549.*

Unity = 1γ

Years.	Positive Disturbance.				Negative Disturbance.				Positive differences.	Negative differences.
	> +29·5γ	+29·5γ to +19·6γ	+19·5γ to +9·6γ	+9·5γ to 0·0γ	0·0γ to −9·5γ	−9·6γ to −19·5γ	−19·6γ to −29·5γ	> −29·5γ		
1	2	3	4	5	6	7	8	9	10	11
1875 ...	42·5	24·5	13·6	5·1	2·2	11·6	22·2	46·5	7·6	7·6
1876 ...	...	28·0	13·2	5·0	2·5	12·1	22·2	42·4	6·3	6·8
1877 ...	38·0	24·0	13·1	4·9	2·6	13·3	21·8	43·2	7·0	8·1
1878 ...	...	25·0	13·0	4·4	2·6	11·4	22·2	50·0	6·0	6·4
1879 ...	...	22·0	12·9	4·6	2·9	12·7	22·6	46·0	6·1	6·1
1880 ...	36·0	26·4	14·3	4·7	3·3	12·7	22·6	50·9	8·0	10·4
1881 ...	57·7	21·2	12·9	4·8	3·3	12·6	21·9	51·4	8·3	11·5
1882 ...	77·0	24·1	12·1	5·6	3·5	12·6	23·6	67·8	11·2	14·8
1883 ...	39·2	22·6	13·7	4·9	3·5	13·5	23·1	49·7	9·0	12·7
1884 ...	50·0	24·4	13·5	5·1	3·0	13·7	23·5	41·6	8·8	13·3
1885 ...	36·0	22·9	13·4	4·9	3·5	13·6	22·6	44·2	8·7	11·7
1886 ...	35·0	24·0	13·1	4·7	3·6	13·3	23·4	52·1	7·1	10·1
1887 ...	36·0	24·0	12·5	4·3	3·9	13·4	23·3	39·4	6·3	10·0
1888 ...	45·5	25·0	12·6	4·6	3·4	13·0	24·6	46·7	6·5	9·7
1889 ...	34·0	...	12·1	4·4	3·4	13·2	23·8	43·4	5·7	8·1
1890 ...	...	22·3	12·0	4·0	3·5	12·7	22·2	40·0	5·3	6·3
1891 ...	35·3	25·8	13·5	4·6	4·2	12·9	23·8	43·3	7·6	11·4
1892 ...	40·9	24·1	13·4	4·7	3·4	13·6	24·7	58·8	11·5	17·3
1893 ...	37·3	23·2	13·5	4·3	3·7	13·6	21·4	46·6	9·0	13·1
1894 ...	53·3	22·7	13·5	4·2	3·6	13·4	25·1	63·2	10·9	17·6
1895 ...	43·5	23·9	13·2	4·5	4·0	13·7	24·4	45·2	8·4	13·3
1896 ...	49·7	23·3	12·8	4·6	4·0	13·1	23·5	46·5	8·0	12·6
1897 ...	38·0	23·0	12·4	4·5	3·9	13·9	24·5	54·2	7·7	11·2
1898 ...	39·7	21·3	12·3	3·8	3·6	14·1	23·8	46·5	7·0	10·9
1899 ...	51·0	22·5	12·0	4·2	3·9	13·7	24·4	57·7	5·6	8·4
1900 ...	53·5	22·7	12·1	3·8	3·5	13·6	24·5	67·0	6·1	7·9
1901 ...	...	20·5	12·0	3·6	3·4	12·5	23·0	36 5	4·6	6·8
1902 ...	37·0	...	11·4	3·8	3·5	13·7	23·0	45·7	4·8	6·4
1903 ...	86·3	24·0	10·9	4·4	3·6	12·9	22·7	78·5	7·4	11·3
1904 ...	38·3	24·2	12·2	4·1	3·5	13·9	23·2	40·5	6·6	10·8
1905 ...	39·3	22·4	13·8	4·4	4·1	13·0	24·6	48 9	7·9	12·1
Average ...	45·0	23·6	12·8	4·2	3·4	13·1	23·3	49·5	7·5	10·5

553. Digressing for a moment we may remark in regard to the dates collected in table 551 that from some 378 disturbances contained therein, without being more exact about the interval than one full day, some 150 disturbances may be shown to have some 75 sequences of either 26, 27 or 28 days, some of which occasionally run into a double, treble or even a higher sequence (*see* table 552). If a period of 13 and 14 days including $12\frac{1}{2}$ and $14\frac{1}{2}$ days is taken some 55 sequences* may be detected running here also into double and higher sequences. It is obvious, however, that while the former result must stand by itself, the latter indicating the 13 and 14 day periods does not necessarily exclude the sequences of the period of 26, 27 or 28. If these are included the $13\frac{1}{2}$-day period or thereabout must become the more pronounced of the two in disturbances also, as it is in the other magnetic curves. In Chapter XIII we have seen at any rate that this period is undoubtedly of greater importance than the 27-day period, in the daily means and daily ranges of H, in the frequency of quiet days, and in the daily means of declination. The prevalence of the period in the quiet days indirectly of course suggests its existence inversely in the disturbed days.

* This is only roughly correct as to the number of sequences proper of 13 and 14 days, half the number of those of 12 and 15 days have been added, as the interval of half a day cannot be ascertained from the date directly for sequences of $12\frac{1}{2}$ and $14\frac{1}{2}$ day periods.

TABLE 551.—*Showing dates of storms indicating a decrease in the daily mean of H by 30γ and more from the value of the preceding day.*

Years.	Months.												Total number of disturbances during the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1872 ...	7, 12, 25	4, 20	2	4, 10 11, 15	1, 10, 23, 25	3, 10, 22	8, 19, 21, 28	3, 4, 9, 14, 15, 25	3, 9, 17, 18, 29	13, 15, 17, 28	11, 15, 24	9, 21	41
1873 ...	19, 25	9	9, 22	2, 18 19	16	19, 27	10, 31	...	...	...	...	15	14
1874 ...	28	4	7, 8, 13	2, 8, 13, 29	26	7	...	1	10, 29	4, 13	6	...	17
1875 ...	...	27	19	7	...	...	14	12	3, 16	5	...	...	8
1876 ...	14	5, 19	25	...	...	...	...	...	...	...	...	10	5
1877 ...	...	...	10	...	3, 11, 29	...	...	...	19	12	3, 20	...	8
1878 ...	24	...	...	...	...	3, 8	...	...	...	...	6	1	5
1879 ...	...	...	...	...	24	18	...	...	...	...	...	...	2
1880 ...	...	...	17	2	...	23	...	12, 19	1, 15	31	3, 20	19	11
1881 ...	22, 31	27	31	...	...	4	...	...	9, 13	17, 31	9	8, 23	12
1882 ...	20	6, 20	...	14, 17, 20	14	24	9, 17, 31	4	25	2, 6	12, 13, 17, 20	16	20
1883 ...	...	22, 25	13, 21, 27	3, 25	21	2, 27	30	18	16	5	2, 20, 22	...	17
1884 ...	26	2	29	11	1	1, 19 23	3, 14, 25	21	18	2, 14	2, 3, 28	15	19
1885 ...	2, 22, 30	27	12, 15	...	11, 26	25	18	1, 28	15	...	18	6	15
1886 ...	9	...	30	...	9	...	27	12	10	6	...	...	7
1887 ...	...	...	...	...	24	5	6	2	26	22	...	16	7
1888 ...	8, 13	...	...	11	7, 21	...	...	16	...	...	...	8	7
1889 ...	...	...	...	...	...	14	17	...	9, 22	...	1	...	5
1890 ...	...	...	...	...	...	...	...	...	...	...	8	...	1
1891 ...	...	...	2	8, 17	14	...	17	29	9, 26, 28	...	20	7	11
1892 ...	5, 29	13	1, 6, 12, 25	24, 26	1, 17, 18	3, 27	13, 17	4, 8, 12	16, 22	11	5	5	24
1893 ...	...	3, 15	26	12	...	4, 19, 29	16	6, 7, 18	8, 26, 30	10, 25	12	5, 24	19
1894 ...	3	21, 23, 25, 28	30, 31	13, 17	28	9, 10	20	20	14, 19	5, 16	13, 23	...	20
1895 ...	...	24, 28	13	11	...	...	6	10	4, 15, 30	13, 27	9, 23	8	14
1896 ...	30	1, 27	4, 12 26	...	2, 18	...	...	21	18	12	6	4	13
1897 ...	2	...	...	20	14, 17, 30	...	31	...	...	...	...	11, 20 29	9
1898 ...	...	11	2, 15	7, 12	4	...	20	...	9, 10	...	...	14	10
1899 ...	...	12	22	18	...	...	...	...	...	...	...	...	3
1900 ...	5	...	13	...	1, 5	...	...	...	...	25	...	...	5
1901 ...	...	...	24	...	...	...	...	...	...	...	4	2, 28	4
1902 ...	...	...	...	11	...	...	...	...	...	31	24	...	3
1903 ...	...	...	...	6	..	...	...	26	19	12, 26, 31	...	13, 30	8
1904 ...	16, 28	...	...	1, 19	13, 28	15, 16	...	...	25	7, 21	4, 16, 25	...	14
1905 ...	...	3	2, 7	1	...	10	24	2	3, 19	6	12. 15, 16	4, 13	15
Total number of disturbance days, 1872—1904.	26	27	35	36	34	29	26	29	40	33	36	27	378

TABLE 552.—*Showing the dates of disturbances in table 551 which indicate a sequence of 26, 27 or 28 days.*

Year.	Date of first disturbance.	Date of subsequent sequence.	Interval in days.	Year.	Date of first disturbance.	Date of subsequent sequence.	Interval in days.	Year.	Date of first disturbance.	Date of subsequent sequence.	Interval in days.
1872 ...	January 7th ...	Feb. 4th ...	28	1877	May 3rd ...	May 29th ...	26	1892	July 13th ...	August 8th .	26
„ ...	„ 25th...	„ 20th ...	26	1880	August 19th ...	Sep. 15th ...	27	„	„ 17th ...	„ 12th .	26
„ ...	Feb. 4th ...	March 2nd ...	27	1881	Jan. 31st ...	Feb. 27th ...	27	1893	June 19th ...	July 16th ...	27
„ ...	April 4th ...	May 1st ...	27	„	Dec. 23rd ...	Jan. 20th ...	28	1894	Sept. 19th ...	October 16th.	27
„ ...	May 25th ...	June 22nd ...	28	1882	April 17th ...	May 14th ...	27	„	October 16th.	Nov. 13th ...	28
„ ...	June 10th ...	July 8th ...	28	„	July 9th ...	August 4th ...	26	„	Sept. 4th ...	Sept. 30th ...	26
„ ...	„ 24th ...	„ 19th ...	27	„	Nov. 20th ...	Dec. 16th ...	26	1895	„ 15th ...	October 13th.	28
„ ...	July 8th ...	August 4th ...	26	1883	Feb. 22nd ...	March 21st ...	27	„	„ 30th ...	„ 27th.	27
„ ...	„ 19th ...	„ 14th ...	26	„	April 25th ...	May 21st ...	26	„	October 13th.	Nov. 9th ..	27
„ ...	„ 28th ...	„ 25th ...	28	„	October 9th ...	Nov. 2nd ...	28	„	„ 27th	„ 23rd ...	27
„ ...	August 14 ...	Sept. 9th ...	26	1884	July 25th ...	August 21st ...	27	1896	Jan. 30th ...	Feb. 27th ...	28
„ ...	Sept. 3rd ...	„ 29th ...	26	„	August 21st ...	Sep. 18th ...	28	„	Feb. 27th ...	March 26th .	28
„ ...	„ 17th ...	October 3rd ...	26	„	Sept. 18th ...	October 14th...	26	„	August 21st .	Sept. 18th ...	28
„ ...	„ 18th ...	„ 15th ...	27	„	Nov. 2nd ...	Nov. 28th ...	26	„	Nov. 6th ...	Dec. 4th ...	28
„ ...	October 15th ..	Nov. 11th ...	27	1885	Jan. 2nd ...	Jan. 30th ...	28	1897	April 20th ...	May 17th ...	27
„ ...	„ 28th ..	„ 24th. ...	27	„	„ 30th ...	Feb. 27th ...	28	1898	March 15th .	April 12th...	28
„ ...	Nov. 11th ...	Dec. 9th ...	28	„	August 1st ...	August 28th ...	27	„	April 7th ...	May 4th ...	27
„ ...	„ 24th ...	„ 21st ...	27	1886	Sep. 10th ...	October 6th ...	26	1899	March 22nd .	April 18th...	27
1873 ...	February 9th ...	March 9th ...	28	1887	July 6th ...	August 2nd ...	27	1901	Nov. 4th ...	Dec. 2nd ...	28
„ ...	March 22nd ...	April 18th ...	27	„	Sep. 26th ...	October 22nd ..	26	„	Dec. 2nd ...	„ 28th ...	26
„ ...	April 18th ...	May 16th ...	28	„	Dec. 16th ...	Jan. 13th ...	28	1904	Sept. 25th ...	October 21st.	26
1874 ...	March 7th ...	April 2nd ...	26	1888	April 11th ...	May 7th ...	26	„	October 7th .	Nov. 4th ...	28
„ ...	„ 13th ...	„ 8th ...	26	1891	„ 17th ...	„ 14th ...	27	„	„ 21st .	„ 16th ...	26
„ ...	April 2nd ...	„ 29th ...	27	„	August 29th ...	Sep. 26th ...	28	1905	Feb. 3rd ...	March 2nd...	27
„ ...	„ 29th ...	May 26th ...	27	1892	Feb. 13th ...	March 12th ...	28	„	Nov. 15th ...	Dec. 13th ...	28

The mean interval for the 75 disturbance sequences = 27·0 days.

554. To recur to the analysis of the magnetic data in paragraph 552, whatever may the view be in regard to its efficacy in comparing the secular progression of the frequency and intensity of the component divisions of any single series, there can be little doubt that it furnishes an effective method of critical comparison when two parallel series have to be closely examined in detail. The solar spot numbers hence have been dealt with for the period 1887 to 1905 in precisely the same way as the magnetic data (*see* tables 553 and 554). The normal diurnal variability of H for the above period is about 8·3γ while that of the spot numbers is 7·9 indicating a ratio of 1·1 to 1. Thus in the comparison between the solar spots and magnetic disturbances, their division into four convenient groups positive and negative of different magnitudes, from 0 to 9·5, 9·6 to 19·5, 19·6 to 29·5 and greater than 29·5, are fairly comparable to one another in each case, the spots being represented in numbers and the magnetic series in γs (C. G. S. unit). It will be noted that positive groups in spots indicating spot growth, correspond to the respective negative groups in the magnetic series, both of which connote the true disturbance phenomenon,* solar and terrestrial, while the negative groups in spots indicating spot decay and positive disturbances in the magnetics, both of which are regarded as recuperative effects, are in their turn comparable one to the other.

Proceeding to the comparison, we find that out of 365 days in the year, 6 days only on the average are recorded in the spot series in the largest group, *viz.*, greater than 29·5, while in the same group, the magnetic series shows 10 days. The numbers of days registered in the next group, *viz.*, 19·6 to 29·5, respectively, for the two series are 11·5 and 10·0. In the group 9·6 to 19·5, there are 36 and 28 days, and in the group 0 to 9·5, 128 and 101 days. It will thus be seen that in the sun-spot series the total number of days of positive movements, is 182. This indicates nearly equal division of the year for positive and negative movements connoting almost the same duration of activity in the formation of the spot as in its decay. In the magnetic series on the other hand we know that negative disturbances indicating the demagnetisation of the earth, are much more intense than the positive ones which restore the daily means of H to its normal value; and in the distribution of the days in the year hence, we find that 149 days only contribute to the former, that is the true disturbance, while it takes 216 days for the positive movements to restore the disturbed magnetic conditions to the normal state. The ratio thus made out is 5 to 7. It becomes obvious from the above that this distribution either on the whole or in the several groups, is at least not in close agreement in the two series. Passing on to the consideration of the secular progression we have already seen that the 11-year law seems to obtain in a well pronounced manner in both series when the magnitude of the disturbances exceeds 30. And this 11-year influence continues to assert itself in the frequency of spot numbers from these disturbances of the highest magnitude downwards to those of ±9·5. Thus only two central groups 0 to +9·5 and 0 to −9·5 may be regarded

* There is sufficient ground for suggesting that these demagnetising effects constitute the true disturbance phenomenon for reasons already referred to in Chapter X, paragraphs 434 and 435, and for the facts namely (1) that the damagnetising effects as shown by the absolute values from mean minimum-spot epoch to mean maximum-spot epoch, amount to about 28γ in H, and 25γ in V (see tables 239 and 247), increasing in individual annual values to as much as 62γ and 79γ respectively; and (2) that during magnetic storms invariably the damagnetising effects which are greater than 100γ on an average in the value of H and last for about 10 hours, are almost fully compensated *subsequently* in the next two or three days.

TABLE 553.—*Showing the frequency of occurrence of days on which consecutive differences of daily sun-spot numbers attain certain magnitudes grouped into convenient divisions and the total sums of these departures during these days.*

Unity (for Intensity figures) = 1γ

Years.	> −29·5γ.		−29·5 to −19·6γ.		−19·5 to −9·6γ.		−9·5 to 0γ.		0 to +9·5γ.		+9·6 to +19·5γ.		+19·6 to +29·5γ.		> +29·5γ.		All negative differences.		All positive differences.		Number of days for which the difference is 0.
	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	Frequency.	Tota Intensity.	Frequency.	Total Intensity.	Frequency.	Total Intensity.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1887 ...	...		3	68	25	340	154	357	153	350	29	381	1	22	...	...	182	765	183	753	107
1888 ...			2	42	13	146	175	342	161	314	15	205	...	...	...	...	190	530	176	519	144
1889 ...			...	...	13	151	171	239	169	231	12	169	...	...	...	...	184	390	181	400	219
1890 ...			1	24	20	263	160	289	166	311	14	169	4	88	...	...	181	576	184	568	159
1891 ...	4	128	12	278	46	623	115	419	121	493	59	805	6	135	2	70	177	1448	188	1503	34
1892 ...	21	760	21	496	52	706	77	310	101	459	56	755	25	583	13	493	171	2272	195	2296	13
1893 ...	23	920	29	704	49	667	81	402	74	345	55	767	29	682	25	990	182	2693	183	2784	7
1894 ...	19	712	32	772	59	847	74	303	77	353	53	753	36	847	15	581	184	2634	181	2534	18
1895 ...	9	307	36	836	63	887	73	312	89	372	55	749	24	599	16	604	181	2342	184	2324	19
1896 ...	7	237	22	525	45	614	114	521	92	362	63	859	14	319	9	313	188	1887	178	1863	20
1897 ...	1	30	10	223	41	563	133	538	125	475	45	609	8	195	2	69	185	1354	180	1348	52
1898 ...	1	30	12	278	43	597	127	436	132	502	34	453	14	309	2	71	183	1341	182	1335	43
1899 ...			5	120	21	274	163	464	147	445	26	334	3	68	...	...	189	858	176	847	104
1900 ...			2	42	22	274	160	395	162	416	17	224	1	28	1	36	184	711	181	704	151
1901 ...			...	...	6	83	178	175	173	162	8	96	...	...	...	...	184	258	181	258	281
1902 ...			...	...	9	124	178	267	165	211	11	147	2	43	...	...	187	391	178	391	251
1903 ...	3	128	10	245	40	515	133	469	127	446	37	499	11	251	4	177	186	1357	179	1373	50
1904 ...	4	139	17	395	45	604	118	525	112	492	51	665	12	277	7	253	184	1663	182	1687	19
1905 ...	15	663	21	491	62	844	84	442	89	432	52	730	28	673	14	606	182	2440	183	2441	8
1906 ...	11	407	23	554	54	721	92	426	97	395	48	642	25	585	15	520	180	2108	185	2142	16
Average, 1887-1905.	5·6	213	12	292	35	480	130	379	128	377	36	540	11	270	5·8	224	183	1364	182	1365	89
Average for corresponding magnetic differences.	3·7	16·6	5·5	129	38	487	169	718	101	369	28	374	10	241	10	516	216	1500	149	1501	18

to remain as directly unaffected, days of which on the contrary show an inverse 11-year variation. In the magnetic series on the other hand the region directly unaffected by the 11-year period, we know, lies between the limiting groups 0 to +9·5 and 0 to −29·5.

The existence of these somewhat radically different features in the two series which are otherwise closely accordant, renders the parallelism we seek to establish between them not a little complex and uncertain.

TABLE 554.—*Showing the numerical values of the average intensity characteristic of each group in the consecutive differences of daily sun-spot numbers or total intensity numbers divided by frequency in table 553.*

Years.	> −29·5γ.	−29·5 to −19·6γ.	−19·5 to −9·6γ.	−9·5 to 0·0γ.	0·0 to +9·5γ.	+9·6 to +19·5γ.	+19·6 to +29·5γ.	> +29·5γ.	Negative differences.	Positive differences.
1	2	3	4	5	6	7	8	9	10	11
1887 ...	...	22·7	13·6	2·3	2·3	13·1	22·0	...	4·2	4·1
1888 ...	...	21·0	11·2	2·0	2·0	13·7	...	...	2·8	2·9
1889 ...	...	...	11·6	1·4	1·4	14·1	...	...	2·1	2·2
1890 ...	...	24·0	13·1	1·8	1·9	12·1	22·0	...	3·2	3·1
1891 ...	32·0	23·2	13·8	3·6	4·1	13·6	22·5	35·0	8·2	8·0
1892 ...	36·2	23·6	13·6	4·0	4·5	13·5	23·6	37·9	13·3	11·8
1893 ...	40·0	24·3	13·6	5·0	4·7	13·9	23·5	39·6	14·8	15·2
1894 ...	37·5	24·1	14·4	4·1	4·6	14·2	23·5	38·7	14·3	14·0
1895 ...	34·1	23·2	14·1	4·3	4·2	13·6	25·0	37·7	12·9	12·6
1896 ...	33·9	23·9	13·6	4·6	4·0	13·6	22·8	34·8	10·0	10·5
1897 ...	30·0	22·3	13·7	4·0	3·8	13·5	24·4	34·5	7·3	7·5
1898 ...	30·0	23·2	13·9	3·4	3·8	13·3	22·1	35·5	7·3	7·3
1899 ...	...	24·0	13·0	2·8	3·0	12·8	22·7	...	4·5	4·8
1900 ...	...	21·0	12·5	2·5	2·5	13·2	28·0	36·0	3·9	3·9
1901 ...	...	...	13·8	1·0	0·9	12·0	...	...	1·4	1·4
1902 ...	...	...	13·8	1·5	1·3	13·4	21·5	...	2·1	2·2
1903 ...	46·0	24·5	12·9	3·5	3·5	13·5	22·8	44·2	7·3	7·7
1904 ...	34·7	23·2	13·4	4·4	4·4	13·0	23·1	36·1	9·0	9·3
1905 ...	44·2	23·4	13·6	5·3	4·9	14·0	23·9	43·3	13·4	13·3
1906 ...	37·0	24·1	13·4	4·6	4·1	13·4	23·4	34·7	11·7	11·6
Average, 1887—1905.	36·2	23·2	13·3	3·2	3·3	13·4	23·3	37·8	7·5	7·5
Average for corresponding magnetic differences, 1887—1905.	44·6	23·2	12·5	4·3	3·7	13·4	23·7	49·9	7·2	10·8

555. In the absolute phenomenon, Chapter I, I have shown that the mean absolute values of H, not to speak of the data of other elements, clearly indicate a perturbation effect of about ±30γ the period of which is suspiciously near to that of Schwabe's sun-spot period of about 11 years. A glance at the progression of the absolute magnetic curve in figure 1* or 2, plate 100, shows that in the minor features these curves have a corresponding inverse echo to every fluctuation indicated in the curve representing the number and intensities of the larger disturbances shown in table 549, columns 22 and 23, and the relation between them as one of cause and effect is of course obvious. The dominant feature noticeable in both and common to the spot curve, is the sweep of the 11-year period. But the minor movements which are not the less significant have no corresponding fluctuations in the spot curve (see figure 3). For example the relatively less disturbed condition of the year 1893 as compared with that of the more heavily disturbed years 1892 and 1894, is not at all indicated in the total spot numbers. This is, however, discerned, as already referred to in the sun-spot curve of the northern half of the sun's disc, as also in the prominence curve of the southern half. Similarly also the rapid rise of absolute force in 1883 and 1884 and the fall in 1885 indicating the perturbing effects on the annual values of absolute force, have corresponding movements in the curve of prominence alone. Thus to seek for movements parallel to the magnetic curves when not discovered in Wolfer's spot numbers, one has to roam at large over solar data of various kinds. The few cases enumerated above are sufficient hence to show how erroneous it would be to draw any hasty conclusion either way in regard to the parallelism, when the comparison is confined to the total spot numbers alone. At the same time even if it were possible thus to extend the comparison

* This series is practically an independent absolute series derived from the continuous registration of Grubb's variation instrument (*see* Chapter III, Part I) where the 11-year fluctuations are more smoothly exhibited than in figure 2.

over an unlimited field of solar data, it can confer no substantial advantage, as it is problematic if such patchwork comparison could be of much practical utility, especially as the data of other solar elements are admittedly incomplete, and otherwise much more defective than the spot numbers.

The rough numerical relation between the perturbation effects of the absolute series and the spot numbers (see figures, 2 and 3, plate 100), as given by the formula $\Delta H = a + bs$ to which reference has elsewhere been made, gives by the method of least squares, the values of the constants $a = 16{\cdot}45$ and $b = -{\cdot}454$. This means that when the perturbing influence on the absolute force at Colaba is nil and the departure ΔH is zero, the average number of spots corresponding to the theoretical value of the absolute force (*see* paragraph 295) is $\frac{a}{b} = \frac{16{\cdot}45}{{\cdot}45} = 36{\cdot}2$. Considering that $b = {\cdot}454$ we have practically $\frac{1}{b} = 2{\cdot}2$ and thus corresponding to a change of about $2{\cdot}2$ spots in excess or defect of the average number $36{\cdot}2$, a perturbation effect of 1γ seems to occur in the absolute force. The difference curve which remains after equating the two series by the numerical relation above indicated shows however that large residual departures remain which clearly indicate that a considerable portion of the magnetic fluctuations in the annual values has no corresponding movements in the spot numbers. As the residual departure curve shows a striking parallelism to the curve of the number of the larger disturbances (*vide* column 14, table 384), the connection between spot numbers and the magnetic storms as affecting the absolute values, becomes considerably obscured.

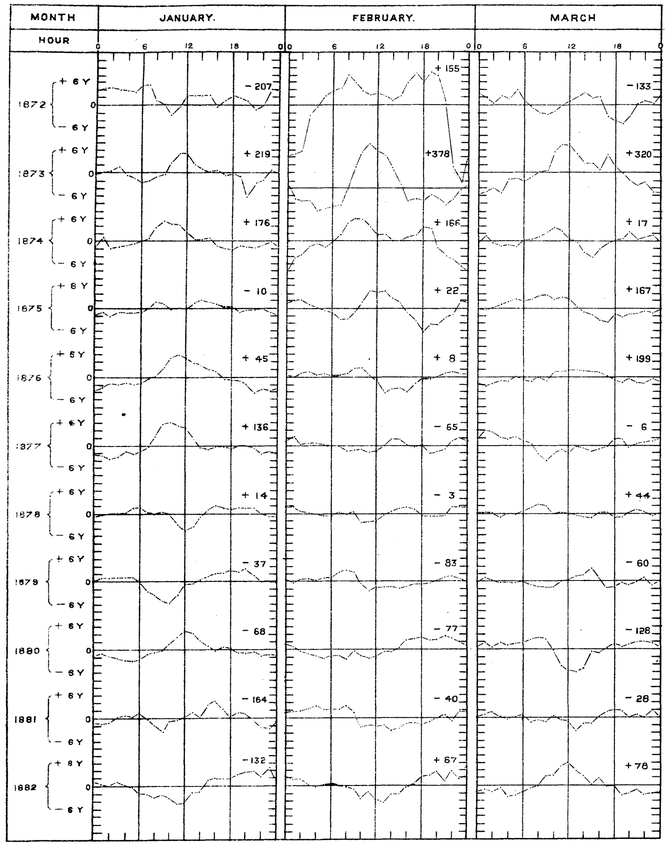
556. The examination of all the tables referred to in paragraph 550, together with the curves charted in plates 100 and 101, is sufficient at the outset to make two initial points at issue fairly clear leaving little doubt about the results, namely, (1) that the periodic parts of the phenomena as represented by the smoothed range curve in figure 4, plate 100, and the spot curve as shown in figure 3 exhibit decidedly close, though not precisely exact, parallel conditions, and (2) that the aperiodic parts of the two series as shown by the variability and other similar curves, show widely dissimilar progressions it being difficult, if not impossible, to discern any common relation between the two. The diurnal variability curve of spots shown in figure 6, plate 100, for example, has hardly any resemblance to the curve of the mean diurnal magnetic variability of H shown in figure 5. The spot curve in figure 3, which indicates the smooth periodic phenomenon when compared with its own variability curve, exhibits no apparently marked divergent features, while it is noticeable that the two similarly derived magnetic curves, figures 2 and 5, 6 or 7, plate 101, are clearly dissimilar in their run. The latter fact is suggestive so far.

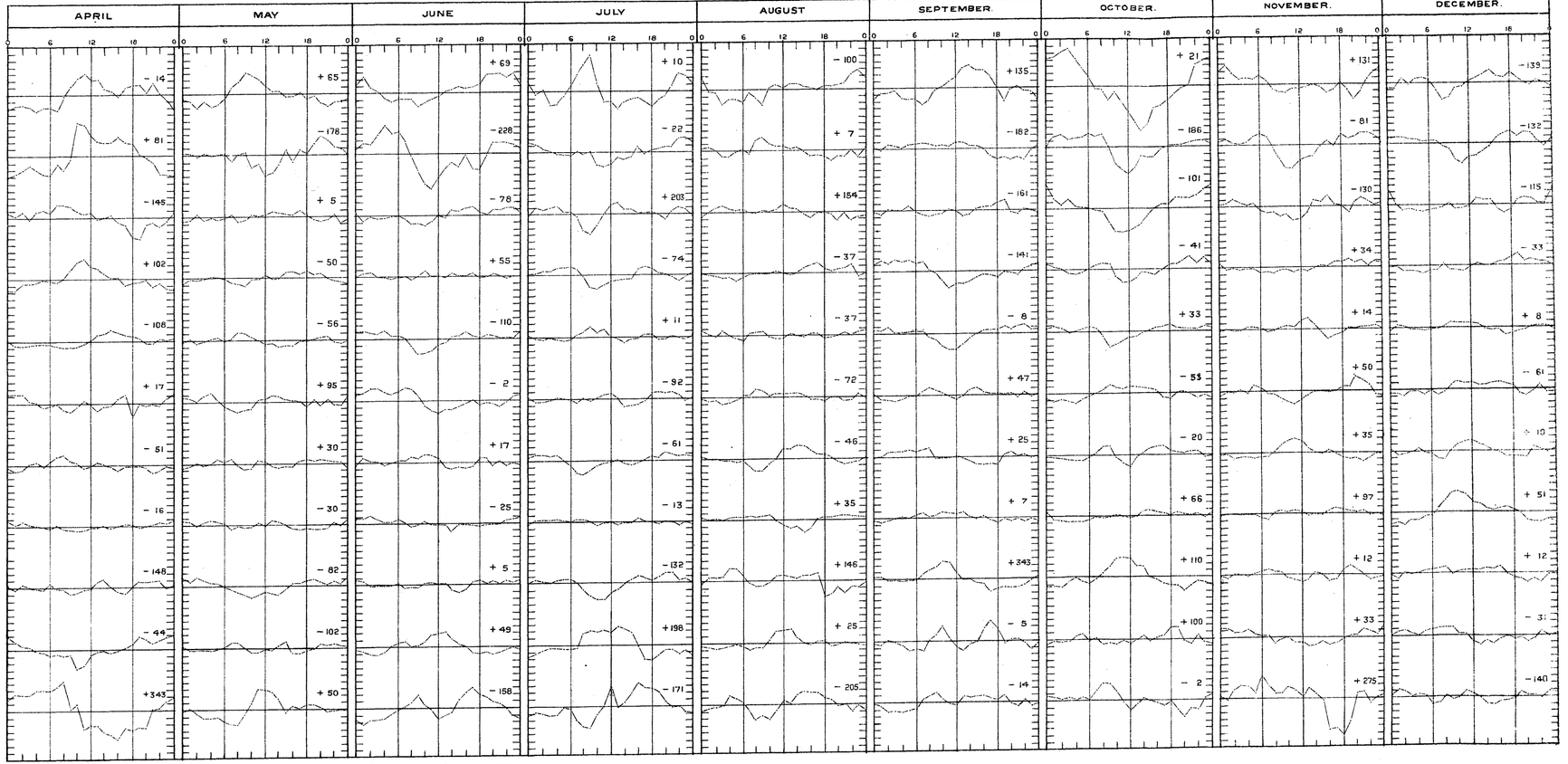
Carefully examining and comparing (1) the phenomenon of spot growth and spot decay from day to day as shown in table 543, with the dates of the larger disturbances referred to in paragraph 552, and listed in table 551, even when a lag of two or three days is allowed in the comparison, on the supposition that Arrhenius's negatively charged particles would take that interval to reach the earth; (2) the excess diurnal variations of H when the periodic seasonal and secular changes have been eliminated from them (*vide* plates 102, 102*a*, 102*b*), with the average monthly excess of the spot numbers treated precisely in the manner of the former data (*vide* table 555) and marked for ready reference on the corresponding magnetic curves in the above plates; and finally (3) the mean variability of the daily mean of H with that of spot numbers shown in figures 5 and 6, plate 100, a single conclusion alone appears to be inevitable to us. It becomes impossible with the data before us to concede that any direct relation at least can exisit between the two phenomena. For it will be readily seen, as the reader will find for himself without difficulty, that for every single case of coincidence where the magnetic storm may with some certainty be associated with the development of a spot group as was the case for example on 13th February or 24th April 1892, a number of instances may be adduced when an active group of spots in the sun, gives no indication of any corresponding echo in the magnetic traces as was the case on April 30th, 1903. And what is perhaps of greater significance a disturbance can be shown to have developed in the magnetic curves as on April 11th, 1902, which was the largest disturbance on record that year, when absolutely no visible sign of a spot or its development could be traced on the surface of the sun for over half a month either preceding or succeeding the day of the storm. However biased one may hence be in favour of the view of a direct relation between solar storms and magnetic disturbances, of the kind towards which the trend of thought lately is strongly inclined, evidence like the above can scarcely fail to give rise to serious misgivings unless of course as suggested by Maunder, additional factors such as (1) the existence of restricted areas of spots magnetically active as they traverse the central meridian, and (2) the projection from them of ions radiated in definite stream lines, etc., etc., are requisitioned to overcome the difficulties in satisfactorily explaining all the three cases above referred to, at one and the same time. If, however, owing to some peculiar conditions of incidence as stated above it is difficult without additional qualifying assumptions to readily adduce convincing proofs in the day-to-day phenomena in regard to the parallelism between sun-spot growth and magnetic disturbances, one may expect at least some reliable and more promising results in the

COLABA OBSERVATORY.

Disturbance Inequalities or Diurnal Inequalities of each month
less the Average Diurnal, Seasonal and Secular Variations.

Plate 102.



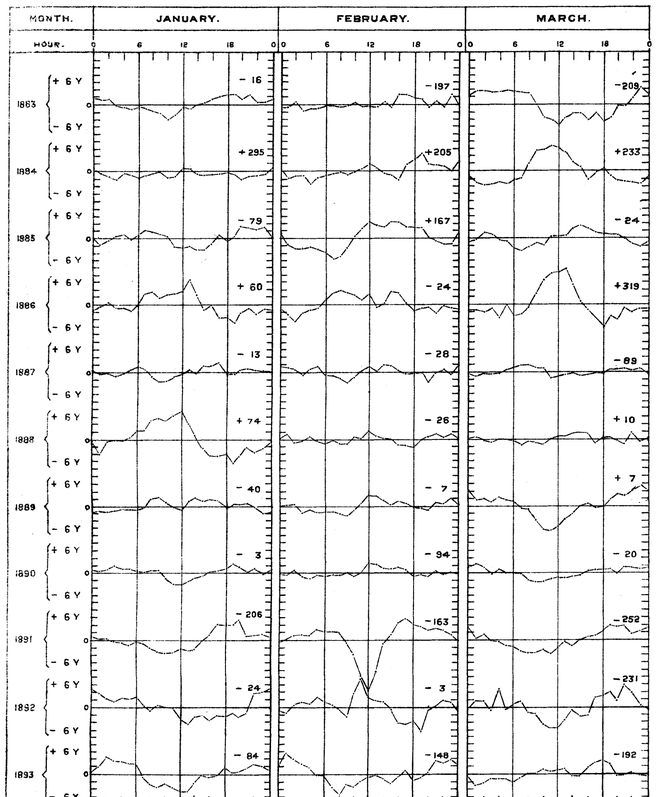


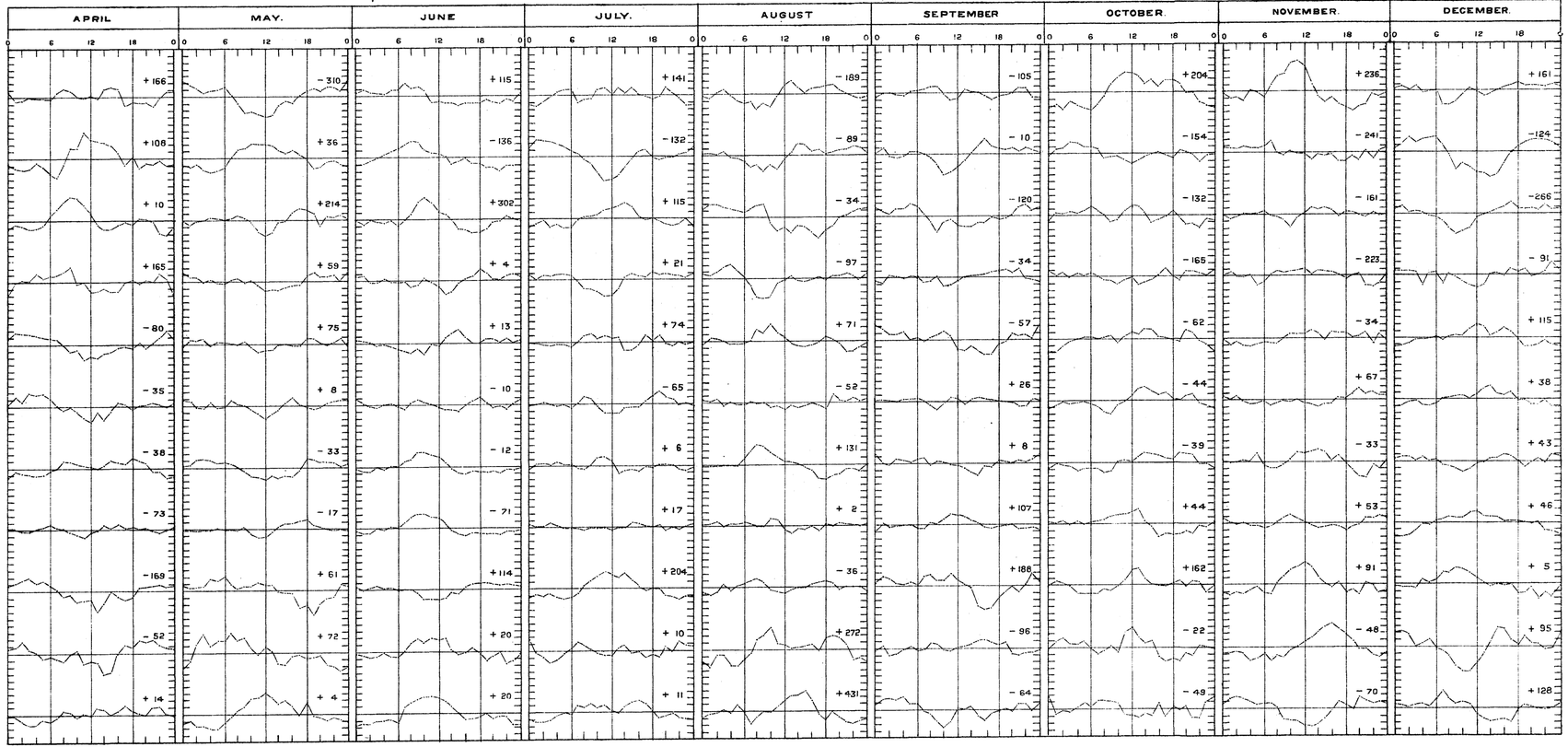
Govt. Photozinco. Office, Poona, 1910.

COLABA OBSERVATORY.

Disturbance Inequalities or Diurnal Inequalities of each month
less the Average Diurnal, Seasonal and Secular Variations.

Plate 102.A.





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COLABA OBSERVATORY

Disturbance Inequalities of H or Diurnal Inequalities of each month
less the Average Diurnal, Seasonl and Secular Variations

Plate 102 b.

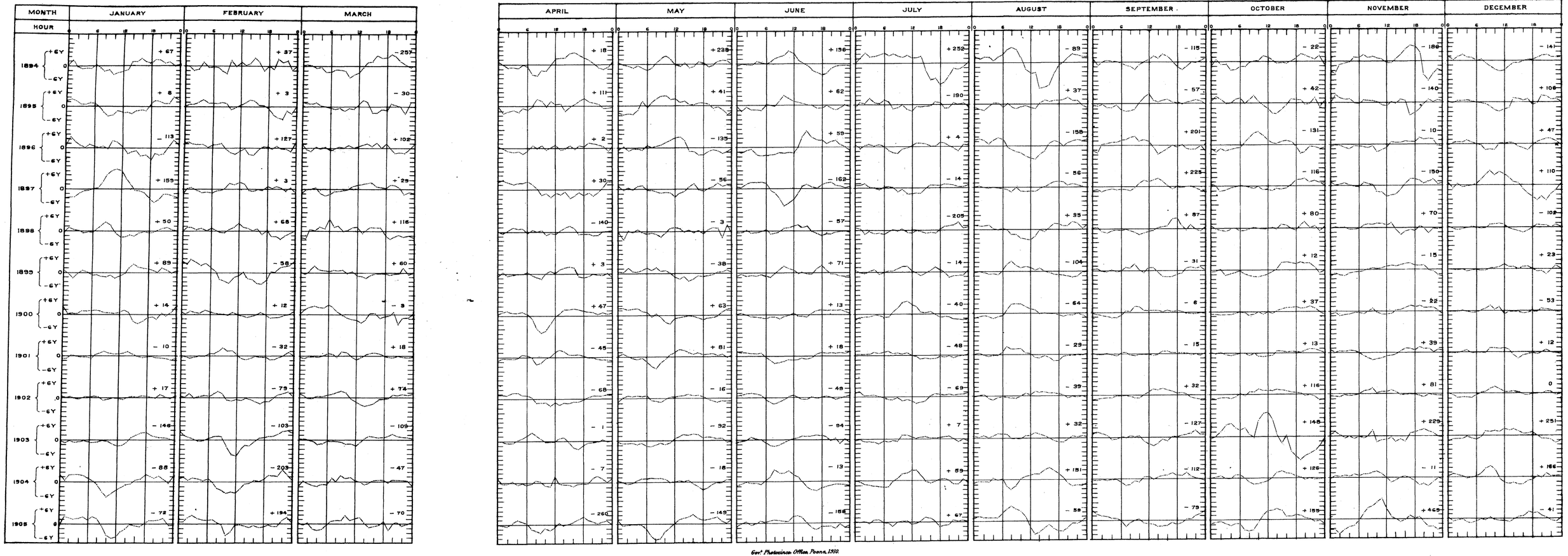

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TABLE 555.—*Showing the excesses of monthly sun-spot numbers in table 541, obtained by subtracting the average monthly means and the secular variation.*

Years.	Month.												Average Secular Variation.
	January.	February.	March.	April	May.	June.	July.	August.	September.	October.	November.	December.	
1872 ...	−20·7	+15·5	−13·3	− 1·4	+ 6·5	+ 6·9	+ 1·0	−10·0	+13·5	+ 2·1	+13·1	−13·9	+66·2
1873 ...	+21·9	+37·8	+32·0	+ 8·1	−17·8	−22·8	− 2·2	+ 0·7	−18·2	−18·6	− 8·1	−13·2	+30·8
1874 ...	+17·6	+16·6	+ 1·7	−14·5	+ 0·5	− 7·8	+20·3	+15·4	−16·1	−10·1	−13·0	−11·5	+ 9·2
1875 ...	− 1·0	+ 2·2	+16·7	+10·2	− 5·0	+ 5·5	− 7·4	− 3·7	−14·1	− 4·1	+ 3·4	− 3·3	−18·4
1876 ...	+ 4·5	+ 0·8	+19·9	−10·8	− 5·6	−11·0	+ 1·1	− 3·7	− 0·8	+ 3·3	+ 1·4	+ 0·8	−24·2
1877 ...	+13·6	− 6·5	− 0·6	+ 1·7	+ 9·5	− 0·2	− 9·2	− 7·2	+ 4·7	− 5·3	+ 5·0	− 6·1	−23·2
1878 ...	+ 1·4	− 0·3	+ 4·4	− 5·1	+ 3·0	+ 1·7	− 6·1	− 4·6	+ 2·5	− 2·0	+ 3·5	+ 1·0	−32·1
1879 ...	− 3·7	− 8·3	− 6·0	− 1·6	− 3·0	− 2·5	− 1·3	+ 3·5	+ 0·7	+ 6·6	+ 9·7	+ 5·1	−29·5
1880 ...	− 6·8	− 7·7	−12·8	−14·8	− 8·2	+ 0·5	−13·2	+14·6	+34·3	+11·0	+ 1·2	+ 1·2	− 3·2
1881 ...	−16·4	− 4·0	− 2·8	− 4·4	−10·2	+ 4·9	+19·8	+ 2·5	− 0·5	+10·0	+ 3·3	− 3·1	+18·8
1882 ...	−13·2	+ 6·7	+ 7·8	+34·3	+ 5·0	−15·8	−17·1	−20·5	− 1·4	− 0·2	+27·5	−14·0	+24·2
1883 ...	− 1·6	−19·7	−20·9	+16·6	−31·0	+11·5	+14·1	−18·9	−10·5	+20·4	+23·6	+16·1	+28·2
1884 ...	+29·5	+20·5	+23·3	+10·8	+ 3·6	−13·6	−13·2	− 8·9	− 1·0	−15·4	−24·1	−12·4	+28·0
1885 ...	− 7·9	+16·7	− 2·4	+ 1·0	+21·4	+30·2	+11·5	− 3·4	−12·0	−13·2	−16·1	−26·6	+16·7
1886 ...	+ 6·0	− 2·4	+31·9	+16·5	+ 5·9	+ 0·4	+ 2·1	+ 9·7	− 3·4	−16·5	−22·3	− 9·1	−10·1
1887 ...	− 1·3	− 2·8	− 8·9	− 8·0	+ 7·5	+ 1·3	+ 7·4	+ 7·1	− 5·1	− 6·2	− 3·4	+11·5	−22·4
1888 ...	+ 7·4	− 2·6	+ 1·0	− 3·5	+ 0·8	− 1·0	− 6·5	− 5·2	+ 2·6	− 4·4	+ 6·7	+ 3·8	−28·7
1889 ...	− 4·0	− 0·7	+ 0·7	− 3·8	− 3·3	− 1·2	+ 0·6	+13·1	+ 0·8	− 3·9	− 3·3	+ 4·3	−29·2
1890 ...	− 0·3	− 9·4	− 2·0	− 7·3	− 1·7	− 7·1	+ 1·7	+ 0·2	+10·7	+ 4·4	+ 5·3	+ 4·6	−28·4
1891 ...	−20·6	−16·3	−25·2	−16·9	+ 6·1	+11·4	+20·4	− 3·6	+18·8	+16·2	+ 9·1	+ 0·5	+ 0·1
1892 ...	− 2·4	− 0·3	−23·1	− 5·2	+ 7·2	+ 2·0	+ 1·0	+27·2	− 9·6	− 2·2	− 4·8	+ 9·5	+37·5
1893 ...	− 8·4	−14·8	−19·2	+ 1·4	+ 0·4	+ 2·0	+ 1·1	+43·1	− 6·4	− 4·9	− 7·0	+12·8	+49·4
1894 ...	+ 6·7	+ 3·7	−25·7	+ 1·8	+23·8	+19·6	+25·2	− 8·9	−11·5	− 2·2	−18·6	−14·1	+42·5
1895 ...	+ 0·8	+ 0·3	− 3·0	+11·1	+ 4·1	+ 6·2	−19·0	+ 3·7	− 5·7	+ 4·2	−14·0	+10·6	+28·5
1896 ...	−11·3	+12·7	+10·2	+ 0·2	−13·5	+ 5·9	+ 0·4	−15·8	+20·1	−13·1	− 1·0	+ 4·7	+ 6·3
1897 ...	+15·9	+ 0·3	+ 2·9	+ 3·0	− 5·6	−16·2	− 1·4	− 5·6	+22·5	−11·6	−15·0	+11·0	− 9·3
1898 ...	+ 5·0	+ 6·8	+11·6	−14·0	− 0·3	− 5·7	−20·5	+ 3·5	+ 8·7	+ 8·0	+ 7·0	−10·2	− 8·8
1899 ...	+ 8·9	− 5·8	+ 6·0	+ 0·3	− 3·8	+ 7·1	− 1·4	−10·4	− 3·1	+ 1·2	− 1·5	+ 2·3	−23·4
1900 ...	+ 1·4	+ 1·2	− 0·9	+ 4·7	+ 6·3	+ 1·3	− 4·0	− 6·4	− 0·6	+ 3·7	− 2·2	− 5·3	−26·0
1901 ...	− 1·0	− 3·2	+ 1·8	− 4·5	+ 8·1	+ 1·8	− 4·8	− 2·9	− 1·5	+ 1·3	+ 3·9	+ 1·2	−32·8
1902 ...	+ 1·7	− 7·9	+ 7·4	− 6·8	− 1·6	− 4·9	− 6·9	− 3·9	+ 3·2	+11·6	+ 8·1	0	−30·5
1903 ...	−14·6	−10·3	−10·9	− 0·1	− 9·2	− 9·4	+ 0·7	+ 3·2	−12·7	+14·8	+22·9	+25·1	−11·1
1904 ...	− 8·8	−20·3	− 4·7	− 0·7	− 1·8	− 1·3	+ 5·9	+15·1	−11·2	+12·6	− 1·1	+16·6	+ 6·4
1905 ...	− 7·2	+19·4	− 7·0	−26·0	−14·9	−15·8	+ 6·7	− 5·9	− 7·9	+15·5	+46·5	− 4·1	+28·0
Means, 1872—1904.	34·0	38·4	35·5	37·3	34·9	36·8	38·3	36·7	34·9	35·2	32·7	31·6	35·5

smoother monthly and annual averages. But even here (*vide* tables 385, 535 and 544, 545) we fail to discover convincing evidence of any direct relation. That some kind of connection, however, exists between them can scarcely be doubted, as will be seen from the parallelism indicated by the periodic portions of the phenomena the examination of which follows presently.

In the (last) chapter on daily means in the discussion of the probable short periods involved in the magnetic curves (paragraph 537) it was noted that the magnetic elements are in all probability subject to the influence of about 13·5-day and 27-day periods, the former being the more definite and unmistakably marked period of the two. Schuster has also shown by the application of his 'periodogram' analysis that a period of about $13\frac{1}{2}$ days rather than one of 27 days exists in the Greenwich magnetic disturbances discussed by Maunder. If so the view in favour of the connection between the two phenomena in respect at least of the rotational period of the sun, becomes somewhat obscure even though apparently such a relation is forcibly demonstrated by the 27-day sequences shown by disturbances which have been appropriately separated in table 551 and referred to in paragraph 553 as being directly connected with the sun-spot period. But can the relatively more important $13\frac{1}{2}$-day period indicated at the same time in the magnetic curves, be passed over without any explanation, and ascribed to fortuitous causes? May not the difficulty which confronts us in explaining the non-coincidence of the disturbances or the aperiodic parts of the phenomena, be overcome by some more plausible assumption than the one of radial streams which is palpably suggested by the visible phenomena of coronal and cometary appendages? Possibly the varying conductivity of the circumsolar or interplanetary space itself may differ in the immediate environments of the sun and our earth, and this may constitute the disturbing elements which control the critical conditions * at each place and eventually determine the disturbances which may not hence fall necessarily simultaneous or be equal in magnitude in the sun and on our earth.

The periodic part of the phenomena which indicates much closer relation may now be taken up for examination.

557. In their secular march, the smoothed periodic (summed) ranges of H and the solar spot numbers which are charted respectively in figures 3 and 4 in plate 100, undoubtedly disclose a strikingly accordant parallelism. Before however considering this in detail, the general run of the curve may, in the first instance, be examined and some of its peculiar characteristics noted. It will be observed that (1) the rise from the minimum conditions to the maximum in the 11-year period oscillations, is almost always rapid while the fall back to minimum conditions is slow and laboured; (2) the shorter the interval in time the conditions of the minimum take to change to those which determine the maximum, the greater is the intensity of the maximum attained; (3) the less intense are the conditions determining the minimum which is thus prevented from falling to too low a value, the more accentuated is the following maximum; and (4) the longer is the interval in time taken for the conditions to alter from maximum to minimum, the lower is the minimum reached and the more diffused and feebler is the succeeding maximum. The same features are of course noted to obtain closely also in the solar spot curve.

558. To help us in our search for hidden periodicities in a series, no exact method reliable enough to separate the true periods, is known except that of the periodogram developed by Schuster. The simple treatments referred to in the next six paragraphs hence are attempted not with a view to discover exact results, but as they involve no laborious calculations and in view of the uncertainty which must always prevail in the best of efforts owing to the shortness of the data which consist of but about five 11-year periods only, rough and simple treatments have their obvious advantages.

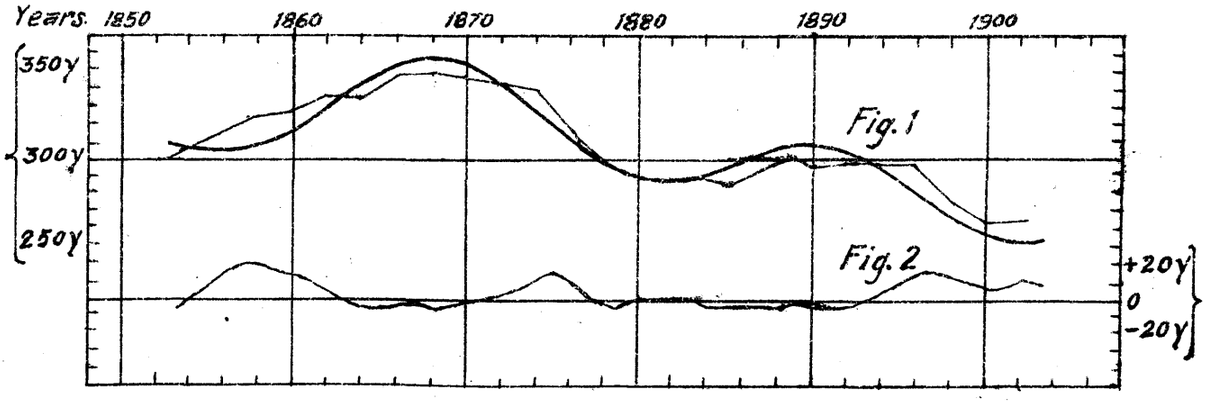
559. If it is assumed that one period has been prevalent throughout the period considered at Colaba, without any variation in its activity, it is clear from the dominant and characteristic sweep of the curve, that the cycles are apparently repeated about every 11 years. It becomes possible hence to analyse the smoothed range data (table 536) in the usual way by the application of the Fourier theorem for the following seven periods, *viz.*, 11·0, 11·1, 11·2, 11·25, 11·3, 11·4 and 11·5 years, with a view to examine which of these periods indicates the largest amplitude. In the analysis twenty-four equidistant values of the monthly mean ranges in table 536 were taken so as to cover in each case the exact period considered; and the amplitudes† so obtained by the analyses were found respectively for the above periods to be 76·3γ, 77·1γ, 78·0γ, 78·7γ, 79·1γ, 78·8γ, and 77·9γ. It will thus be seen that the amplitude appears to increase as the period 11·3 years, is approached and to decrease thereafter. As the periods are very close together and the differences in the amplitudes are not convincingly large; and moreover as the actual number of years considered in each case cannot be identically the same, the results

* The secondary causes induced in the earth itself, called into existence by solar radiation may also form other unknown factors which may co-operate in the climax of a disturbance.

† The phases of the maximum epochs for the periods are respectively 1871·9, 1871·9, 1871·9, 1871·9, 1871·8, 1871·8, and 1871·8.

may not be regarded as strictly comparable. However in the result of the analyses such as it is, there is sufficient evidence to warrant the inference, if the periods are taken sufficiently apart such as 11·0, 11·2, and 11·4 years, that the probability is distinctly greater for the period indicated by the Colaba data to lie between 11·2 and 11·4 years than between 11·0 and 11·2 years.

560. Accepting hence provisionally that the prevailing period for the data considered is of 11·3 years, the curve may be examined further. If overlapping means of 136 monthly means of ranges in table 536 be now taken and smoothed down in the usual way, we eliminate the 11·3-year period with its subperiods completely. The operation allows at the same time the character of the incidence of the larger period movements though affected by the smoothing operation, to be fairly disclosed for examination. It may be noted incidentally that data similarly derived but from 132 monthly means forming the exact period of 11·0 years, show that the results after the process of elimination in either of the two cases, are practically the same (*vide* tables 556 and 557). The residual curve in column 14 of the tables above referred to and charted as thin curve in figure 1 below, may hence be regarded as giving a fairly succinct idea of the character of the progression due to the larger period which remains practically unaffected within a certain limit of variation in the period eliminated, *e. g.*, 11·0 years to 11·3 years. It will be seen however that in the smoothing operation, along with the 11-year period and its submultiples, such of the submultiples of the larger period as may be near to 11-year and its submultiples, will unfortunately also be more or less eliminated, and we can scarcely under the circumstances, expect the residual curve to give the true character of the curve of the larger periodicity and its submultiples. Nevertheless one point remains fairly undisputable, namely, that anything like Bruckner's period of 35 years* or thereabouts, is not at least prominently indicated in the sweep of the residual curve. On the other hand, the prevalence of a period twice as large or more may be strongly suspected. It was this result and others which follow that led in the year 1902, to the publication† of the view which has



since been confirmed that the next maximum in the magnetic curves which was expected to occur about the year 1905 or 1906 would in all probability be a very low maximum and a diffused one (see paragraph 557); (2) that it would certainly not be anything like the great outburst of activity noted about the years 1870-1871; and (3) that the effects due to the larger period seemed then (in 1902) to be very near if not actually to attain its minimum sweep after having passed its upper turning point somewhere in the neighbourhood of the year 1870.

561. The 11·3-year period having been, for the time, accepted as the most probable period prevalent in the Colaba curves, the further examination of the data may be made in two ways. It may be assumed (*a*) that the fundamental period is some large multiple of the 11-year period and due to the same initial cause; or what is more probably the truth, (*b*) that the 11-year period movements are independently due to conditions inherent in the radiation of the sun itself set up by electrical and thermal effects similar to those explained by Dr. Halm‡, and that the larger period effects may be due to conditions extraneous to the sun such as meteor streams or some other cause existing in the interplanetary space and to secondary or induced effects in the earth itself; and that the interaction of the effects of this large period and its submutliples whichever are effective, may, it is conceivable by merely damping or enlarging the average oscillation of the 11·3-year (or thereabout), induce that varying activity in the 11-year period which, as suggested by Dr. Schuster, renders the problem of the discovery of the hidden periodicities so difficult to attack.

* As the great magnetic activity of 1870-1871 followed the almost equally large burst in the year 1837, about 33 years after, one naturally expected a similar recurrence in 1905 or thereabout.

† Weather Review, Meteorological Department, Government of India, August 1903.

‡ Annals of the Royal Observatory, Edinburgh, Vol. I, 1902.

TABLE 556.—*Showing the overlapping means of 132 monthly values of the smoothed summed ranges of H shown in table 536.*

Unity = 1γ = ·00001 C. G. S.

Years.	Months.												Annual means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1852 ...	...	...	...	...	...	...	297	297	297	297	297	297	297
1853 ...	297	297	297	297	297	297	298	298	298	298	298	299	298
1854 ...	299	299	300	300	301	301	301	302	302	303	303	304	301
1855 ...	304	305	305	306	307	307	308	309	309	310	311	311	308
1856 ...	312	313	313	314	315	315	316	316	317	317	318	318	316
1857 ...	319	319	319	320	320	321	321	322	322	323	323	324	321
1858 ...	324	325	325	326	326	326	326	327	327	327	327	327	326
1859 ...	327	327	327	327	327	328	328	328	328	328	328	328	328
1860 ...	329	329	329	329	330	330	330	330	331	331	331	332	330
1861 ...	332	332	332	333	333	333	333	333	333	333	333	333	333
1862 ...	333	333	333	333	333	333	333	332	332	332	332	332	333
1863 ...	332	332	332	332	332	332	332	332	332	332	332	332	332
1864 ...	332	332	332	332	332	333	333	333	333	333	334	334	333
1865 ...	335	335	336	336	337	337	338	338	339	339	340	340	338
1866 ...	340	341	341	341	342	342	342	343	343	344	344	345	342
1867 ...	345	345	346	346	347	347	347	348	348	348	348	348	347
1868 ...	349	349	349	349	348	348	348	348	348	348	348	348	348
1869 ...	348	348	348	348	348	348	348	347	347	347	347	347	348
1870 ...	347	347	347	347	347	346	346	346	346	346	346	346	346
1871 ...	346	346	346	346	346	346	346	345	345	345	345	345	346
1872 ...	345	345	344	344	344	344	344	344	344	344	344	344	344
1873 ...	343	343	343	343	343	343	343	342	342	342	342	342	343
1874 ...	342	341	341	341	340	340	340	339	338	338	337	337	340
1875 ...	336	335	335	334	333	332	331	330	329	328	327	326	332
1876 ...	324	323	321	320	318	317	315	313	312	310	309	308	316
1877 ...	306	305	304	303	302	301	300	299	298	297	296	295	301
1878 ...	294	293	293	292	292	291	291	291	290	290	290	290	291
1879 ...	290	289	289	289	289	289	289	289	289	289	289	290	289
1880 ...	290	290	290	290	290	290	290	290	290	290	290	290	290
1881 ...	290	290	290	290	289	289	289	289	289	289	289	288	289
1882 ...	288	288	288	288	288	289	289	289	289	289	289	289	289
1883 ...	289	289	288	288	288	288	288	288	288	288	288	288	288
1884 ...	288	288	288	288	288	288	288	287	287	287	287	287	288
1885 ...	287	287	287	287	287	287	287	287	287	287	287	287	287
1886 ...	287	287	287	288	288	288	288	288	288	289	289	289	288
1887 ...	289	289	289	290	290	290	290	291	291	292	292	293	290
1888 ...	293	294	295	295	296	296	296	297	297	297	298	298	296
1889 ...	298	298	298	299	299	298	298	298	298	298	298	298	298
1890 ...	298	298	298	297	297	297	297	297	297	297	296	296	297
1891 ...	296	296	296	295	295	295	295	295	295	295	295	295	295
1892 ...	295	295	295	295	295	296	296	296	296	296	296	296	296
1893 ...	296	296	296	296	296	296	296	295	295	295	295	295	296
1894 ...	295	295	295	295	295	295	295	295	295	295	295	295	295
1895 ...	295	295	295	295	295	295	296	296	296	296	296	295	296
1896 ...	295	295	295	295	294	294	294	293	293	292	292	291	294
1897 ...	291	290	289	288	288	287	286	285	285	284	283	282	287
1898 ...	282	281	280	279	278	278	277	276	275	274	273	272	278
1899 ...	272	271	270	269	268	268	267	267	266	266	265	265	268
1900 ...	264	264	264	263	263	263	263	263	262	262	262	262	263
1901 ...	261	261	261	261	261	261	260	260	260	260	261	261	261
1902 ...	261	261	261	261	262	262	262	262	263	263	263	263	262
1903 ...	264	264	264	264	265	265	265	265	266	266	266	267	265
Average ...	...	...	...	...	...	...	...	...	...	...	...	...	307

TABLE 557.—*Showing the overlapping means of 136 monthly values of the summed ranges of H shown in table 536.*

Years.	Months.												Annual means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
1852 ...	...	...	...	...	...	...	...	297	298	298	298	299	...
1853 ...	299	299	299	299	300	300	300	300	301	301	301	302	300
1854 ...	302	303	303	304	304	304	305	305	305	306	306	306	304
1855 ...	307	307	307	308	308	309	310	310	311	311	312	312	309
1856 ...	313	314	314	315	315	316	316	317	317	318	318	319	316
1857 ...	319	319	320	320	320	321	321	322	322	322	323	323	321
1858 ...	324	324	324	325	325	325	325	326	326	326	326	326	325
1859 ...	326	326	326	326	326	326	326	326	326	326	327	327	326
1860 ...	327	327	327	327	328	328	328	329	329	329	329	330	328
1861 ...	330	330	330	331	331	331	331	331	331	331	331	331	331
1862 ...	331	331	331	331	331	331	331	331	331	331	331	331	331
1863 ...	331	331	331	331	332	332	332	332	332	333	333	333	332
1864 ...	333	333	333	334	334	335	335	335	336	336	337	338	335
1865 ...	338	339	340	340	341	341	342	342	342	343	343	343	341
1866 ...	343	343	344	344	344	344	345	345	345	346	346	346	345
1867 ...	347	347	347	348	348	348	348	348	349	349	349	349	348
1868 ...	349	349	349	348	348	348	348	348	348	347	347	347	348
1869 ...	347	347	347	347	346	346	346	346	346	346	346	346	346
1870 ...	346	345	345	345	345	345	345	345	344	344	344	344	345
1871 ...	344	344	344	344	344	344	343	343	343	343	343	343	343
1872 ...	343	342	342	342	342	342	342	342	342	342	342	341	342
1873 ...	341	341	341	341	341	341	341	341	340	340	340	340	341
1874 ...	340	340	340	340	339	339	339	338	338	338	337	337	339
1875 ...	336	336	335	335	334	333	333	332	331	330	329	328	333
1876 ...	327	326	324	323	321	319	318	316	315	313	312	310	319
1877 ...	309	308	307	305	304	303	302	301	300	299	299	298	303
1878 ...	297	296	295	295	294	294	293	293	292	292	292	291	294
1879 ...	291	291	291	290	290	290	290	290	290	290	290	290	290
1880 ...	290	290	290	290	290	290	290	290	290	290	290	290	290
1881 ...	289	289	289	289	289	288	288	288	288	288	288	288	288
1882 ...	288	288	288	288	288	288	288	288	288	288	287	287	288
1883 ...	287	287	287	287	287	287	287	287	287	287	257	287	287
1884 ...	287	287	287	287	287	287	286	286	286	286	286	286	286
1885 ...	286	286	286	286	286	286	286	286	287	287	287	287	286
1886 ...	287	288	288	288	288	289	289	289	290	290	290	290	289
1887 ...	290	290	291	291	291	292	292	292	293	293	294	295	292
1888 ...	295	296	296	297	297	297	298	298	298	299	299	299	297
1889 ...	299	300	300	300	300	300	300	300	299	299	299	299	300
1890 ...	299	298	298	298	298	298	298	297	297	297	297	297	298
1891 ...	296	296	296	296	295	295	295	295	295	294	294	294	295
1892 ...	294	294	294	294	295	295	295	295	295	295	295	295	295
1893 ...	295	295	295	295	295	295	294	294	294	294	294	294	294
1894 ...	294	293	293	293	293	293	293	294	294	294	294	294	293
1895 ...	294	294	294	294	294	294	294	294	294	294	294	294	294
1896 ...	294	294	294	293	293	293	293	292	292	292	291	291	293
1897 ...	290	290	289	288	288	287	287	286	285	285	284	283	287
1898 ...	282	282	281	280	280	279	278	277	277	276	275	274	278
1899 ...	273	273	272	271	270	270	269	268	268	267	267	267	270
1900 ...	266	266	266	265	265	265	264	264	264	264	263	263	265
1901 ...	263	262	262	262	262	262	262	261	261	262	262	262	262
1902 ...	262	262	262	262	263	263	263	263	263	264	264	264	263
1903 ...	264	264	265	265	265	265	266	266	266	266	267	267	265
Average ...	...	...	...	...	...	...	...	...	...	...	...	...	308

TABLE 558.—*Showing the details of the process of derivation of the Theoretical Curves of*

Unity = 1γ = ·00001 C. G. S.

Years.	Annual means of smoothed summed ranges of H.	Computed values of summed ranges. Sum of 68 and 22·7 year periods plus a constant (=303γ).	Computed values of summed ranges or sum of 68, 22·7, 13·6, 11·3 and 5·7 year periods plus a constant (=303γ).	Observed minus computed values—column 2 less column 4.	Summed ranges in column 2 less 200γ the value when spot number = 0.	Average variation of summed ranges for 11·3-year periods plus the value of zero (=1147) deduced from 1855 to 1899 omitting 1877.	Overlapping means of 132 monthly values of summed ranges given in table 536.	Ratio of the overlapping means in column 8 to the mean value (1147) of the zero of the average 11·3-year variation in column 7.	Calculated values of summed ranges or average 11·3-year variation in column 7 multiplied by ratios in column 9.	Observed minus calculated values—column 6 less column 10.	Theoretical values of summed ranges or sum of 11·3 and 5·7 year periods. Fourier series plus (303 − 200) = 103γ.
1	2	3	4	5	6	7	8	9	10	11	12
1841 ...	318	.....	261	...	...	.....	...	.....	.....	...	74
1842 ...	281	.....	260	...	...	.....	...	.....	.....	...	58
1843 ...	258	.....	258	...	...	.....	...	.....	.....	...	42
1844 ...	253	.....	256	...	...	.....	...	.....	.....	...	33
1845 ...	260	.....	280	...	...	.....	...	.....	.....	...	53
1846 ...	286	.....	329	...	...	.....	...	.....	.....	...	104
1847 ...	355	.....	380	...	...	.....	...	.....	.....	...	160
1848 ...	407	.....	401	+ 6	207	.....	...	.....	.....	...	190
1849 ...	368	.....	382	−14	168	.....	...	.....	.....	...	179
1850 ...	307	.....	336	−29	107	.....	...	.....	.....	...	141
1851 ...	294	.....	294	0	94	.....	...	.....	.....	...	104
1852 ...	260	310	271	−11	60	.....	...	.....	.....	...	80
1853 ...	272	306	256	+16	72	61	98	·86	52	+20	64
1854 ...	235	305	246	−11	35	42	101	·89	37	− 2	47
1855 ...	222	303	238	−16	22	36	108	·95	34	−12	33
1856 ...	256	302	254	+ 2	56	50	116	1·02	51	+ 5	42
1857 ...	291	304	303	−12	91	89	121	1·06	94	− 3	84
1858 ...	363	306	364	− 1	163	153	126	1·11	170	− 7	142
1859 ...	449	310	407	+42	249	216	128	1·12	242	+ 7	184
1860 ...	441	316	410	+31	241	209	130	1·14	238	+ 3	188
1861 ...	393	321	376	+17	193	177	133	1·17	207	−14	157
1862 ...	355	327	332	+23	155	133	133	1·17	156	− 1	115
1863 ...	316	334	302	+14	116	87	132	1·16	101	+15	86
1864 ...	285	340	289	− 4	85	61	133	1·17	71	+14	70
1865 ...	262	346	276	−14	62	42	138	1·21	51	+11	52
1866 ...	254	349	268	−14	54	36	142	1·25	45	+ 9	37
1867 ...	252	352	276	−24	52	50	147	1·29	64	−12	35
1868 ...	283	355	318	−35	83	89	148	1·30	116	−33	66
1869 ...	370	352	380	−10	170	153	148	1·30	199	−29	122
1870 ...	506	350	437	+69	306	216	146	1·28	276	+30	174
1871 ...	489	345	454	+35	289	209	146	1·28	268	+21	193
1872 ...	438	340	424	+14	238	177	144	1·26	223	+15	169
1873 ...	358	333	372	−14	158	133	143	1·25	166	− 8	128
1874 ...	306	325	322	−16	106	87	140	1·23	107	− 1	94
1875 ...	269	318	287	−18	69	61	132	1·16	71	− 2	74
1876 ...	250	311	256	− 6	50	42	116	1·02	43	+ 7	58
1877 ...	235	303	226	+ 9	35	39	101	·89	35	0	42
1878 ...	236	298	218	+18	36	36	91	·80	29	+ 7	33
1879 ...	251	293	226	+25	51	50	89	·78	39	+12	53
1880 ...	283	290	279	+ 4	83	89	90	·79	70	+13	104
1881 ...	327	288	340	−13	127	153	89	·78	119	+ 8	160
1882 ...	321	288	380	−59	121	216	89	·78	168	−47	190
1883 ...	341	288	376	−35	141	209	88	·77	161	−20	179
1884 ...	345	291	346	− 1	145	177	88	·77	136	+ 9	141
1885 ...	321	294	314	+ 7	121	133	87	·76	101	+20	104
1886 ...	259	296	289	−30	59	87	88	·77	67	− 8	80
1887 ...	246	300	272	−26	46	61	90	·79	48	− 2	64
1888 ...	233	301	248	−15	33	42	96	·84	35	− 2	47
1889 ...	231	303	228	+ 3	31	36	98	·86	31	0	33
1890 ...	242	304	230	+12	42	50	97	·85	42	0	42
1891 ...	299	302	265	+34	99	89	95	·83	74	+25	84
1892 ...	353	300	320	+33	153	153	96	·84	129	+24	142
1893 ...	388	296	361	+27	188	216	96	·84	181	+ 7	184
1894 ...	364	290	366	− 2	164	209	95	·83	173	− 9	188
1895 ...	331	285	338	− 7	131	177	96	·84	149	−18	157
1896 ...	297	279	298	− 1	97	133	94	·82	109	−12	115
1897 ...	267	272	270	− 3	67	87	87	·76	66	+ 1	86
1898 ...	246	266	251	− 5	46	61	78	·68	41	+ 5	70
1899 ...	224	260	228	− 4	24	42	68	·60	25	− 1	52
1900 ...	238	257	206	+32	38	36	63	·55	20	+18	37
1901 ...	227	254	194	+33	27	50	61	·54	27	0	35
1902 ...	221	252	215	+ 6	21	89	62	·54	48	−27	66
1903 ...	250	.....	264	−14	50	153	65	·57	87	−37	122
1904 ...	281	.....	311	−30	81	.....	...	.....	.....	...	174
1905 ...	306	.....	332	−26	106	.....	...	.....	.....	...	193
1906 ...	295	.....	314	−19	95	.....	...	.....	.....	...	169
1907 ...	303	.....	285	+18	103	.....	...	.....	.....	...	128
1908 ...	293	.....	266	+27	93	.....	...	.....	.....	...	94
Average ...	.....	.....	303	±18	...	114	...	.....	.....	±12	103

NOTE.—303γ is the mean value of the summed ranges for the period considered, 200γ is the value of the datum above which alone the fluctuations

the Secular Variation of the summed ranges of H and their comparison with sun-spot numbers.

Theoretical values of summed ranges, sum of 68, 22·7 and 13·6 year period. Fourier series plus (303 − 200) = 103γ.	Theoretical values in column 13 + 103, the mean value of the summed ranges for 68 years.	Column 12 × column 14 or calculated values of summed ranges.	Observed minus computed values—column 6 less column 15.	Summed ranges calculated by formula $R = a + bs$ where R = annual means in column 2 (1847—1905), s = annual means of spot numbers in table 542, $a = 2057$, $b = 2{\cdot}22$.	Observed minus calculated values—column 2 less column 17.	Summed ranges calculated by formula $R = a + bs$ where R = calculated values in coulmn 10 + 200γ, s = corresponding spot numbers in column 6, table 559, $a = 2077$, $b = 2{\cdot}31$.	Column 10 + 200γ less col. 19.	Summed ranges calculated by formula $R = a + bs$ where R = average values in column 7 + 200γ, s = corresponding spot numbers in column 3, table 559, $a = 2137$, $b = 1{\cdot}99$.	Column 7 + 200γ less col. 21.	Summed ranges calculated by formula $R = a + bs$ where R = overlapping means in column 8 + 200γ, s = corresponding spot numbers in column 4, table 559, $a = 1997$, $b = 2{\cdot}48$.	Column 8 + 200γ less col. 23.
13	14	15	16	17	18	19	20	21	22	23	24
90	...	...	...	.....	...	.....	...	.....	...	.....	...
105	...	...	...	.....	...	.....	...	.....	...	.....	...
119	...	...	...	.....	...	.....	...	.....	...	.....	...
126	...	...	...	.....	...	.....	...	.....	...	.....	...
130	...	...	...	.....	...	.....	...	.....	...	.....	...
128	...	...	...	.....	...	.....	...	.....	...	.....	...
123	...	...	...	.....	...	.....	...	.....	...	.....	...
114	111	211	− 4	482	−75	.....	...	.....	...	.....	...
106	103	184	−16	416	−48	.....	...	.....	...	.....	...
98	97	137	−30	360	−53	.....	...	.....	...	.....	...
93	92	96	− 2	345	−51	.....	...	.....	...	.....	...
94	93	74	−14	323	−63	.....	...	.....	...	.....	...
95	94	60	+12	292	−20	272	−20	267	− 6	325	−27
102	99	47	−12	252	−17	242	− 5	245	− 3	318	−17
108	105	35	−13	223	− 1	230	+ 4	233	+ 3	318	−10
115	112	47	+ 9	216	+40	235	+16	239	+11	318	− 2
122	120	101	−10	256	+35	297	− 3	295	− 6	318	+ 3
125	123	175	−12	329	+34	378	− 8	370	−17	316	+10
126	124	228	+21	405	+44	438	+ 4	420	− 4	318	+10
125	123	231	+10	416	+25	415	+23	396	+13	321	+ 9
122	120	188	+ 5	378	+15	378	+29	364	+13	321	+12
120	117	135	+20	340	+15	341	+15	328	+ 5	323	+10
119	116	100	+16	305	+11	299	+ 2	291	− 4	325	+ 7
122	120	84	+ 1	305	−20	274	− 3	267	− 6	330	+ 3
127	125	65	− 3	274	−12	249	+ 2	245	− 3	340	− 2
134	132	49	+ 5	238	+16	235	+10	233	+ 3	345	− 3
144	140	49	+ 3	225	+27	244	+20	239	+11	350	− 3
155	152	100	−17	287	− 4	322	− 6	295	− 6	350	− 2
161	158	193	−23	382	−12	429	−30	370	−17	350	− 2
166	163	284	+22	498	+ 8	491	−15	420	− 4	345	+ 1
164	159	307	−18	458	+31	450	+18	396	+13	340	+ 6
158	155	262	−24	427	+21	408	+15	364	+13	340	+ 4
147	143	183	−25	356	+ 9	357	+ 9	328	+ 5	338	+ 5
131	129	121	−15	300	+ 9	304	+ 3	291	− 4	333	+ 7
116	113	84	−15	247	+26	267	+ 4	267	− 6	318	+14
101	100	58	− 8	232	+21	237	+ 6	245	− 3	303	+13
87	86	36	− 1	229	+ 8	230	+ 5	239	0	291	+10
88	87	29	+ 7	214	+24	223	+ 6	233	+ 3	283	+ 8
76	74	39	+12	223	+29	228	+11	239	+11	283	+ 6
78	76	79	+ 4	276	+ 8	272	− 2	295	− 6	283	+ 7
83	81	130	− 3	325	+ 3	334	−15	370	−17	286	+ 3
92	89	169	−48	334	−12	376	− 8	420	− 4	286	+ 3
100	99	177	−36	349	− 7	355	+ 6	396	+13	286	+ 2
108	105	148	− 3	345	− 1	329	+ 7	364	+13	286	+ 2
113	110	114	+ 7	318	+ 3	302	− 1	328	+ 5	286	+ 1
112	109	87	−28	260	− 1	269	− 2	291	− 4	286	+ 2
111	108	69	−23	234	+12	253	− 5	267	− 6	291	− 1
104	101	47	−14	221	+12	235	0	245	− 3	296	0
98	97	32	− 1	218	+13	225	+ 6	233	+ 3	298	0
91	90	38	+ 4	223	+19	240	+ 2	239	+11	298	− 1
84	82	69	+30	289	+10	281	− 7	295	− 6	296	− 1
81	79	112	+41	360	− 6	353	−24	370	−17	298	− 2
80	78	144	+44	391	− 3	403	−22	420	− 4	301	− 5
81	79	149	+15	380	−16	380	− 7	396	+13	301	− 6
84	82	129	+ 2	340	− 9	355	− 6	364	+13	303	− 7
86	85	98	− 1	300	− 3	318	− 9	328	+ 5	301	− 7
87	86	74	− 7	267	0	276	−10	291	− 4	293	− 6
84	82	57	−11	260	−14	249	− 8	267	− 6	283	− 5
79	77	40	−16	236	−12	230	− 5	245	− 3	273	− 5
72	70	26	+12	225	+13	221	− 1	233	+ 3	271	− 8
62	62	22	+ 5	212	+15	223	+ 4	239	+11	268	− 7
52	52	34	−13	216	+ 5	265	−17	295	− 6	273	−11
45	44	54	− 4	258	− 8	.....	...	.....	...	.....	...
40	39	68	+13	298	−17	.....	...	.....	...	.....	...
42	41	79	+27	345	−34	.....	...	.....	...	.....	...
48	47	79	+16	.....	...	.....	...	.....	...	.....	...
60	60	77	+26	.....	...	.....	...	.....	...	.....	...
75	73	69	+24	.....	...	.....	...	.....	...	.....	...
103	...	...	±14	.....	±15	.....	± 9	.....	± 7	.....	± 6

of the 11-year period occur and 103γ (303 − 200) is the difference between the zero of the Fourier curves and the datum used in the above calculations.

562. Any way taking up a cursory examination of the curve, in the first instance on the first of these two suppositions and following up the suggestion made in paragraph 560 about the great period being about 64 years or larger, the largest period which is possible to discuss in the Colaba data would be $6 \times 11{\cdot}3 = 68$ years nearly. The real period* is in all probability much larger than the one tentatively adopted, but the shortness of the available data necessarily precludes the adoption of any higher multiple. And even for this the Colaba data which are available only from 1846 to 1908 are short by 5 years. These additional data had therefore to be derived by interpolation from the average values of the whole period, and partly from the incomplete data which exist at Colaba from 1842. The whole data (*see* column 2, table 558) were then analysed in the usual way for the period of 68 years, and the result of the analysis showing the compounded series of the first and the third components plus the mean value (*vide* column 3) is charted in thick curve in figure 1 above (paragraph 560). It will be readily seen how the two components solely by themselves show a striking parallelism to the thin curve ; and though the amplitude of the latter must be affected by the smoothing operation involved in its derivation and the two curves are thus not strictly comparable, the departures nevertheless indicate a fairly close fit. The results of the analysis summarised below show that the amplitudes of the first and the third components are respectively as much as 3/7 and 2/7 of the amplitude of the dominant 11·3-year period. The amplitude of the second component or the 34 year period, is insignificantly small as expected.

Period.	Maximum epoch.	Amplitude.
$1 \times 68 = 68$ years.	1866·0	30.
$[\frac{1}{2} \times 68 = 34$,,	...	8.]
$\frac{1}{3} \times 68 = 22{\cdot}7$,,	1869·0	20.
$[\frac{1}{5} \times 68 = 13{\cdot}6$,,	1871·8	19.
$\frac{1}{6} \times 68 = 11{\cdot}3$,,	1871·7	73.
$\frac{1}{7} \times 68 = 9{\cdot}7$,,	1871·0	18.
$[\frac{1}{8} \times 68 = 8{\cdot}5$,,	...	5·]
$\frac{1}{9} \times 68 = 7{\cdot}6$,,	1871·0	14.
$\frac{1}{12} \times 68 = 5{\cdot}6$,,	1871·2	19.

The periods which indicate significantly large amplitudes and which may thus be regarded as probably connoting real periodicities, are 1, $\frac{1}{3}$, $\frac{1}{5}$, $\frac{1}{6}$ and $\frac{1}{12}$ of 68 years. These have been used in the reductions and the curve so derived is shown in column 4, table 558. The residual errors or the differences between the observed and the theoretical curves, are shown in column 5, and in figure 21 in plate 101, from which it will be seen that its largest amplitude is more than $\frac{2}{5}$ of the whole and the inexpediency of the process is of course plainly apparent. But the method enables a theoretical curve roughly fitting the observed conditions to be obtained which serves some useful purpose if the fit can be depended upon to continue even for the next single cycle of the 11-year period.

563. For this purpose however, the data may be conveniently and perhaps advantageously dealt with in a different way in light of the second of the two suppositions suggested in paragraph 561. The permanency of the 11-year period being assumed, the cause of the constantly recurring curve of the 11·3-year (or thereabout) period and its submultiples, may as already remarked be supposed to lie in the sun itself. The high temperature periodically waxing and waning together with the motion of rotation may be quite sufficient in themselves to have the radiation of the sun imbued with ionising, radioactive or some analogous properties which however small in magnitude, may by a triggerlike action produce enormous changes, as they periodically affect the highly sensitive and critically balanced magnetic field of our earth. And these effects in their turn may be supposed to be modified, that is damped or amplified by the interaction of the secondary causes due to the larger periodicity by affecting the conductivity of the space itself near the earth which may be controlled from outside by meteor streams and such causes, and from within conceivably by induced effects in the earth itself.

The progression of these larger period effects may be taken to be very roughly indicated by such a curve as the one shown in paragraph 560 the smaller sub-periods of which unfortunately however have been obliterated perforce by the smoothing operation by which it has been derived. It is not difficult to conceive of an interaction of the kind referred to above, but the propriety of the manner in which it is suggested to occur as described below, may perhaps be found open to grave objection. Inadmissible as it may appear, its justification is seen in the results, and a passing reference to it may not be perhaps uninteresting. The principle of Fourier that any complex periodic motion must be compounded of a definite number of simple harmonic motions of definite periods, of definite amplitudes, and definite phases, does not appear strictly applicable to the problem. For apparently there is nothing to prevent

* The real period cannot be 68 years as assumed as it will while satisfying conditions between 1870 and 1906 will not be applicable to the curve before 1870 especially in regard to the maximum of 1837 which was nearly as large as that of 1870.

Colaba Observatory

Secular variations of Solar spot numbers and Magnetic (Periodic) ranges of H. D. and V. and of the variability and departures from the mean of the Daily means and daily ranges of H.

Plate 101.

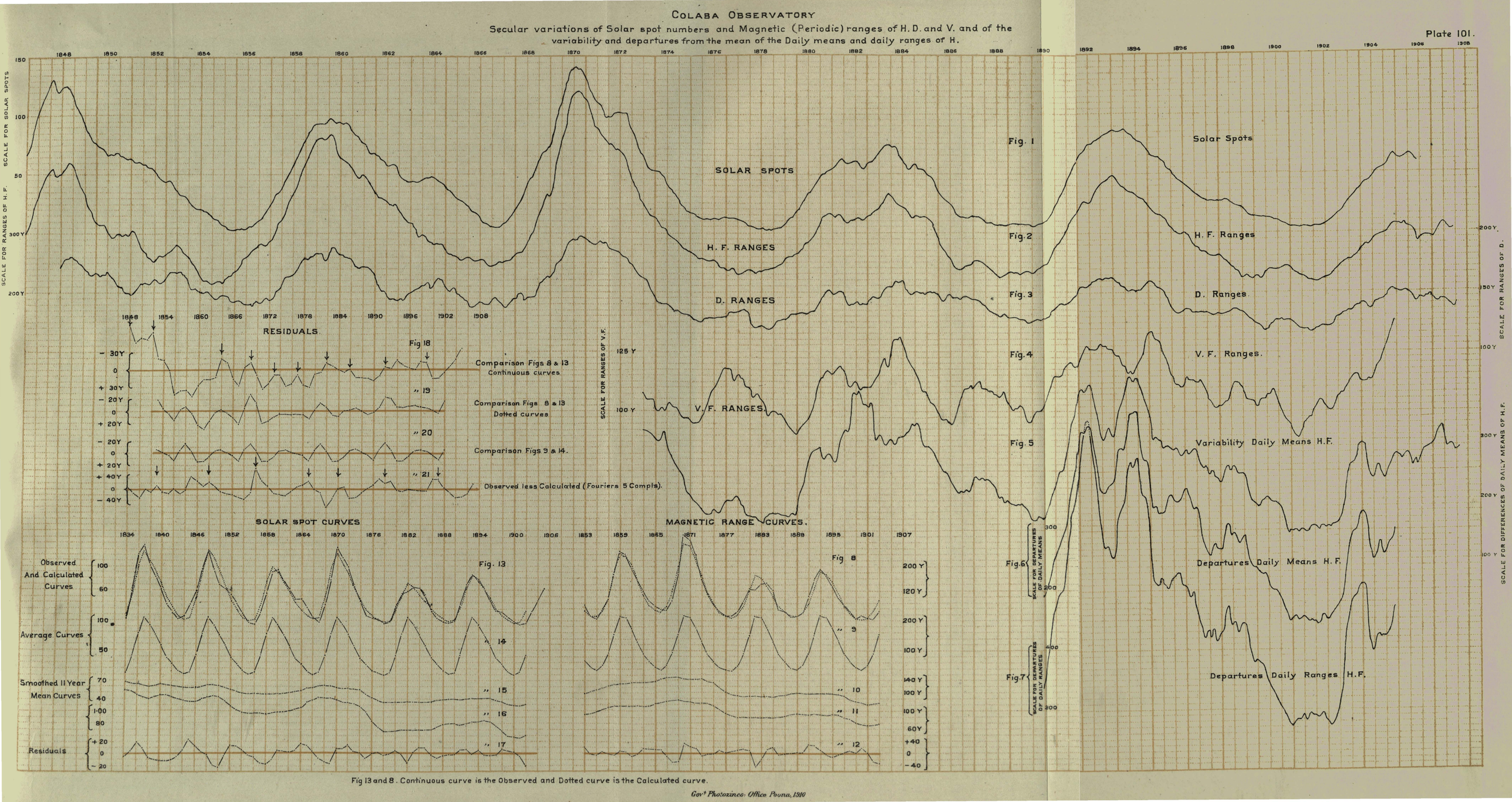


Fig 13 and 8. Continuous curve is the Observed and Dotted curve is the Calculated curve.

Gov't Photozinco: Office Poona, 1910

the possibility of the existence in the phenomenon, of some cumulative or progressive undulating tendencies resulting in a much more complex motion of an altogether different type. An attempt at some simple modification hence in the method usually adopted, seems justifiable.

The observed annual means of the summed ranges of H in column 2, table 558, are recopied in column 6 reduced by 200γ, the number which denotes the range figure below which the range is never reduced (that is the one which corresponds to clear surface of the sun). The approximate curve of the 11·3-year period is obtained by averaging the data from 1855 to 1899, that is from minimum to minimum, omitting one year—conveniently the year 1877—from the 45 years considered here. This operation provides for the above period fairly approximately. From this average curve, the continuous curve as shown in column 7, is derived again by interpolating the value of the year 1877 from those of 1876 and 1878. In column 8 are entered for convenience of reference the smoothed 11-year means, already referred to in paragraph 560. As the mean value of the ranges of H for the period considered is 314γ corresponding to the mean of 11 years, we have 314γ − 200γ = 114γ which gives the absolute change in range for this average condition of the 11-year period. Dividing hence all the range numbers in column 8 by 114γ, we obtain what may be called the ratios, or co-efficients to the mean where unity represents the average condition. These may be regarded as roughly representing the interaction effects of the larger period, which thus simply damp or enlarge the ordinates of the oscillations of the mean 11·3-year period (*see* column 9). The numbers in column 7 hence, instead of being dealt with in the usual way where periodic motions are compounded, are *multiplied* by the corresponding co-efficients in column 9 which thus furnish the theoretical curve we seek, namely the dominant 11·3-year pulse, the ordinates of which are made to wax and wane by suitable factors representing the effects of the secondary cause of the larger periodicity. This theoretically derived curve is shown in column 10. The results in columns 6 to 11 appear charted in figures 8 to 12 in plate 101 while the curve in column 10 is shown as a dotted curve in figure 8. It will be seen that the treatment allows of the original curve to be reproduced with much smaller errors. The departures of theoretical from the observed curve shown in column 11 and charted in figure 12 are markedly small. The largest departures by the former treatment are + 69γ and − 59γ (*vide* column 5) which in the above results are reduced to + 30γ and − 47γ. The mean departure is also reduced from 18γ to 12γ. Thus there is an all round closer approximation obtained, and if the process is accepted for the moment as roughly indicating what probably really obtains in the working of the efficient causes, these residual errors may be ascribed to a faulty average curve of 11·3 years the period of which may not be exact, or to the use of faulty co-efficients which represent the damping interaction effects of the larger period. For we know that the smoothing operation while affecting the main curve also eliminates the shorter sub-periods of the large period and a considerable portion of the errors may not improbably be due to this cause (*see* paragraph 566). It is interesting to note that by making use of the results of the Fourier analysis itself, referred to in paragraph 562, and instead of superposing as is done in the usual process, the effects of the component periods [68·0, 22·7 and 13·6 years] upon those of [11·3 and 5·7 years] if the products of the latter and the factors or ratios to the mean derived from the former, are taken as shown in detail in columns 12 to 16 of table 558, better results than those in column 5 are apparently secured. In column 12 appear the computed values of the Fourier series of 11·3 and 5·7 years periods plus the constant 103γ—that is 303γ the mean range for the average condition of the period considered which is 68 years here, less 200γ the value of the datum above which alone the fluctuations of the 11-year period, occur. In column 13 similarly the computed values of the Fourier curves of 68·0, 22·7 and 13·6 years are given. In column 14 appear the co-efficients or ratios to the mean, that is the numbers in column 13 divided by 103γ the absolute change of range from the zero to the mean condition. In column 15 are given the products of the factors shown in column 14 and the numbers in column 12. The differences of numbers in column 6 and column 15 are given in column 16. It is difficult to suggest any method by which a complex series of the kind to be dealt with on the assumption made above can be resolved into its two component series* and no alternative remains but to utilise the results of the Fourier analysis conveniently grouped into two component parts as shown above, for the purposes of a rough approximation. Whatever the result be worth, the fact that it enables a closer approximation to the observed series to be obtained, is at least suggestive of the possible mode of action of the efficient causes at work, which present to us the complex 11-year curve the activity of which varies from time to time.

564. The secular progression of the periodic portions of the two series may now be examined. According to Schuster the dominant period in the spot data is of 11·12 years, and though not much value is to be attached to the results in the Colaba magnetic data arrived at in paragraph 559, it is difficult to accept other than a period of 11·3 years as the most probable period prevalent in the number of years considered. It will be seen that the much prolonged interval between the maximum of 1893 and the following minimum in 1902 and the maximum of 1905-06 succeeding the former after an interval of about

* The five component simple harmonic curves which have been accepted as significant can be grouped into two effective groups in more than one way such as [68·0 + 22·7] and [13·6 + 11·3 + 5·7] or as [68·0 + 13·6] and [22·7 + 11·3 + 5·7], &c., &c. Other combinations except the one treated above give unsatisfactory results.

13 years are practically responsible for the lengthening out of the period to one of 11·3 years in the Colaba data, which might otherwise be about the same as Schuster's solar spot period. Any way accepting the analysis in paragraph 562 as giving us a rough idea of the probable periods involved, it must have been noted that the 13·6-year period shown there, is practically coincident with the 13·5-year period indicated in the solar data by Schuster's periodogram analysis, the epochs of maxima of which, are also fairly accordant. Then again if after eliminating the theoretical curve shown in column 4 from the observed series, a residual curve is obtained (*vide* column 5, also figure 21, plate 101), it will be observed that the process of elimination brings out in the magnetic data, the 8·5-year (or thereabout) period clearly also, though it is not so definitely marked as in Schuster's solar curve. As the analysis in paragraph 562 indicates however that the amplitude of this period, is insignificantly small, it is probably faulty in this respect for these oscillations in the Colaba data can hardly be accepted altogether as the result of the average effects of the sub-periods 9·7-year and 7·6-year the amplitudes of which are found to be significantly large.

565. Apart from such comparison which involves the consideration of definite periodicities, the two series may be equated anda numerical relation obtained by the use of the formula $R = a + bS$ which is usually adopted, where a and b are some constants and R and S respectively represent the magnetic ranges and solar spot numbers. The difference curve derived from the treatment, indicates how far and in what respect may the close parallelism which obviously obtains between the two phenomena, be regarded to be differentiated in any particular direction. The constants of reduction indicating the numerical relation obtained by least squares from the annual values,* are $a = 205\gamma$ and $b = 2{\cdot}22$. It will be seen from the residual curve shown in column 18 of table 558, which is charted in figure 18, plate 101, that the mean departure is 15γ and excluding the initial years, the magnitude of the greatest departure is 44γ. At any rate the curve discloses, in a striking manner, residual periodic oscillations of about 5 years (*vide* figure 18). Schuster in his analysis refers to the 4·75-year period as one of the most persistent periods in the solar spot numbers indicated by his periodogram. It thus appears that here at least the magnetic curve shows indications which definitely differ from the solar curve in regard to the specific influence of this periodicity.

566. The solar numbers (*vide* column 2, table 559) are treated precisely in the manner indicated in paragraph 563 for the magnetic data. The average solar spot curve shown in column 3, table 559, which is charted in figure 14, plate 101, is derived by arranging the spot numbers in rows of 11 annual values. The data used covers six 11-year cycles commencing from 1833 and ending with 1899, the year 1877 being omitted for the purpose of securing the average curve as in the case of the magnetic data.

The whole curve is then rederived by the help of this average curve, the value for 1877 being interpolated as shown in column 3, and charted in figure 14. It will be seen that the treatment followed though arbitrary is the same in both the curves, magnetic and solar, and allows of the two series to be made nearly as possible identical in regard to the maxima and minima turning points. The omission of one particular year in the derivation of the average curves approximately makes up for the supposed difference in the probable periods of the two series (11·3-year and 11·12-year) as a single year is omitted in one case from a period of 45 years and in the other case from one of 67 years.

In column 4, table 559, are given the smoothed 11-year means which divided by 50—the number of solar spots in the average condition of the period considered—furnish the necessary co-efficients or ratios to the mean. These are shown in column 5 and the products of these co-efficients and the corresponding numbers in the average curve shown in column 3 enable the calculated curve of spots to be rederived (*vide* column 6). The results shown in columns 2 to 7 are charted in figures 13 to 17 while the theoretical curve appears charted in figure 13 as the dotted curve. The departures of the calculated from the observed spot numbers, which are shown in column 7 and charted in figure 17 show that the spot curve theoretically thus reproduced shows closer accordant result and gives smaller errors than what is possible by the usual method of analysis.

If now numerical relations like those already secured in paragraph 565 for the whole curves of magnetic range and spot numbers, are also derived for (1) the calculated (dotted) curves shown in figures 8 and 13, (2) the average curves shown in figures 9 and 14, and (3) the smoothed 11-year means, figures 10 and 15, we obtain by least squares the different constants as follow:—$a' = 207\gamma$, $b' = 2{\cdot}31$; $a'' = 2{\cdot}13\gamma$, $b'' = 1{\cdot}99$; and $a''' = 1{\cdot}99$, $b''' = 2{\cdot}48$. These values seem to be somewhat divergent but after equating each series by the derived constants and obtaining the residual curves (see columns 18, 20, 22 and 24 of table 558) we find that on the whole these curves show no intrinsic difference in character among themselves. The residual curves in columns 18, 20 and 22 which are charted in

* The correct method should have been of course the treatment of the monthly values, but this refinement was not attempted.

TABLE 559.—*Showing the details of the process of derivation of the theoretical curves of the secular variation of sun-spot numbers.*

Years.	Annual means of smoothed sun-spot numbers in table 542.	Average values of sun-spot numbers for the 11-year period deduced from 1833 to 1899 omitting 1877.	Overlapping means of 11 yearly values of means in column 2.	Ratio of the means in column 4 to 50 the mean of the average 11-year values in column 3.	Calculated values of sun-spot numbers, column 3 × column 5.	Observed minus calculated values, column 2 less column 6.	Years.	Annual means of smoothed sun-spot numbers in table 542.	Average values of sun-spot numbers for the 11-year period deduced from 1833 to 1899 omitting 1877.	Overlapping means of 11 yearly values of means in column 2.	Ratio of the means in column 4 to 50 the mean of the average 11-year values in column 3.	Calculated values of sun-spot numbers, column 3 × column 5.	Observed minus calculated values, column 2 less column 6.
1	2	3	4	5	6	7	1	2	3	4	5	6	7
1834 ...	13	13	67	134	17	− 4	1869 ...	79	79	61	122	96	−17
1835 ...	59	41	66	132	54	+ 5	1870 ...	132	104	59	118	123	+ 9
1836 ...	121	79	64	128	101	+20	1871 ...	114	92	57	114	105	+ 9
1837 ...	137	104	61	122	127	+10	1872 ...	100	76	57	114	87	+13
1838 ...	103	92	60	120	110	− 7	1873 ...	68	58	56	112	65	+ 3
1839 ...	83	76	61	122	93	−10	1874 ...	43	39	54	108	42	+ 1
1840 ...	62	58	63	126	73	−11	1875 ...	19	27	49	98	26	− 7
1841 ...	38	39	63	126	49	−11	1876 ...	12	16	42	84	13	− 1
1842 ...	23	27	61	122	33	−10	1877 ...	11	13	37	74	10	+ 1
1843 ...	13	16	60	120	19	− 6	1878 ...	4	10	34	68	7	− 3
1844 ...	18	10	59	118	12	+ 6	1879 ...	8	13	34	68	9	− 1
1845 ...	38	13	58	116	15	+23	1880 ...	32	41	34	68	28	+ 4
1846 ...	60	41	58	116	48	+12	1881 ...	54	79	35	70	55	− 1
1847 ...	97	79	60	120	95	+ 2	1882 ...	58	104	35	70	73	−15
1848 ...	125	104	61	122	127	− 2	1883 ...	65	92	35	70	64	+ 1
1849 ...	95	92	62	124	114	−19	1884 ...	63	76	35	70	53	+10
1850 ...	70	76	61	122	93	−23	1885 ...	51	58	35	70	41	+10
1851 ...	63	58	58	116	67	− 4	1886 ...	25	39	35	70	27	− 2
1852 ...	53	39	54	108	42	+11	1887 ...	13	27	37	74	20	− 7
1853 ...	39	27	51	102	28	+11	1888 ...	7	16	39	78	12	− 5
1854 ...	21	16	48	96	15	+ 6	1889 ...	6	10	40	80	8	− 2
1855 ...	8	10	48	96	10	− 2	1890 ...	8	13	40	80	10	− 2
1856 ...	5	13	48	96	12	− 7	1891 ...	38	41	39	78	32	+ 6
1857 ...	23	41	48	96	39	−16	1892 ...	70	79	40	80	63	+ 7
1858 ...	56	79	47	94	74	−18	1893 ...	84	104	41	82	85	− 1
1859 ...	90	104	48	96	100	−10	1894 ...	79	92	41	82	75	+ 4
1860 ...	95	92	49	98	90	+ 5	1895 ...	61	76	42	84	64	− 3
1861 ...	78	76	49	98	74	+ 4	1896 ...	43	58	41	82	48	− 5
1862 ...	61	58	50	100	58	+ 3	1897 ...	28	39	38	76	30	− 2
1863 ...	45	39	51	102	40	+ 5	1898 ...	25	27	34	68	18	+ 7
1864 ...	45	27	53	106	29	+16	1899 ...	14	16	30	60	10	+ 4
1865 ...	31	16	57	114	18	+13	1900 ...	9	10	29	58	6	+ 3
1866 ...	15	10	59	118	12	+ 3	1901 ...	3	13	28	56	7	− 4
1867 ...	9	13	61	122	16	− 7	1902 ...	5	41	30	60	25	−20
1868 ...	37	41	61	122	50	−13							

TABLE 560.—*Showing the comparison of the secular variation of summed ranges of D, H and V.*

Years.	Annual means of smoothed summed ranges of H.	Annual means of smoothed summed ranges of V.	Annual means of smoothed summed ranges of D.	Ratio—Column 3÷column 2.	Ratio—Column 4÷column 2.	Ratio—Column 3÷column 4.	Summed ranges of V calculated by formula $\Delta V = a + b\Delta H$.	Summed ranges of D calculated by formula $\Delta D = a + b\Delta H$.	Summed ranges of V calculated by formula $\Delta V = a + b\Delta D$.	Departures—Column 3 minus column 8.	Departures—Column 4 minus column 9.	Departures—Column 3 minus column 10.
1	2	3	4	5	6	7	8	9	10	11	12	13
1873 ...	365	109	0·163	0·299	0·447	·669	122	157	125	−13	+ 6	−16
1874 ...	309	101	·140	·327	·453	·721	113	144	111	−12	− 4	−10
1875 ...	273	96	·130	·352	·476	·738	108	136	105	−12	− 6	− 9
1876 ...	253	108	·128	·427	·506	·844	105	131	104	+ 3	− 3	+ 4
1877 ...	237	115	·133	·485	·561	·865	103	127	107	+12	+ 6	+ 8
1878 ...	238	104	·122	·437	·513	·852	103	128	100	+ 1	− 6	+ 4
1879 ...	252	97	·127	·385	·504	·764	105	131	103	− 8	− 4	− 6
1880 ...	284	97	·133	·342	·468	·729	110	138	107	−13	− 5	−10
1881 ...	328	116	·148	·354	·451	·754	116	149	116	0	− 1	0
1882 ...	322	112	·141	·348	·438	·794	115	147	112	− 3	− 6	0
1883 ...	342	115	·147	·336	·429	·782	118	152	115	− 3	− 5	0
1884 ...	344	126	·154	·366	·448	·818	119	152	119	+ 7	+ 2	+ 7
1885 ...	321	109	·150	·339	·467	·727	115	147	117	− 6	+ 3	− 8
1886 ...	259	97	·145	·375	·559	·669	106	133	114	− 9	+12	−17
1887 ...	246	109	·143	·443	·581	·762	104	130	113	+ 5	+13	− 4
1888 ...	233	107	·133	·459	·571	·805	103	127	107	+ 4	+ 6	0
1889 ...	231	100	·127	·433	·550	·787	102	126	103	− 2	+ 1	− 3
1890 ...	242	103	·128	·426	·529	·805	104	129	104	− 1	− 1	− 1
1891 ...	299	117	·140	·391	·468	·836	112	142	111	+ 5	− 2	+ 6
1892 ...	354	125	·156	·353	·441	·801	120	155	121	+ 5	+ 1	+ 4
1893 ...	388	125	·160	·322	·412	·781	125	163	123	0	− 3	+ 2
1894 ...	364	120	·152	·330	·418	·789	121	157	118	− 1	− 5	+ 2
1895 ...	331	127	·153	·384	·462	·830	117	149	119	+10	+ 4	+ 8
1896 ...	297	112	·135	·377	·455	·830	112	141	108	0	− 6	+ 4
1897 ...	267	108	·133	·404	·498	·812	107	134	107	+ 1	− 1	+ 1
1898 ...	246	107	·134	·435	·545	·799	104	130	107	+ 3	+ 4	0
1899 ...	224	105	·126	·469	·562	·833	101	124	102	+ 4	+ 2	+ 3
1900 ...	238	103	·124	·433	·521	·831	103	128	101	0	− 4	+ 2
1901 ...	227	93	·120	·410	·529	·775	102	125	99	− 9	− 5	− 6
1902 ...	221	102	·120	·462	·543	·850	101	124	99	+ 1	− 4	+ 3
1903 ...	250	110	·133	·440	·532	·827	105	131	107	+ 5	+ 2	+ 3
1904 ...	281	115	·139	·409	·495	·827	109	138	110	+ 6	+ 1	+ 5
1905 ...	312	139	·150	·446	·481	·927	114	145	117	+25	+ 5	+22
Average ...	284	110	·138	·394	·494	·795	110	138	110	± 6	± 4	+ 5

figures 18, 19 and 20 do show some markedly common features, and though the results must to a certain extent be affected by the treatment adopted, some suspicion is created notwithstanding that so accordant a result as is shown by the residuals can scarcely be fortuitous and may perhaps indicate inherent differences between the solar and magnetic series due to some specific differentiating cause of action. At the bottom of each column in table 558 are given the mean departures in the case of each curve which for the figures 18, 19 and 20 are respectively 15γ, 9γ and 7γ.

These errors compared with the amplitudes of the original curves in each case, give the ratios $\frac{15}{192}$, $\frac{9}{128}$, and $\frac{7}{90}$ respectively. It will be seen that they are fairly much the same. However when the mean departure of the residual curve of the larger period given by the smoothed 11-year means shown in column 24 of the table, is compared with the amplitude of the original curve, a ratio of $\frac{6}{43}$ is indicated which is nearly twice as large as any of the former values. If the consideration thus of the magnetic and solar spot curves separately into two parts, namely (1) the 11-year curve and (2) the larger period curve, be relied upon to give at least roughly comparable results in each case, there is some reason to infer that the probability is apparently greater for the inherent differences to lie in the oscillations of the larger period and its sub-periods, than in the dominant 11-year period curves. That the ratio which the mean departure bears to the amplitude of the original curve is $\frac{1}{7}$ in the former case and about $\frac{1}{14}$ in the latter, at any rate tends to favour this view.

567. Apart from these small differences a fair case in regard to the parallelism between the periodic ranges of H at Colaba, and solar spot numbers is so far made out. But to the question whether any thing like a clear case of a relation of direct cause and effect is indicated in the data thus examined the answer can scarcely be decisively elicited either one way or the other. If it be advanced that such relation does obtain, it becomes necessary at the same time to concede that even the periodic phenomena where one might naturally expect much closer if not absolute coincidence of effects, are disturbed or modified to some extent by other definite and possibly periodic cause of action obtaining in one of them.

568. At any rate when the curves representing the secular changes in declination and vertical force ranges shown in figures 3 and 4, plate 101, come to be examined, it becomes obvious at a glance that whatever be the initial cause of these periodic movements, its effects on the different elements are distinctly different, modified and made complex in all probability locally by terrestrial* conditions. In the Colaba curves the nearest approach to the solar spot curve is shown by the periodic ranges of H. It will also be seen that the curve of the *periodic* ranges of V (figure 4, plate 101) shows relatively as disturbed conditions of secular growth as does the *aperiodic* range curve of H. Much larger departures hence than those noted in the numerical comparison of the periodic ranges of H with the sun-spot numbers, would remain to be explained in a similar comparison with the periodic ranges of V. So also will be the case for the D ranges, but to a lesser degree. The examination of figures 3 and 4 in plate 101 also shows that while the sweep of the 11-year curve is very small in magnitude in the declination and vertical force range curves reduced almost to a fraction of that of the horizontal force, the shorter period movements somehow persist unaffected and remain active and by contrast become thus more emphasised and explicit in the former two of the elements at Colaba. These short period movements which thus continue to remain almost equally effective in all the elements, may possibly be due to an origin independent of the 11-year period the incidence of which alone is somehow affected damping the amplitudes of D and V, especially of the latter element. The examination of the mean annual values of these ranges, shown in columns 2, 3 and 4 of table 560, further indicates that in their secular march for the larger period, the progressions of H and D ranges are more or less similar in character. For example the values of ranges about the years of maximum 1872, 1882, 1893, and 1905, exhibit a slow but steady decay from cycle to cycle in both these elements. It is notable however that in V, this progression appears if anything to be almost the reverse, the later years showing an actual growth rather than a decline in the magnitude of the ranges. It may be hence of interest to examine how the secular march of the D and V ranges is in each case differentiated from that of H ranges which has been fully examined already.

569. In tables 379, 380, and 561 are collected the ratios which the ranges of H, V, and D bear to one another, which roughly indicate the relative activity of the secular progression of the ranges in the three component variations.

Examining the annual values† of the ratios in table 560 and considering the march of the two elements V and H, we find that the average ratio ·394 which obtains between the ranges of V and H,

* Within or in the immediate environments above the earth.

† These differ slightly from those given in columns 14 of tables 379, 380 and 561, as they are derived directly from the annual values of the ranges and not from the average ratios of 12 months, as shown in the latter tables.

TABLE 561.—*Ratios of the activities of the vertical and northerly components as measured by the summed ranges of the ordinates of their diurnal variations.*

Years.	Months.												Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1873 ...	0·226	0·146	0·200	0·218	0·397	0·401	0·542	0·377	0·541	0·337	0·132	0·153	0·306
1874 ...	·199	·126	·221	·291	·419	·348	·435	·455	·706	·455	·158	·104	·326
1875 ...	·393	·202	·196	·287	·447	·395	·394	·485	·964	·421	·184	·111	·373
1876 ...	·272	·211	·239	·319	·481	·514	·406	·677	1·092	·648	·274	·182	·443
1877 ...	·336	·332	·363	·552	·588	·524	·483	·707	0·937	·398	·149	·355	·477
1878 ...	·606	·253	·307	·489	·481	·421	·544	·574	·933	·518	·160	·213	·458
1879 ...	·486	·204	·208	·365	·481	·487	·451	·639	·762	·427	·192	·129	·403
1880 ...	·105	·192	·180	·299	·427	·349	·442	·625	·690	·358	·174	·110	·329
1881 ...	·282	·201	·236	·366	·429	·386	·338	·512	·708	·432	·144	·133	·347
1882 ...	·257	·285	·242	·399	·429	·387	·408	·545	·539	·343	·141	·157	·344
1883 ...	·346	·159	·206	·376	·526	·364	·372	·423	·628	·300	·159	·257	·343
1884 ...	·342	·288	·264	·384	·352	·361	·461	·616	733	·362	·213	·303	·390
1885 ...	·251	·222	·247	·318	·438	·316	·330	·549	·739	·271	·142	·233	·338
1886 ...	·281	·160	·170	·415	·521	·371	·449	·673	·798	·433	·129	·184	·382
1887 ...	·414	·155	·294	·536	·615	·559	·521	·631	·970	·386	·161	·171	·451
1888 ...	·240	·272	·299	·630	·549	·527	·565	·784	·922	·436	·198	·134	·463
1889 ...	·309	·232	·409	·577	·627	·364	·420	·506	·929	·529	·155	·297	·446
1890 ...	·338	·185	·296	·416	·483	·460	·438	·694	·852	·419	·159	·178	·410
1891 ...	·492	·226	·387	·454	·472	·408	·330	·535	·697	·426	·153	·237	·401
1892 ...	·330	·236	·297	·372	·363	·339	·389	·516	·620	·397	·212	·175	·354
1893 ...	·325	·234	·260	·268	·353	·321	·317	·437	·630	·357	·179	·155	·320
1894 ...	·289	·132	·309	·284	·327	·329	·332	·467	·653	·378	·143	·299	·328
1895 ...	·407	·231	·315	·377	·423	·505	·420	·552	·635	·373	·191	·261	·391
1896 ...	·289	·136	·259	·410	·460	·378	·423	·677	·761	·284	·265	·157	·375
1897 ...	·361	·237	·272	·439	·590	·520	·419	·651	·715	·469	·157	·094	·410
1898 ...	·307	·213	·222	·400	·526	·466	·441	·887	1·041	·471	·171	·191	·445
1899 ...	·646	·415	·318	·387	·547	·747	·442	·569	0·826	·556	·180	·284	·493
1900 ...	·446	·266	·356	·531	·612	·427	·450	·542	·832	·505	·214	·110	·441
1901 ...	·201	·174	·244	·382	·500	·520	·407	·498	·931	·443	·287	·135	·393
1902 ...	·662	·202	·342	·462	·516	·601	·559	·661	·936	·460	·147	·165	·476
1903 ...	·376	·216	·254	·433	·486	·620	·495	·648	1·000	·357	·270	·155	·442
1904 ...	·497	·308	·256	·414	·484	·356	·427	·542	0·810	·484	·198	·171	·412
1905 ...	·369	·433	·266	·441	·557	·435	·448	·566	·899	·522	·206	·315	·455
Means ...	·354	·227	·271	·403	·482	·440	·433	·582	·801	·423	·182	·191	·399

is practically what prevails between the absolute values of V and H themselves—that is the ratio tan I, which for the period considered is $\frac{145}{373} = .389$ C. G. S. The rough coincidence of the two values may be and perhaps is fortuitous. But if any physical connection is possible in an equatorial station like Colaba, the equality suggests, that in the average condition of 11 years (corresponding to the mean condition of the magnetic activity of 11 years), the incidence of the secular effect on the ranges of the two elements, is roughly proportional to the magnitude of the absolute values themselves.

570. This relation, apart from irregularities, is disturbed periodically by the 11-year period law. During the maximum spot epoch the increase in the range of H appears to be proportionally greater than in that of V, and the ratio $\frac{\Delta V}{\Delta H}$ becomes reduced in value. When the years of minimum spot epoch are approached, opposite conditions obtain, and the ratio is increased in value. Whether any true physical connection exists in the two elements H and V between the oscillations of the absolute values and of their ranges it is difficult to say, but bearing the above fluctuations in the ratios of the ranges $\frac{\Delta V}{\Delta H}$ in mind, a parallel phenomenon in the absolute values may be pertinently recalled and noted here. In Chapter I, paragraph 295, we have seen that the values of H generally stand lower during the maximum spot epoch, while during the minimum when the disturbances are least incident the absolute values stand higher. It has also been noted that the former conditions are associated with larger amplitudes of variations and the latter with reduced amplitudes. We have also reasons to believe (*see* Chapter IV, paragraph 339) that the vertical force, too, behaves in the same way under the influence of this 11-year period law. If thus the oscillations in both the elements are accepted as a true phenomenon and if V and H denominate the theoretical absolute values as shown in columns 15 and 5 of tables 247 and 239, respectively, corrected for and free from the effects of the 11-year oscillations, $\frac{V}{H}$ or tan I must give the mean ratio of the absolute elements for the mean condition of the 11-year period. During the maximum spot epoch now a decrement in the values of both V and H occurs and we may for the moment take the simplest case and assume that at Colaba the incidence of the 11-year perturbation effect on the absolute value is about equal in magnitude on the two elements. This appears actually to be the case as will be seen roughly from results in columns 6 and 16 of tables 239 and 247, but as the indications may be regarded as doubtful, advisedly it has been regarded as an assumption. The ratio $\frac{V}{H}$ or tan I hence becomes $\frac{V-f}{H-f}$ (f being the perturbation effect), which is thus appreciably reduced in value. On the other hand during the minimum epoch the ratio alters to $\frac{V+f}{H+f}$ and is appreciably made larger. We find thus that under the influence of the periodic 11-year law, the ratios of the absolute values or tan I must indicate (besides the secular progression) a minute oscillation which apparently synchronises with the relatively much larger variations of the ratios of the ranges. This result is of course consequential, if it be conceded, as we must, that both the absolute values and the ranges of the elements H and V are subject to the 11-year disturbance in the way indicated above. The examination of the Colaba inclination data though available only for the short period (1888 to 1905) nevertheless does show (*vide* Chapter III, table 245) that their secular oscillations run fairly parallel with those of V. That is H, V, and I are all similarly affected by the 11-year periodicity, and all of them stand *lower* in value about the maximum spot years and relatively *higher* about the minimum epoch. The assumption hence advisedly made above that the changes in the absolute values of H and V due to the perturbation effect on the two elements, of the 11-year period, are on the average about the same affecting V proportionally much more than H, is on the whole not far from the truth.

565. Turning now to the irregularities or departures from the law above discussed, the range series of V and D shown in columns 3 and 4, table 560, may each be numerically compared in the usual way with the range series of H in column 2. The constants derived by least squares are for V: $a = 69\gamma$, $b = .14$; and for D: $a' = 72\gamma$ $b' = .23$. Thus as already remarked elsewhere the amplitudes of the ranges of V and D are very small compared with those of H. In columns 8 and 9 the calculated series of V and D derived by the above constants are given and the departures of these from the observed are shown in columns 11 and 12. It will be seen from the magnitude of the departures that the irregularities are more pronounced in the case of V ranges than those of D. The large departure in V for the year 1905 for example shows that the secular effect on the ranges during this year of maximum spots, was abnormal and affects the ranges of V much more than those of H, as the ratio $\frac{\Delta V}{\Delta H}$ ($= .446$) which in the maximum epoch should be less than the average ratio .394, is on the contrary much greater. Examining the absolute phenomenon for a similar indication of this abnormal feature, we do find precisely the same action, but of course of a very minute kind. The ratio $\frac{V}{H}$ or tan I is altered to $\frac{V-1}{H-16}$, 1γ and 16γ being the departures of the observed absolute values from the theoretical values (*vide* columns 16 and 6, tables 247 and 239, respectively). It is thus seen that in the absolute phenomenon too, the ratio tanI is abnormally affected.

571. The year 1905 thus behaves in regard to range ratio more like a year of minimum spot epoch than one of maximum. The year 1895, which is a transition year, shows a somewhat similar but less marked irregularity. In 1887 the conditions become abnormal both for H and D. The year 1880 shows practically the same abnormal features but less intensely marked than in the year 1905; as however it is a year of minimum spot, the conditions are just reversed as shown by the opposite sign. In columns 10 and 13 are given the results of similar comparison between ranges of V and D. The mean departures shown at the bottom of each column 11, 12 and 13 indicate how far in each case the degree of parallelism between the growth of the ranges of the several elements, is maintained. If the data in tables 379, 380 and 561 are examined, we find abnormal values grouped generally in larger numbers about the years 1874—1878 and 1895—1903 which are known to be meteorologically abnormal. This naturally leads the inquiry to the relation which is supposed to exist between the two phenomena, the examination of which is taken up in the next section.

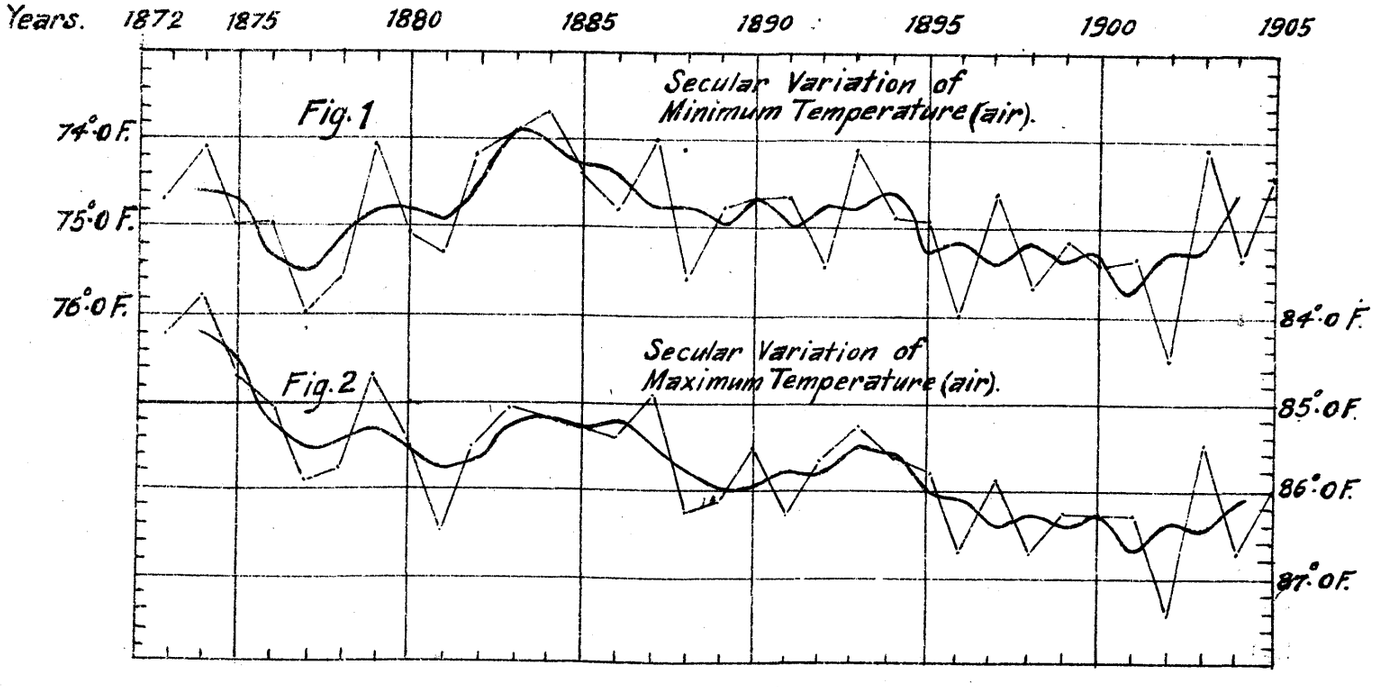
2.—Relation to Meteorological Phenomenon.

572. The sun is of course the direct efficient cause primarily responsible for all changes in the meteorological conditions of our atmosphere. And yet even with the present advanced state of our knowledge it is not possible to see plainly either into the working of the secondary meteorological and electrical forces which are called into existence locally by the initial efficient cause, or into the laws which govern their progression. Some advance has undoubtedly been made by different workers and evidence has been adduced, amongst others principally by Lockyer, in regard to the relation between certain meteorological phenomena and solar activity as manifested by spots, prominences, etc., but much of the ground remains yet absolutely unbroken. We know also, thanks to the researches of Schuster, that the efficient cause of the major portion of the diurnal variations observed in the march of terrestrial magnetic forces, must initially of course lie outside the earth in the sun. The relation so far is apparent, but the next step forward as to how and in what manner the effects are incident, is a difficult one to take. It remains to be seen how far the Colaba data* are helpful in the first instance in furnishing the evidence necessary to establish the relation between the two derived phenomena the source of both of which is made out initially at least to lie in the sun. The question is taken up for examination by considering the march of the two phenomena as they progress in their (1) secular changes, (2) annual variations, and (3) diurnal inequalities.

573. *Secular Variation.*—We have already seen that the dominant sweep in the secular march of the magnetic curves generally, is that of the 11-year period. A glance however at the curves of the principal meteorological elements at Colaba, namely temperature, barometer, vapour pressure, and ground temperature (*vide* tables 562 to 575 and plate 104), at once convinces us that the influence of this period, though clearly existent, is not so conspicuously manifest here as in the magnetic phenomenon generally. Its effects however are by no means indefinitely or feebly marked. In the absolute temperature series, and in the vapour pressure curve a clearly pronounced tendency for the secular sweep to follow this law is readily observable. In plate 104 have been collected for facility of comparison, the secular curves of the several meteorological and a few of the magnetic elements. Figure 1 shows the march of the absolute air temperature (dry-bulb). During the period considered, there have been interruptions and changes in the manner of the exposure, etc., of the thermometers and thrice, namely in the years 1852, 1866 and 1872, the continuity of the record is broken which renders the comparability of the annual values for the period 1846—1905 as one single series objectionable for obvious reasons. No corrections however for continuity have been attempted, as for our purpose it will be sufficient to regard the series separately in groups; and in any case after the year 1872, the last series covering three 11-year cycles, is absolutely continuous made up as it is of the thermograph register. It will be seen that when overlapping means of three consecutive annual means are taken, the smoothed curve so derived as shown in the thick curve in figure 1, does unmistakably exhibit the influence of this periodicity, indicating a fall of temperature at times of maximum spot epoch and a rise during the minimum. The series from 1847 to 1852, and from 1853 to 1866 considered independently by themselves, also show practically a similar influence. The vapour pressure curve in figure 11, as must be expected from the temperature results, indicates these effects also in the later period; and though the 11-year pulse is also clearly discernible to the same degree in the earlier period, curiously enough the maximum and minimum phases are displaced. This is in all probability due to the breaks in the continuity about the years 1852 and 1866.

* In the Colaba magnetic data we have seen how even in the amplitude of the annual varations and in secular variations the effective action of the sun which is presumably suggested by the nearly concurrent incidence of the 11-year fluctuations, can be unmistakably traced.

574. Examining the curves of both the periodic and non-periodic ranges of temperature shown in figures 3 and 5, where the former are derived for the whole period from the average diurnal inequalities of the year, and the latter from the greatest and least hourly readings from 1848 to 1872, and from the daily records of the self-registering maximum and minimum thermometers for the later period—1873 to 1905, we find that apparently no appreciable or certain influence of this periodicity exists in these curves. Chambers in the Proceedings of the Royal Society, Vol. XXXIV, while discussing the non-periodic ranges at Colaba, suitably corrected for the breaks* in the continuity of the record about the years 1852, 1866 and 1872, has suggested that the ranges vary inversely with the 11-year fluctuations. On the other hand the curve of the ranges from 1873 to 1905 which is absolutely reliable in regard to continuity, not only does not show this tendency, but on the contrary, if any thing, it creates a suspicion of a direct variation with the 11-year period. For if the annual values in tables 564 and 565 are grouped into years separated for the maximum and minimum spot epochs,† the results do show that both the periodic and the non-periodic ranges may be affected by a small fluctuation varying directly with the 11-year period. The periodic range during the maximum spot years is made out to be 7°·5 and during the minimum 7°·3. The figures for the non-periodic range are respectively 10°·9 and 10°·6. The same results are also obtained by taking the consecutive groups of years divided into maximum and minimum epochs as shown in table 564, column 15. These differences are very small and in view of the general uncertainty created by the conflicting results, the verdict must obviously remain open, as no decision can be possible under such circumstances. The examination however by themselves of the maximum and the minimum temperature series of the later period from which the ranges have been derived, throws some light on the apparent discordance noted in the results above referred to. It will appear from the two series for the period 1872—1905, table 563, which are charted below (see figures 1 and 2), that they unmistakably show the incidence of the inverse 11-year period law as might be expected from the behaviour of the temperature curve itself, which shows this periodicity. Both these curves indicate a fall in the maximum



Thin curves: Observed. Thick curves: Smoothed curves (mean of 3 years).

and minimum temperature series about the years of maximum spots, and high values during the minimum spot epoch. If now the ranges, that is the ordinates between the two curves, are considered, it becomes obvious that if the incident effects of the 11-year disturbance, affect the two series equally, the range

* In order to correct for the break of continuity, Chambers reduces the average ranges of the periods 1848—1851, 1853—1865, 1866—1872, to the same common scale of the average of the ranges of the period 1873 to 1880 and uses the factors so obtained to modify the ranges of the first three periods. It will be seen that as in each case the number of years dealt with does not include a complete cycle of 11 years, the results would be affected by the treatment adopted, though the character of the curve during the periods of course will not alter.

† Years of maximum spot 1872, 1873, 1881, 1882, 1883, 1884, 1892, 1893, 1894, 1895, 1903, 1904 and 1905.
Years of minimum spot 1876, 1877, 1878, 1879, 1888, 1889, 1890, 1900, 1901, 1902.

TABLE 562.—*Showing the mean monthly and annual values of the temperature of the air derived from hourly eye-observations for the period 1847 to 1872 and dry bulb thermograms for the period 1873—1905.*

Years.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Annual means smoothed by taking overlapping means of three consecutive values.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1847 ...	75·2	73·7	79·4	82·1	83·9	81·0	80·4	79·8	78·9	82·1	75·9	75·5	79·0	79·8
1848 ...	75·5	75·1	78·7	83·1	84·6	81·4	81·1	80·2	81·0	80·9	79·3	76·6	79·8	79·5
1849 ...	73·3	75·8	79·2	82·1	85·2	81·3	80·1	80·1	78·8	81·2	81·3	76·5	79·6	79·8
1850 ...	72·4	75·1	79·3	82·0	84·4	83·8	81·7	81·0	80·7	83·0	79·3	75·8	79·9	79·7
1851 ...	72·2	75·5	79·8	83·3	84·6	82·5	80·1	79·9	80·4	81·5	79·4	75·0	79·5	79·9
1852 ...	71·9	75·8	80·1	83·2	86·3	83·9	82·0	80·3	80·6	82·1	80·2	75·7	80·2	80·1
1853 ...	71·6	76·4	81·6	83·5	86·9	84·0	80·5	80·8	80·7	82·0	80·6	76·9	80·5	80·4
1854 ...	75·8	75·0	80·3	83·9	86·9	84·2	80·4	81·3	80·9	81·7	79·8	77·3	80·6	80·6
1855 ...	74·7	77·0	79·2	82·0	86·0	83·8	82·0	82·1	81·0	82·6	80·5	77·7	80·7	80·6
1856 ...	76·4	77·1	81·5	84·7	86·1	83·0	81·0	80·6	80·1	80·9	79·0	75·4	80·5	80·4
1857 ...	74·7	77·7	81·8	83·1	86·1	83·4	82·1	79·3	79·0	80·5	77·4	73·9	79·9	80·2
1858 ...	73·3	75·2	79·9	84·4	86·2	83·8	81·2	80·5	80·5	81·2	79·1	75·5	80·1	80·1
1859 ...	74·6	76·6	79·3	84·5	85·2	84·1	82·5	80·4	79·9	80·3	80·5	74·2	80·2	80·1
1860 ...	72·3	75·5	79·2	81·6	85·0	83·9	81·0	80·8	81·2	83·2	78·7	77·5	80·0	79·8
1861 ...	74·8	75·7	77·9	82·8	85·2	82·7	80·6	79·4	80·4	80·5	76·9	74·4	79·3	80·0
1862 ...	72·9	76·9	78·4	83·0	85·8	83·6	83·1	81·6	81·4	82·4	81·5	76·6	80·6	79·9
1863 ...	74·3	76·1	79·0	83·7	86·0	82·5	80·8	79·5	79·5	81·6	78·6	75·7	79·8	80·1
1864 ...	71·3	75·0	78·0	81·3	84·1	84·4	82·0	80·3	81·2	81·9	80·6	78·3	79·9	80·2
1865 ...	77·3	77·0	79·5	84·9	87·6	85·4	82·8	80·3	81·2	80·9	78·7	77·0	81·0	79·7
1866 ...	72·9	71·8	77·2	79·2	82·7	82·7	79·6	79·2	80·0	81·4	77·8	75·4	78·3	79·4
1867 ...	74·2	73·1	76·9	80·6	84·7	84·7	80·5	79·7	79·6	79·9	76·6	74·9	78·8	78·7
1868 ...	72·9	74·8	76·6	81·6	84·5	83·2	80·2	79·6	80·0	81·3	78·8	75·7	79·1	79·3
1869 ...	75·3	75·7	77·9	82·0	84·1	83·9	82·1	80·8	79·8	80·2	79·1	77·5	79·9	79·3
1870 ...	73·6	75·6	78·8	81·2	83·7	82·7	79·4	79·4	79·3	79·5	79·0	76·3	79·0	79·7
1871 ...	74·9	76·3	79·3	83·5	85·6	83·4	80·7	79·1	79·4	81·2	80·4	77·4	80·1	79·3
1872 ...	71·7	73·5	78·6	81·6	84·1	82·9	80·1	79·2	79·8	79·7	78·2	77·6	78·9	79·3
1873 ...	72·1	75·8	78·0	81·6	84·0	82·1	80·4	79·3	79·2	79·8	78·6	75·4	78·9	78·7
1874 ...	71·1	73·2	76·8	80·2	83·7	81·6	79·4	79·5	79·6	80·7	77·7	75·7	78·3	78·8
1875 ...	72·2	73·7	79·4	82·3	83·8	82·8	81·3	80·1	79·2	80·1	79·4	77·0	79·3	79·0
1876 ...	74·9	75·3	78·5	81·4	84·4	83·6	80·9	79·9	79·5	79·6	77·6	76·3	79·3	79·6
1877 ...	74·4	74·6	78·4	81·3	84·0	83·9	83·0	81·9	82·0	81·6	81·0	77·9	80·3	79·9
1878 ...	73·3	76·6	79·5	82·5	85·1	84·4	80·9	80·6	81·0	82·5	80·0	74·7	80·1	79·7
1879 ...	74·9	75·1	78·5	81·5	82·9	82·0	81·3	78·8	79·4	79·9	76·1	73·1	78·6	79·4
1880 ...	73·2	73·0	80·2	83·2	84·5	83·3	79·9	79·8	79·1	81·2	79·7	76·9	79·5	79·4
1881 ...	76·1	77·4	79·1	82·2	85·1	83·2	80·8	80·3	80·3	80·4	78·6	76·2	80·0	79·5
1882 ...	75·8	74·9	79·5	82·0	83·6	81·8	79·3	80·3	79·6	80·1	77·0	75·7	79·1	79·3
1883 ...	75·2	74·4	77·4	82·2	84·2	82·4	80·6	80·3	78·7	80·1	77·7	72·8	78·8	78·9
1884 ...	71·9	73·6	78·7	81·3	83·4	83·5	80·9	80·5	79·4	79·8	77·6	74·7	78·8	78·9
1885 ...	73·7	72·3	77·7	80·1	83·3	84·3	81·4	80·2	80·7	81·9	80·0	75·2	79·2	79·2
1886 ...	73·5	73·6	78·8	81·6	85·0	83·3	80·7	80·4	80·5	80·6	79·8	75·7	79·5	79·1
1887 ...	72·6	73·8	77·8	81·2	84·2	81·1	79·6	79·1	78·9	81·0	79·5	76·2	78·7	79·4
1888 ...	74·1	75·8	79·8	82·5	84·1	83·0	81·1	79·7	81·0	82·7	80·8	77·2	80·1	79·5
1889 ...	75·3	75·5	79·1	82·1	85·4	83·3	80·9	81·1	81·8	80·1	76·0	74·6	79·6	79·7
1890 ...	75·1	77·2	79·3	82·4	83·9	81·4	79·8	78·7	79·5	80·1	78·5	76·1	79·3	79·5
1891 ...	74·1	73·5	77·7	81·1	83·7	84·9	80·8	80·5	79·8	81·4	79·3	76·7	79·5	79·6
1892 ...	75·5	77·3	79·1	85·0	85·6	82·5	81·3	79·1	78·8	81·2	78·0	75·7	79·9	79·4
1893 ...	72·9	72·1	77·3	82·7	83·6	81·8	80·5	80·0	79·8	80·2	79·2	76·5	78·9	79·5
1894 ...	75·1	76·7	79·5	82·5	84·6	82·9	80·6	80·5	79·0	80·2	78·0	75·5	79·6	79·4
1895 ...	73·2	74·8	79·2	81·9	84·1	83·1	80·9	79·9	79·5	81·3	80·6	76·4	79·6	80·0
1896 ...	75·9	75·3	79·4	84·2	85·8	83·4	80·9	79·5	81·6	83·4	81·0	77·8	80·7	79·9
1897 ...	73·6	74·1	77·0	82·3	84·6	85·0	81·3	81·1	81·0	81·4	77·9	74·9	79·5	80·2
1898 ...	74·6	75·2	79·2	83·1	85·1	83·1	81·0	80·6	80·0	83·4	81·0	77·9	80·3	79·9
1899 ...	72·0	75·1	79·5	82·4	84·9	82·5	81·8	81·4	81·2	82·8	79·4	77·2	80·0	80·1
1900 ...	73·2	74·2	78·7	81·9	84·3	85·0	82·4	80·4	80·7	80·9	80·0	78·0	80·0	79·9
1901 ...	73·1	72·5	79·0	83·2	85·7	83·1	81·0	80·1	81·2	80·8	80·2	77·3	79·8	80·2
1902 ...	75·8	76·2	80·8	83·3	85·9	84·4	82·0	81·6	80·1	83·0	80·6	76·6	80·9	79·8
1903 ...	73·3	73·2	75·6	81·1	83·2	82·9	80·8	80·4	80·7	81·0	77·8	74·8	78·7	79·8
1904 ...	74·8	76·3	78·9	82·0	84·7	83·0	81·6	80·6	80·7	82·1	78·3	75·4	79·8	79·1
1905 ...	72·2	70·1	75·1	78·5	84·4	85·4	81·8	81·2	80·7	82·4	80·3	75·3	78·9	79·3
1906 ...	72·7	72·5	76·4	80·4	85·0	82·9	80·8	80·7	80·3	80·9	80·7	76·7	79·2	79·3
1907 ...	75·7	75·1	78·7	82·4	84·0	83·5	81·2	79·7	80·5	81·7	80·7	75·7	79·9	79·4
1908 ...	74·3	74·2	76·4	82·3	84·0	84·0	80·5	79·5	80·3	81·1	77·5	73·9	79·0	79·3
1909 ...	71·9	73·7	78·7	81·2	85·2	83·4	79·9	80·3	79·1	80·1	78·5	75·0	78·9	...
Means, 1873—1905 ...	73·9	74·6	78·5	82·0	84·4	83·1	80·9	80·2	80·1	81·1	79·0	76·0	79·5	
Annual variation ...	−5·6	−4·9	−1·0	+2·5	+4·9	+3·6	+1·4	+0·7	+0·6	+1·6	−0·5	−3·5	...	

TABLE 563.—*Showing the mean monthly and annual maximum and minimum temperatures as recorded by maximum and minimum thermometers.*

Years.	January.		February.		March.		April.		May.		June.		July.		August.		September.		October.		November.		December.		Annual means.		Annual means smoothed by taking overlapping means of three consecutive values.	Annual means smoothed by taking overlapping means of three consecutive values.
	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.	Mean maximum temperature.	Mean minimum temperature.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1873 ...	79·4	65·8	82·2	70·8	83·9	73·6	87·2	77·8	89·2	80·6	85·4	78·9	82·8	78·0	82·6	76·8	83·1	76·1	85·9	74·7	85·7	73·4	83·6	69·8	84·2	74·7	...	...
1874 ...	78·7	65·2	80·7	67·4	83·2	72·0	86·1	76·1	88·8	80·4	85·3	78·3	82·2	77·0	83·0	76·7	83·3	76·7	86·4	76·1	84·9	72·6	83·3	70·7	83·8	74·1	84·2	74·6
1875 ...	79·6	66·2	80·1	68·5	85·5	74·6	88·0	77·9	89·5	80·6	86·9	79·7	84·8	78·1	83·5	77·1	82·4	76·3	85·7	75·6	86·5	74·1	84·1	71·5	84·7	75·0	84·5	74·7
1876 ...	82·3	69·3	82·8	69·7	84·5	73·9	87·2	77·4	90·0	81·0	87·9	80·4	83·9	78·0	83·7	77·2	83·8	75·8	85·9	74·6	84·4	72·1	84·3	70·5	85·1	75·0	85·2	75·3
1877 ...	81·3	69·0	80·9	68·9	84·9	73·4	87·3	76·7	89·8	80·5	88·5	80·4	87·1	79·7	86·0	78·8	86·7	78·3	86·3	77·5	87·8	75·5	84·1	73·2	85·9	76·0	85·6	75·5
1878 ...	80·1	67·3	84·0	70·5	85·7	74·4	88·4	77·7	91·0	81·6	89·1	80·7	84·3	77·5	84·0	77·5	85·3	77·6	88·6	78·2	86·0	75·4	82·9	68·8	85·8	75·6	85·5	75·2
1879 ...	83·0	68·9	82·0	69·4	85·5	72·9	87·5	76·9	88·3	79·3	85·9	78·7	85·4	78·4	82·1	76·1	84·0	76·2	85·9	75·5	84·3	70·5	82·0	66·7	84·7	74·1	85·3	74·9
1880 ...	81·7	67·1	80·7	67·1	86·6	75·4	89·2	78·8	90·3	81·0	88·0	79·8	83·6	76·9	83·8	76·6	83·0	75·7	87·0	76·9	87·5	74·6	85·2	71·3	85·5	75·1	85·6	74·8
1881 ...	84·9	70·0	84·8	71·8	85·8	74·0	88·6	77·5	91·0	81·2	88·3	79·7	84·5	77·7	84·4	76·9	84·6	76·8	87·4	75·5	87·8	72·6	86·0	69·7	86·5	75·3	85·8	74·9
1882 ...	84·8	69·2	83·6	68·5	86·8	73·7	88·5	76·7	89·5	79·7	85·8	78·1	82·4	76·0	84·5	77·2	84·0	76·0	87·0	75·0	85·1	70·9	84·6	69·4	85·5	74·2	85·7	74·5
1883 ...	83·5	69·0	82·5	67·8	84·5	71·9	88·5	77·6	90·3	80·0	87·0	78·1	84·2	76·8	84·1	77·0	83·0	75·2	86·0	75·6	85·6	71·8	82·6	66·5	85·1	73·9	85·3	73·9
1884 ...	81·3	65·3	81·3	67·1	85·2	73·0	87·5	76·4	89·4	79·2	88·6	79·4	84·4	77·0	84·6	76·8	83·3	75·7	86·7	74·6	86·3	71·4	83·4	68·9	85·2	73·7	85·2	74·0
1885 ...	81·2	67·4	80·3	65·3	84·4	72·2	86·0	75·5	88·9	79·5	89·0	81·1	85·1	77·5	84·0	76·9	85·6	76·4	87·8	76·9	87·8	74·3	83·4	69·5	85·3	74·4	85·3	74·3
1886 ...	81·3	67·8	82·0	67·0	86·4	73·5	88·2	76·2	90·7	81·2	87·4	79·4	84·0	77·3	84·4	77·0	85·1	76·8	85·7	76·9	86·2	74·7	83·0	70·0	85·4	74·8	85·2	74·4
1887 ...	79·9	66·4	82·5	66·7	84·6	72·4	87·4	76·6	90·0	80·7	85·2	77·6	82·9	76·3	83·1	75·7	83·2	75·5	87·8	76·3	87·6	73·8	85·1	70·1	84·9	74·0	85·5	74·8
1888 ...	81·0	68·8	83·1	70·1	86·8	75·0	88·9	78·2	90·0	80·3	87·4	79·7	84·6	77·8	83·5	76·6	85·8	77·2	90·1	77·3	88·2	75·4	86·0	71·3	86·3	75·6	85·8	74·8
1889 ...	83·6	68·9	83·7	69·3	86·1	73·8	88·1	77·3	91·6	81·3	87·7	80·0	84·8	77·9	84·9	77·8	87·1	78·2	86·5	75·5	84·8	69·8	84·3	68·4	86·1	74·8	86·0	75·0
1890 ...	84·7	68·6	85·2	70·6	85·8	74·3	88·4	78·0	89·7	80·0	85·4	77·6	83·3	76·2	83·2	75·4	84·3	76·2	86·6	75·6	85·7	73·3	83·6	70·5	85·5	74·7	86·0	74·7
1891 ...	83·4	67·5	82·3	66·9	84·6	72·0	87·2	76·5	89·9	80·1	90·5	81·6	84·4	77·8	84·7	77·6	84·7	76·3	88·8	76·4	88·3	73·6	86·8	70·5	86·3	74·7	85·8	75·0
1892 ...	83·5	69·3	84·8	71·6	85·4	74·1	90·5	81·0	91·2	82·2	86·3	78·9	84·6	78·5	82·3	76·2	82·5	75·5	87·0	77·0	86·2	71·8	84·2	69·9	85·7	75·5	85·8	74·8
1893 ...	81·1	66·3	80·3	65·2	84·8	71·6	89·3	77·9	89·8	79·9	85·9	78·2	84·8	76·9	84·2	76·8	84·5	76·1	87·2	74·9	86·9	74·3	85·0	70·7	85·3	74·1	85·5	74·8
1894 ...	83·1	68·7	84·0	70·9	86·4	74·3	88·9	77·9	90·9	81·1	87·4	79·7	84·2	77·0	84·7	77·3	83·1	75·7	85·6	76·1	86·2	71·4	83·2	69·3	85·6	74·9	85·6	74·6
1895 ...	80·7	66·8	83·0	68·2	86·1	73·9	88·5	77·1	90·3	80·6	88·0	79·8	84·7	77·7	83·9	76·7	83·8	76·1	87·7	76·5	88·3	75·2	85·1	70·1	85·8	74·9	86·0	75·3
1896 ...	84·0	69·7	82·4	69·0	86·1	74·2	90·5	79·3	91·5	82·1	87·6	79·6	84·2	77·6	83·6	76·6	86·6	77·6	90·2	78·7	88·2	75·4	85·9	71·9	86·7	76·0	86·1	75·2
1897 ...	81·1	67·1	81·4	68·1	84·3	71·2	88·7	77·6	90·7	80·7	89·5	80·1	84·9	77·7	85·3	77·8	85·6	77·1	87·4	76·7	87·0	72·0	84·6	68·7	85·9	74·6	86·4	75·4
1898 ...	85·1	67·7	82·6	69·6	86·5	73·3	89·2	78·7	91·1	81·5	87·5	79·8	84·2	77·6	84·6	77·3	84·5	76·6	90·1	78·2	88·9	75·4	85·6	72·4	86·7	75·7	86·3	75·2
1899 ...	81·5	64·6	82·8	69·0	86·5	73·7	88·6	77·8	90·5	81·2	86·7	78·9	85·3	78·7	85·6	77·8	85·8	77·3	88·6	78·4	87·0	73·8	86·2	70·9	86·3	75·2	86·4	75·4
1900 ...	81·1	67·1	81·6	68·0	85·7	73·3	88·2	77·5	90·8	80·7	90·3	81·8	86·5	79·3	83·8	77·5	85·1	77·5	88·4	76·0	87·8	74·5	85·9	72·0	86·3	75·4	86·3	75·3
1901 ..	80·9	66·9	80·4	66·2	86·4	74·0	89·6	78·8	91·4	82·4	87·9	79·4	84·9	77·7	84·1	77·4	86·7	77·8	87·4	77·0	89·4	75·1	86·5	71·9	86·3	75·4	86·7	75·8
1902 ...	84·9	69·8	85·1	70·0	88·2	75·7	90·2	78·9	92·5	82·3	89·9	81·0	85·7	79·0	85·8	78·3	84·6	76·9	89·6	78·9	88·6	75·8	83·9	72·0	87·4	76·5	86·4	75·3
1903 ...	81·7	67·8	82·7	67·0	83·8	70·6	88 5	76·1	89·5	79·1	87·6	79·4	84·2	77·7	84·4	77·5	85·4	77·2	87·2	76·6	86·3	72·3	84·7	68·5	85·5	74·1	86·5	75·3
1904 ...	83·7	69·1	85·3	70·5	86·7	73·5	89·0	77·9	91·2	81·0	87·5	79·7	85·4	78·1	84·8	77·6	85·6	77·8	89·3	77·6	87·4	72·7	84·6	69·9	86·7	75·4	86·1	74·6
1905 ...	80·9	66·6	80·0	63·5	82·8	70·4	85·9	73·9	90·7	80·5	91·3	82·0	85·4	78·8	85·6	77·9	85·8	77·3	89·7	78·1	88·9	74·9	84·9	69·4	86·0	74·4	86·3	74·8
1906 ...	82·1	66·6	81·3	66·9	84·4	71·5	88·0	75·5	91·5	80·9	87·8	79·0	84·3	77·8	84·6	77·9	85·1	77·3	89·0	76·4	89·4	75·7	86·3	71·3	86·1	74·7	86·3	74·9
1907 ...	84·9	70·4	83·7	69·9	86·6	73·9	89·7	78·6	91·2	79·9	88·6	80·0	84·8	78·0	82·9	77·1	86·0	77·2	88·6	77·5	89·4	75·4	85·6	69·8	86·8	75·6	86·3	75·0
1908 ...	83·4	68·7	83·6	68·3	85·0	71·3	89·8	77·8	90·5	80·3	89·0	80·6	83·7	77·6	83·3	76·8	85·9	77·4	88·3	77·4	86·1	72·3	83·8	68·1	86·0	74·7	86·2	75·0
1909 ...	80·2	66·5	82·7	68·2	87·0	73·3	88·9	76·8	92·1	81·8	87·9	79·9	83·4	77·1	85·1	77·2	83·7	76·0	88·1	75·7	87·6	72·8	83·7	70·3	85 9	74·6		
Average, 1873 to 1905 ...	82·1	67·7	82·5	68·5	85·5	73·3	88·3	77·5	90·3	80·7	87·7	79·6	84·5	77·7	84·1	77·1	84·6	76·7	87·5	76·5	86·9	73·5	84·5	70·1	85·7	74·9		
Annual variation...	− 3·6	− 7·2	− 3·2	− 6·4	− 0·2	− 1·6	+ 2·6	+ 2·6	+ 4·6	+ 5·8	+ 2·0	+ 4·7	− 1·2	+ 2·8	− 1·6	+ 2·2	− 1·1	+ 1·8	+ 1·8	+ 1·6	+ 1·2	− 1·4	− 1·2	− 4·8	...	...		
Mean temperature of the nocturnal radiation thermometer.	58·6		59·7		65·6		71·2		76·2		76·8		75·4		74·7		73·6		70·5		64·4		60·2		68·9		.....	
Annual variation ...	− 10·3		9·2		− 3·3		+ 2·3		+ 7·3		+ 7·9		+ 6·5		+ 5·8		+ 4·7		+ 1·6		− 4·5		− 8·7		...		.....	

TABLE 564.—*Showing the non-periodic diurnal ranges of temperature obtained from the mean monthly maximum and minimum tamperatures derived from the readings of the maximum and minimum thermometers for the period 1873 to 1909 and from mean daily range of the hourly readings of temperature for the period 1847 to 1872.*

Years.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Yearly means.	Average of the annual means for groups of years round the maximum and minimum sun-spot years.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1847 ...	...	...	...	...	...	8·1	7·3	8·2	8·7	12·2	15·4	16·2	...	...
1848 ...	17·6	15·4	13·8	11·4	10·7	8·2	7·4	6·8	9·5	11·0	15·4	15·3	11·9	...
1849 ...	14·9	13·9	13·2	11·9	9·9	8·2	7·2	6·7	7·2	12·3	15·0	16·5	11·4	...
1850 ...	14·9	18·2	13·1	11·7	10·3	9·9	8·2	8·1	9·0	11·9	15·9	15·3	12·2	...
1851 ...	15·8	15·2	13·4	12·7	10·6	9·1	6·7	7·5	9·4	11·3	13·0	16·2	11·7	...
1852 ...	16·0	14·8	14·1	13·2	11·8	9·3	7·5	7·2	8·0	11·1	15·2	12·9	11·8	...
1853 ...	15·8	15·0	14·7	12·6	11·9	8·5	6·5	8·5	8·3	13·1	14·3	16·1	12·1	...
1854 ...	15·4	15·9	14·4	12·4	11·5	9·2	6·5	7·9	8·3	11·5	13·1	12·1	11·5	...
1855 ...	13·8	12·6	12·8	12·2	11·5	9·0	7·6	9·0	9·2	11·2	13·9	14·1	11·4	...
1856 ...	13·8	13·6	11·8	12·2	11·2	8·8	6·6	7·8	8·4	10·4	13·3	13·5	10·9	...
1857 ...	12·6	14·8	14·1	12·2	10·8	9·7	7·4	5·4	7·3	11·2	13·2	14·9	11·1	...
1858 ...	15·0	14·2	11·8	12·1	10·6	9·4	7·6	7·2	8·3	11·4	13·5	13·1	11·2	...
1859 ...	13·8	12·9	13·5	11·9	10·3	9·0	8·0	6·8	8·3	10·2	12·7	14·0	10·9	...
1860 ...	14·8	12·1	12·0	10·1	9·6	9·1	5·9	7·4	7·7	10·0	15·4	15·2	10·8	...
1861 ...	14·3	15·3	12·5	11·3	10·7	8·8	5·6	5·4	8·1	9·4	13·6	14·1	10·8	...
1862 ...	13·6	14·7	13·3	11·5	10·5	8·3	7·4	7·7	7·8	10·2	12·8	15·2	11·1	...
1863 ...	14·6	16·5	11·8	11·5	10·6	7·4	7·0	6·7	8·4	11·0	14·0	13·9	11·1	...
1864 ...	15·1	14·0	13·0	11·9	10·4	8·9	6·4	7·0	9·2	12·1	12·6	14·7	11·2	...
1865 ...	14·6	13·3	12·6	11·3	10·2	9·5	7·0	6·3	9·2	11·1	13·6	12·5	10·9	...
1866 ...	13·4	13·7	10·8	10·9	9·2	7·0	5·9	5·6	7·9	10·6	14·0	13·3	10·2	...
1867 ...	13·0	13·7	11·6	9·5	8·7	7·3	6·0	5·6	6·8	10·0	12·3	13·2	9·8	...
1868 ...	13·0	12·8	11·0	9·9	9·1	7·3	6·4	5·9	7·7	10·9	13·6	13·4	10·1	...
1869 ...	13·0	12·4	10·6	10·0	9·2	7·3	6·3	6·1	6·6	9·5	12·1	10·6	9·5	...
1870 ...	12·5	12·9	10·9	10·5	8·7	7·5	5·3	6·3	7·0	8·9	10·8	12·0	9·4	...
1871 ...	12·8	12·4	11·7	10·2	8·6	7·5	6·5	5·9	6·9	10·4	11·1	11·9	9·7	...
1872 ...	13·5	14·2	11·1	10·4	9·0	7·3	5·3	6·2	7·1	10·4	13·4	11·1	9·9	...
1873 ...	13·6	11·4	10·3	9·4	8·6	6·5	4·8	5·8	7·0	11·2	12·3	13·8	9·6	...
1874 ...	13·5	13·3	11·2	10·0	8·4	7·0	5·4	6·3	6·6	10·3	12·3	12·6	9·7	
1875 ...	13·4	11·6	10·9	10·1	8·9	7·2	6·7	6·4	6·1	10·1	12·4	12·6	9·7	
1876 ...	13·0	13·1	10·6	9·8	9·0	7·5	5·9	6·5	8·0	11·3	12·3	13·8	10·1	
1877 ...	12·3	12·0	11·5	10·6	9·3	8·1	7·4	7·2	8·4	8·8	12·3	10·9	9·9	10·07
1878 ...	12·8	13·5	11·3	10·7	9·4	8·4	6·8	6·5	7·7	10·4	10·6	14·1	10·2	
1879 ...	14·1	12·6	12·6	10·6	9·0	7·2	7·0	6·0	7·8	10·4	13·8	15·3	10·5	
1880 ...	14·6	13·6	11·2	10·4	9·3	8·2	6·7	7·2	7·3	10·1	12·9	13·9	10·4	
1881 ...	14·9	13·0	11·8	11·1	9·8	8·6	6·8	7·5	7·8	11·9	15·2	16·3	11·2	
1882 ...	15·6	15·1	13·1	11·8	9·8	7·7	6·4	7·3	8·0	12·0	14·2	15·2	11·3	
1883 ...	14·5	14·7	12·6	10·9	10·3	8·9	7·4	7·1	7·8	10·4	13·8	16·1	11·2	11·20
1884 ...	16·0	14·2	12·2	11·1	10·2	9·2	7·4	7·8	7·6	12·1	14·9	14·5	11·4	
1885 ...	13·8	15·0	12·2	10·5	9·4	7·9	7·6	7·1	9·2	10·9	13·5	13·9	10·9	
1886 ...	13·5	15·0	12·9	12·0	9·5	8·0	6·7	7·4	8·3	8·8	11·5	13·0	10·5	
1887 ...	13·5	15·8	12·2	10·8	9·3	7·6	6·6	7·4	7·7	11·5	13·8	15·0	10·9	
1888 ...	12·2	13·0	11·8	10·7	9·7	7·7	6·8	6·9	8·6	12·8	12·8	14·7	10·6	10·80
1889 ...	14·7	14·4	12·3	10·8	10·3	7·7	6·9	7·1	8·9	11·0	15·0	15·9	11·2	
1890 ...	16·1	14·6	11·5	10·4	9·7	7·8	7·1	7·8	8·1	11·0	12·4	13·1	10·8	
1891 ...	15·9	15·4	12·6	10·7	9·8	8·9	6·6	7·1	8·4	12·4	14·7	16·3	11·6	
1892 ...	14·2	13·2	11·3	9·5	9·0	7·4	6·1	6·1	7·0	10·0	14·4	14·3	10·2	
1893 ...	14·8	15·1	13·2	11·4	9·9	7·7	7·9	7·4	8·4	12·3	12·6	14·3	11·2	
1894 ...	14·4	13·1	12·1	11·0	9·8	7·7	7·2	7·4	7·4	9·5	14·8	13·9	10·7	10·96
1895 ...	13·9	14·8	12·2	11·4	9·7	8·2	7·0	7·2	7·7	11·2	13·1	15·0	10·9	
1896 ...	14·3	13·4	11·9	11·2	9·4	8·0	6·6	7·0	9·0	11·5	12·8	14·0	10·8	
1897 ...	14·0	13·3	13·1	11·1	10·0	9·4	7·2	7·5	8·5	10·7	15·0	15·9	11·3	
1898 ...	17·4	13·0	13·2	10·5	9·6	7·7	6·6	7·3	7·9	11·9	13·5	13·2	11·0	
1899 ...	16·9	13·8	12·8	10·8	9·3	7·8	6·6	7·8	8·5	10·2	13·2	15·3	11·1	
1900 ...	14·0	13·6	12·4	10·7	10·1	8·5	7·2	6·3	7·6	12·4	13·3	13·9	10·8	10·94
1901 ...	14·0	14·2	12·4	10·8	9·0	8·5	7·2	6·7	8·9	10·4	14·3	14·6	10·9	
1902 ...	15·1	15·1	12·5	11·3	10·2	8·9	6·7	7·5	7·7	10·7	12·8	11·9	10·9	
1903 ...	13·9	15·7	13·2	12·4	10·4	8·2	6·5	6·9	8·2	10·6	14·0	16·2	11·3	
1904 ...	14·6	14·8	13·2	11·1	10·2	7·8	7·3	7·2	7·8	11·7	14·7	14·7	11·3	
1905 ...	14·3	16·5	12·4	12·0	10·2	9·3	6·6	7·7	8·5	11·6	14·0	15·5	11·5	
1906 ...	15·5	14·4	12·9	12·5	10·6	8·8	6·5	6·7	7·8	12·6	13·7	15·0	11·4	11·31
1907 ...	14·5	13·8	12·7	11·1	11·3	8·6	6·8	5·8	8·8	11·1	14·0	15·8	11·2	
1908 ...	14·7	15·3	13·7	12·0	10·2	8·4	6·1	6·5	8·5	10·9	13·8	15·7	11·3	
1909 ...	13·7	14·5	13·7	12·1	10·3	8·0	6·3	7·9	7·7	12·4	14·8	13·4	11·2	
Means, 1873—1905...	14·4	14·0	12·1	10·8	9·6	8·0	6·8	7·0	7·9	11·0	13·4	14·3	10·8	
Annual variation ...	+3·6	+3·2	+1·3	0·0	−1·2	−2·8	−4·0	−3·8	−2·9	+0·2	+2·6	+3·5	...	

TABLE 565.—*Showing the periodic ranges of temperature derived from the mean monthly diurnal variations of temperature obtained from the tabulations of the dry bulb thermograms.*

Years.	Month.												Yearly means.	Range of mean diurnal variation for the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	°	°	°	°	°	°	°	°	°	°	°	°	°	°
1873 ...	10·8	10·2	9·1	7·8	7·1	4·6	3·0	3·3	5·1	10·1	11·0	12·3	7·9	7·8
1874 ...	11·5	11·1	9·4	8·1	7·1	4·7	2·8	3·6	4·7	8·8	11·1	11·3	7·8	7·7
1875 ...	11·3	9·9	9·2	8·4	6·8	4·1	3·0	3·9	3·6	8·6	11·0	10·6	7·5	7·3
1876 ...	11·1	10·7	8·3	7·7	7·0	5·2	2·8	3·2	4·7	8·9	9·9	11·5	7·6	7·5
1877 ...	9·5	8·8	8·8	8·2	6·8	5·2	4·3	3·7	6·0	7·0	10·2	8·9	7·3	7·2
1878 ...	9·8	10·1	8·6	8·2	6·9	5·8	3·2	3·3	4·6	7·9	8·3	10·9	7·3	7·2
1879 ...	11·0	9·6	9·4	8·0	5·9	4·1	3·7	2·4	3·6	7·8	11·2	11·2	7·4	7·3
1880 ...	11·4	9·7	8·4	7·7	7·0	4·4	3·2	3·9	4·3	7·3	9·2	10·3	7·2	7·1
1881 ...	11·3	9·9	8·3	7·8	7·2	4·7	2·8	3·5	3·8	8·3	11·2	11·7	7·5	7·4
1882 ...	10·9	10·6	9·2	8·6	6·9	3·8	2·0	3·7	4·7	8·2	9·8	10·9	7·4	7·4
1883 ...	10·4	10·1	8·9	7·4	7·3	4·5	3·0	3·5	3·8	7·6	10·1	11·8	7·4	7·3
1884 ...	11·9	9·8	8·5	7·5	7·0	5·4	2·5	3·8	3·6	8·9	11·0	10·2	7·5	7·4
1885 ...	9·7	11·1	8·5	7·7	7·1	5·0	3·4	3·1	6·1	7·9	10·5	10·5	7·5	7·5
1886 ...	9·9	10·5	9·4	9·0	6·7	4·2	3·4	3·8	5·2	6·3	8·6	9·8	7·2	7·1
1887 ...	9·8	11·8	8·4	7·9	6·5	3·6	2·9	3·8	4·7	8·3	10·5	11·5	7·5	7·3
1888 ...	8·6	9·0	7·8	7·4	7·4	4·1	2·4	2·7	5·6	9·5	9·5	11·3	7·1	7·0
1889 ...	10·6	10·3	8·7	7·9	7·3	4·1	3·3	3·4	5·8	8·0	11·5	11·5	7·7	7·6
1890 ...	12·1	10·4	8·4	7·5	7·0	3·9	2·6	3·6	4·8	7·9	9·2	9·6	7·2	7·1
1891 ...	11·6	10·1	9·2	7·6	7·1	6·6	2·3	3·6	4·3	9·5	11·3	12·3	8·0	7·9
1892 ...	10·8	10·3	8·9	7·3	7·1	4·6	3·2	3·1	3·6	7·0	11·5	10·5	7·3	7·3
1893 ...	10·2	10·5	9·1	8·0	6·2	4·1	3·6	3·5	4·1	9·0	8·7	10·7	7·3	7·2
1894 ...	10·4	9·9	8·3	7·6	6·8	4·1	3·0	3·1	3·4	5·9	11·1	10·0	7·0	6·9
1895 ...	9·7	10·5	8·4	8·0	6·6	4·5	3·7	3·9	4·8	8·6	10·2	11·9	7·6	7·6
1896 ...	11·0	10·0	8·7	8.6	6·9	4·5	2·2	3·3	6·2	8·5	9·6	10·2	7·5	7·3
1897 ...	9·7	9·3	9·3	8·0	7·2	4·1	2·5	3·6	5·3	8·1	12·4	12·2	7·6	7·5
1898 ...	13·3	9·2	9·2	7·5	6·7	4·4	2·4	3·8	5·2	8·9	10·1	9·5	7·5	7·4
1899 ...	11·9	9·9	9·1	7·7	6·9	4·3	4·0	4·3	6·0	7·8	10·3	11·7	7·8	7·8
1900 ...	9·7	9·6	8·8	7·7	7·4	5·5	3·6	3·1	4·2	9·5	10·2	9·9	7·4	7·3
1901 ...	9·2	9·7	9·2	8·2	7·1	4·4	2·8	3·1	5·8	7·4	10·3	10·7	7·3	7·2
1902 ...	10·7	10·9	8·9	8·3	7·4	5·4	3·8	4·2	4·4	7·7	10·4	8·8	7·6	7·4
1903 ...	9·8	11·1	9·3	8·8	6·8	4·8	3·0	3·2	5·1	7·5	10·3	11·8	7·6	7·6
1904 ...	10·2	10·6	9·1	7·9	7·5	3·8	3·3	4·2	5·0	8·3	10·9	11·1	7·7	7·5
1905 ...	9·8	10·9	8·0	8·7	7·6	6·1	3·0	4·2	4·9	7·9	9·9	11·6	7·7	7·5
Means, 1873—1905...	10·6	10·2	8·8	8·0	7·0	4·6	3.0	3·5	4·8	8·1	10·1	10·9	7·5	...
Annual variation ...	+3·1	+2·7	+1·3	+0·5	−0·5	−2·9	−4·5	−4·0	−2·7	+0·6	+2·6	+3·4	...	

Range of mean diurnal variations for the year.

Years	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
	°	°	°	°	°	°		°	°	°	°	°	°
Range	9·9	10·1	9·4	10·1	9·7	10·5	10·8	10·0	10·2	9·9	9·9	10·0	9·8
Years	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
	°	°	°	°	°	°	°	°		°	°	°	°
Range	9·7	9·9	10·1	10·0	10·1	9·9	9·1	8·8	9·0	8·4	8·5	8·8	8·0

TABLE 566.—*Showing the mean monthly and annual values of the barometric pressure derived from the hourly eye-readings of the barometer No. 58 during the period 1847 to 1872 and from barograms (corrected to the barometer No. 58) during the period 1873—1909.*

Years.	Months.												Yearly means.	Annual means smoothed by taking overlapping means of three consecutive values.	Annual means smoothed by taking overlapping means of eleven consecutive values.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1847 ...	29·917	29·903	29·872	29·791	29·722	29·621	29·651	29·707	29·748	29·825	29·893	29·897	29·797	29·804	.....
1848 ...	·927	·916	·830	·770	·741	·649	·654	·706	·812	·826	·909	·922	·805	·800	.....
1849 ...	·945	·906	·870	·779	·714	·624	·672	·700	·727	·841	·889	·911	·798	·804	.....
1850 ...	·878	·927	·885	·816	·763	·639	·643	·736	·786	·785	·891	·949	·808	·801	.....
1851 ...	·958	·901	·857	·779	·739	·631	·599	·697	·782	·828	·838	·946	·796	·803	.....
1852 ...	·929	·903	·829	·794	·746	·630	·660	·731	·756	·856	·905	·923	·805	·805	.....
1853 ...	·940	·873	·859	·797	·775	·644	·673	·742	·793	·854	·863	·955	·814	·808	.....
1854 ...	·935	·921	·885	·792	·760	·674	·618	·712	·715	·785	·923	·933	·804	·814	29·8079
1855 ...	·935	·932	·853	·818	·787	·663	·658	·743	·787	·826	·939	·944	·824	·811	·8085
1856 ...	·985	·922	·835	·787	·718	·651	·610	·707	·799	·834	·897	·932	·806	·813	·8075
1857 ...	·930	·869	·831	·790	·735	·640	·649	·681	·811	·857	·918	·981	·808	·809	·8063
1858 ...	·921	·939	·852	·798	·674	·698	·670	·720	·778	·822	·927	·944	·812	·811	·8051
1859 ...	·933	·918	·878	·787	·789	·662	·628	·731	·779	·854	·851	·931	·812	·809	·8067
1860 ...	·953	·875	·845	·827	·764	·650	·631	·725	·735	·809	·917	·919	·804	·804	·8074
1861 ...	·907	·897	·857	·764	·713	·666	·639	·689	·774	·857	·867	·932	·797	·795	·8072
1862 ...	·920	·871	·862	·801	·786	·634	·625	·689	·693	·780	·853	·887	·783	·791	·8088
1863 ...	·939	·883	·838	·746	·734	·606	·637	·697	·767	·811	·895	·947	·792	·802	·8114
1864 ...	·945	·923	·887	·821	·815	·674	·660	·742	·794	·867	·920	·931	·832	·812	·8115
1865 ...	·972	·910	·874	·800	·741	·669	·656	·666	·788	·848	·890	·918	·811	·822	·8102
1866 ...	·959	·905	·867	·816	·775	·675	·661	·706	·795	·808	·927	·969	·822	·819	·8103
1867 ...	·965	·916	·879	·819	·734	·671	·667	·692	·750	·826	·983	·981	·824	·827	·8099
1868 ...	·937	·921	·881	·831	·796	·673	·699	·742	·817	·857	·920	·963	·836	·825	·8125
1869 ...	·966	·936	·879	·821	·773	·659	·668	·705	·730	·824	·908	·904	·814	·816	·8141
1870 ...	·879	·877	·836	·795	·764	·651	·637	·724	·754	·807	·900	·936	·797	·805	·8119
1871 ...	·894	·891	·863	·793	·768	·641	·672	·733	·779	·821	·870	·932	·805	·798	·8124
1872 ...	·932	·907	·820	·776	·767	·640	·658	·677	·760	·820	·866	·892	·795	·803	·8145
1873 ...	·924	·895	·859	·803	·733	·646	·641	·742	·788	·824	·935	·943	·811	·805	·8124
1874 ...	·975	·925	·857	·826	·720	·628	·655	·720	·740	·801	·920	·953	·810	·810	·8092
1875 ...	·918	·905	·849	·780	·772	·652	·655	·720	·754	·833	·923	·938	·808	·811	·8095
1876 ...	·922	·904	·868	·758	·763	·683	·631	·728	·802	·875	·896	·957	·816	·823	·8116
1877 ...	·976	·936	·887	·827	·790	·713	·745	·762	·808	·865	·921	·917	·846	·821	·8118
1878 ...	·953	·953	·902	·820	·783	·683	·654	·665	·688	·780	·836	·882	·800	·816	·8135
1879 ...	·924	·895	·860	·796	·673	·675	·680	·686	·794	·831	·897	·902	·801	·806	·8150
1880 ...	·917	·909	·844	·787	·747	·668	·685	·753	·777	·849	·911	·975	·818	·813	·8165
1881 ...	·963	·946	·895	·817	·756	·705	·677	·696	·773	·831	·865	·914	·820	·815	·8165
1882 ...	·965	·917	·873	·776	·766	·648	·633	·733	·771	·800	·869	·936	·807	·813	·8167
1883 ...	·929	·900	·880	·791	·735	·639	·670	·715	·785	·848	·869	·989	·812	·815	·8155
1884 ...	·993	·939	·855	·824	·772	·712	·648	·696	·756	·874	·899	·954	·827	·822	·8171
1885 ...	·987	·902	·881	·820	·802	·652	·667	·695	·806	·843	·927	·927	·826	·821	·8183
1886 ...	·944	·925	·864	·806	·723	·654	·653	·718	·790	·789	·896	·947	·809	·818	·8197
1887 ...	·898	·935	·851	·801	·783	·662	·686	·728	·802	·839	·904	·928	·818	·820	·8170
1888 ...	·975	·951	·889	·810	·758	·664	·682	·717	·830	·864	·885	·961	·832	·823	·8177
1889 ...	·970	·957	·923	·810	·781	·666	·647	·700	·746	·803	·882	·930	·818	·821	·8175
1890 ...	·910	·911	·841	·788	·754	·632	·666	·756	·785	·857	·920	·947	·814	·822	·8167
1891 ...	·952	·939	·866	·835	·766	·734	·653	·749	·792	·859	·898	·960	·834	·813	·8162
1892 ...	·929	·863	·811	·761	·754	·657	·608	·693	·740	·797	·897	·968	·790	·813	·8163
1893 ...	·907	·938	·866	·791	·755	·648	·687	·728	·775	·826	·899	·958	·815	·805	·8145
1894 ...	·928	·920	·855	·787	·784	·636	·658	·694	·758	·806	·933	·945	·809	·815	·8145
1895 ...	·930	·926	·840	·803	·792	·654	·689	·704	·799	·820	·933	·936	·819	·816	·8154
1896 ...	·945	·944	·848	·776	·796	·618	·665	·736	·821	·878	·865	·953	·820	·816	·8162
1897 ...	·946	·904	·865	·821	·774	·664	·629	·672	·759	·840	·897	·951	·810	·809	·8150
1898 ...	·961	·868	·843	·779	·759	·649	·628	·744	·759	·810	·856	·916	·798	·814	·8171
1899 ...	·950	·894	·857	·799	·760	·660	·732	·759	·847	·847	·936	·954	·833	·819	·8179
1900 ...	·945	·923	·894	·822	·822	·686	·660	·681	·805	·872	·880	·938	·827	·828	·8207
1901 ...	·955	·941	·889	·776	·783	·680	·659	·705	·840	·832	·868	·953	·823	·824	·8208
1902 ...	·921	·982	·843	·799	·782	·704	·622	·719	·764	·883	·927	·909	·821	·820	·8204
1903 ...	·962	·980	·880	·811	·757	·682	·601	·705	·764	·797	·891	·926	·813	·820	·8211
1904 ...	·942	·903	·849	·791	·753	·682	·665	·734	·818	·828	·958	·962	·824	·826	·8219
1905 ...	·976	·951	·898	·861	·767	·711	·679	·739	·782	·827	·944	·942	·840	·828	.....
1906 ...	·951	·910	·901	·815	·771	·678	·624	·717	·781	·850	·926	·921	·820	·825	.....
1907 ...	·931	·917	·877	·809	·794	·668	·645	·702	·820	·827	·865	·926	·815	·818	.....
1908 ...	·963	·890	·881	·791	·798	·685	·661	·698	·774	·829	·901	·948	·818	·813	.....
1909 ...	·916	·906	·844	·803	·756	·646	·650	·750	·764	·837	·887	·921	·807	.....	.....
Means, 1873—1905 ...	·945	·924	·866	·802	·764	·668	·661	·718	·782	·834	·901	·941	·817	.....	
Annual variation.	+·128	+·107	+·049	−·015	−·053	−·149	−·156	−·099	−·035	+·017	+·084	+·124	...	.....	

TABLE 567.—*Showing the periodic ranges of barometric pressure derived from the mean monthly diurnal variations obtained from the hourly tabulations of barograms.*

Years.	Months.												Yearly means.	Range of mean diurnal variation for the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1873 ...	0·122	0·117	0·120	0·115	0·119	0·074	0·066	0·081	0·093	0·120	0·123	0·120	0·106	0·104
1874 ...	·118	·126	·115	·123	·109	·084	·076	·076	·107	·116	·118	·121	·107	·107
1875 ...	·119	·112	·124	·125	·106	·082	·069	·077	·090	·117	·120	·127	·106	·105
1876 ...	·130	·117	·116	·123	·092	·084	·066	·073	·087	·118	·123	·120	·104	·103
1877 ...	·115	·112	·121	·127	·106	·086	·066	·073	·099	·122	·129	·120	·106	·104
1878 ...	·117	·128	·119	·116	·098	·089	·076	·085	·101	·118	·113	·113	·106	·104
1879 ...	·120	·116	·127	·115	·103	·077	·070	·078	·089	·121	·117	·120	·104	·103
1880 ...	·125	·118	·134	·122	·105	·072	·071	·078	·096	·120	·119	·117	·106	·105
1881 ...	·122	·124	·115	·121	·103	·070	·070	·079	·096	·116	·122	·125	·105	·103
1882 ...	·128	·124	·128	·118	·109	·075	·072	·079	·099	·116	·118	·121	·107	·105
1883 ...	·122	·122	·120	·123	·101	·079	·071	·081	·089	·116	·119	·122	·105	·103
1884 ...	·123	·113	·123	·124	·098	·076	·068	·080	·090	·115	·119	·117	·104	·103
1885 ...	·116	·126	·120	·119	·109	·091	·064	·071	·108	·123	·132	·122	·108	·106
1886 ...	·126	·126	·119	·126	·114	·090	·071	·080	·100	·118	·126	·120	·110	·108
1887 ...	·124	·130	·117	·135	·099	·077	·063	·077	·096	·123	·122	·125	·107	·106
1888 ...	·109	·114	·116	·117	·109	·076	·068	·073	·102	·119	·122	·128	·104	·103
1889 ...	·125	·122	·122	·119	·107	·070	·072	·077	·111	·116	·122	·126	·107	·106
1890 ...	·123	·120	·119	·131	·101	·075	·071	·074	·092	·119	·115	·121	·105	·103
1891 ...	·121	·117	·115	·116	·108	·080	·066	·075	·086	·126	·123	·123	·105	·103
1892 ...	·121	·128	·121	·128	·105	·086	·073	·083	·094	·114	·116	·117	·107	·106
1893 ...	·118	·110	·120	·117	·106	·085	·070	·077	·087	·119	·124	·126	·105	·103
1894 ...	·121	·130	·123	·120	·099	·078	·066	·074	·097	·114	·127	·122	·106	·103
1895 ...	·123	·119	·121	·122	·099	·088	·068	·073	·102	·119	·122	·128	·107	·105
1896 ...	·120	·124	·125	·122	·104	·084	·071	·077	·099	·120	·122	·119	·107	·105
1897 ...	·119	·119	·122	·121	·099	·092	·069	·081	·103	·114	·121	·121	·107	·105
1898 ...	·122	·115	·119	·129	·104	·082	·072	·076	·103	·126	·128	·123	·108	·106
1899 ...	·116	·123	·129	·119	·102	·076	·072	·075	·103	·118	·121	·126	·107	·104
1900 ...	·115	·124	·119	·119	·102	·086	·071	·071	·087	·118	·117	·116	·104	·103
1901 ...	·119	·118	·125	·117	·105	·081	·066	·073	·100	·119	·127	·118	·106	·104
1902 ...	·121	·118	·126	·118	·104	·082	·066	·077	·094	·121	·122	·114	·105	·104
1903 ...	·117	·127	·114	·119	·112	·083	·072	·077	·096	·119	·118	·120	·106	·105
1904 ...	·125	·123	·125	·113	·099	·079	·064	·074	·096	·120	·121	·118	·105	·102
1905 ...	·120	·118	·118	·115	·104	·077	·066	·073	·087	·110	·119	·123	·102	·100
Means, 1873—1905...	·121	·121	·121	·121	·104	·081	·069	·077	·096	·118	·121	·121	·106	
Annual variation ...	+·015	+·015	+·015	+·015	−·002	−·025	−·037	−·029	−·010	+·012	+·015	+·015		

Range of mean diurnal variations for the year.

Years	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
Range	In. 0·101	In. 0·103	In. 0·106	In. 0·107	In. 0·105	In. 0·107	In. 0·105	In. 0·099	In. 0·103	In. 0·104	In. 0·102	In. 0·098	In. 0·102
Years ...	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
Range	In. 0·101	In. 0·101	In. 0·103	In. 0·100	In. 0·101	In. 0·100	In. 0·101	In. 0·106	In. 0·104	In. 0·104	In. 0·106	In. 0·103	In. 0·106

TABLE 568.—*Showing the mean daily abnormals of barometric pressure or the monthly averages of departures of the daily mean barometric pressure derived from observations taken at 6, 10, 14, 16 and 22 hours from the corresponding daily normal value.*

Years.	Months.												Yearly means.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1873 ...	±0·032	±0·026	±0·023	±0·052	±0·066	±0·052	±0·030	±0·061	±0·043	±0·026	±0·045	±0·028	±0·040
1874 ...	·040	·033	·026	·037	·047	·064	·045	·032	·052	·056	·027	·035	·041
1875 ...	·036	·022	·024	·029	·040	·032	·040	·044	·047	·040	·038	·033	·035
1876 ...	0·24	·024	·026	·044	·059	·036	·037	·043	·048	·055	·029	·025	·037
1877 ...	·041	·066	·034	·039	·062	·065	·096	·053	·051	·042	·034	·032	·051
1878 ...	·040	·048	·051	·034	·035	·049	·044	·057	·089	·059	·065	·056	·052
1879 ...	·023	·038	·027	·032	·081	·059	·053	·034	·041	·039	·032	·036	·041
1880 ...	·056	·035	·037	·038	·026	·053	·052	·067	·043	·051	·038	·040	·045
1881 ...	·036	·045	·042	·029	·033	·049	·045	·036	·038	·036	·045	·031	·039
1882 ...	·036	·030	·038	·028	·032	·107	·046	·037	·047	·040	·045	·028	·043
1883 ...	·047	0·33	·027	·025	·030	·046	·039	·058	·048	·030	·041	·057	·040
1884 ...	·058	·039	·024	·036	·041	·069	·056	·039	·046	·049	·016	·042	·043
1885 ...	·049	·023	·034	·030	·050	·045	·036	·059	·043	·024	·045	·055	·041
1886 ...	·043	·029	·031	·036	·042	·055	·049	·038	·036	·056	·032	·031	·040
1887 ...	0·39	·062	·028	·034	·036	·055	·046	·030	·055	·056	·029	·028	·041
1888 ...	·049	·048	·034	·042	·028	·031	·040	·031	·071	·049	·038	·028	·041
1889 ...	·034	·052	·062	·027	·030	·066	·039	·039	·072	·062	·039	·034	·046
1890 ...	·031	·041	·042	·034	·034	·036	·049	·058	·049	·051	·045	·032	·042
1891 ...	·027	·044	·019	·041	·036	·087	·057	·046	·041	·039	·034	·031	·042
1892 ...	·038	·048	·058	·059	·037	·058	·060	·043	·050	·070	·034	·035	·049
1893 ...	·040	·036	·051	·042	·040	·033	·040	·039	·030	·064	·035	·049	·042
1894 ...	·031	·029	·028	·022	·039	·040	·051	·045	·027	·055	·054	·033	·038
1895 ...	·025	043	·032	·033	·052	·074	·049	·037	·049	·043	·036	·040	·043
1896 ...	·021	·044	·032	·032	·047	·080	·083	·050	·053	·053	·048	·033	·048
1897 ...	·025	·023	·031	·034	·028	·054	·062	·057	·039	·031	·028	·026	·036
1898 ...	·031	·049	·027	·031	·040	·076	·042	·037	·030	·035	·051	·031	·040
1899 ...	0·31	·030	·038	·050	·033	·048	·085	·055	·079	·040	·040	·025	·046
1900 ...	·035	·024	·044	·027	·075	·056	·043	·058	·047	·046	·039	·040	·044
1901 ...	·011	·037	·031	·034	·034	·057	·039	·046	·066	·033	·039	·028	·038
1902 ...	0·28	·060	·026	·021	·030	·088	·080	·059	·039	·064	·043	·055	·049
1903 ...	·033	·059	·031	·029	·034	·038	·067	·035	·039	·042	·031	·025	·038
1904 ...	·033	·031	·035	·041	·037	·041	·044	·035	·056	·033	·060	·053	·042
1905 ...	·043	·033	·050	·060	·045	·058	·038	·039	·042	·042	·048	·020	·043
Means, 1873—1905...	·035	·039	·035	·036	·042	·056	·051	·045	·049	·046	·039	·036	·042
Annual variation ...	−·007	−·003	−·007	−·006	·000	+·014	+·009	+·003	+·007	+·004	−·003	−·006	

TABLE 569.—*Showing the mean monthly and annual values of the pressure of vapour derived from hourly eye-readings of the dry bulb and wet bulb thermometers for the period 1847 to 1872 and from hourly tabulations of thermograms for the period 1873 to 1909.*

Years.	Months.												Yearly means.	Annual means smoothed by taking overlapping means of three consecutive values.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1847 ...	0·633	0·606	0·758	0·832	0·898	0·934	0·907	0·890	0·851	0·890	0·693	0·646	0·795	0·802
1848 ...	·643	·629	·727	·860	·888	·918	·909	·873	·866	·909	·733	·676	·803	·798
1849 ...	·588	·661	·727	·804	·861	·969	·916	·892	·872	·858	·805	·601	·796	·794
1850 ...	·566	·596	·723	·783	·887	·942	·935	·892	·858	·889	·694	·648	·784	·787
1851 ...	·555	·639	·741	·839	·858	·929	·918	·890	·828	·861	·731	·590	·782	·778
1852 ...	·508	·637	·707	·800	·844	·920	·906	·873	·877	·858	·676	·627	·769	·772
1853 ...	·511	·617	·712	·818	·894	·934	·897	·854	·855	·776	·709	·598	·765	·776
1854 ...	·595	·557	·716	·840	·907	·946	·924	·895	·899	·846	·732	·688	·795	·785
1855 ...	·596	·664	·717	·793	·935	·947	·919	·863	·875	·869	·714	·634	·794	·795
1856 ...	·642	·625	·787	·849	·900	·933	·917	·873	·841	·842	·707	·634	·796	·794
1857 ...	·628	·674	·793	·822	·933	·910	·920	·894	·862	·827	·675	·566	·792	·801
1858 ...	·625	·650	·769	·875	·968	·923	·947	·911	·880	·858	·707	·669	·815	·805
1859 ...	·652	·693	·732	·852	·890	·956	·957	·890	·888	·853	·742	·608	·809	·808
1860 ...	·562	·654	·737	·834	·887	·956	·948	·893	·893	·922	·650	·668	·800	·794
1861 ...	·565	·612	·696	·822	·890	·921	·910	·883	·850	·839	·673	·598	·772	·783
1862 ...	·553	·619	·653	·785	·851	·922	·934	·906	·915	·868	·747	·582	·778	·770
1863 ...	·597	·577	·698	·836	·855	·902	·879	·863	·835	·818	·671	·583	·759	·762
1864 ...	·484	·561	·651	·768	·825	·900	·900	·871	·870	·805	·705	·632	·748	·765
1865 ...	·625	·607	·693	·883	·906	·930	·917	·901	·841	·833	·677	·651	·789	·766
1866 ...	·586	·545	·707	·768	·848	·932	·909	·895	·861	·854	·648	·596	·762	·778
1867 ...	·598	·560	·722	·819	·912	·947	·909	·903	·873	·860	·657	·647	·784	·777
1868 ...	·583	·663	·674	·814	·905	·953	·902	·879	·868	·868	·688	·622	·785	·785
1869 ...	·629	·608	·691	·832	·875	·930	·919	·908	·887	·815	·664	·689	·787	·781
1870 ...	·566	·613	·698	·797	·837	·915	·895	·861	·856	·859	·755	·613	·772	·786
1871 ...	·632	·641	·720	·856	·900	·915	·890	·860	·863	·873	·786	·666	·800	·777
1872 ...	·515	·535	·737	·789	·839	·925	·901	·866	·878	·797	·645	·671	·758	·771
1873 ...	·532	·614	·705	·800	·882	·906	·880	·841	·841	·803	·671	·587	·755	·752
1874 ...	·513	·547	·653	·779	·857	·892	·866	·842	·875	·809	·674	·611	·743	·753
1875 ...	·515	·598	·741	·800	·854	·911	·894	·858	·858	·774	·681	·631	·760	·751
1876 ...	·584	·590	·701	·792	·862	·892	·880	·838	·805	·786	·670	·613	·751	·766
1877 ...	·598	·583	·703	·813	·855	·916	·912	·880	·891	·862	·748	·695	·788	·778
1878 ...	·563	·633	·747	·812	·875	·914	·921	·919	·919	·891	·769	·583	·795	·777
1879 ...	·580	·600	·672	·790	·903	·909	·887	·863	·814	·795	·615	·552	·748	·770
1880 ...	·569	·533	·771	·841	·856	·891	·860	·825	·832	·865	·717	·645	·767	·763
1881 ...	·579	·668	·706	·826	·904	·902	·894	·870	·849	·829	·654	·612	·774	·768
1882 ...	·610	·597	·721	·803	·840	·908	·869	·840	·860	·816	·667	·640	·764	·765
1883 ...	·587	·585	·678	·844	·878	·921	·889	·851	·835	·827	·682	·525	·758	·759
1884 ...	·544	·606	·720	·793	·856	·895	·896	·875	·855	·778	·659	·596	·756	·761
1885 ...	·619	·536	·713	·766	·869	·926	·894	·871	·866	·853	·708	·607	·769	·768
1886 ...	·570	·571	·706	·788	·910	·920	·889	·856	·869	·877	·767	·636	·780	·769
1887 ...	·589	·574	·715	·818	·848	·882	·869	·844	·826	·813	·714	·612	·759	·777
1888 ...	·618	·646	·771	·837	·870	·931	·905	·864	·856	·837	·757	·632	·794	·780
1889 ...	·618	·620	·731	·835	·932	·939	·913	·890	·899	·825	·645	·599	·787	·784
1890 ...	·589	·641	·721	·836	·866	·907	·870	·824	·821	·815	·717	·644	·771	·772
1891 ...	·568	·557	·648	·810	·873	·919	·904	·873	·862	·814	·662	·589	·757	·773
1892 ...	·621	·637	·755	·897	·875	·923	·908	·869	·851	·871	·652	·641	·792	·769
1893 ...	·560	·548	·684	·807	·871	·899	·875	·855	·839	·799	·748	·620	·759	·778
1894 ...	·616	·658	·727	·841	·858	·929	·893	·867	·852	·855	·665	·647	·784	·773
1895 ...	·580	·608	·738	·818	·861	·923	·889	·863	·851	·831	·754	·596	·776	·787
1896 ...	·628	·629	·743	·869	·915	·948	·908	·868	·847	·883	·755	·636	·802	·786
1897 ...	·592	·593	·692	·834	·898	·952	·922	·903	·900	·848	·656	·582	·781	·793
1898 ...	·580	·621	·720	·854	·893	·931	·911	·876	·874	·878	·752	·680	·797	·784
1899 ...	·510	·620	·742	·817	·882	·897	·885	·861	·846	·877	·729	·633	·775	·788
1900 ...	·561	·603	·741	·846	·874	·949	·943	·906	·888	·806	·725	·674	·793	·785
1901 ...	·578	·509	·741	·861	·898	·937	·920	·893	·873	·878	·711	·640	·787	·800
1902 ...	·643	·648	·806	·874	·913	·933	·933	·894	·893	·894	·719	·677	·819	·794
1903 ...	·585	·568	·668	·787	·892	·939	·927	·893	·898	·838	·706	·597	·775	·793
1904 ...	·612	·643	·717	·827	·893	·933	·906	·870	·853	·870	·679	·621	·785	·775
1905 ...	·571	·481	·640	·766	·920	·930	·925	·895	·863	·876	·725	·596	·766	·775
1906 ...	·553	·557	·684	·805	·905	·927	·921	·890	·855	·815	·739	·638	·774	·774
1907 ...	·640	·625	·728	·805	·846	·921	·917	·870	·853	·883	·725	·576	·782	·775
1908 ...	·607	·586	·664	·814	·860	·924	·901	·873	·889	·868	·686	·566	·770	·779
1909 ...	·575	·628	·717	·804	·900	·944	·901	·875	·859	·837	·714	·674	·786	...
Means, 1873—1905...	·581	·596	·716	·821	·880	·918	·898	·868	·859	·839	·702	·620	·775	
Annual variation ...	−·194	−·179	−·059	+·046	+·105	+·143	+·123	+·093	+·084	+·064	−·073	−·155		

TABLE 570.—*Showing the periodic ranges of pressure of vapour derived from the mean monthly diurnal variations of vapour pressure deduced from the hourly tabulations of dry bulb and wet bulb thermograms.*

Years.	Months.												Yearly means.	Range of mean diurnal variation for the year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.	In.
1873 ...	0·102	0·078	0·041	0·028	0·049	0·051	0·050	0·045	0·056	0·103	0·102	0·101	0·067	0·052
1874 ...	·106	·093	·070	·058	·030	·050	·039	·058	·156	·051	·123	·116	·079	·053
1875 ...	·050	·074	·081	·065	·041	·038	·040	·054	·053	·068	·154	·121	·070	·046
1876 ...	·126	·106	·037	·034	·041	·041	·041	·041	·053	·090	·122	·162	·074	·051
1877 ...	·090	·073	·058	·055	·046	·041	·058	·041	·065	·041	·101	·074	·062	·042
1878 ...	·094	·097	·048	·032	·036	·052	·048	·050	·063	·059	·042	·131	·063	·049
1879 ...	·131	·057	·059	·075	·050	·049	·039	·047	·053	·081	·099	·131	·073	·056
1880 ...	·136	·074	·065	·046	·048	·045	·040	·043	·055	·060	·095	·101	·067	·051
1881 ...	·120	·063	·042	·047	·055	·048	·038	·047	·047	·086	·117	·146	·071	·046
1882 ...	·136	·076	·059	·057	·049	·045	·030	·041	·050	·070	·116	·102	·069	·053
1883 ...	·103	·093	·032	·059	·055	·062	·041	·040	·065	·066	·072	·129	·068	·044
1884 ...	·102	·073	·084	·041	·048	·050	·038	·058	·049	·066	·135	·146	·074	·054
1885 ...	·092	·081	·063	·047	·049	·053	·044	·046	·047	·060	·121	·083	·065	·046
1886 ...	·075	·133	·050	·060	·042	·033	·049	·042	·046	·055	·092	·098	·065	·049
1887 ...	·063	·119	·066	·046	·030	·035	·041	·051	·034	·080	·116	·144	·069	·054
1888 ...	·065	·054	·052	·040	·035	·040	·039	·043	·046	·087	·065	·131	·058	·041
1889 ...	·098	·083	·053	·056	·049	·052	·046	·054	·051	·061	·113	·133	·071	·057
1890 ...	·139	·128	·035	·053	·033	·058	·042	·052	·052	·083	·071	·101	·071	·049
1891 ...	·111	·133	·053	·061	·037	·037	·044	·052	·072	·058	·131	·186	·081	·058
1892 ...	·125	·083	·047	·047	·045	·044	·038	·053	·040	·077	·104	·095	·066	·041
1893 ...	·064	·074	·034	·049	·038	·039	·055	·046	·045	·067	·095	·126	·061	·042
1894 ...	·104	·097	·033	·045	·040	·048	·049	·043	·040	·060	·117	·081	·063	·042
1895 ...	·076	·076	·050	·058	·034	·041	·059	·054	·049	·058	·106	·124	·065	·043
1896 ...	·109	·102	·064	·054	·037	·059	·034	·045	·055	·065	·107	·135	·072	·057
1897 ...	·091	·062	·055	·061	·051	·053	·044	·046	·063	·067	·124	·178	·075	·054
1898 ...	·177	·068	·075	·032	·041	·050	·040	·053	·056	·055	·114	·107	·072	·053
1899 ...	·126	·087	·080	·038	·042	·044	·048	·055	·050	·048	·083	·185	·074	·049
1900 ...	·102	·085	·065	·053	·040	·048	·045	·051	·059	·101	·132	·124	·075	·060
1901 ...	·093	·076	·086	·043	·040	·043	·046	·044	·046	·048	·147	·155	·072	·055
1902 ...	·128	·097	·050	·050	·039	·056	·054	·047	·038	·058	·100	·088	·067	·048
1903 ...	·065	·093	·043	·057	·039	·066	·045	·048	·057	·053	·096	·143	·067	·053
1904 ...	·124	·112	·052	·050	·040	·046	·047	·054	·047	·069	·138	·119	·075	·060
1905 ..	·078	·111	·046	·053	·046	·042	·041	·059	·060	·061	·040	·135	·073	·051
Means, 1873—190 ...	·103	·088	·055	·050	·042	·047	·044	·049	·055	·067	·109	·125	·069	
Annual variation ...	+·034	+·019	−·014	−·019	−·027	−·022	−·025	·020	−·014	−·002	+·040	+·056		

Range of mean diurnal variations for the year.

Years.	1847.	1848.	1849.	1850.	1851.	1852.	1853.	1854.	1855.	1856.	1857.	1858.	1859.
Range	In. 0·056	In. 0·044	In. 0·040	In. 0·040	In. 0·062	In. 0·047	In. 0·053	In. 0·045	In. 0·041	In. 0·051	In. 0·057	In. 0·060	In. 0·060
Years.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
Range	In. 0·044	In. 0·038	In. 0·041	In. 0·044	In. 0·044	In. 0·043	In. 0·058	In. 0·065	In. 0·061	In. 0·050	In. 0·047	In. 0·058	In. 0·058

TABLE 571.—*Monthly and annual means of the temperature of the ground one inch below the surface and also the sums without regard to signs of the annual variations for each year.*

Year.	Month.												Year.	Sums without regard to signs of the annual variation.	Averages of the sums for groups of years round the maximum and minimum sun-spot epochs.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	°	°	°	°	°	°	°	°	°	°	°	°	°		
1873 ...	74·3	77·7	79·7	83·5	85·8	83·6	81·7	80·7	80·5	81·1	80·3	77·5	80·5	264	
1874 ...	73·3	75·2	75·5	81·7	85·3	82·9	80·7	80·8	80·9	82·1	79·7	77·9	79·7	334	
1875 ...	74·5	75·8	81·2	84·1	85·9	84·5	82·8	81·6	80·4	81·4	81·4	79·0	81·0	292	
1876 ...	76·7	77·5	80·6	83·5	86·6	85·2	81·9	81·3	80·9	81·4	79·4	78·1	81·1	267	
1877 ...	76·2	76·4	80·3	83·2	86·2	85·3	84·5	83·4	83·4	82·8	82·6	79·4	82·0	311	
1878 ...	75·2	78·5	81·3	84·5	87·3	86·0	82·1	81·9	82·3	84·4	82·0	77·0	81·9	309	295
1879 ...	77·2	77·3	80·7	83·4	84·7	83·6	82·9	80·1	81·2	81·7	78·5	75·6	80·6	283	
1880 ...	75·6	75·4	82·3	85·4	86·8	85·2	81·6	81·7	80·8	83·3	82·0	79·4	81·6	307	
1881 ...	78·8	79·9	81·8	84·7	87·6	85·4	82·4	82·0	82·0	82·7	81·2	78·8	82·3	229	
1882 ...	78·5	77·7	82·0	84·4	86·1	83·3	80·7	82·1	81·4	82·4	79·5	78·1	81·3	246	
1883 ...	77·7	77·1	79·9	84·5	86·5	84·1	82·1	81·8	80·3	82·0	79·8	75·6	80·9	306	288
1884 ...	74·5	75·8	80·8	83·3	85·5	85·4	82·5	82·3	81·0	81·8	79·7	77·0	80 8	324	
1885 ...	76·1	74·8	79·8	82·1	85·3	86·1	83·1	81·9	82·5	83·3	82·2	77·7	81·2	333	
1886 ...	76·0	75·9	81·0	83·5	87·0	85·0	82·2	82·2	82·2	82·6	81·6	77·9	81·4	299	
1887 ...	75·2	76·1	79·8	83·2	86·4	83·0	81·2	80·8	80·6	82·8	81·6	78·6	80·8	271	
1888 ...	76·2	77·9	81·8	84·6	86·3	85·0	82·7	81·4	82·9	84·8	83·1	79·8	82·2	279	273
1889 ...	77·9	78·2	81·4	84·3	87·7	85·1	82·7	82·7	83·8	82·1	78·6	77·3	81·8	314	
1890 ...	77·7	79·6	81·5	84·4	86·0	83·2	81·5	80·6	81·4	82·3	80·7	78·5	81·4	204	
1891 ...	76·8	76·2	80·0	83·3	86·0	87·3	82·4	82·3	81·7	83·6	81·8	79·6	81·7	290	
1892 ...	77·8	79·7	81·3	86·9	87·9	84·3	83·0	80·6	80·2	83·0	80·1	78·0	81·9	312	
1893 ...	75·4	74·8	79·6	84·5	85·6	83·4	82·1	81·4	81·4	82·2	81·5	78·9	80·9	298	
1894 ...	77·4	78·9	81·6	84·7	86·8	84·6	82·1	82·1	80·7	82·0	80·1	77·7	81·6	259	300
1895 ...	75·5	76·9	81·2	83·9	86·3	85·0	82·5	81·5	81·2	83·1	82·7	78·8	81·5	284	
1896 ...	78·2	77·6	81·5	86·2	87·8	85·0	82·1	81·0	83·2	85·3	83·0	80·0	82·6	301	
1897 ...	75·9	76·3	79·0	84·0	86·6	85·7	82·6	82·4	82·7	83·3	80·3	77·3	81·3	359	
1898 ...	77·1	77·5	81·4	85·2	87·5	85·2	82·6	82·4	81·9	85·4	83·2	80·2	82·5	286	
1899 ...	74·6	77·5	81·7	84·6	87·2	84·6	83·6	83·4	83·3	84·8	81·6	79·5	82·2	322	
1900 ...	75·9	76·1	81·2	84·3	87·0	87·1	84·3	82·1	82·7	83·4	82·4	80·5	82·2	310	306
1901 ...	75·8	75·2	81·6	85·7	88·3	85·4	82·9	82·0	83·5	83·2	82·8	79·9	82·2	329	
1902 ...	78·5	79·1	83·3	85·9	88·5	86·6	84·0	83·5	82·2	85·3	83·0	79·2	83·3	285	
1903 ...	76·2	76·2	78·6	83·7	85·5	84·7	82·5	82·3	82·8	83·0	80·4	77·6	81·1	333	
1904 ...	77·5	79·0	81·5	84·8	87·4	85·2	83·7	82·8	82·9	84·5	80·9	78·0	82·3	298	
1905 ...	75·1	73·2	77·9	81·4	87·0	87·9	83·9	83·3	82·9	84·8	82·7	77·8	81·5	441	
1906 ...	75·6	75·5	79·2	83·2	87·4	85·1	82·9	82·7	82·3	83·4	82·9	79·3	81·6	339	336
1907 ...	78·3	77·6	81·3	84·9	86·7	85·7	83·0	81·5	82·8	83·9	82·7	78·3	82·2	283	
1908 ...	76·9	76·9	79·1	84·5	86·4	86·0	82·4	81·4	82·6	83·5	80·0	76·5	81·3	348	
1909 ...	74·9	76·4	81·1	83·6	87·4	85·4	81·7	82·2	81·1	82·4	80·8	77·7	81·2	307	
Means, 1873—1905.	76·3	77·0	80·7	84·2	86·6	85·0	82·5	81·9	81·9	83·1	81·2	78·4	81·6		
Variations...	−5·3	−4·6	−0·9	+2·6	+5·0	+3·4	+0·9	+0·3	+0·3	+1·5	−0·4	−3·2			

Annual means from 1860 to 1872.

Year.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Annual means ...	79·6	79·0	80·3	79·5	79·7	81·0	79·3	79·7	80·1	80·8	80·0	81·0	79·8

TABLE 572.—*Monthly and annual means of the temperature of the ground nine inches below the surface and also the sums without regard to signs of the annual variation for each year.*

Year.	Month. January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.	Sums without regard to signs of the annual variations.	Averages of the sums for groups of years round the maximum and minimum sun-spot epochs.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	°	°	°	°	°	°	°	°	°	°	°	°	°		
1873 ...	74·9	77·6	79·0	82·6	84·5	84·0	82·3	81·3	80·6	80·8	79·9	77·7	80·4	262	
1874 ...	74·2	75·0	78·1	80·9	83·9	83·3	81·7	81·1	81·1	81·6	79·5	77·8	79·8	294	
1875 ...	75·1	75·2	79·8	82·7	84·4	84·5	83·1	81·9	80·9	81·2	80·8	79·0	80·7	276	
1876 ...	77·2	77·2	79·8	82·3	85·1	85·0	83·0	81·8	80·9	81·2	79·5	77·9	80·9	259	
1877 ...	76·5	76·5	79·5	82·1	84·6	85·0	84·4	83·6	83·1	82·6	82·0	79·9	81·6	286	
1878 ...	76·0	77·8	80·4	83·3	85·7	86·0	82·8	82·3	82·4	83·4	81·7	77·5	81·6	295	279
1879 ...	76·9	77·0	79·7	82·6	84·1	83·5	82·8	80·8	80·9	81·1	78·4	75·6	80·3	276	
1880 ...	75·2	75·1	80·6	83·8	85·3	85·0	82·0	80·5	81·0	82·3	81·3	79·1	80·9	284	
1881 ...	78·2	79·0	80·8	83·5	86·2	85·2	82·9	82·1	81·9	82·0	80·5	78·3	81·7	236	
1882 ...	78·0	77·2	80·5	83·3	84·9	83·7	81·5	81·8	81·3	81·8	79·2	78·0	80·9	236	
1883 ...	77·5	76·7	79·1	83·2	85·3	84·4	82·5	82·1	80·5	81·4	79·6	75·6	80·7	299	283
1884 ...	74·6	75·7	79·8	82·3	84·8	85·4	83·5	82·8	81·7	81·6	79·8	77·5	80·8	331	
1885 ...	76·6	75·3	78·7	81·7	84·2	85·7	83·8	82·4	82·3	83·0	82·2	78·5	81·2	314	
1886 ...	77·0	76·1	80·3	82·6	85·8	85·5	83·0	82·4	82·0	82·4	81·7	78·8	81·5	272	
1887 ...	76·1	76·1	79·3	82·1	85·1	83.6	82·0	81·3	80·8	82·0	81·3	78·7	80·7	252	
1888 ...	77·0	77·7	80·9	83·5	85·1	85·2	83·3	82·1	82·5	83·7	82·9	80·0	82·0	247	255
1889 ...	78·2	78·2	80·7	83·3	86·3	85·5	83·3	83·1	83·6	82·4	79·1	77·4	81·8	303	
1890 ...	77·7	78·9	81·0	83·5	85·2	83·9	82·3	81·1	81·3	81·9	80·8	78·8	81·4	200	
1891 ...	77·0	76·3	79·3	82·3	84·8	86·6	83·4	82·6	81·9	82·8	81·6	79·3	81·5	281	
1892 ...	78·2	79·5	80·7	85·5	86·9	84·8	83·9	81·7	80·7	82·4	80·1	78·2	81·9	282	
1893 ...	76·2	75·0	78·6	83·1	84·9	83·8	82·5	81·8	81·6	82·0	81·3	79·3	80·8	287	
1894 ...	77·9	78·7	80·9	83·7	85·8	85·1	83·0	82·6	81·3	82·0	80·2	78·4	81·6	248	278
1895 ...	76·5	76·8	80·6	83·0	85·4	85·3	83·4	82·2	81·5	82·8	82·4	79·2	81·6	267	
1896 ...	78·6	77·9	80·7	84·9	86·8	85·6	83·4	81·7	82·8	84·6	83·1	80·6	82·5	267	
1897 ...	77·2	76·9	79·0	83·1	85·7	85·7	83·7	82·9	82·9	83·1	80·8	78·4	81·6	316	
1898 ...	77·7	78·4	81·5	85·1	87·6	86·9	84·9	84·3	83·7	85·6	84·4	82·0	83·5	289	
1899 ...	76·9	78·8	82·2	85·3	87·3	86·6	85·7	85·4	85·1	86·0	83·4	81·3	83·7	314	
1900 ...	78·6	78·5	82·2	85·3	88·0	88·6	86·6	84·7	84·6	84·6	83·5	82·2	83·9	296	299
1901 ...	78·3	77·4	82·1	86·1	88·6	87·5	85·4	84·4	85·0	84·8	84·0	81·3	83·7	319	
1902 ...	80·4	80·4	83·7	86·8	89·0	88·2	86·5	85·8	84·4	86·2	84·5	81·6	84·8	275	
1903 ...	78·9	77·7	80·1	84·4	86·9	86·6	85·1	84·5	84·7	84·7	82·1	79·4	82·9	329	
1904 ...	78·8	80·1	82·2	85·8	88·0	87·3	85·8	85·0	84·4	85·3	82·7	80·3	83·8	299	
1905 ...	77·9	75·1	79·2	82·3	87·4	89·0	86·3	85·5	84·8	85·7	84·0	79·9	83·1	421	
1906 ...	77·4	77·3	80·0	83·5	87·7	87·3	85·5	85·2	84·2	84·4	83·8	81·1	83·1	334	324
1907 ...	80·1	79·3	82·1	85·3	87·0	87·3	85·7	84·5	84·6	85·0	83·6	80·2	83·7	267	
1908 ...	78·7	78·5	79·9	84·4	86·6	87·3	85·2	83·7	84·0	84·7	81·9	78·7	82·8	326	
1909 ...	77·4	77·6	81·3	83·9	87·4	87·1	84·3	83·8	83·2	83·5	82·3	79·9	82·6	295	
Means, 1873—1905.	77·2	77·3	80·3	83·5	85·9	85·5	83·6	82·7	82·4	83·0	81·5	79·0	81·8		
Variations ...	−4·6	−4·5	−1·5	+1·7	+4·1	+3·7	+1·8	+0·9	+0·6	+1·2	−0·3	−2·8			

Annual means from 1860 to 1872.

Year.	1860.	1861.	1862.	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.	1871.	1872.
	°	°	°	°	°	°	°	°	°	°	°	°	°
Annual means ...	81·1	81·0	81·6	80·7	80·7	82·0	80·0	80·1	80·4	81·2	80·6	81·5	80·4

TABLE 573.—*Monthly and annual means of the temperature of the ground twenty inches below the surface and also the sums without regard to signs of the annual variations for each year.*

Year.	Month.												Year.	Sums without regard to signs of the annual variations.	Averages of the sums for groups of years round the maximum and minimum sun-spot epochs.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	°	°	°	°	°	°	°	°	°	°	°	°	°		
1873 ...	78·2	79·2	80·1	83·0	84·7	85·3	84·2	83·4	82·7	82·7	82·1	80·9	82·2	211	
1874 ...	78·0	77·1	79·4	81·1	83·8	84·7	83·9	82·9	82·7	83·1	82·1	80·6	81·6	238	
1875 ...	78·6	77·3	80·4	83·1	84·5	85·9	84·8	83·8	82·8	82·8	82·7	81·5	82·3	234	
1876 ...	80·0	79·2	80·7	83·0	85·0	86·1	85·0	83·7	82·8	83·0	82·0	80·3	82·6	212	
1877 ...	79·0	78·5	80·5	82·4	84·7	86·1	85·4	85·1	84·3	84·3	83·9	82·4	83·0	250	233
1878 ...	79·9	79·7	81·3	83·9	85·8	87·1	84·7	84·0	83·8	84·4	83·7	81·0	83·3	223	
1879 ...	79·3	79·2	80·5	83·0	84·8	84·8	84·3	82·9	82·5	82·4	81·0	78·4	81·9	225	
1880 ...	77·6	77·4	80·4	83·9	85·4	86·4	84·2	83·4	82·9	83·4	83·0	81·7	82·5	255	
1881 ...	80·5	80·5	82·0	84·0	86·5	87·0	85·3	84·1	83·8	83·7	83·0	81·0	83·4	206	
1882 ...	80·4	79·8	81·2	84·1	85·6	85·8	84·2	83·7	83·3	83·7	81·8	80·7	82·9	207	
1883 ...	80·2	79·1	80·5	83·5	86·0	86·4	84·8	84·2	82·9	83·1	82·1	78·8	82·6	250	247
1884 ...	77·4	77·8	80·5	83·2	85·3	86·8	86·0	84·9	84·0	83·5	82·4	80·5	82·7	297	
1885 ...	79·4	78·3	79·6	82·7	84·8	86·8	86·2	84·6	84·0	84·4	84·5	81·8	83·1	273	
1886 ...	80·6	87·8	81·5	83·5	86·3	87·5	85·4	84·4	83·8	84·0	84·0	82·0	83·5	220	
1887 ...	79·7	78·6	80·6	83·0	85·6	85·9	84·3	83·4	82·7	83·2	83·3	81·3	82·6	208	
1888 ...	80·0	79·4	81·5	84·1	85·7	87·0	85·6	84·3	84·2	84·8	85·2	83.2	83·7	220	213
1889 ...	81·3	80·6	82·1	84·0	86·7	87·5	85·6	85·0	84·9	84·7	82·2	80·4	83·7	244	
1890 ...	80·3	80·7	82·3	84·3	86·1	86·2	84·9	83·4	83·0	83·7	83·2	81·6	83·3	175	
1891 ...	80·1	78·9	80·7	83·0	85·4	87·5	86·0	84·7	84·0	84·2	84·0	82·1	83·4	242	
1892 ...	80·9	81·5	81·9	85·6	87·5	87.1	86·2	84·4	82·8	83·6	82·7	80·8	83·7	240	
1893 ...	79·4	78·0	79·9	83·2	85·6	85·8	84·8	83·9	83·6	84·0	83·7	82·5	82·9	232	
1894 ...	80·8	80·8	82·0	84·6	86·6	87·1	85·7	84·9	83·6	83·8	82·7	81·4	83·7	214	232
1895 ...	79·7	79·2	81·9	83·9	86·2	87·1	85·7	84·4	83·7	84·4	84·2	82·2	83·5	226	
1896 ...	81·3	80·5	81·9	85·5	87·5	87·8	86·0	84·1	84·3	85·7	85·4	83·6	84·5	222	
1897 ...	80·9	79·7	80·8	83·6	86·5	87·5	86·4	85·0	85·0	85·1	84·1	82·1	83·9	247	
1898 ...	81·1	81·7	83·6	86·7	89·3	89·8	88·2	87·3	86·7	87·7	87·3	85·7	86·3	257	
1899 ...	81·8	82·1	84·3	87·2	89·1	89·5	88·4	88·1	87·8	87·9	86·9	84·9	86·5	288	
1900 ...	83·0	81·7	84·1	87·2	89·8	91·4	89·7	88·0	87·5	87·1	86·3	85·6	86·8	264	255
1901 ...	82·9	81·8	83·9	87·7	90·4	90·6	88·6	87·4	87·4	87·4	87·1	85·0	86·7	262	
1902 ...	84·0	83·7	85·8	88·6	90·8	91·0	89·8	88·8	87·4	88·3	87·7	85·5	87·6	234	
1903 ...	83·3	81·5	83·0	86·2	89·3	89·3	88·2	87·5	87·4	87·2	85·7	83·5	86·0	261	
1904 ...	82·5	83·2	84·6	87·8	90·0	90·3	88·9	88·1	87·2	87·5	86·3	84·2	86·7	256	
1905 ...	82·7	79·6	82·0	84·6	89·1	91·2	89·4	88·4	87·6	87·9	87·1	84·1	86·1	355	
1906 ...	81·8	81·2	82·7	85·6	89·3	90·1	88·8	88·1	87·2	86·9	86·5	84·8	86·1	286	264
1907 ...	83·9	83·2	84·6	87·2	89·1	89·8	88·3	87·4	87·1	87·1	86·4	84·0	86·5	209	
1908 ...	82·7	82·3	83·0	85·9	88·3	89·5	88·2	87·0	86·5	86·8	85·6	83·0	85·7	242	
1909 ...	82·2	81·3	83·7	85·7	89·0	89·9	87·6	86·6	86·2	85·8	85·1	83·4	85·5	241	
Means, 1873—1905.	80·4	79·9	81·7	84·4	86·7	87·5	86·1	85·0	84·5	84·7	84·0	82·2	83·9		
Variations.	−3·5	−4·0	−2·2	+0·5	+2·8	+3·6	+2·2	+1·1	+0·6	+0·8	+0·1	−1·7			

Annual means from 1849 to 1872.

Year.	1849	1850	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
Annual means	83·6	84·1	81·6	81·7	81·7	82·2	81·7	82·0	80·9	80·8	81·2	82·2	82·2	84·0	83·8	83·2	84·2	82·5	82·1	82·2	82·8	82·5	83·0	82·2

TABLE 574.—*Monthly and annual means of the temperature of the ground sixty inches below the surface and also the sums without regard to signs of the annual variations for each year.*

Years.	Months.												Year.	Sums without regard to signs of the annual variation.	Averages of the sums of groups of years round the maximum and minimum sun-spot epochs.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	°	°	°	°	°	°	°	°	°	°	°	°	°		
1873 ...	81·6	81·4	81·6	82·6	84·1	85·0	84·9	84·3	83·7	83·3	83·1	82·3	83·2	127	
1874 ...	81·5	80·6	80·7	81·6	83·2	84·2	84·5	83·8	82·9	83·1	83·0	82·7	82·6	126	
1875 ...	81·6	80·6	81·0	82·4	83·8	85·1	85·0	84·3	83·7	83·5	83·4	83·0	83·1	140	
1876 ...	82·3	81·7	81·6	82·8	84·1	85·5	85·5	84·7	83·9	83·7	83·3	82·5	83·5	129	
1877 ...	81·8	81·2	81·8	82·4	83·8	85·4	85·7	85·3	85·1	84·7	84·6	84·0	83·8	162	
1878 ...	82·9	82·3	82·2	83·4	84·6	86·1	85·7	84·7	84·1	84·2	84·1	83·5	84·0	112	138
1879 ...	82·1	81·4	81·8	82·8	84·2	84·7	84·6	83·9	83·1	82·8	82·5	81·5	82·9	114	
1880 ...	80·5	80·0	80·4	82·5	84·0	85·3	85·0	84·0	83·5	83·4	83·5	83·2	82·9	169	
1881 ...	82·6	82·3	82·7	83·7	85·3	86·6	86·2	85·1	84·5	84·2	84·0	83·3	84·2	133	
1882 ...	82·6	82·1	82·1	83·5	85·1	86·0	85·4	84·6	84·1	83·9	83·6	83·0	83·8	122	
1883 ...	82·7	82·1	82·1	83·2	85·1	86·2	85·9	85·0	84·0	83·5	83·3	82·1	83·8	148	137
1884 ...	80·8	80·2	80·9	82·5	84·2	85·7	86·2	85·5	84·6	83·9	83·3	82·5	83·4	190	
1885 ...	81·5	80·9	80·8	82·2	83·8	85·5	86·3	85·3	84·4	84·3	84·7	84·0	83·6	185	
1886 ...	82·9	81·8	82·0	83·4	85·0	86·7	86·1	84·9	84·2	84·1	84·3	83·7	84·1	133	
1887 ...	82·5	81·2	81·4	82·7	84·4	85·8	85·2	84·0	83·6	83·4	83·5	83·1	83·4	122	
1888 ...	82·1	81·3	81·6	83·2	84·9	86·2	86·3	85·0	84·4	84·6	85·2	84·7	84·1	167	136
1889 ...	83·5	82·8	82·8	83·8	85·4	86·9	86·4	85·5	85·0	85·1	84·3	83·1	84·5	140	
1890 ...	82·4	82·3	82·7	83·9	85·3	86·3	85·9	84·6	83·8	83·7	83·9	83·5	84·0	119	
1891 ...	82·6	81·6	81·6	82·7	84·4	86·1	86·6	85·5	84·7	84·5	84·5	83·9	84·1	157	
1892 ...	83·0	82·7	82·8	84·4	86.1	87·0	86·8	85·6	84·2	83·4	83·4	82·6	84·4	166	
1893 ...	81·8	80·9	80·9	82·3	84·5	85·6	85·3	84·6	84·3	84·3	84·3	84·2	83·6	168	
1894 ...	83·2	82·6	82·8	84·1	85·5	86·6	86·5	85·5	84·6	84·3	84·1	83·5	84·4	129	151
1895 ...	82·5	81·6	82·1	83·3	85·1	86·6	86·4	85·4	84 7	84·5	84·5	84·0	84·2	153	
1896 ...	83·3	82·6	82·4	84·2	86·0	87·4	86·7	85·3	84·5	84·9	85·4	85·0	84·8	141	
1897 ...	83·9	82·7	82·6	83·5	85·5	86·9	87·0	85·9	85·4	85·5	85·2	84·4	84·9	145	
1898 ...	83·6	83·5	84·0	85·6	87·4	88·7	88·3	87·4	86·8	86·6	86·9	86·4	86·3	166	
1899 ...	85·0	84·3	84·5	85·9	87·4	88·6	88·4	88·0	87·7	87·6	87·4	86·7	86·8	151	
1900 ...	85·5	84·5	84·6	86·2	88·1	89·6	89·7	88·6	87·7	87·3	87·0	86·6	87·1	166	157
1901 ...	85·6	84·7	84·6	86·5	88·4	89·8	89·1	87·8	87·3	87·4	87·6	86·7	87·1	151	
1902 ...	85·9	85·5	85·9	87·2	88·9	90·2	90·0	89·1	88·2	87·7	87·9	87·1	87·8	150	
1903 ...	85·8	84·6	84·4	85·5	87·7	88·6	88·3	87·5	87·3	87·0	86·6	85·6	86·6	139	
1904 ...	84·6	84·5	84·9	86·4	88·1	89·4	88·8	88·2	87·5	87·3	87·1	86·0	86·9	162	
1905 ...	85·1	83·5	83·2	84·6	86·9	89·2	89·4	88·5	87·8	87·6	87·5	86·4	86·6	209	
1906 ...	84·9	84·0	83·9	85·2	87·2	88·9	88·8	88·1	87·2	86·8	86·7	86·1	86·5	166	154
1907 ...	85·5	84·8	84·9	86·1	87·3	88·6	88·2	87·4	86·8	86·6	86·6	86·0	86·6	110	
1908 ...	84·9	84·0	83·9	85·0	86·8	88·1	88·2	87·3	86·5	86·6	86·4	85·3	86·1	146	
1909 ...	84·7	83·7	84·1	85·3	87·0	88·5	88·1	86·8	86·2	85·8	85·5	84·9	85·9	144	
Means, 1873—1905.	83·0	82·3	82·5	83·8	85·5	86·8	86·6	85·7	85·0	84·8	84·8	84·1	84·6		
Variations.	−1·6	−2·3	−2·1	−0·8	+0·9	+2·2	+2·0	+1·1	+0·4	+0·2	+0·2	−0·5			

Annual means from 1851 to 1872.

Year.	1851	1852	1853	1854	1855	1856	1857	1858	1859	1860	1861	1862	1863	1864	1865	1866	1867	1868	1869	1870	1871	1872
	°	°	°	°	°	°	°	°	°	°	°	°		°	°	°	°	°	°	°	°	°
Annual means	83·5	83·6	83·6	83·9	83·6	84·0	83·0	82·5	82·9	83·6	83·9	84·2	84·0	83·6	84·5	83·3	83·2	83·4	83·7	83·7	83·8	83·1

TABLE 575.—*Monthly and annual means of the temperature of the ground one-hundred and thirty-two inches below the surface and also the sums without regard to signs of the annual variations for each year.*

Years.	Months.												Year.	Sums without regard to signs of the annual variation.	Averages of the sums of groups of years round the maximum and minimum sun-spot epochs.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	°	°	°	°	°	°	°	°	°	°	°	°	°		
1879 ...	82·5	82·1	81·9	82·0	82·6	83·0	83·6	83·4	82·9	82·6	82·3	81·9	82·6	54	
1880 ...	81·4	80·9	80·9	81·2	82·1	83·2	83·7	83·6	83·4	83·0	82·8	82·7	82·4	111	
1881 ...	82·4	82·1	82·0	82·5	83·3	84·2	84·7	84·5	84·0	83·8	83·6	83·2	83·4	93	
1882 ...	82·7	82·3	82·0	82·4	83·3	84·1	84·5	84·4	84·0	83·7	83·4	83·0	83·3	84	
1883 ...	82·7	82·3	82·2	82·6	83·4	84·2	84·6	84·3	83·8	83·4	83·1	82·4	83·2	84	100
1884 ...	81·7	81·2	81·2	81·6	82·6	83·5	84·3	84·3	83·9	83·5	83·1	82·5	82·8	118	
1885 ...	81·8	81·3	81·0	81·3	82·1	83·1	83·9	84·1	83·8	83·6	83·5	83·2	82·7	123	
1886 ...	82·7	82·3	82·2	82·5	83·2	84·1	84·9	84·5	83·8	83·6	83·5	83·4	83·4	81	
1887 ...	82·7	82·0	81·8	82·0	82·7	83·5	84·0	83·8	83·4	83·0	82·6	82·3	82·8	72	
1888 ...	81·9	81·6	81·4	81·9	82·8	83·7	84·4	84·2	83·9	83·7	83·7	83·6	83·1	114	86
1889 ...	83·3	82·8	82·6	82·9	83·7	84·5	85·0	85·0	84·7	84·4	84·0	83·3	83·8	90	
1890 ...	82·8	82·4	82·4	82·8	83·5	84·2	84·6	84·4	83·9	83·5	83·4	83·0	83·4	73	
1891 ...	82·6	82·1	81·9	82·1	82·9	84·0	84·7	85·0	84·6	84·3	83·8	83·6	83·5	114	
1892 ...	83·1	82·7	82·7	83·2	84·0	84·8	85·3	85·2	84·2	83·2	82·6	82·4	83·6	108	
1893 ...	81·8	81·4	81·2	81·5	82·3	83·2	84·0	84·0	83·7	83·6	83·4	83·3	82·8	114	
1894 ...	82·8	82·5	82·4	82·8	83·5	84·3	85·0	84·9	84·3	84·0	83·5	83·2	83·6	90	101
1895 ...	82·6	82·0	82·0	82·4	83·2	84·1	84·7	84·7	84·5	84·2	83·9	83·5	83·5	104	
1896 ...	83·2	82·6	82·4	83·1	83·8	84·7	85·3	85·2	84·5	84·3	84·3	84·1	84·0	93	
1897 ...	83·7	83·1	82·9	83·1	83·8	84·7	85·3	85·3	84·8	84·5	84·1	83·8	84·1	83	
1898 ...	83·4	83·0	83·1	83·6	84·5	85·3	85·8	85·7	85·4	85·2	85·0	84·9	84·6	105	
1899 ...	84·5	84·1	83·8	84·2	84·9	84·6	86·1	86·2	86·1	85·9	85·8	85·5	85·2	93	
1900 ...	85·1	84·5	84·4	84·5	85·3	86·2	86·7	86·9	86·5	86·2	86·1	85·8	85·7	92	88
1901 ...	85·2	84·7	84·5	84·8	85·5	86·3	86·6	86·2	86·0	86·0	86·0	85·8	85·6	70	
1902 ...	85·4	85·3	85·3	85·4	86·1	86·8	87·4	87·5	87·0	86·4	86·4	86·2	86·3	78	
1903 ...	85·5	85·0	84·5	84·8	85·3	86·0	86·4	86·2	85·8	85·5	85·5	85·1	85·5	52	
1904 ...	84·6	84·2	84·1	84·4	85·3	86·0	86·4	86·3	86·0	86·0	85·9	85·4	85·4	86	
1905 ...	85·0	84·2	83·8	83·8	84·6	85·7	86·4	86·6	86·5	86·3	86·2	85·8	85·4	113	
1906 ...	85·0	84·2	83·9	84·2	84·8	85·6	86·1	86·1	85·9	85·7	85·7	85·3	85·2	79	77
1907 ...	85·0	84·7	84·6	84·7	85·2	85·9	86·1	86·0	85·9	85·6	85·6	85·3	85·4	56	
1908 ...	84·8	84·3	83·9	84·0	84·5	85·3	86·1	86·1	85·9	85·8	85·3	85·0	85·1	80	
1909 ...	84·6	84·0	83·9	83·9	84·4	85·4	86·1	85·9	85·3	84·9	84·8	84·5	84·8	71	
Means, 1879—1905.	83·2	82·8	82·6	82·9	83·7	84·5	85·1	85·1	84·6	84·3	84·1	83·8	83·9		
Variations.	−0·7	−1·1	−1·3	−1·0	−0·2	+0·6	+1·2	+1·2	+0·7	+0·4	+0·2	−0·1			

curve would show no periodicity whatever. On the other hand if the effects are unequal, then alone may we expect the range curve to show the prevalence of the period. Thus in any 11-year cycle, if the series denoting maximum temperatures is affected by these fluctuations more than the one denoting the minimum temperatures, we should have the range curve, as was probably the case in the period* discussed by Chambers, indicating a law of inverse 11-year variation. On the other hand, if this influence on the afternoon hour had waned, while the minimum temperatures were subjected to relatively greater influence of this periodicity, as was probably the case in the recent period 1873—1905, the law indicated by the range would be that of the direct 11-year period. Presumably thus there is quite the possibility of both the results indicated above being correct, for during the early period the influence of the 11-year period may have obtained to a greater degree than the normal, on the afternoon maximum temperature hour and less so on the early morning minimum temperature hour when the sun is below the horizon, while in the later period probably just the opposite conditions prevailed. How far this explanation is correct it is of course difficult to say, but the evidence leading to the inference so far is not unconvincing. In passing it may be incidentally noted also how in the maximum temperature series a large period secular rise is conspicuously indicated while it is not so obviously emphasised in the sweep of the minimum temperature series. This is clearly suggestive. We shall presently have an occasion to refer to this large period secular change.

575. The next element of importance is the barometer. The curve shown in figure 8 represents the annual values of barometric pressure (table 566), and the whole series may be regarded as continuous† throughout the period. The annual means smoothed in the manner referred to above for the temperature curve, enable the 11-year fluctuations to be brought out unmistakably clear. The maximum epochs about the years 1848—1850, 1861-1862, 1870—1872, 1881-1882, 1893 and 1906-1907 (*vide* table 566, column 15) are fairly prominently indicated as also their corresponding minima with the single exception of the lower turning point about the years 1877-1878, which is abnormally placed, even higher than the maximum of 1882. The periodic ranges of barometer (table 567) shown in figure 9, and the abnormals, that is the sums without regard to sign of the daily departures from the normal value of pressure divided by the number of days in the month (table 568), charted in figure 10 on the other hand however indicate no apparently marked fluctuations and may be passed over without any remarks.

576. From the curves of ground temperature, figures 2 and 7, it will be seen that the influence of the 11-year period though not apparently disclosed therein charted as they are on a small scale, may also be suspected, as the curve in figure 2 clearly runs closely parallel to that in figure 1 resembling it in all details. The major portion of the movements in the air temperature is of course derived from the convective currents from the ground, and though the ground temperatures must be subsequently modified by the conductivity of the ground and other factors more and more as increasing depths are reached, the parallelism in the two sets of the curves remains notwithstanding strickingly close in main details. It will further be seen when the secular changes in the intensity of the annual variations of ground temperature at different depths derived by summing up the monthly ordinates of each year without regard to sign, are considered, that the secular disturbance effects of the 11-year period on the annual variations of ground temperature, which under ordinary circumstances are not noticeable, are also brought out (*see* columns 15 and 16, tables 571 to 575), when the annual values so derived are properly grouped about the maximum and minimum spot epochs. Incidentally it may be mentioned here that the remark made in Chapter I of this volume in regard to the absence of this 11-year influence on the ground temperature variations, is subject to this correction. The argument hence in regard to the relation between the two phenomena examined in paragraph 306 which suffered for want of evidence of the existence of this periodicity in the ground temperature variations, derives additional importance from the above modification.

577. Before passing on from the 11-year period movements in the secular curves, to fluctuations of shorter periods, it becomes appropriately necessary for us to examine the data in connection with the large unknown period the existence of which is so conspicuous a feature in the magnetic curves as referred to in paragraph 560. We have noted there how the magnetic activity as represented by the ranges of H, and the solar energy as indicated by the spot numbers, both of which appear to reach their maximum turning point in the neighbourhood of the year 1870, steadily decline and attain their lowest value about the year 1902. It is noteworthy how this slow decay in the magnetic and solar energy, is also indicated in the temperature curve (figure 1, plate 104), in the ground temperature curves, figures 2 and 7, and in the barometer curve, figure 8, by a slow secular rise in all these elements. They all indicate the attainment of the maximum about the year 1902 (*vide* tables 562 to 575), suggesting a turning point about the very time that the magnetic curve of H ranges,

* In the earlier period the ranges were derived directly from the daily register and no maximum and minimum readings were separately registered. Thus the examination of the latter is not possible unless these are again derived from the old data.

† Refer foot-note, paragraph 577.

COLABA OBSERVATORY.

Secular Variations of meteorological and some magnetic elements.

Plate 104.

1845 1848 1851 1854 1857 1860 1863 1866 1869 1872 1875 1878 1881 1884 1887 1890 1893 1896 1899 1902 1905

78° 79° 80° 81°

Fig. 1 — Temperature.

81° 82° 83°

82° 84° 86°

Fig. 2 — Ground Temperature. 20″ Below Ground.

10° 9° 8°

Fig. 3 — Range of Temperature. (Periodic).

60 Y 120 Y

Fig. 4 — Intensity of Annual Variation of H.

+20″ 0 −20″

Fig. 4A — Departure of D Magnetograph Zero.

11° 10°

Fig. 5 — Range of Temperature. (Non Periodic).

+20 Y −20 Y

Fig. 6 — Departure Magnetic Ranges Less Solar Spots.

80° 81° 82°

Fig. 7 — Ground Temperature 1″ Below Surface.

INCHES 29·780 29·800 29·820

Fig. 8 — Barometer.

INCH ·110 ·100

Fig. 9 — Range of Barometer.

·050″ ·040″

Fig. 10 — Mean Daily Abnormals of Barometer.

INCH ·750 ·800

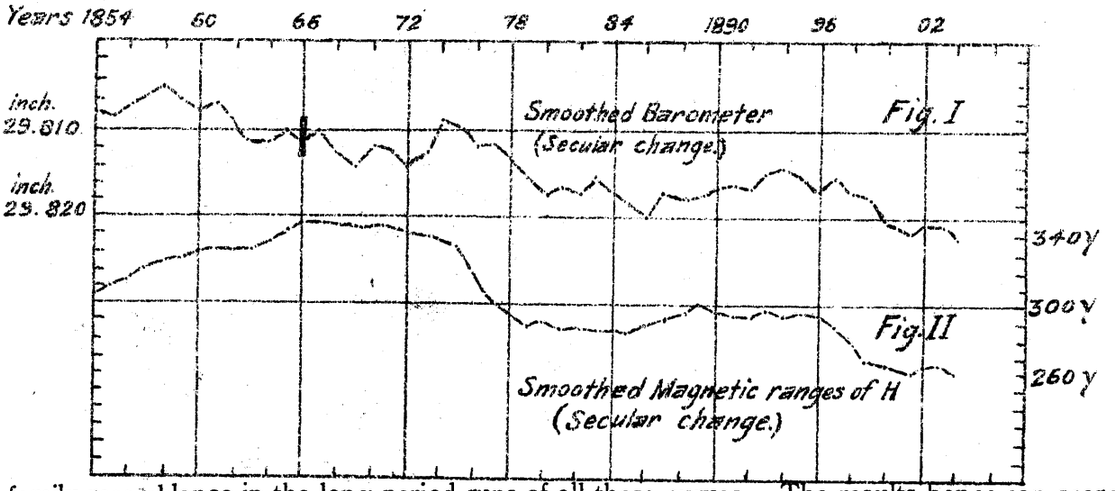
Fig. 11 — Vapour Pressure.

·060 ·040

Fig. 12 — Range of Vapour Pressure.

Govt. Photozinco. Office, Poona. 1910.

shows a lower turning point. This secular change appears to be indicated alike in the vapour pressure curve as also in that of the non-periodic range of temperature (*vide* figures 11 and 5) and in the maximum air temperature series to which a reference has already been made. It will thus be seen that there is a



general family resemblance in the long period runs of all these curves. The results hence can scarcely be ascribed to fortuitous causes, and the conviction is forced upon us that all meteorological elements are subject to some slow period secular change which appears to run fairly concurrent with that noted in the magnetic and solar curves. For it will be seen that the curve of the annual values of barometer when smoothed for 11 years as attempted in the magnetic curve of ranges in paragraph 560 (*vide* column 16, table 566) and shown side by side with the latter as charted above in figures I and II, unmistakably presents the general parallelism in a most striking manner at least for the later period* 1867 to 1905.

578. Referring now to the shorter period fluctuations, we may note that the feature which appeals most to the eye in nearly all the curves charted in plate 104, is the prevalence of the biennial (or thereabout) period movements, to the existence of which in the magnetic curves a passing reference has already been incidentally made in paragraph 551. The more or less persistent appearance of these movements has also been observed there; but apart from the question of their probable prevalence in the magnetic curves thus referred to, similar movements, it will be remembered, were also noted in paragraphs 182 and 211, Part I, of this volume, while discussing the curve of the Declination magnetograph zero. Some considerable doubt was entertained then as to whether these movements were due to fortuitous cause or to real magnetic influence. The zero of the differential instruments for obvious reasons cannot have any regular or periodic movements. Temperature which may possibly prove a vitiating factor in other instruments, has so far as we know no influence whatever on Declination instruments, such at least as may affect their absolute or other values. This curve of the Declination Magnetograph zero, as also that of the secular change in the annual variations of absolute Horizontal force, referred to already in paragraph 551, are charted in figures 4 and 4*a* in plate 104 along with other meteorological data. It will be seen that though sometimes the movements are not synchronous, the parallelism between the figures 4 and 4*a* is striking and unmistakable. The result hence while removing, to a considerable extent, the misgivings referred to in Part I of this volume, in regard to the nature of the movements, appears to confirm in an indirect manner, the probability of the existence of the two-year movements in the magnetic curves generally as they have been noted to prevail in other magnetic elements also. When these fluctuations come to be compared with those in the meteorological elements, we find that these movements in both these phenomena are seen sometimes to persist for years at a time following each other with rhythmic precision (*vide* especially figures 3 and 5, plate 104). This concurrent incidence, hence, strongly suggests a common origin, if not a closely direct relation between the two phenomena.

The examination of the secular variations cursorily made as above, at any rate indicates the probable common existence in the two phenomena generally (1) of the 11-year period, (2) of the large unknown period which induces a slow and minute but definitely marked secular change in all the elements and (3) of the relatively rapid fluctuations of a 2-year (or thereabout) period. The suggestions

* The method of observations of the barometer was altered from 1866. Up to then for every observation the usual operation of setting the ivory zero point of the scale, was performed. But as this became more and more difficult and uncertain on account of the accumulation of scum on the surface of the mercury and the glass cistern of the barometer becoming more and more opaque every day, the zero of the scale was once for all set on the 22nd May 1866, and the setting screw was removed, and suitable corrections for capacity were thereafter applied (see Bombay Magnetic and Meteorological Observations, 1865—1870, Introduction, pp. X, XI). It will thus be seen that the latter method allows of the very fine secular changes to be brought out more correctly than in the earlier period, as fresh adjustments every time of the zero of the instrument, cannot but be fatal to the correct registration of such minute secular changes which have since been so faithfully recorded.

TABLE 576.—*Showing the amplitude* P *and the first maximum* μ *reckoned from 1st January, for the annual and semi-annual terms of magnetic and meteorological elements.*

	μ_1	μ_2	Date of 1st maximum (+) or 1st minimum (−) of the annual term.	Date of 1st maximum (+) or 1st minimum (−) of the semi-annual term.	P_1	P_2
Absolute D. (from absolute observations) ...	1°	97°	− 3 July. + 1 January.	− 7 January. + 8 April.	6″	3″
Absolute D. (by magnetograph) ...	299	114	− 1 May. +30 October.	−24 January. +26 April.	1″	8″
Summed ranges of D. ...	196	92	−16 January. +18 July.	− 2 January. + 3 April.	82γ	10γ
D. Magnetograph zero ...	21	33	−23 July. +21 January.	− 5 May. + 2 February.	5″	5″
Absolute H. (from absolute observations) ...	183	159	− 3 January. + 5 July.	−11 March. +10 June.	2·6γ	2·2γ
Absolute H. (by magnetograph) ...	296	160	−28 April. +27 October.	−12 March. +11 June.	1·9γ	2·6γ
Summed ranges of H. ...	137	100	−17 November. +19 May.	−10 January. +11 April.	45γ	23γ
H. Magnetograph zero ...	335	165	− 6 June. + 6 December.	−17 March. +16 June.	3·8γ	0·5γ
Absolute V. ...	91	8	− 1 October. + 2 April.	− 9 April. + 8 January.	3·8γ	5·5γ
Summed ranges of V. ...	193	79	−13 January. +15 July.	−20 December. +21 March.	53γ	23γ
Temperature ...	182	121	− 2 January. + 4 July.	−31 January. + 3 May.	3°·68	2°·44
Temperature Ranges (non-periodic) ...	16	146	−18 July. +16 January.	−26 February. +28 May.	3·8	0·6
Temperature Ranges ...	17	133	−19 July. +17 January.	−13 February. +15 May.	3·71	0·93
Barometric Pressure ...	7	99	− 9 July. + 7 January.	− 9 January. +10 April.	0·136 in	0·010 in
Barometric Pressure ranges ...	20	110	−22 July. +20 January.	−20 January. +22 April.	0·244	0·120
Vapour Pressure ...	194	113	−14 January. +16 July.	−23 January. +25 April.	0·162	0·044
Vapour Pressure ranges ...	350	170	−21 June. +21 December.	−22 March. +21 June.	0·360	0·142
Surface Temperature (1 inch deep) ...	179	122	−31 December. + 1 July.	− 1 February. + 4 May.	3°·38	2°·51
Ground Temperature (9 inches deep) ...	187	127	− 7 January. + 9 July.	− 7 February. + 9 May.	3·36	1·95
„ „ (20 inches deep) ...	194	138	−14 January. +16 July.	−18 February. +20 May.	2·90	1·49
„ „ (60 inches deep) ...	211	159	−31 January. + 2 August.	−11 March. +10 June.	1·81	0·86
„ „ (132 inches deep) ...	235	181	−25 February. +26 August.	− 2 April. + 3 July.	1·14	0·32
Maximum air thermometer ...	161	125	−12 December. +12 June.	− 4 February. + 7 May.	1·57	2·88
Minimum air thermometer ...	187	120	− 7 January. + 9 July.	−30 January. + 2 May.	5·23	2·48
Minimum grass thermometer	190	113	−10 January. +12 July.	−23 January. +25 April.	9·06	2·06

thus made may not be deemed convincing so far perhaps as to lead one to conclude that the two phenomena in their secular march are directly interrelated, but they undoubtedly remove the question from the region of fortuitous uncertainty to one of great probability thus opening out a field of no mean promise for further investigation.

579. *The annual variations.*—The examination of the data as they progress in their seasonal march is conveniently made by directly considering the results of Fourier analysis, for they allow of the comparison to be made in detail with greater force, if each component really represents some efficient physical cause. In the Colaba data we have seen that the annual and semi-annual pulses have throughout been characteristically pronounced, and as it is not difficult to conceive of efficient causes for the same, the examination so far individually of these two terms is justifiable. In table 576 are grouped for convenient comparison, the phases and amplitudes of the several meteorological and magnetical elements in their seasonal march. It will be seen from the table that while widely pronounced differences readily appear in many cases indicating no possible relation unless convenient lags in the incidence of effects are assumed to force concurrence between them, equally well defined and accordant results obtain in a few marked cases suggesting quite an opposite conclusion.

Taking up the declination element in the first instance, we find that in the annual term the epoch of maximum in the absolute values, falls on 1st January. This, it will be seen, is coincident with the minimum epoch of temperature which falls on 2nd January, and agrees fairly well also with the maximum epoch of barometer which falls on the 7th January. In the variations of ranges we find the same accordant synchronism. The minimum epoch of the declination ranges falls on 16th January, while the maximum for temperature ranges, and that for barometer ranges fall respectively on 16th and 20th January. The dates of occurrence of the maximum phases of vapour pressure differ from those of declination by more than a week and have not been considered. It will be noted that in the annual term, the maximum epoch in absolute values of declination falls coincident with the minimum epoch of its own ranges. That is on the 1st January while the absolute value is at its maximum, the range of the diurnal variation stands at a minimum, and on 1st July when the absolute value is the smallest, the range attains its maximum. The reverse exactly obtains in temperature and vapour pressure for we know that the greatest ranges of temperature at Colaba occur in winter falling concurrent with low temperatures, and *vice versa*. But in the barometer the maximum of absolute values, falls about 13 days prior to the attainment of the maximum by the ranges, and thus in this element both the absolute values and the ranges vary almost together in their seasonal march and not inversely as in the magnetics, temperature, or vapour pressure. In the semi-annual term the coincidence is even less marked. The maximum for declination (absolute) occurs on the 8th April while that of the barometer on the 10th April. This is about the only coincidence notable in the data, the rest being inadmissibly divergent. In the semi-annual term it may be noted that contrary to what obtains in the annual term, the epochs of maxima of the absolute and the ranges of variations in both the magnetics and meteorological elements though not actually coincident fall near together almost in all elements, within a quarter of a wave length.

In the results of horizontal force, the minimum of the annual term in the absolute value, is attained on 3rd January which is fairly concurrent with the dates of the minimum of temperature and of the maximum of barometer which are incident respectively on 2nd January and 7th January. In the ranges, the minimum, which occurs on the 19th November, however does not appear to fall concurrent with the maximum epoch of vapour pressure ranges which is incident on the 21st December. In the semi-annual term also there is scarcely any coincidence worth noting except that the nearest approach to the maximum of H ranges which occurs on the 11th April, is shown by the barometer ranges the maximum epoch of which falls on the 22nd April.

In the vertical force element the annual term indicates the attainment of the maximum epoch in the absolute values on 2nd April, and so far this date stands pre-eminently by itself isolated from all others as no other phenomenon indicates an epoch near to this by a long way. In the march of the ranges, however, the minimum, which is reached about 13th January, is fairly coincident with the dates of the maxima of temperature and barometer ranges which occur about 17th and 20th January respectively. In the semi-annual term the epoch for the maximum in the absolute values of vertical force, falls about 8th January. This is closely accordant with the epoch of minimum of barometer which falls on 9th January. In the vertical force ranges the maxima are incident on the equinoctial days 21st March and 21st September on which dates also fall the occurrence of the minima of vapour pressure.

580. Passing on from the phases of the seasonal variations to the consideration of the amplitudes of the two components, we find that the ratio of P_1 to P_2 in the three elements D, H and V stands respectively at 2 to 1, 1 to 1 and 2 to 3. The dominance of the semi-annual term in V is, it will be noted, an excep-

tional feature. In the ranges of all these elements on the other hand, the annual invariably remains the dominant term. The ratios respectively stand at 8 to 1, 2 to 1 and 2·3 to 1. In the meteorological elements the annual term whether in the absolute phenomena or in the ranges also invariably determines the dominant pulse, the semi-annual term being almost suppressed in certain cases. Especially is this term notably reduced when the sun effects are modified later presumably by terrestrial or secondary causes, as for example in ground temperatures as gradually increasing depths are reached and also in the minimum air and nocturnal radiation (minimum grass) temperature series, both of which must obviously be strongly modified by forces controlling terrestrial radiation. In ordinary air temperature the ratio in the absolute values stands for the two components at 1·5 to 1. In the ranges the ratio suddenly increases to 6 to 1. This feature, which suddenly emphasises the importance of the annual term in the ranges when compared with the condition prevailing in their respective absolute values, is common both to the magnetic and meteorological elements. It will also be noticed that in the maximum air temperature series the ratio of the amplitude of the annual to that of the semi-annual term, is about 1 to 2, while in the minimum air it becomes 2 to 1 nearly; and this ratio is still further increased to so much as 4·5 to 1 as shown by the minimum (grass) temperature series.

In the ground temperature series a similar modification also occurs. The ratio varies from 1·7 to 1 at a depth of 9″ below ground, to 3·5 to 1 at the depth of 11 feet where the semi-annual term is nearly suppressed. It will thus be seen that in the meteorological elements such as air and ground temperatures, the semi-annual term which is initially present as a significant term, loses its importance either by remaining constant while the annual term is rapidly emphasised as is apparently the case in the minimum air and nocturnal radiation temperatures, or by being relatively more rapidly suppressed than the annual term as appears to be the case in the ground temperature series. The subsequent effects hence on the air temperature and the ground temperature series due to the incidence of terrestrial influences, are best seen by a reference to table 576 where the amplitude and the phases of the annual and semi-annual terms of the maximum air, minimum air and minimum grass temperature series as also those of the ground temperature at various depths are given in detail. The feature which is well marked in the data is the rapid growth in the temperature series generally, of the annual term when affected by terrestrial influence. The converse result is seen to obtain as might be expected in the magnetics. For the annual term in the absolute value of H *as observed,* is reduced in the series of absolute force which is derived indirectly by the use of the magnetograph where we have observed (*see* Part I, Chapters II and III) that certain influence at work has been noted to exist which somehow modifies the march of the magnetic phenomena relatively at the electrometer tower where absolute observations are made, and in the under-ground room where the differential instruments—the magnetographs—are located. For this we have no other explanation to advance except that it may be due to magnetic influence induced by the strong local factor which in some way may affect the observations in the under-ground room more so than at the tower. Similarly also in the declination element the same reduction in the amplitude of the annual term in the two absolute series, is noted. Then again, it will be seen that in the semi-annual term the amplitudes of which in temperatures, definitely diminish for the same reason as the annual terms increase there, in the magnetics the opposite effects obtain and the semi-annual terms increase while the annual terms diminish.

Throughout the discussion, it will have been noted that attempts have been made to indicate the concurrent incidence of the phenomena and the similarity in their features wherever they were apparent, and such points only as showed any striking parallelism or marked discordance have been referred to. It is quite possible however that many more points of similarity can be cited if certain lags justifiable apparently on physical basis, are assumed to exist; but the temptation to discuss here and in the case of the diurnal curves, the results of such forced hypothetical concurrence has been resisted for obvious reasons.

581. *The diurnal variation.*—In regard to the parallelism in the diurnal pulse of the several elements in the two phenomena, the examination may best be made in the first instance by an inspection of the sweeps of the several inequalities together, for which purpose the curves of the average diurnal inequalities of the year, as also of the month of September which give somewhat closer sweeps the data of which in regard to the meteorological elements are collected for reference in tables 577 to 579, have also been charted in plate 106. It will be readily seen that a general superficial resemblance is noticeable between the two sets of curves. In the September curves the turning point about the minimum at 6 p.m. in the temperature curve, with which that of vapour pressure may be regarded as almost concurrent, is clearly shown by the vertical force curve at the same hour precisely, and by the horizontal force and declination curves an hour later, the corresponding turning points of V and D being those of maximum, that of H being that of minimum. The maximum turning point of H and the minimum of V occur thereafter at about 11 a.m. concurrent with the minimum of

TABLE 577.—*The mean diurnal variation of temperature for each month of the year, for the summer and winter half-years, and for the whole year, derived from dry-bulb thermograms for the years 1873 to 1896.*

Bombay Civil Time.	Month.												April to September.	October to March.	Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
H. m.	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0 2 ...	−2·4	−2·4	−2·1	−2·1	−2·0	−1·1	−0·7	−0·8	−1·1	−2·1	−2·5	−2·7	−1·3	−2·4	−1·8
1 2 ...	−2·8	−2·7	−2·4	−2·4	−2·3	−1·3	−0·9	−1·0	−1·3	−2·4	−2·8	−3·0	−1·5	−2·7	−2·1
2 2 ...	−3·2	−3·1	−2·8	−2·8	−2·5	−1·5	−1·0	−1·1	−1·5	−2·7	−3·1	−3·3	−1·7	−3·0	−2·4
3 2 ...	−3·5	−3·5	−3·2	−3·1	−2·7	−1·7	−1·1	−1·2	−1·7	−2·9	−3·4	−3·6	−1·9	−3·4	−2·6
4 2 ...	−3·9	−3·9	−3·6	−3·4	−2·9	−1·8	−1·1	−1·3	−1·8	−3·2	−3·8	−3·9	−2·1	−3·7	−2·9
5 2 ...	−4·3	−4·3	−3·9	−3·7	−3·1	−2·0	−1·2	−1·4	−2·0	−3·4	−4·1	−4·2	−2·2	−4·0	−3·1
6 2 ...	−4·6	−4·7	−4·2	−3·8	−2·9	−2·0	−1·1	−1·4	−2·1	−3·6	−4·4	−4·5	−2·2	−4·3	−3·3
7 2 ...	−4·7	−4·7	−3·5	−2·2	−1·5	−1·3	−0·8	−1·1	−1·6	−2·9	−3·9	−4·4	−1·4	−4·0	−2·7
8 2 ...	−3·2	−2·7	−1·3	−0·2	0·0	−0·4	−0·2	−0·4	−0·6	−1·4	−2·3	−3·0	−0·3	−2·3	−1·3
9 2 ...	−1·3	−0·6	+0·7	+1·3	+1·2	+0·5	+0·3	+0·3	+0·3	+0·2	−0·5	−1·2	+0·7	−0·5	+0·1
10 2 ...	+0·9	+1·7	+2·3	+2·5	+2·2	+1·3	+0·9	+1·0	+1·3	+1·8	+1·8	+1·0	+1·5	+1·6	+1·6
11 2 ...	+3·0	+3·5	+3·3	+3·1	+2·9	+1·8	+1·3	+1·5	+1·8	+3·1	+3·6	+3·2	+2·1	+3·3	+2·7
12 2 ...	+4·7	+4·7	+4·0	+3·7	+3·4	+2·2	+1·5	+1·8	+2·2	+3·9	+5·0	+5·1	+2·5	+4·6	+3·5
13 2 ...	+5·6	+5·2	+4·4	+4·0	+3·6	+2·4	+1·6	+1·9	+2·4	+4·4	+5·7	+6·1	+2·7	+5·2	+3·9
14 2 ...	+5·9	+5·5	+4·5	+4·1	+3·8	+2·4	+1·7	+1·9	+2·6	+4·5	+5·8	+6·4	+2·7	+5·4	+4·1
15 2 ...	+5·7	+5·2	+4·3	+3·8	+3·5	+2·3	+1·4	+1·7	+2·4	+4·2	+5·3	+5·9	+2·5	+5·1	+3·8
16 2 ...	+5·0	+4·6	+3·8	+3·3	+2·9	+1·9	+1·0	+1·4	+2·0	+3·6	+4·3	+5·0	+2·1	+4·4	+3·2
17 2 ...	+3·5	+3·3	+2·7	+2·3	+1·9	+1·3	+0·6	+0·7	+1·2	+2·1	+2·3	+3·0	+1·3	+2·8	+2·1
18 2 ...	+1·8	+1·4	+0·9	+0·6	+0·4	+0·4	+0·1	+0·1	+0·3	+0·8	+1·1	+1·5	+0·3	+1·2	+0·8
19 2 ...	+0·9	+0·6	+0·1	−0·3	−0·6	−0·2	−0·3	−0·3	−0·1	+0·1	+0·5	+0·8	−0·3	+0·5	+0·1
20 2 ...	+0·4	+0·1	−0·4	−0·7	−1·0	−0·5	−0·4	−0·5	−0·4	−0·3	0·0	+0·1	−0·6	0·0	−0·3
21 2 ...	−0·3	−0·4	−0·8	−1·1	−1·3	−0·7	−0·5	−0·6	−0·6	−0·8	−0·7	−0·6	−0·8	−0·6	−0·7
22 2 ...	−1·2	−1·1	−1·2	−1·4	−1·4	−0·8	−0·5	−0·6	−0·7	−1·3	−1·5	−1·5	−0·9	−1·3	−1·1
23 2 ...	−1·9	−1·8	−1·7	−1·7	−1·7	−1·0	−0·7	−0·8	−1·0	−1·8	−2·2	−2·3	−1·1	−1·9	−1·5

TABLE 578.—*The mean diurnal variation of barometric pressure for each month of the year, for summer and winter half-years, and for the whole year, derived from barograms for the years 1873 to 1896.*

Bombay Civil Time.	Month.												April to September.	October to March.	Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
H. m.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
0 7 ...	+·005	+·009	+·009	+·006	+·003	+·009	+·008	+·006	+·004	+·002	·000	+·003	+·006	+·005	+·005
1 7 ...	−·006	−·005	−·006	−·007	−·012	−·009	−·011	−·010	−·011	−·013	−·012	−·008	−·010	−·008	−·009
2 7 ...	−·019	−·019	−·021	−·020	−·023	−·021	−·024	−·025	−·024	−·024	−·024	−·020	−·023	−·021	−·022
3 7 ...	−·028	−·028	−·027	−·027	−·026	−·027	−·031	−·032	−·031	−·026	−·028	−·028	−0·29	−·028	−·028
4 7 ...	−·028	−·029	−·025	−·021	−·020	−·024	−·030	−·030	−·028	−·023	−·024	−·025	−·026	−·026	−·026
5 7 ...	−·019	−·019	−·014	−·008	−·009	−·017	−·024	−·023	−·017	−·010	−·013	−·015	−·016	−·015	−·016
6 7 ...	−·001	+·001	+·006	+·010	+·009	+·001	−·008	−·008	−·001	+·011	+·009	+·003	·000	+·005	+·003
7 7 ...	+·023	+·024	+·029	+·032	+·029	+·017	+·008	+·010	+·019	+·033	+·032	+·027	+·019	+·028	+·024
8 7 ...	+·049	+·047	+·051	+·054	+·046	+·030	+·023	+·027	+·040	+·052	+·053	+·052	+·036	+·051	+·044
9 7 ...	+·068	+·064	+·064	+·063	+·054	+·038	+·032	+·037	+·049	+·063	+·067	+·067	+·045	+·065	+·055
10 7 ...	+·067	+·066	+·064	+·060	+·052	+·039	+·035	+·040	+·050	+·058	+·059	+·063	+·046	+·063	+·054
11 7 ...	+·046	+·048	+·048	+·047	+·042	+·032	+·031	+·034	+·038	+·035	+·036	+·042	+·037	+·043	+·040
12 7 ...	+·014	+·018	+·021	+·025	+·025	+·020	+·020	+·020	+·016	+·007	+·006	+·009	+·021	+·012	+·017
13 7 ...	−·018	−·013	−·008	−·004	+·001	+·003	+·005	+·002	−·009	−·021	−·025	−·023	−·001	−·018	−·009
14 7 ...	−·041	−·038	−·034	−·030	−·021	−·015	−·009	−·015	−·030	−·044	−·045	−·045	−·020	−·041	−·031
15 7 ...	−·053	−·053	−·053	−·050	−·040	−·032	−·023	−·029	−·045	−·056	−·055	−·055	−·037	−·054	−·045
16 7 ...	−·052	−·054	−·056	−·059	−·051	−·041	−·033	−·036	−·046	−·052	−·052	−·053	−·044	−·053	−·049
17 7 ...	−·044	−·047	−·051	−·055	−·047	−·039	−·031	−·032	−·038	−·041	−·040	−·043	−·040	−·044	−·042
18 7 ...	−·029	−·034	−·039	−·041	−·035	−·027	−·020	−·020	−·022	−·024	−·023	−·026	−·027	−·029	−·028
19 7 ...	−·007	−·014	−·019	−·022	−·020	−·009	−·004	−·004	−·004	−·003	−·001	−·003	−·011	−·008	−·009
20 7 ...	+·012	+·008	+·001	−·003	−·002	+·006	+·011	+·012	+·014	+·016	+·017	+·014	+·006	+·011	+·009
21 7 ...	+·023	+·021	+·018	+·013	+·011	+·018	+·022	+·025	+·028	+·024	+·025	+·025	+·019	+·023	+·021
22 7 ...	+·023	+·024	+·023	+·021	+·019	+·026	+·029	+·030	+·029	+·023	+·025	+·025	+·029	+·024	+·026
23 7 ...	+·015	+·018	+·018	+·016	+·014	+·022	+·023	+·023	+·020	+·014	+·015	+·015	+·019	+·016	+·018

TABLE 579.—*The mean diurnal variation of pressure of vapour for each month of the year, for the summer and winter half-years, and for the whole year, deduced from dry-bulb and wet-bulb thermograms for the years 1873 to 1896.*

Bombay Civil Time.	Months.												April to September.	October to March.	Year.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.			
H. m	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
0 2 ...	+·001	−·001	+·004	+·001	−·004	−·007	−·007	−·009	−·011	−·005	+·004	+·005	−·006	+·001	−·002
1 2 ...	−·002	−·002	+·002	−·004	−·009	−·010	−·010	−·011	−·013	−·012	+·001	+·001	−·010	−·002	−·006
2 2 ...	−·008	−·006	−·002	−·008	−·013	−·013	−·012	−·012	−·012	−·014	−·004	−·007	−·012	−·007	−·009
3 2 ...	−·018	−·011	−·005	−·014	−·019	−·016	−·015	−·014	−·017	−·019	−·013	−·019	−·016	−·014	−·015
4 2 ...	−·025	−·020	−·011	−·019	−·021	−·020	−·015	−·016	−·016	−·024	−·021	−·025	−·018	−·021	−·020
5 2 ...	−·034	−·028	−·020	−·024	−·024	−·021	−·017	−·017	−·017	−·030	−·029	−·033	−·020	−·029	−·025
6 2 ...	−·041	−·040	−·023	−·022	−·018	−·018	−·014	−·015	−·015	−·031	−·034	−·039	−·017	−·035	−·026
7 2 ...	−·043	−·043	−·021	−·012	−·011	−·012	−·010	−·009	−·005	−·020	−·032	−·040	−·010	−·033	−·021
8 2 ...	−·033	−·035	−·016	−·008	−·005	−·003	·000	+·002	+·008	−·009	−·026	−·031	−·001	−·025	−·013
9 2 ...	−·028	−·033	−·015	−·003	−·001	+·006	+·008	+·010	+·019	−·001	−·024	−·029	+·006	−·021	−·008
10 2 ...	−·022	−·024	−·009	+·006	+·003	+·014	+·018	+·022	+·028	+·004	−·021	−·025	+·015	−·016	−·001
11 2 ...	−·025	−·026	−·001	+·014	+·006	+·018	+·021	+·024	+·026	−·004	−·031	−·032	+·018	−·020	−·001
12 2 ...	−·028	−·012	+·013	+·020	+·011	+·019	+·022	+·026	+·025	−·004	−·039	−·045	+·021	−·019	+·001
13 2 ...	−·014	+·012	+·021	+·020	+·013	+·021	+·021	+·023	+·024	+·007	−·030	−·034	+·020	−·006	+·007
14 2 ...	+·009	+·030	+·022	+·018	+·016	+·021	+·021	+·023	+·022	+·021	−·005	−·008	+·020	+·011	+·016
15 2 ...	+·026	+·037	+·018	+·013	+·015	+·017	+·014	+·015	+·014	+·026	+·018	+·023	+·015	+·025	+·020
16 2 ...	+·041	+·039	+·014	+·008	+·015	+·014	+·010	+·010	+·008	+·028	+·040	+·049	+·011	+·035	+·023
17 2 ...	+·047	+·038	+·008	+·003	+·013	+·007	+·002	−·001	−·004	+·025	+·044	+·059	+·003	+·037	+·020
18 2 ...	+·050	+·032	·000	−·003	+·007	+·001	−·004	−·007	−·011	+·020	+·047	+·063	−·003	+·035	+·016
19 2 ...	+·051	+·028	−·001	−·004	+·005	−·002	−·007	−·010	−·013	+·019	+·051	+·064	−·005	+·035	+·015
20 2 ...	+·047	+·028	+·004	+·002	+·007	−·003	−·008	−·010	−·011	+·020	+·054	+·058	−·004	+·035	+·016
21 2 ...	+·034	+·022	+·006	+·004	+·006	−·003	−·007	−·008	−·011	+·011	+·039	+·036	−·003	+·025	+·011
22 2 ...	+·013	+·012	+·007	+·008	+·006	−·002	−·004	−·007	−·008	+·001	+·013	+·008	−·001	+·009	+·004
23 2 ...	+·002	+·005	+·005	+·005	+·003	−·005	−·007	−·008	−·011	−·007	·000	+·001	−·004	+·001	−·001

TABLE 580.—*Showing the amplitude* P *and the first maximum* μ *reckoned from midnight for the first four orders of the harmonic components of the diurnal inequalities of temperature, barometric pressure, and pressure of vapour derived from tables 577 to 579.*

Temperature of the Air.										Barometric Pressure.									Pressure of Vapour.								
Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4	Months.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
	°	°	°	°	° ′	° ′	° ′	° ′		in.	in.	in.	in.	° ′	° ′	° ′	° ′		in.	in.	in.	in.	° ′	° ′	° ′	° ′
January ...	4·74	1·58	0·33	0·22	227 39	20 30	64 15	57 37	January ...	·0198	·0440	·0065	·0028	108 26	144 43	29 23	53 18	January ...	·0419	·0091	·0066	·0043	282 31	85 54	25 27	43 20
February ...	4·57	1·53	0·27	0·36	224 44	15 18	53 1	58 17	February ...	·0212	·0438	·0046	·0018	108 29	146 45	28 54	58 16	February ...	·0360	·0099	·0010	·0050	275 15	48 20	106 40	41 43
March ...	3·91	1·26	0·25	0·38	218 7	9 17	27 49	54 47	March ...	·0248	·0429	·0021	·0011	109 2	147 21	24 8	61 40	March ...	·0142	·0107	·0028	·0020	258 50	16 35	87 54	36 44
April ...	3·62	1·05	0·33	0·33	211 45	5 7	14 34	50 20	April ...	·0275	·0409	·0001	·0002	110 41	147 40	96 26	57 28	April ...	·0134	·0110	·0016	·0007	232 13	177 36	93 13	41 51
May ...	3·25	0·90	0·28	0·25	207 4	7 42	8 28	50 33	May ...	·0237	·0356	·0019	·0002	117 26	147 46	86 17	79 12	May ...	·0162	·0048	·0022	·0007	240 7	167 16	111 11	44 21
June ...	2·04	0·65	0·12	0·12	212 3	10 25	15 16	52 18	June ...	·0121	·0325	·0032	·0005	117 52	149 24	88 59	9 29	June ...	·0173	·0076	·0010	·0012	213 31	178 41	7 24	52 8
July ...	1·30	0·47	0·02	0·08	206 37	8 26	4 58	56 45	July ...	·0069	·0314	·0031	·0001	153 58	150 12	90 53	44 43	July ...	·0164	·0082	·0003	·0013	198 51	178 51	7 33	56 6
August ...	1·51	0·57	0·02	0·11	209 16	10 34	26 14	57 43	August ...	·0077	·0342	·0019	·0008	141 38	148 49	87 29	62 12	August ...	·0180	·0096	·0004	·0016	192 53	179 36	14 23	51 40
September ...	2·09	0·70	0·07	0·18	214 11	10 53	20 5	53 49	September...	·0127	·0394	·0014	·0010	112 28	144 59	48 8	62 55	September...	·0198	·0100	·0014	·0027	183 41	173 51	12 10	47 49
October ...	3·68	1·19	0·11	0·24	217 12	12 57	48 44	52 20	October ...	·0203	·0422	·0034	·0014	101 54	140 22	31 18	52 57	October ...	·0241	·0008	·0044	·0052	251 41	110 29	13 20	42 5
November ...	4·51	1·57	0·34	0·21	220 0	15 57	62 18	48 12	November ...	·0196	·0437	·0045	·0022	101 38	140 9	27 18	52 19	November ...	·0391	·0135	·0083	·0059	291 15	93 51	23 3	43 11
December ...	4·85	1·67	0·43	0·15	224 5	20 44	68 53	49 13	December ...	·0191	·0438	·0059	·0027	102 58	142 25	29 29	52 22	December ...	·0460	·0170	·0122	·0037	288 43	91 6	22 39	45 2
Winter ...	4·37	1·45	0·23	0·25	222 17	16 2	58 44	54 14	Winter ...	·0209	·0432	·0045	·0020	105 32	143 38	28 47	54 20	Winter ...	·0327	·0059	·0047	·0043	279 3	78 17	20 49	42 30
Summer ...	2·30	0·72	0·14	0·18	210 20	8 25	13 4	52 26	Summer ...	·0127	·0359	·0018	·0005	123 4	148 2	87 9	63 12	Summer ...	·0158	·0085	·0008	·0013	208 15	176 36	116 38	49 16
Year ...	3·32	1·08	0·08	0·21	218 8	13 32	46 10	53 27	Year ...	·0176	·0394	·0013	·0012	110 59	145 38	29 51	56 5	Year ...	·0203	·0016	·0025	·0028	257 34	12 4	17 43	44 9

TABLE 581.—*Excess diurnal inequality of temperature for each average month of the period 1873—1896 over the average year, showing the average seasonal disturbance.*

Bombay Civil Time.	Months.												Average seasonable variation.*		
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Temperature.	Declination.†	Vertical Force.†
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
H. m.	°	°	°	°	°	°	°	°	°	°	°	°	°	′	γ
0 2 ...	-0·6	-0·6	-0·3	-0·3	-0·2	+0·7	+1·1	+1·0	+0·7	-0·3	-0·7	-0·9	+0·5	+0·01	+0·7
1 2 ...	-0·7	-0·6	-0·3	-0·3	-0·2	+0·8	+1·2	+1·1	+0·8	-0·3	-0·7	-0·9	+0·6	+0·06	+0·9
2 2 ...	-0·8	-0·7	-0·4	-0·4	-0·1	+0·9	+1·4	+1·3	+0·9	-0·3	-0·7	-0·9	+0·6	+0·12	+1·0
3 2 ...	-0·9	-0·9	-0·6	-0·5	-0·1	+0·9	+1·5	+1·4	+0·9	-0·3	-0·8	-1·0	+0·7	+0·19	+1·1
4 2 ...	-1·0	-1·0	-0·7	-0·5	0·0	+1·1	+1·8	+1·6	+1·1	-0·3	-0·9	-1·0	+0·8	+0·28	+1·5
5 2 ...	-1·2	-1·2	-0·8	-0·6	0·0	+1·1	+1·9	+1·7	+1·1	0·3	-1·0	-1·1	+0·9	+0·46	+2·6
6 2 ...	-1·3	-1·4	-0·9	-0·5	+0·4	+1·3	+2·2	+1·9	+1·2	-0·3	-1·1	-1·2	+1·1	+1·02	+5·0
7 2 ...	-2·0	-2·0	-0·8	+0·5	+1·2	+1·4	+1·9	+1·6	+1·1	-0·2	-1·2	-1·7	+1·3	+1·17	+2·3
8 2 ...	-1·9	-1·4	0·0	+1·1	+1·3	+0·9	+1·1	+0·9	+0·7	-0·1	-1·0	-1·7	+1·0	+0·81	-2·8
9 2 ...	-1·4	-0·7	+0·6	+1·2	+1·1	+0·4	+0·2	+0·2	+0·2	+0·1	-0·6	-1·3	+0·5	+0·17	-5·6
10 2 ...	-0·7	+0·1	+0·7	+0·9	+0·6	-0·3	-0·7	-0·6	-0·3	+0·2	+0·2	-0·6	0·0	-0·31	-5·2
11 2 ...	+0·3	+0·8	+0·6	+0·4	+0·2	-0·9	-1·4	-1·2	-0·9	+0·4	+0·9	+0·5	-0·6	-0·58	-4·3
12 2 ...	+1·2	+1·2	+0·5	+0·2	-0·1	-1·3	-2·0	-1·7	-1·3	+0·4	+1·5	+1·6	-1·0	-0·81	-3·9
13 2 ...	+1·7	+1·3	+0·5	+0·1	-0·3	-1·5	-2·3	-2·0	-1·5	+0·5	+1·8	+2·2	-1·3	-0·83	-2·1
14 2 ...	+1·8	+1·4	+0·4	0·0	-0·3	-1·7	-2·4	-2·2	-1·5	+0·4	+1·7	+2·3	-1·3	-0·66	+0·3
15 2 ...	+1·9	+1·4	+0·5	0·0	-0·3	-1·5	-2·4	-2·1	-1·4	+0·4	+1·5	+2·1	-1·3	-0·39	+2·1
16 2 ...	+1·8	+1·4	+0·6	+0·1	-0·3	-1·3	-2·2	-1·8	-1·2	+0·4	+1·1	+1·8	1·1	-0·12	+2·8
17 2 ...	+1·4	+1·2	+0·6	+0·2	-0·2	-0·8	-1·5	-1·4	-0·9	0·0	+0·2	+0·9	-0·7	+0·06	+2·3
18 2 ...	+1·0	+0·6	+0·1	-0·2	-0·4	-0·4	-0·7	-0·7	-0·5	0·0	+0·3	+0·7	-0·5	-0·02	+0·1
19 2 ...	+0·8	+0·5	0·0	-0·4	-0·7	-0·3	-0·4	-0·4	-0·2	0·0	+0·4	+0·7	-0·4	-0·18	-0·5
20 2 ...	+0·7	+0·4	-0·1	-0·4	-0·7	-0·2	-0·1	-0·2	-0·1	0·0	+0·3	+0·4	-0·3	-0·17	+0·1
21 2 ...	+0·4	+0·3	-0·1	-0·4	-0·6	0·0	+0·2	+0·1	+0·1	-0·1	0·0	+0·1	-0·1	-0·13	+0·5
22 2 ...	-0·1	0·0	-0·1	-0·3	-0·3	+0·3	+0·6	+0·5	+0·4	-0·2	-0·4	-0·4	+0·2	-0·08	+0·6
23 2 ...	-0·4	-0·3	-0·2	-0·2	-0·2	+0·5	+0·8	+0·7	+0·5	-0·3	-0·7	-0·8	+0·4	-0·05	+0·5
Sums without regard to signs ...	26·0	21·4	10·4	9·7	9·8	20·5	32·0	28·3	19·5	5·8	19·7	26·8	...	...	...

* The average seasonal variations are obtained by subtracting the sums for the six months October to March from the sums for the six months April to September and dividing the difference by 12.

† The Declination and Vertical Force results are derived from tables 299 and 341.

vapour pressure, followed by the minimum of D which occurs about 12 noon. The maximum of temperature follows of course at about 2 p.m., and thus the apparent rough similarity with it ceases and the magnetic curves thereafter, that is after noon, show greater parallelism to the wave of the barometer, the second minimum of which occurring about 4 p.m. falls almost concurrent with the second (afternoon) maxima of D and V. The second maximum of vapour pressure is incident at about 6 p.m. All the points referred to above are applicable more or less generally to the yearly results also, except in the case of the vapour pressure curve which is the only one which indicates a rapid and irregular seasonal change. This curve, which may be regarded roughly as composed at Colaba solely of a 24-hour wave, has its minimum and maximum phase incident at about 6 a.m. and 6 p.m. respectively in the annual curve, which shift to about noon and midnight in September. This is the only element in which the phase angle has such a large fluctuation in the year, and amongst other meteorological elements this is more likely to be responsible in some indirect way for similar large seasonal changes in the magnetic elements, especially those of declination, if any inherent connection between the two phenomena does really exist.

582. In comparison work of this nature, Fourier analysis undoubtedly affords some useful help in the critical examination of details of inequalities so analysed. But in order that it may be effective, the component variations in each phenomenon must have a real existence ascribable to efficient physical causes. This in all probability, is problematic, and the analysis under such circumstance offers no special advantage except the one of convenience and usage. It will be seen from the results collected in table 580 for the annual curves that in the 24-hour wave, H indicates inadmissibly discordant results; D which shows the attainment of its minimum at about $15^h{\cdot}6$ is roughly coincident with the time of maximum of temperature which occurs at $14^h{\cdot}5$. V like H also shows no accordant epochs. In the semi-diurnal period we have a somewhat more promising result. D which attains its maximum at 7·0 a.m. falls almost coincident with the minimum of temperature which falls at $6^h{\cdot}9$, at which time also falls the occurrence of the minimum of vapour pressure. The epoch of minimum in H which falls at $5^h{\cdot}6$ is incident fairly near to that of the minimum of temperature which occurs at $6^h{\cdot}9$, and of vapour pressure at $6^h{\cdot}8$. V on the other hand shows its maximum epoch at $4^h{\cdot}8$ which is not much discordant when compared with the time of occurence of the minimum of barometer which is incident at $3^h{\cdot}7$; (3) in the 8-hour period we find the minima both of H and temperature fall concurrent at $7^h{\cdot}2$ and $7^h{\cdot}1$ respectively. The maximum of vertical force, which is attained at $6^h{\cdot}9$, falls also fairly concurrent with the temperature minimum, the barometer minimum preceding the event about an hour earlier at $6^h{\cdot}0$.

Considering now the amplitudes of the various components and the ratios they bear to each other, we find that in H, P_1, P_2 and P_3 stand in the ratio of $1 : \frac{1}{2} : \frac{1}{5}$ to one another. In D the ratios are 1 : 1·1 : 1·1; in V the figures are $1 : \frac{9}{10} : \frac{9}{10}$. In the meteorological elements, temperature indicates the ratios $1 : \frac{1}{3} : \frac{1}{40}$; barometer, $1 : 2{\cdot}2 : \frac{1}{14}$; and vapour pressure $1 : \frac{1}{10} : \frac{1}{10}$. Thus in the meteorological elements the amplitudes of the first and second component only are significantly large, and in the barometer only is the second component relatively more important than the first. On the other hand in the magnetic elements the importance of the second component is well marked both in D and V, it being equally significant as the first. In H however it takes a secondary place, being about one half of the first component.

The results noted above show that no complete case of coincidence of effects is made out even with regard to a single element where we may unhesitatingly suggest an intimate connection. Only in the case of declination and temperature at Colaba at most, is it possible to concede a roughly accordant concurrence. From the several points of agreement referred to in the comparison however, as also from the rough parallelism noted generally in the sweeps of the curves in the two phenomena, it is difficult not to feel at the same time, especially when we know that these variations in the elements are due fundamentally to the same initial cause, that they must both be influenced by the interaction of some common factor most probably the conductivity of the atmosphere, which may simultaneously affect and be affected by the thermal, electrical, and other agencies at work which eventually determine both the phenomena. Moreover we do not as yet fully understand the phenomena of evaporation and condensation at ordinary temperatures which are presumably associated with some electrical forces at work. Still less do we know about the recent discovery of radio-activity generally and of the rocks of our earth especially, and how far the phenomenon affects the conductivity of the lower regions of the atmosphere and of the crust of the earth itself, some 30 miles at least in depth, which, according to Strutt, bears these radio-active substances, and its reactions upon the conditions controlling earth currents and other electrical forces induced within the earth by the varying potential outside. For it is quite probable, that further knowledge of these may furnish the links necessary to establish the relation which seems inherent between the two phenomena, but which at present we are unable to establish.

TABLE 582.—*Excess diurnal inequality of pressure of vapour for each average month of the period 1873—1896 over the average year showing the average seasonal disturbance.*

Bombay Civil Time.	Month.												Average seasonal variation.
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	
1	2	3	4	5	6	7	8	9	10	11	12	13	14
H. m. ...	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.	Inches.
0 2 ..	+·003	+·001	+·006	+·003	−·002	−·005	−·005	−·007	−·009	−·003	+·006	+·007	−·004
1 2 ...	+·004	+·004	+·008	+·002	−·003	−·004	−·004	−·005	−·007	−·006	+·007	+·007	−·004
2 2 ...	+·001	+·003	+·007	+·001	−·004	−·004	−·003	−·003	−·003	−·005	+·005	+·002	−·002
3 2 ...	−·003	+·004	+·010	+·001	−·004	−·001	·000	+·001	−·002	−·004	+·002	−·004	−·001
4 2 ...	−·005	·000	+·009	+·001	−·001	·000	+·005	+·004	+·004	−·004	−·001	−·005	+·002
5 2 ...	−·009	−·003	+·005	+·001	+·001	+·004	+·008	+·008	+·008	−·005	−·004	−·008	+·004
6 2 ...	−·015	−·014	+·003	+·004	+·008	+·008	+·012	+·011	+·011	−·005	−·008	−·013	+·009
7 2 ...	−·022	−·022	·000	+·009	+·010	+·009	+·011	+·012	+·016	+·001	−·011	−·019	+·012
8 2 ...	−·020	−·022	−·003	+·005	+·008	+·010	+·013	+·015	+·021	+·004	−·013	−·018	+·012
9 2 ...	−·020	−·025	−·007	+·005	+·007	+·014	+·016	+·018	+·027	+·007	−·016	−·021	+·014
10 2 ...	−·021	−·023	−·008	+·007	+·004	+·015	+·019	+·023	+·029	+·005	−·020	−·024	+·016
11 2 ...	−·024	−·025	·000	+·015	+·007	+·019	+·022	+·025	+·027	−·003	−·030	−·031	+·019
12 2 ...	−·029	−·013	+·012	+·019	+·010	+·018	+·021	+·025	+·024	−·005	−·040	−·046	+·020
13 2 ...	−·021	+·005	+·014	+·013	+·006	+·014	+·014	+·016	+·017	·000	−·037	−·041	+·013
14 2 ...	−·007	+·014	+·006	+·002	·000	+·005	+·005	+·007	+·006	+·005	−·021	−·024	+·004
15 2 ...	+·006	+·017	−·002	−·007	−·005	−·003	−·006	−·005	−·006	+·006	−·002	+·003	−·005
16 2 ...	+·018	+·016	−·009	−·015	−·008	−·009	−·013	−·013	−·015	+·005	+·017	+·026	−·012
17 2 ...	+·027	+·018	−·012	−·017	−·007	−·013	−·018	−·021	−·024	+·005	+·024	+·039	−·017
18 2 ...	+·034	+·016	−·016	−·019	−·009	−·015	−·020	−·023	−·027	+·004	+·031	+·047	−·019
19 2 ...	+·036	+·013	−·016	−·019	−·010	−·017	−·022	−·025	−·028	+·004	+·036	+·049	−·020
20 2 ...	+·031	+·012	−·012	−·014	−·009	−·019	−·024	−·026	−·027	+·004	+·038	+·042	−·019
21 2 ...	+·023	+·011	−·005	−·007	−·005	−·014	−·018	−·019	−·022	·000	+·028	+·025	−·014
22 2 ...	+·009	+·008	+·003	+·004	+·002	−·006	−·008	−·011	−·012	−·003	+·009	+·004	−·005
23 2 ...	+·003	+·006	+·006	+·006	+·004	−·004	−·006	−·007	−·010	−·006	+·001	+·002	−·002
Sum without regard to signs ...	·391	·295	·179	·196	·134	·230	·293	·330	·382	·099	·407	·507	..

583. In Chapters V to VII, Part II, of this volume, where the diurnal variations of the several magnetic elements have been discussed, it has been suggested that the seasonal changes in the variations appear practically to be of the same character as the diurnal inequalities themselves. Eliminating hence the average annual diurnal wave from the average monthly inequalities, we obtain seasonal excesses from month to month which may be regarded as the disturbance effects on the inequality as it progresses from month to month in its annual march. Those of magnetical elements have already appeared in tables 299 and 341 while those of the meteorological elements are given in tables 581, 582 and 583. In plate 105 these are charted for the four elements—temperature, declination, vapour pressure, and vertical force. The variations of H have been omitted advisedly as we know that at Colaba the declination and vertical force elements are remarkably free from other disturbance effects due to storms, etc., while they are relatively much strongly affected by seasonal changes; whereas H is affected much more by the former than by the latter. It will be seen from the figures in the plate referred to how these excess variations appear to be regular in form and progression, and are strikingly similar to each other in the case of temperature and declination elements at Colaba* and to a lesser degree in the other two. All seem to show a conspicuously marked annual variation, the months of March and October practically determining the turning points about which the seasonal disturbance variations in all curves alter their character completely. It will be seen that the progression otherwise is fairly regular also. The attainment of the maximum summer disturbance in declination, takes place about August; in temperature about July; and in vertical force and vapour pressure about September. The winter maximum disturbance effects are attained invariably in all the elements in December. Considering that the progressions are not irregular, one may obtain for each element the characteristic average disturbance curve. This average curve is derivable from the excess variations of April to September taken erect and compounded with those from October to March taken inverted. These averages for each element are shown in figures 13 to 16, plate 106, while over each figure is charted in dotted curve the original inequality (proportionately reduced for comparison). In temperature, declination and vertical force, it will be seen that there is a close concurrence between the

Fourier Analysis of seasonal excess variations as compared to those of the original diurnal inequality.

		P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
		′	′	′	′	° ′	° ′	° ′	° ′
Declination ...	Original inequality ...	0·44	0·48	0·50	0·18	53 58	105 16	125 16	43 35
	Average seasonal excesses ...	0·47	0·44	0·25	0·06	65 28	100 27	119 0	37 6
Vertical Force.	Original inequality ...	4·69γ	4·07γ	4·19γ	1·68γ	360 54	71 26	103 10	26 46
	Average seasonal excesses ...	1·82γ	2·54γ	1·64γ	0·48γ	354 25	70 43	100 55	0 44
		°	°	°	°				
Temperature .	Original inequality ...	3·32	1·08	0·08	0·21	218 8	13 32	46 10	53 27
	Average seasonal excesses ...	1·07	0·38	0·17	0·04	55 1	113 0	2 44	8 55
		″	″	″	″				
Pressure of Vapour.	Original inequality ...	0·020	0·002	0·002	0·003	257 34	12 4	17 43	44 9
	Average seasonal excesses ...	0·015	0·007	0·002	0·001	127 22	173 5	84 21	83 25

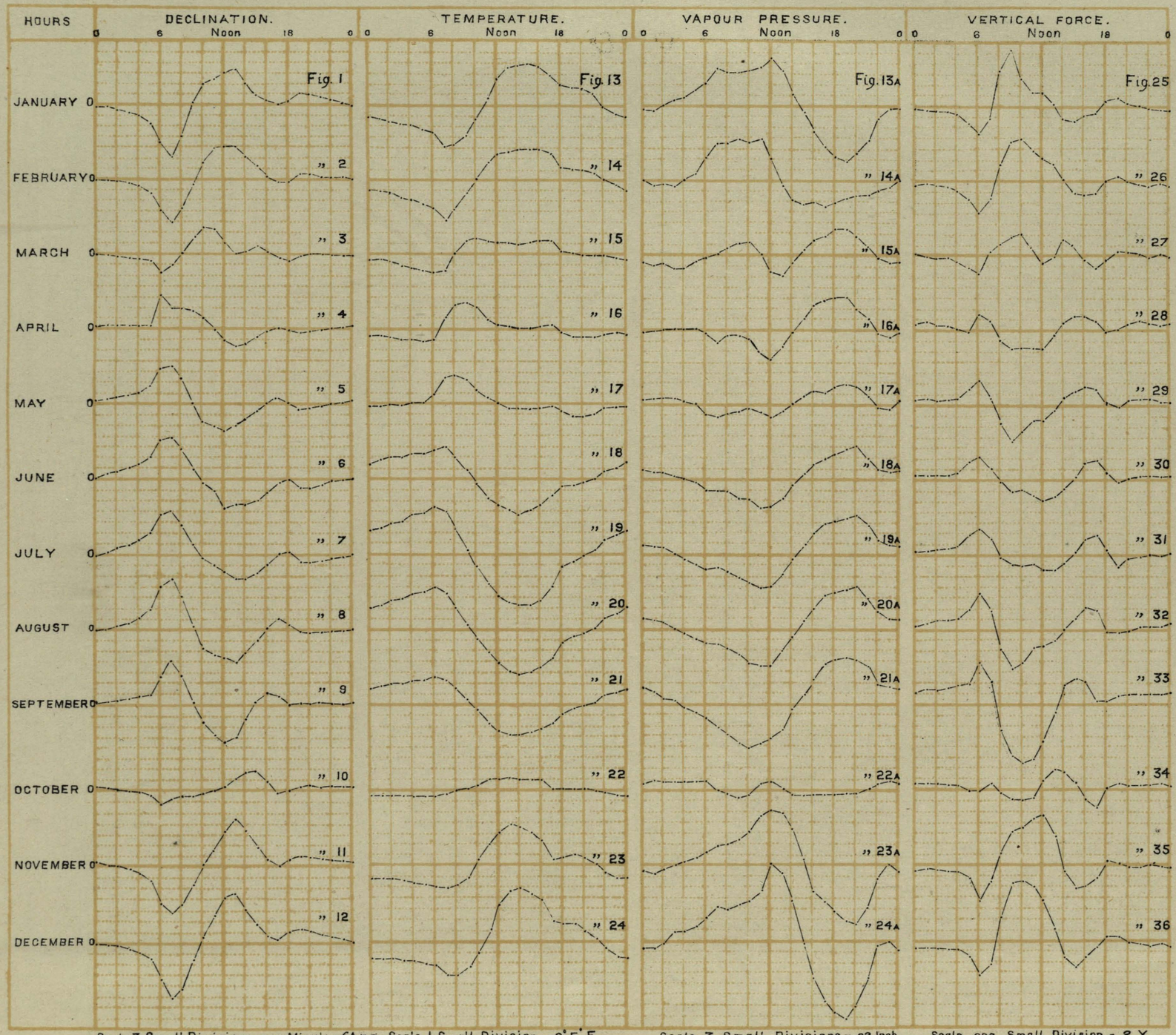
seasonal effect and the original inequalities, except in regard to amplitude. Though this is markedly apparent from the sweeps of the inequalities themselves, the results of Fourier analysis shown in the table above do not exhibit the same quite so forcibly. It will be seen that in declination while the amplitudes are nearly the same, there is a small disagreement in the phases; on the other hand in the vertical force the phases are strikingly coincident and the amplitudes alone differ. In temperature the phases which are inverted, differ slightly as also the amplitudes. The vapour pressure curves in any case show inadmissible irregularities which are accentuated in the results of the analysis. In passing we may also note that the examination of the barometer excess variations similarly derived as above, indicates a progression which

* Curves similarly derived from Kew data do show the same result though not to the same degree of accordance as at Colaba. It should be also noted that the progression of the temperature excess curves at Kew is inverse in its seasonal march to that at Colaba.

COLABA OBSERVATORY.

Excess diurnal Variations of Declination, Temperature, Vapour pressure, and Vertical Force for each month, over their average diurnal inequalities of the year.

Plate 105.



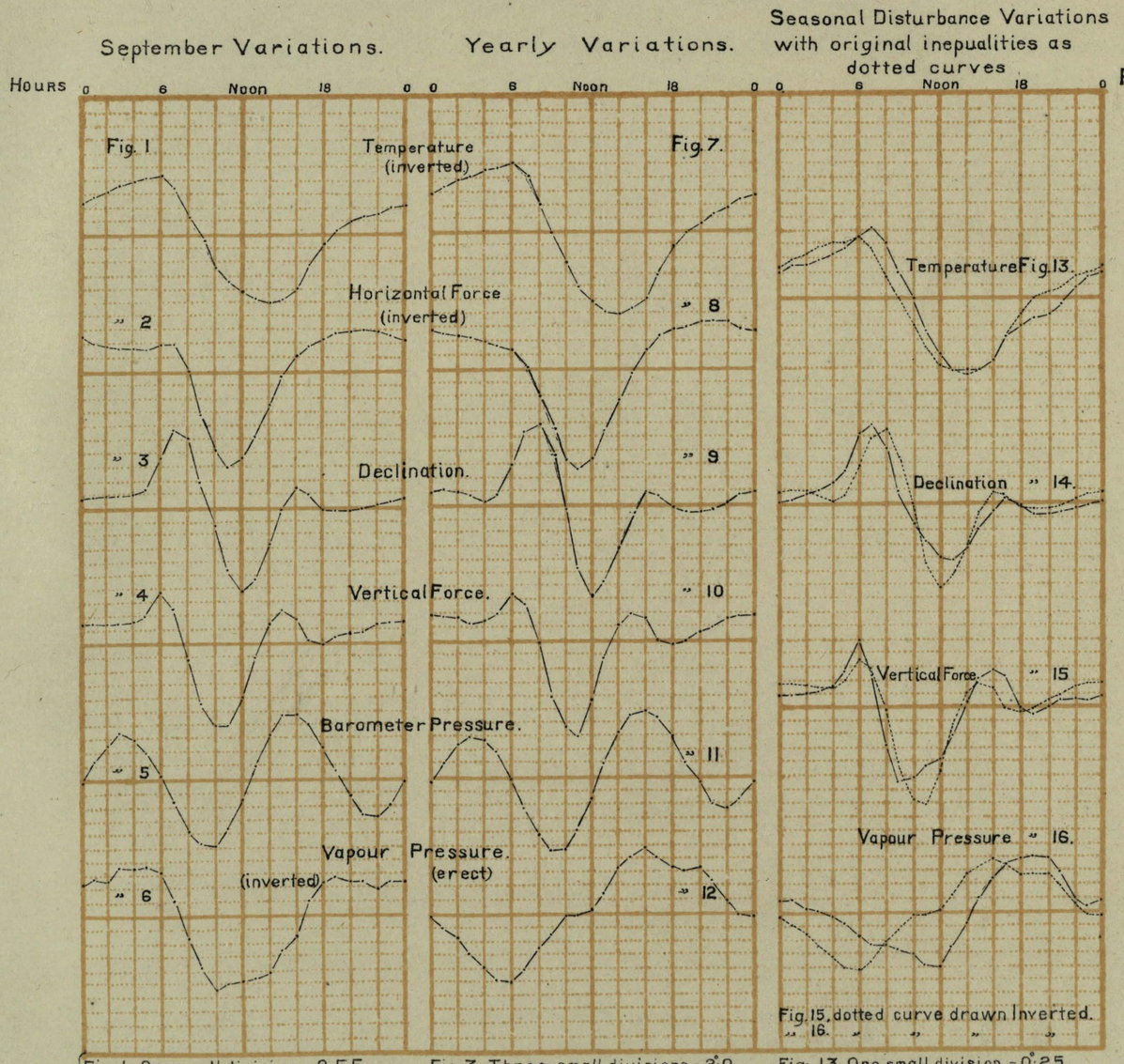
Scale 3 Small Divisions = one Minute of Arc. Scale 1 Small Division = 0°.5 F. Scale 3 Small Divisions = .02 Inch. Scale one Small Division = 2 Y.

Govt. Photozinco: Office Poona. 1910.

COLABA OBSERVATORY

Diurnal Variations of Meteorological and Magnetical Elements.

Plate 106.



Scale.

Fig: 1. One small division = 0·5 F.
" 2. " " " = 4 Y.
" 3. " " " 0·4.
" 4. " " " 4 Y.
" 5. " " " 0·01 inch.
" 6. " " " 0·005 inch

Fig: 7. Three small divisions = 2°0.
" 8 One " " = 4 Y.
" 9 " " " 0·2.
" 10 " " " 2 Y.
" 11 " " " 0·01 inch
" 12 " " " 0·005 inch

Fig: 13. One small division = 0°25.
" 14 " " " = 0·2.
" 15 " " " = 1 Y.
" 16 " " " = 0·005 inch.

Full curves show average seasonal disturbance.
Dotted curves show original inequalities reduced proportionately.

Govt. Photozinco. Office, Poona. 1910.

TABLE 584.—*Showing the mean diurnal variation of temperature for each of the years 1873 to 1905 derived from dry bulb thermograms.*

Unity = 0°·1 F.

Bombay Civil Time.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Range.
Years.																									
1873 ...	−21	−22	−25	−28	−30	−32	−35	−27	−12	+4	+19	+29	+37	+42	+43	+41	+33	+21	+ 7	+ 1	− 5	− 8	−13	−17	78
1874 ...	−19	−22	−25	−28	−31	−33	−34	−28	−12	+4	+18	+29	+37	+42	+43	+40	+33	+20	+ 7	0	− 4	− 8	−13	−17	77
1875 ...	−19	−23	−25	−27	−30	−32	−33	−27	−11	+3	+17	+28	+37	+40	+40	+38	+32	+20	+ 7	+ 1	− 3	− 7	−12	−16	73
1876 ...	−18	−21	−24	−27	−29	−32	−34	−27	−11	+3	+18	+29	+37	+40	+41	+38	+32	+20	+ 6	0	− 4	− 7	−11	−15	75
1877 ...	−19	−21	−24	−26	−29	−31	−33	−27	−12	+2	+17	+27	+34	+39	+39	+37	+31	+20	+ 7	0	− 4	− 8	−12	−15	72
1878 ...	−18	−20	−22	−26	−29	−32	−33	−27	−13	+2	+17	+27	+34	+38	+39	+37	+30	+20	+ 7	+ 1	− 3	− 6	−11	−14	72
1879 ...	−18	−20	−23	−25	−29	−30	−32	−27	−12	+3	+17	+28	+36	+40	+41	+38	+31	+20	+ 6	+ 1	− 3	− 6	−11	−15	73
1880 ...	−18	−21	−23	−26	−29	−31	−32	−27	−12	+1	+17	+27	+35	+38	+39	+37	+32	+20	+ 7	0	− 3	− 7	−11	−15	71
1881 ...	−19	−22	−24	−27	−29	−31	−32	−26	−13	0	+15	+27	+36	+40	+42	+39	+33	+21	+ 7	0	− 4	− 8	−12	−17	74
1882 ...	−18	−21	−24	−27	−29	−32	−33	−27	−12	+2	+17	+28	+36	+40	+41	+39	+33	+21	+ 8	+ 1	− 3	− 7	−11	−15	74
1883 ...	−18	−21	−23	−25	−27	−30	−32	−26	−13	+2	+16	+26	+35	+40	+41	+38	+33	+22	+ 8	+ 1	− 3	− 7	−11	−15	73
1884 ...	−19	−22	−24	−26	−29	−31	−32	−27	−14	0	+14	+26	+35	+41	+42	+39	+32	+20	+ 7	0	− 3	− 7	−11	−16	74
1885 ...	−18	−21	−24	−26	−29	−32	−33	−27	−13	+2	+17	+28	+36	+40	+42	+39	+33	+21	+ 9	+ 1	− 3	− 7	−11	−16	75
1886 ...	−18	−20	−23	−26	−28	−31	−32	−26	−13	0	+16	+26	+34	+38	+39	+37	+31	+19	+ 6	− 1	− 4	− 8	−12	−15	71
1887 ...	−18	−22	−24	−26	−28	−31	−32	−27	−15	−2	+14	+25	+35	+40	+41	+38	+33	+20	+ 7	0	− 4	− 8	−11	−16	73
1888 ...	−17	−20	−22	−25	−26	−29	−30	−25	−13	0	+15	+26	+33	+37	+40	+38	+33	+21	+ 9	+ 1	− 2	− 7	−10	−15	70
1889 ...	−19	−22	−24	−27	−29	−32	−33	−28	−15	−1	+15	+26	+37	+41	+43	+39	+33	+21	+ 9	+ 2	− 2	− 7	−11	−16	76
1890 ...	−17	−20	−22	−25	−27	−30	−31	−27	−12	0	+14	+25	+34	+38	+40	+37	+32	+21	+ 9	+ 1	− 3	− 7	−10	−14	71
1891 ...	−20	−23	−26	−29	−31	−34	−35	−29	−15	+1	+15	+27	+38	+42	+44	+40	+34	+22	+ 8	+ 1	− 3	− 8	−12	−17	79
1892 ...	−16	−20	−23	−26	−28	−31	−32	−28	−15	0	+14	+25	+34	+39	+41	+37	+32	+22	+10	+ 3	− 1	− 5	− 9	−14	73
1893 ...	−18	−21	−23	−26	−28	−30	−32	−28	−15	−1	+14	+25	+34	+38	+40	+37	+31	+20	+ 8	+ 2	− 2	− 6	−10	−14	72
1894 ...	−18	−20	−23	−26	−28	−30	−31	−27	−14	−1	+14	+25	+32	+37	+38	+35	+31	+21	+ 8	+ 2	− 2	− 6	−10	−15	69
1895 ...	−20	−23	−25	−28	−30	−32	−34	−29	−15	−1	+14	+25	+34	+40	+42	+39	+34	+23	+ 9	+ 2	− 2	− 6	−11	−16	76
1896 ...	−18	−21	−24	−27	−29	−32	−33	−28	−16	−1	+14	+26	+35	+38	+40	+38	+34	+22	+ 9	+ 2	− 2	− 6	−10	−15	73
1897 ...	−19	−22	−24	−27	−30	−32	−33	−29	−15	−1	+15	+26	+35	+41	+42	+39	+34	+22	+ 9	+ 3	− 1	− 6	−10	−15	75
1898 ...	−16	−21	−24	−26	−29	−32	−32	−28	−15	−2	+13	+25	+35	+40	+42	+39	+34	+22	+10	+ 3	− 1	− 6	−10	−15	74
1899 ...	−18	−22	−24	−28	−30	−33	−34	−30	−17	−4	+13	+25	+35	+40	+44	+41	+36	+24	+11	+ 3	− 1	− 6	−10	−15	78
1900 ...	−18	−21	−23	−27	−28	−32	−33	−28	− 4	−1	+15	+26	+35	+38	+40	+37	+33	+21	+ 9	+ 2	− 2	− 6	−10	−15	73
1901 ...	−18	−21	−23	−26	−28	−30	−31	−27	−14	−1	+14	+26	+37	+40	+41	+37	+32	+20	+ 8	+ 1	− 2	− 7	−10	−15	72
1902 ...	−18	−21	−23	−26	−29	−32	−32	−29	−15	−3	+12	+24	+35	+39	+42	+40	+35	+23	+10	+ 2	− 2	− 7	−10	−15	74
1903 ...	−18	−22	−23	−27	−29	−32	−33	−29	−16	−3	+13	+24	+35	+40	+43	+39	+34	+22	+10	+ 3	− 1	− 6	−10	−16	76
1904 ...	−18	−22	−24	−27	−29	−32	−32	−29	−17	−3	+13	+26	+37	+41	+43	+40	+35	+22	+ 9	+ 1	− 2	− 7	−10	−16	75
1905 ...	−18	−22	−24	−27	−29	−32	−32	−29	−15	−2	+14	+26	+37	+41	+43	+39	+34	+21	+ 9	+ 1	− 3	− 7	−10	−15	75
Average, 1873—1905.	−18	−21	−24	−26	−29	−31	−33	−28	−13	0	+15	+26	+35	+40	+41	+38	+33	+21	+ 8	+ 1	− 3	− 7	−11	−15	74

TABLE 585.—*Showing the mean diurnal variation of barometric pressure for each of the years 1873—1905 derived from barograms.*

Unity=0·001 inch.

Bombay Civil Time.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Range.
Years.																									
1873 ...	+5	−10	−22	−29	−26	−16	+ 2	+22	+43	+55	+55	+41	+19	− 8	−30	−44	−49	−43	−29	−10	+ 9	+21	+24	+17	104
1874 ...	+7	− 9	−22	−28	−26	−15	+ 3	+24	+44	+56	+55	+41	+18	− 9	−30	−46	−51	−44	−30	−10	+ 9	+22	+26	+19	107
1875 ...	+5	−10	−22	−27	−24	−14	+ 4	+25	+45	+56	+54	+39	+16	−10	−30	−44	−49	−42	−28	− 9	+ 8	+20	+24	+18	105
1876 ...	+5	−10	−20	−28	−26	−16	+ 2	+23	+43	+55	+53	+38	+15	−10	−31	−45	−48	−42	−28	− 9	+ 8	+20	+23	+17	103
1877 ...	+5	− 9	−21	−27	−24	−13	+ 4	+24	+44	+55	+53	+39	+15	−11	−32	−46	−49	−43	−29	−10	+ 7	+18	+23	+16	104
1878 ...	+6	− 8	−22	−27	−24	−15	+ 2	+24	+44	+54	+53	+38	+15	−11	−32	−46	−50	−43	−28	− 8	+10	+21	+24	+18	104
1879 ...	+5	− 9	−22	−28	−25	−15	+ 4	+24	+43	+55	+54	+39	+16	− 9	−30	−45	−48	−42	−28	− 9	+ 9	+21	+24	+17	103
1880 ...	+6	− 9	−23	−28	−26	−16	+ 2	+24	+44	+56	+55	+41	+17	− 8	−29	−44	−49	−42	−29	− 9	+ 9	+22	+25	+18	105
1881 ...	+6	− 9	−22	−29	−27	−16	+ 2	+23	+43	+55	+54	+40	+17	−10	−31	−45	−48	−42	−29	−10	+ 8	+20	+25	+18	103
1882 ...	+5	−10	−22	−28	−25	−15	+ 4	+25	+45	+56	+56	+41	+17	− 9	−31	−45	−49	−42	−28	− 9	+ 9	+21	+24	+18	105
1883 ...	+5	−10	−23	−29	−27	−16	+ 2	+24	+44	+56	+55	+41	+17	− 8	−30	−44	−47	−40	−27	− 7	+10	+22	+25	+18	103
1884 ...	+5	−10	−24	−31	−29	−18	0	+22	+43	+55	+54	+40	+16	− 9	−31	−45	−48	−42	−27	− 8	+10	+23	+26	+18	103
1885 ...	+6	− 8	−22	−27	−25	−15	+ 3	+24	+43	+55	+54	+40	+16	−10	−33	−47	−51	−43	−29	− 9	+ 9	+21	+25	+19	106
1886 ...	+6	− 9	−23	−29	−26	−16	+ 2	+24	+44	+57	+56	+42	+18	− 8	−31	−47	−51	−44	−30	−10	+ 8	+22	+26	+19	108
1887 ...	+6	− 8	−21	−28	−25	−15	+ 3	+24	+43	+56	+55	+41	+17	− 9	−31	−45	−50	−43	−29	−10	+ 8	+21	+24	+18	106
1888 ...	+5	− 9	−23	−29	−26	−16	+ 2	+23	+43	+56	+54	+41	+18	− 8	−29	−44	−47	−40	−27	− 9	+ 9	+21	+25	+18	103
1889 ...	+5	−10	−23	−29	−27	−16	+ 2	+24	+44	+56	+55	+40	+16	−10	−31	−46	−50	−43	−29	− 9	+ 9	+21	+25	+17	106
1890 ...	+5	−10	−23	−29	−26	−17	+ 2	+22	+43	+55	+54	+40	+17	− 9	−30	−45	−48	−42	−27	− 9	+10	+22	+25	+17	103
1891 ...	+5	−10	−22	−28	−26	−15	+ 3	+23	+43	+55	+54	+40	+17	− 9	−30	−44	−48	−43	−29	−11	+ 7	+19	+24	+17	103
1892 ...	+5	−10	−23	−29	−27	−16	+ 3	+23	+44	+56	+55	+40	+17	−10	−31	−46	−50	−44	−29	− 9	+10	+23	+26	+19	106
1893 ...	+6	− 9	−22	−28	−25	−15	+ 3	+24	+43	+55	+53	+39	+15	−11	−31	−46	−48	−42	−27	− 9	+ 9	+20	+24	+17	103
1894 ...	+6	− 9	−22	−29	−26	−17	+ 2	+22	+43	+54	+55	+41	+17	− 9	−30	−45	−49	−43	−29	−11	+ 9	+21	+25	+18	103
1895 ...	+5	− 9	−22	−28	−25	−15	+ 4	+24	+45	+56	+55	+39	+16	−10	−32	−46	−49	−43	−29	−10	+ 9	+21	+24	+17	105
1896 ...	+5	−10	−23	−29	−26	−15	+ 4	+24	+45	+56	+55	+40	+17	− 8	−30	−45	−49	−42	−28	− 9	+10	+21	+24	+17	105
1897 ...	+5	− 9	−22	−29	−26	−16	+ 3	+24	+45	+56	+56	+40	+17	− 9	−30	−45	−49	−43	−29	− 9	+ 8	+20	+24	+17	105
1898 ...	+4	−10	−22	−27	−25	−14	+ 4	+25	+45	+57	+55	+39	+15	−10	−31	−46	−49	−43	−28	− 9	+ 8	+20	+23	+16	106
1899 ...	+4	−11	−24	−30	−26	−16	+ 3	+20	+37	+56	+55	+41	+17	− 8	−30	−44	−48	−41	−27	− 9	+ 9	+20	+23	+16	104
1900 ...	+5	− 8	−21	−27	−25	−15	+ 3	+23	+43	+55	+53	+39	+16	− 6	−30	−44	−48	−42	−28	− 9	+ 8	+20	+23	+17	103
1901 ...	+5	− 9	−21	−28	−26	−15	+ 2	+23	+43	+55	+54	+39	+16	−10	−31	−45	−49	−42	−28	− 9	+ 9	+21	+25	+18	104
1902 ...	+5	− 9	−22	−27	−25	−15	+ 3	+24	+44	+56	+53	+39	+16	−10	−31	−45	−48	−42	−27	− 8	+10	+21	+24	+18	104
1903 ...	+6	− 7	−22	−28	−25	−15	+ 2	+23	+42	+55	+54	+41	+17	− 9	−31	−45	−50	−43	−29	−10	+ 8	+21	+25	+18	105
1904 ...	+4	−11	−23	−28	−26	−16	+ 2	+23	+43	+55	+55	+41	+18	− 7	−29	−43	−47	−40	−28	− 9	+ 8	+21	+23	+16	102
1905 ...	+5	− 9	−22	−28	−26	−16	+ 2	+22	+42	+54	+53	+40	+17	− 8	−29	−42	−46	−40	−28	− 9	+ 8	+20	+23	+16	100
Average, 1873—1905.	+5	− 9	−22	−28	−26	−15	+ 3	+23	+44	+55	+54	+40	+17	− 9	−30	−45	−49	−42	−28	− 9	+ 9	+21	+24	+17	104

TABLE 586.—*Showing the mean diurnal variation of pressure of vapour for each of the years 1873—1905 derived from dry-bulb and wet-bulb thermograms.*

Unity = 0·001 inch.

Bombay Civil Time.	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Range.
Years.																									
1873 ...	− 3	− 3	− 10	− 15	− 20	− 25	− 28	− 19	− 13	− 9	− 5	− 4	+ 2	+ 11	+ 18	+ 24	+ 24	+ 21	+ 16	+ 15	+ 13	+ 9	+ 2	− 1	52
1874 ...	− 1	− 6	− 12	− 15	− 21	− 19	− 28	− 23	− 16	− 9	− 6	− 2	+ 2	+ 10	+ 18	+ 25	+ 25	+ 23	+ 16	+ 17	+ 16	+ 13	+ 3	0	53
1875 ...	− 5	− 8	− 10	− 24	− 19	− 26	− 26	− 20	− 15	− 9	0	+ 3	+ 1	+ 3	+ 14	+ 16	+ 20	+ 17	+ 17	+ 18	+ 18	+ 17	+ 7	− 2	46
1876 ...	+ 1	− 4	− 8	− 14	− 20	− 25	− 29	− 21	− 11	− 8	− 4	− 9	− 8	+ 6	+ 14	+ 16	+ 22	+ 21	+ 19	+ 18	+ 19	+ 14	+ 6	+ 2	51
1877 ...	− 6	− 7	− 10	− 13	− 19	− 23	− 22	− 18	− 7	− 4	+ 1	+ 1	+ 3	+ 6	+ 14	+ 18	+ 19	+ 18	+ 11	+ 11	+ 11	+ 10	+ 5	− 1	42
1878 ...	− 3	− 5	− 9	− 14	− 19	− 24	− 27	− 23	− 17	− 10	− 3	+ 2	+ 6	+ 14	+ 19	+ 22	+ 22	+ 20	+ 14	+ 13	+ 12	+ 9	+ 1	− 2	49
1879 ...	+ 2	− 7	− 10	− 15	− 21	− 27	− 30	− 24	− 17	− 10	− 2	− 3	+ 3	+ 9	+ 18	+ 23	+ 26	+ 21	+ 16	+ 15	+ 17	+ 11	+ 3	+ 1	56
1880 ...	− 6	− 8	− 12	− 15	− 19	− 26	− 26	− 22	− 13	− 7	+ 1	+ 2	+ 4	+ 11	+ 19	+ 21	+ 25	+ 20	+ 19	+ 15	+ 14	+ 9	+ 1	− 6	51
1881 ...	− 2	− 7	− 9	− 16	− 18	− 22	− 21	− 19	− 11	− 7	− 2	− 5	− 7	0	+ 12	+ 17	+ 24	+ 22	+ 19	+ 18	+ 18	+ 11	+ 5	0	46
1882 ...	− 2	− 4	− 9	− 15	− 19	− 25	− 26	− 22	− 14	− 9	− 2	− 4	− 3	+ 7	+ 19	+ 22	+ 27	+ 20	+ 15	+ 15	+ 17	+ 11	+ 3	− 3	53
1883 ...	− 2	− 7	− 10	− 14	− 17	− 21	− 24	− 22	− 12	− 5	+ 3	+ 1	+ 3	+ 6	+ 11	+ 13	+ 20	+ 18	+ 15	+ 15	+ 17	+ 10	+ 3	− 1	44
1884 ...	− 4	− 5	− 10	− 15	− 22	− 26	− 27	− 24	− 17	− 11	− 6	− 3	0	+ 5	+ 16	+ 22	+ 27	+ 26	+ 20	+ 19	+ 17	+ 12	+ 4	− 1	54
1885 ...	− 3	− 6	− 10	− 15	− 20	− 25	− 25	− 22	− 12	− 8	+ 2	+ 4	+ 6	+ 11	+ 18	+ 21	+ 21	+ 16	+ 14	+ 12	+ 14	+ 8	+ 2	− 5	46
1886 ...	− 1	− 7	− 11	− 16	− 22	− 27	− 23	− 19	− 13	− 9	− 1	0	+ 2	+ 10	+ 15	+ 21	+ 22	+ 18	+ 15	+ 12	+ 14	+ 11	+ 4	+ 2	49
1887 ...	− 3	− 9	− 7	− 14	− 18	− 23	− 25	− 24	− 16	− 9	0	− 3	− 3	+ 2	+ 11	+ 20	+ 29	+ 23	+ 20	+ 16	+ 15	+ 11	+ 6	− 2	54
1888 ...	− 4	− 7	− 8	− 12	− 16	− 22	− 22	− 17	− 10	− 4	+ 2	0	+ 1	+ 4	+ 13	+ 16	+ 19	+ 16	+ 14	+ 12	+ 15	+ 10	+ 5	− 3	41
1889 ...	− 3	− 9	− 13	− 18	− 22	− 29	− 29	− 25	− 12	− 8	+ 2	− 2	+ 3	+ 11	+ 22	+ 28	+ 28	+ 22	+ 15	+ 13	+ 15	+ 6	+ 1	− 4	57
1890 ...	− 1	− 4	− 9	− 16	− 21	− 25	− 28	− 23	− 12	− 6	+ 1	0	+ 3	+ 10	+ 16	+ 18	+ 21	+ 18	+ 15	+ 15	+ 16	+ 9	+ 1	− 3	49
1891 ...	+ 1	− 3	− 9	− 16	− 22	− 27	− 31	− 27	− 20	− 13	− 6	− 7	− 8	+ 4	+ 17	+ 24	+ 27	+ 25	+ 23	+ 22	+ 22	+ 16	+ 4	+ 1	58
1892 ...	− 3	− 6	− 8	− 14	− 17	− 22	− 21	− 20	− 13	− 8	+ 1	0	− 2	+ 3	+ 13	+ 16	+ 19	+ 17	+ 16	+ 17	+ 18	+ 13	+ 4	− 3	41
1893 ...	− 1	− 4	− 9	− 16	− 19	− 22	− 23	− 18	− 10	− 5	+ 3	+ 1	0	+ 4	+ 12	+ 13	+ 19	+ 15	+ 12	+ 11	+ 14	+ 12	+ 9	0	42
1894 ...	− 3	− 4	− 8	− 13	− 18	− 21	− 24	− 21	− 10	− 4	+ 3	+ 4	+ 2	+ 7	+ 15	+ 17	+ 18	+ 16	+ 13	+ 12	+ 12	+ 8	+ 4	− 3	42
1895 ...	− 4	− 8	− 10	− 18	− 19	− 23	− 22	− 20	− 8	− 2	+ 3	+ 1	+ 2	+ 5	+ 11	+ 14	+ 20	+ 20	+ 15	+ 14	+ 15	+ 10	+ 7	+ 1	43
1896 ...	− 1	− 4	− 8	− 15	− 23	− 28	− 32	− 25	− 16	− 8	0	0	+ 3	+ 11	+ 21	+ 24	+ 25	+ 21	+ 17	+ 13	+ 16	+ 8	+ 1	− 3	57
1897 ...	− 7	− 7	− 11	− 17	− 21	− 26	− 26	− 23	− 16	− 9	− 1	− 1	+ 1	+ 9	+ 17	+ 24	+ 28	+ 25	+ 18	+ 16	+ 16	+ 8	+ 5	− 2	54
1898 ...	− 2	− 5	− 7	− 13	− 20	− 26	− 27	− 24	− 17	− 11	− 2	− 3	− 6	+ 3	+ 17	+ 22	+ 26	+ 23	+ 21	+ 18	+ 18	+ 10	+ 4	− 1	53
1899 ...	− 2	− 6	− 9	− 17	− 23	− 25	− 25	− 23	− 16	− 12	− 6	− 2	0	+ 6	+ 14	+ 22	+ 24	+ 22	+ 23	+ 20	+ 20	+ 11	+ 2	− 2	49
1900 ...	0	− 7	− 11	− 20	− 25	− 32	− 27	− 26	− 16	− 11	− 5	− 6	+ 2	+ 9	+ 19	+ 23	+ 28	+ 19	+ 20	+ 20	+ 21	+ 16	+ 9	0	60
1901 ...	− 2	− 4	− 6	− 15	− 17	− 24	− 26	− 23	− 13	− 12	− 7	− 8	− 3	+ 8	+ 21	+ 25	+ 29	+ 23	+ 18	+ 14	+ 16	+ 10	+ 4	− 3	55
1902 ...	0	− 6	− 4	− 12	− 18	− 25	− 26	− 25	− 15	− 10	− 5	− 3	+ 1	+ 4	+ 12	+ 16	+ 22	+ 20	+ 19	+ 14	+ 17	+ 10	+ 8	+ 4	48
1903 ...	− 3	− 9	− 9	− 18	− 21	− 26	− 26	− 22	− 12	− 9	0	− 3	+ 3	+ 6	+ 19	+ 25	+ 27	+ 21	+ 17	+ 15	+ 15	+ 7	+ 3	− 3	53
1904 ...	− 4	− 9	− 13	− 17	− 22	− 27	− 29	− 26	− 18	− 11	− 1	− 2	− 3	+ 5	+ 18	+ 24	+ 31	+ 28	+ 23	+ 20	+ 20	+ 12	+ 3	− 2	60
1905 ...	+ 2	− 3	− 8	− 16	− 18	− 26	− 28	− 25	− 18	− 11	− 6	− 7	− 3	+ 5	+ 18	+ 22	+ 23	+ 20	+ 19	+ 18	+ 20	+ 16	+ 9	+ 2	51
Average, 1873—1905.	− 2	− 6	− 9	− 15	− 20	− 25	− 26	− 22	− 14	− 8	− 1	− 2	0	+ 7	+ 16	+ 20	+ 24	+ 20	+ 17	+ 15	+ 16	+ 11	+ 4	− 1	50

TABLE 587.—*Mean yearly values of the amplitude* P *and of the first maximum* μ *reckoned from midnight for the first four orders of harmonic components of the diurnal inequality of temperature for each year from 1873 to 1905 derived from table 584.*

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
	°	°	°	°	° ′	° ′	° ′	° ′
1873 ...	3·50	1·12	0·09	0·25	215 58	12 52	39 21	51 54
1874 ...	3·47	1·14	0·08	0·23	216 15	12 6	38 14	50 30
1875 ...	3·38	1·05	0·10	0·22	216 50	11 21	45 30	53 1
1876 ...	3·34	1·14	0·08	0·25	216 37	11 5	40 25	53 27
1877 ...	3·26	1·06	0·10	0·23	217 1	12 27	38 29	54 6
1878 ...	3·22	1·09	0·12	0·22	218 11	11 33	38 39	52 42
1879 ...	3·27	1·11	0·10	0·23	217 3	12 10	48 13	51 52
1880 ...	3·25	1·06	0·09	0·24	217 37	12 27	39 21	54 36
1881 ...	3·36	1·09	0·05	0·20	217 16	15 5	56 54	53 7
1882 ...	3·28	1·06	0·07	0·23	217 49	14 52	45 30	54 6
1883 ...	3·35	1·10	0·08	0·22	217 45	12 37	38 14	53 34
1884 ...	3·33	1·10	0·09	0·21	218 4	14 36	64 41	51 50
1885 ...	3·37	1·10	0·09	0·22	217 55	13 12	41 10	53 34
1886 ...	3·19	1·09	0·06	0·21	217 14	13 33	40 49	54 18
1887 ...	3·29	1·11	0·08	0·19	218 35	15 38	62 53	55 10
1888 ...	3·18	1·01	0 06	0·22	218 36	15 42	45 30	55 22
1889 ...	3·41	1·11	0·12	0·18	219 11	14 42	57 21	52 50
1890 ...	3·18	1·05	0·06	0·20	218 59	14 46	43 23	54 43
1891 ...	3·55	1·14	0·08	0·20	218 24	13 47	52 46	52 9
1892 ...	3·25	1·05	0·09	0·19	221 8	13 47	51 39	54 34
1893 ...	3·22	1·06	0·11	0·20	219 50	14 2	57 4	54 43
1894 ...	3·15	0·99	0·10	0·19	219 50	14 3	48 13	55 10
1895 ...	3·43	1·04	0·07	0 23	220 11	15 8	55 11	53 15
1896 ...	3·32	1·05	0·09	0·21	220 37	14 24	48 39	56 45
1897 ...	3·41	1·07	0·10	0·20	220 16	14 23	56 44	53 44
1898 ...	3·34	1·09	0·07	0·15	221 1	15 5	63 13	53 24
1899 ...	3·48	1·11	0·07	0·19	222 15	16 55	57 47	55 10
1900 ...	3·28	0·98	0·07	0·22	218 34	12 13	30 30	49 29
1901 ...	3·26	1·09	0·12	0·10	218 32	14 8	60 30	51 30
1902 ...	3·34	1·10	0·05	0·19	221 15	17 4	56 44	54 34
1903 ...	3·40	1·09	0·11	0·18	221 19	16 15	58 46	52 9
1904 ...	3·41	1·14	0·11	0·18	220 16	16 22	63 56	56 45
1905 ...	3·38	1·14	0·09	0·18	219 37	14 55	64 41	56 11
1873 to 1905 ...	3·31	1·09	0·07	0·21	218 31	14 8	49 16	54 18

TABLE 588.—*Mean yearly values of the amplitude* P *and the first maximum* μ *reckoned from midnight for the first four orders of harmonic components of the diurnal inequality of barometric pressure at Bombay (Colaba) for each of the years from 1873 to 1905 derived from table 585.*

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
	In.	In.	In.	In.	° ′	° ′	° ′	° ′
1873 ...	·0176	·0392	·0013	·0011	113 22	146 8	36 5	56 13
1874 ...	·0181	·0400	·0010	·0010	109 47	146 1	35 31	55 58
1875 ...	·0182	·0386	·0012	·0012	110 41	145 11	27 4	55 30
1876 ...	·0174	·0383	·0018	·0012	110 30	145 28	27 34	51 45
1877 ...	·0187	·0382	·0017	·0010	108 50	145 17	29 31	58 0
1878 ...	·0176	·0389	·0016	·0009	107 17	145 16	31 45	51 22
1879 ...	·0177	·0386	·0013	·0010	111 12	145 24	30 17	54 1
1880 ...	·0176	·0395	·0012	·0012	112 46	145 54	30 10	52 52
1881 ...	·0175	·0392	·0016	·0011	111 26	145 54	25 36	59 47
1882 ...	·0183	·0393	·0015	·0011	111 52	145 19	30 29	57 3
1883 ...	·0169	·0395	·0015	·0011	114 22	145 18	29 13	55 10
1884 ...	·0162	·0401	·0014	·0012	113 53	145 36	27 43	54 30
1885 ...	·0180	·0396	·0016	·0009	107 34	145 39	34 8	59 6
1886 ...	·0182	·0405	·0013	·0011	111 17	146 6	33 13	58 0
1887 ...	·0182	·0392	·0016	·0010	110 17	145 58	31 45	55 58
1888 ...	·0171	·0390	·0014	·0011	114 25	145 47	29 2	59 47
1889 ...	·0177	·0398	·0015	·0011	111 31	145 26	30 29	53 24
1890 ...	·0168	·0392	·0015	·0012	112 59	145 34	33 1	54 30
1891 ...	·0182	·0385	·0012	·0013	112 23	145 54	27 4	58 0
1892 ...	·0176	·0403	·0011	·0013	110 42	145 34	33 29	53 54
1893 ...	·0176	·0387	·0017	·0009	109 40	145 10	28 25	56 54
1894 ...	·0175	·0394	·0013	·0013	111 51	146 13	30 17	56 25
1895 ...	·0183	·0392	·0015	·0013	110 11	145 15	29 13	53 54
1896 ...	·0179	·0393	·0070	·0008	113 1	145 19	21 26	52 33
1897 ...	·0183	·0433	·0016	·0009	112 34	144 51	28 13	51 22
1898 ...	·0187	·0388	·0017	·0013	110 46	144 59	33 59	51 22
1899 ...	·0170	·0386	·0018	·0015	115 45	145 48	39 13	63 27
1900 ...	·0177	·0386	·0014	·0013	111 37	146 16	30 30	40 6
1901 ...	·0172	·0389	·0016	·0012	109 40	145 34	30 33	55 30
1902 ...	·0174	·0389	·0016	·0011	109 52	145 7	30 33	52 12
1903 ...	·0176	·0392	·0015	·0011	109 34	146 8	33 1	58 57
1904 ...	·0181	·0381	·0022	·0013	118 19	145 46	37 54	56 25
1905 ...	·0170	·0378	·0015	·0011	114 33	145 51	29 13	56 13
1873 to 1905 ...	·0177	·0389	·0015	·0009	111 37	145 34	33 1	53 24

TABLE 589.—*Mean yearly values of the amplitude* P *and the first maximum* μ *reckoned from midnight for the first four orders of harmonic components of the diurnal inequality of vapour pressure at Bombay (Colaba) for each of the years from 1873 to 1905 derived from table 586.*

Years.	P_1	P_2	P_3	P_4	μ_1	μ_2	μ_3	μ_4
	In.	In.	In.	In.	° ′	° ′	° ′	° ′
1873 ...	·0208	·0029	·0026	·0028	256 20	27 16	8 42	37 56
1874 ...	·0221	·0025	·0013	·0023	258 13	29 37	8 2	44 53
1875 ...	·0210	·0025	·0015	·0023	258 59	149 48	27 58	45 30
1876 ...	·0208	·0004	·0034	·0036	267 12	163 39	12 41	39 45
1877 ...	·0174	0018	·0021	·0032	252 23	172 18	12 14	45 57
1878 ...	·0207	0043	·0013	·0018	253 39	19 44	26 10	42 22
1879 ...	·0223	·0033	·0024	·0027	259 8	16 8	14 23	44 26
1880 ...	·0214	·0019	·0024	·0027	250 48	24 4	24 51	43 23
1881 ...	·0194	·0017	·0034	·0027	263 42	95 30	13 8	46 34
1882 ...	·0209	·0022	·0026	·0038	258 55	30 28	11 19	42 27
1883 ...	·0182	·0017	·0028	·0022	257 9	165 1	29 8	49 29
1884 ...	·0231	·0017	·0028	·0023	261 17	40 30	27 24	44 15
1885 ...	·0197	·0034	·0019	·0025	250 35	9 11	24 21	41 26
1886 ...	·0199	·0025	·0022	·0019	256 15	2 47	5 49	43 15
1887 ...	·0210	·0013	·0035	·0036	261 27	52 0	19 25	52 30
1888 ...	·0169	·0010	·0022	·0032	255 48	168 31	22 25	45 3
1889 ...	·0231	·0032	·0031	·0037	250 30	22 22	10 11	43 57
1890 ...	·0200	·0027	·0030	·0026	255 25	4 43	22 31	38 37
1891 ...	·0253	·0017	·0033	·0033	267 33	42 9	16 43	41 59
1892 ...	·0185	·0006	·0022	·0027	260 32	144 43	28 46	43 55
1893 ...	·0167	·0029	·0022	·0027	259 7	162 16	13 39	47 37
1894 ...	·0173	·0027	·0027	·0027	253 0	1 34	23 14	45 30
1895 ...	·0182	·0025	·0028	·0023	255 15	148 47	17 56	50 30
1896 ...	·0224	·0043	·0033	·0033	254 59	16 47	18 47	40 37
1897 ...	·0227	·0018	·0025	·0027	255 25	34 19	15 30	47 37
1898 ...	·0222	·0019	·0037	·0032	262 59	42 30	18 25	44 36
1899 ...	·0227	·0011	·0026	·0018	261 7	45 30	21 19	34 49
1900 ...	·0250	·0020	·0019	·0032	261 45	0 30	6 39	38 27
1901 ...	·0217	·0038	·0028	·0038	260 41	42 30	6 0	40 53
1902 ...	·0201	·0021	·0027	·0022	265 56	13 11	21 39	48 5
1903 ...	·0217	·0021	·0031	·0029	253 54	27 54	11 2	44 1
1904 ...	·0251	·0016	·0033	·0031	259 1	54 43	18 47	49 14
1905 ...	·0227	·0021	·0018	·0033	267 28	18 [illegible]	10 [illegible]	43 [illegible]
1873 to 1905 ...	·0206	·0017	·0025	·0028	258 45	14 32	16 34	44 29

CHAPTER XV.

On some Typical Movements in Magnetograms suspected to be associated with Seismic Phenomenon.

584. Before concluding it may perhaps not be out of place to refer incidentally to certain peculiar features noted in the Colaba magnetograms which occur occasionally at or about the time of occurrence of seismic disturbances indicating the possibility of some connection between the two phenomena both of which play so important a role in the physics of the earth. Whether a localised phenomenon such as an earthquake or a volcanic eruption can be effective enough directly to control forces which determine terrestrial magnetism on the entire surface of the globe, is apparently problematic. An indirect relation is not inconceivable however, and the points elicited hence in the Colaba data in support of such a relation have been put in as favourable a light as possible in order to enable the reader to form his own conclusions in regard to the question.

585. We have already seen that the 14-month period which was first noted by Chandler to exist in the variation of our latitudes, may also be suspected to affect the Colaba magnetic data; and if, as suggested by Milne and Knott, the same period variation is discerned in the earthquake record also, it may be conceded that the first link, however slender, in the chain of evidence has probably been forged, indicating some kind of relation between the two phenomena and justifying further examination of the data.

586. If we examine, in the first instance, the magnetic condition of a day on which seismic disturbances have been recorded, and compare it with that of the day not so affected, curiously enough we find that the usual idea prevalent in regard to the existence of some characteristic disturbance in the magnetic curves at or about the time of occurrence of an earthquake, appears to be contraindicated at least in the Colaba data for the period considered. For it will be seen presently that there seems to be distinctly greater probabilities for a seismic disturbance to be incident on a magnetically quiet than on a magnetically disturbed day. This is not unintelligible at least in the light of the explanation advanced in paragraph 434 where a high daily mean of H which is nearly always associated with quiet conditions has been suggested to be due to some kind of strain which, while apparently raising the value of H and presumably the potential of the earth as a whole, exercises a general restraining action on the magnetic oscillations reducing their amplitudes whether they be of the diurnal, annual, or secular pulse.

In the earthquake record we have by no means a connected and continuous history from day to day of the actual seismic condition of our earth anything at least like the one presented by the magnetograph record indicating the terrestrial magnetic conditions. What is supplied by the former data* is merely a disjointed series which is not even complete, of days indicating a climax and rupture, when the gradual accumulation of strain in some part of the crust of the earth, of which the seismographs give no indication, reaches the limit of elasticity of the resisting rocks which then yield under the overgrown stress on the day of the disturbance, and produces the convulsion recorded. As already remarked it is not easy to see how any such action† necessarily restricted as it must be to a minute portion of the earth's surface, can disturb the general magnetic condition of the whole globe. For this and other reasons, though the two series can hardly be expected to give comparable and parallel data leading to some conclusive deductions, they have been collected such as they are, in table 590 for examination. The earthquake record for the period 1889—1897 has been taken from the list kindly supplied by Professor Milne early in 1898 (*vide* paragraph 597) and for the subsequent period 1898 to 1905 from the seismograph records of this Observatory. In column 1, table 590, are collected the dates of the earthquakes; in column 2 appear the character letters showing the magnetic condition of the day at Colaba; in column 3 appear the departures of the daily mean of H from that of the previous day; in column 4 are collected similar departures from the mean value of H for the month; and in column 5 the departures of the daily range over the mean value of the range for the month. Summing up the results we find that out of some 312 days of earthquakes from the year 1891 to 1905, minute, small and large, some 147 or about 47 per cent. fall on magnetic calm days denominated C in the Colaba data; and considering that on an average (see paragraph 544) some 39 per cent. of the days in the year are calm, we should have about 122 earthquakes fall normally on magnetically quiet days, if the distribution is even.

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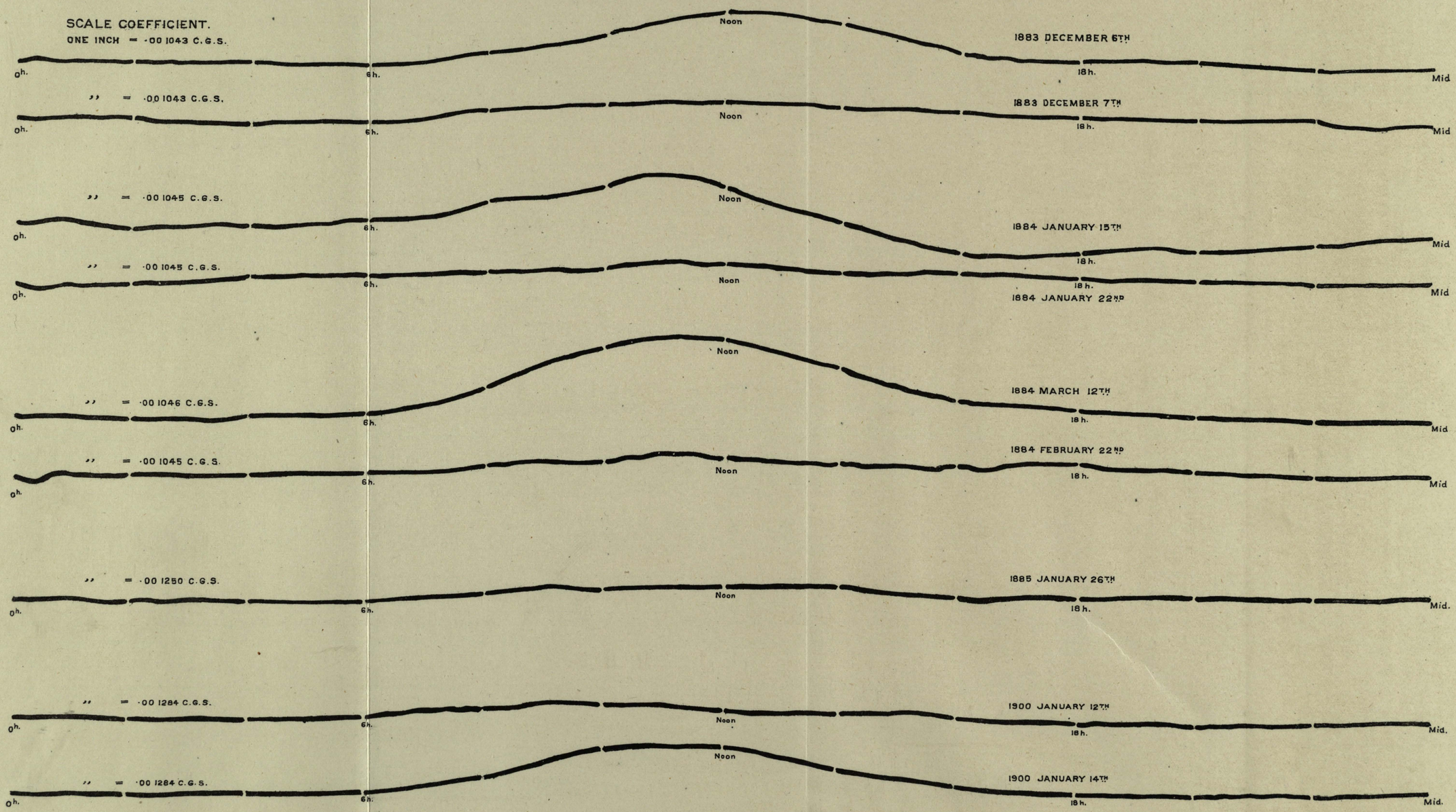
* The data discussed here have been derived from seismographs installed at this Observatory and so far they are absolutely complete and reliable. But if according to Milne about 100 small earthquakes occur every day and about 7 to 8 large ones every month, the Colaba data along with those of almost all other observatories must be regarded as fragmentary and very incomplete indeed.

† The peculiar action of the seismic waves as they travel round the crust of the earth, suspected to affect in some way the magnetographs when the waves pass a place, is not referred to here. A reference to it is made in paragraph 597.

COLABA OBSERVATORY

Magnetograms showing Typical Quiet days.

Plate 107.



Gov.t Photozinco. Office, Poona, 1910.

The result however shows an excess of about 20 per cent. in favour of the probability of the greater incidence of quakes on magnetically quiet days. If the larger* of the earthquakes only are considered, namely those in which the Colaba seismograph has recorded amplitudes of movement greater than 2 m.m., of some 62 such disturbances in the period 1898 to 1905 as many as 34 fall on calm days. As on the average some 24 of these only should be incident on quiet days, here at least a favourable indication of some 42 per cent. over the average distribution is disclosed. Passing on to the consideration of the question whether on a seismically disturbed day, the daily mean of H stands higher or lower than the previous day's mean or the mean of the month (see results in columns 3 and 4, table 590) we find that out of 312 earthquakes some 65 per cent. fall on days where the departures of H are positive whether they are considered from the previous day's mean, or from the mean of the month. The excess percentage over the average distribution indicated by these is about 14 per cent. If we take the average condition of the days during which the 312 quakes occur, we find that during a seismic disturbance the value of H on an average stands higher than the mean of the month by $+2{\cdot}2\gamma$. From the results noted in Chapter XIII, paragraph 535, we find that such a day approximates to a quiet-day. The ranges in column 5 also show almost the same average result. Considering that the seismic data of the kind discussed above are obviously incomplete and otherwise unsuitable for such comparison work, the result obtained can scarcely be expected to be more satisfactory† than the above, though as the percentage of excess made out in favour of the probability is not convincingly large everywhere, the result may not be regarded to have established the relation absolutely. In any case it is conclusive so far in showing that on the average, seismic and magnetic disturbances are certainly not incident concurrently and that the former fall on the quiet side of the average magnetic day.

587. Assuming for the moment that such a relation, namely the concurrence of magnetic calm with seismic disturbances, does exist, it is interesting to examine in detail all the quiet-day magnetograms round about the quiet epochs. Typical specimens of some diurnal waves recorded in the magnetic curves on quiet days are collected for reference in plate 107. In paragraph 479 we have referred to the fact that there are quiet days and quiet days and the extreme difference in the characters of these days is fairly illustrated in plate 107 (see also paragraph 595 and figure 4, plate 108). It will thus be seen that quiet days exist which show the usual full sweep of the diurnal wave as also others in which no appreciably large diurnal pulse can be traced at all. The days have been specially selected in each pair to fall as close to each other as possible so that it may become clear how days even very near to each other, and classed as quiet, are distinctly differentiated in regard to the factor which apparently controls the diurnal march in each case. But it has been carefully ascertained that the difference between the character of the diurnal waves in the two kinds of quiet days generally, lies practically in the amplitude alone, as the residual curve derived from the two variations is almost always of the same character as the diurnal variation itself. This is true in the main whether the average variation of the year is derived from the Astronomer Royal's days or days selected locally (see also paragraph 472, figures 5 and 6).

588. Though the major portion of the periodic diurnal variation must be, as shown by Schuster, derived from causes lying outside the earth, it may be of interest to examine the average variation in the year derived from this particular set of quiet days which fall concurrent with seismic disturbances, and to see if any exceptional differentiating features exist in the variation obtained from them when it is compared with the corresponding variation derived from the average quiet days. The traces of the days which are classed as C but those only on which earthquakes have been recorded, are hence grouped together for each year for the period 1900 to 1905, and the diurnal variations of these sets of days are derived for each of these six years, and shown in table 591, columns 2 to 7. From these corrected for the non-cyclic change, the corresponding variations of the average quiet days shown in table 438 are taken away, and the residual variations appear in columns 8 to 13. These when charted show that we have here clearly to deal with a different kind of residual curve which consists of irregular movements, and which has no resemblance whatever to the original diurnal variation. Though in the average result of six years as shown in column 14, the differences almost vanish as might be expected, in each individual year's result, the residuals are fairly large and irregular, and it is difficult not to feel that these days are distinctly affected by some irregular perturbations and whatever be their cause they cannot but be regarded as peculiar to these sets of days alone. The suspicion thus created is further strengthened when we find that the aperiodic contribution (*see* last row of figures in table 591) is certainly not of the class of the usual average quiet days referred to in tables 452 and 453. The average value of the element for the above set of quiet days for the six years considered is $+0{\cdot}5\gamma$, while the corresponding values of the normal

* These do not necessarily include all relatively large disturbances as a distant quake giving an amplitude at Colaba less than 2 m. m. may be really larger in intensity than a much nearer one, giving an amplitude of 2 m. m. or more.

† In the magnetic data the periodic oscillations of 13·5-day, 27·0-day and 14-month periods are strongly suspected to exist. The seismic data may, if any relation of the kind noted above does obtain, possibly be similarly influenced though it would be almost impossible to prove their existence in the kind of data available. In such a case the coincidence expected should be more for epochs than for the exact days

TABLE 590.—*Showing the dates of seismic disturbances, the magnetic character of the day, the departure of the absolute value of H for the day from that of the preceding day and from the mean of the month and the departure of the diurnal range of H from the mean value of the month.*

Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).	Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).	Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
		γ	γ	γ			γ	γ	γ			γ	γ	γ
1889 April 18th.	Ca	− 2			1894 June 20th.	S	+ 4	+ 6	+15	1899 Dec. 31st.	Ca	− 1	− 4	− 8
„ July 11th.	*Ca	+ 2			„ July 10th.	C	+16	+26	−30					
„ „ 28th.	Ca	+10			„ „ 12th.	C	− 2	+27	−12	1900 Jan. 4th.	Ca	+ 6	+19	+ 2
„ August 25th.	S	− 2			„ October 7th.	Ca	− 3	+ 1	+ 7	„ „ 5th.	Sa	−36	−17	+93
					„ „ 22nd.	Ca	+ 7	+ 6	−19	„ „ 11th.	Ca	+ 2	+11	−14
1891 October 27th.	S	+ 7	− 8	− 8	„ „ 27th.	S	+ 7	− 5	+ 6	„ „ 16th.	Ca	+ 6	− 5	− 6
										„ „ 17th.	Ca	+ 2	− 3	− 9
1892 March 16th.	Ca	− 5	+ 6	− 31	1895 January 18th.	S	+13	− 3	− 5	„ „ 20th.	Sa	−10	−16	+ 4
„ April 19th.	C	+ 2	+22	− 28	„ July 8th.	C	− 3	+ 1	+ 1	„ „ **29th.**	**C**	**+ 2**	**+ 4**	**−18**
„ May 12th.	Ca	+ 8	+24	− 12	„ August 9th.	Ca	−23	−11	+30	„ February 7th.	*C	+ 8	− 2	−16
„ October 19th.	Sa	+ 7	−21	− 9	„ Nov. 13th.	S	− 2	−12	−24	„ April 24th.	Ca	− 9	− 9	−20
„ Nov. 4th.	Ma	−27	− 9	+117						„ May 2nd.	Ca	+26	+ 3	− 8
„ „ 27th.	Ca	+ 7	+12	− 24	1896 June 15th.	Ca	−13	−10	+10	„ „ 4th.	Ca	+ 7	+16	+ 7
„ Dec. 9th.	Ca	+10	− 2	− 4	„ „ 29th.	S	+18	+16	− 5	„ „ 11th.	Ca	+ 1	+ 2	− 2
„ „ 20th.	C	+20	+10	− 15	„ August 26th.	Ca	+ 7	− 1	−11	„ June 4th.	C	+ 5	− 9	+ 7
					„ „ 31st.	*C	+ 2	+ 6	− 7	„ July 29th.	C	0	− 4	0
1893 January 28th.	Ca	+ 9	+12	− 4	„ Sept. 6th.	S	− 2	+ 5	− 8	„ „ 31st.	*Ca	+ 4	− 1	−14
„ „ 31st.	C	+ 8	+13	− 21	„ „ 14th.	Ca	+14	+16	−15	„ Sept. 1st.	*C	+ 7	+ 2	− 4
„ February 1st.	Ca	− 5	+17	− 10	„ „ 22nd.	S	+20	− 9	− 4	„ „ 2nd.	C	+ 2	+ 4	− 5
„ „ 6th.	S	+18	−26	− 11	„ Nov. 1st.	C	+15	+12	− 2	„ „ 9th.	C	+ 2	+ 6	+ 2
„ „ 9th.	*C	+ 6	+ 4	− 17						„ „ 17th.	C	+ 5	0	− 3
„ „ 13th.	Ca	+15	+33	+ 40	1897 Jan. 10th.	Ca	0	+12	−19	„ „ 20th.	C	+ 2	+ 4	+ 1
„ „ 16th.	S	− 4	−29	− 19	„ June 12th.	*Ca	+ 8	+16	− 6	„ October 7th.	C	− 2	0	− 7
„ „ 21st.	C	+ 7	0	− 12	„ August 5th.	C	+ 5	+ 3	− 3	„ „ **9th.**	**C**	**− 4**	**− 5**	**− 3**
„ „ 22nd.	C	+ 1	0	− 7	„ Sept. 20th.	C	− 9	+ 1	−22	„ „ **10th.**	**Ca**	**+ 8**	**+ 3**	**−10**
„ March 2nd	C	−10	+10	− 23	„ „ 21st.	*Ca	+ 1	+ 2	+ 3	„ „ **29th.**	**C**	**+ 4**	**− 9**	**− 5**
„ „ 14th.	S	−20	−14	+ 22	„ Dec. 28th.	C	+11	+18	−18	„ Nov. 5th.	C	+ 4	+ 5	+ 2
„ „ 20th.	C	+ 2	+10	− 14	„ „ 29th.	S	−37	−19	+13	„ „ 9th.	C	0	+ 1	− 5
„ „ 23rd.	C	+ 2	+13	− 14						„ „ 11th.	C	− 2	+ 2	− 8
„ April 8th.	S	− 7	− 1	+ 9	1898 Sept. 22nd.	Ca	+12	+23	−20	„ „ 12th.	Ca	− 1	+ 1	+ 7
„ „ 17th.	Ca	+10	− 1	− 1	„ „ **25th.**	**Ca**	**+ 3**	**+ 6**	**−18**	„ „ **16th.**	**C**	**+ 1**	**0**	**−19**
„ „ 23rd.	C	+10	+19	− 7	„ „ 26th.	C	+11	+17	−21	„ „ 24th.	C	− 9	− 2	+11
„ „ 29th.	C	+ 3	− 5	− 30	„ October 11th.	C	+10	+ 8	−19	„ „ 30th.	C	+ 3	+ 2	−10
„ May 2nd.	C	+ 7	+ 8	− 10	„ „ **15th.**	***Ca**	**+10**	**+14**	**+ 8**	„ **Dec. 25th.**	**C**	**−15**	**− 5**	**+ 7**
„ „ 18th.	S	− 6	+ 4	+ 38	„ **Nov. 17th.**	**S**	**−21**	**− 5**	**+39**					
„ „ 19th.	C	− 5	− 1	+ 5	„ Dec. 1st.	C	+20	+ 3	− 5	1901 **Jan. 7th.**	**Ca**	**+ 5**	**− 1**	**− 3**
„ „ 23rd.	C	− 3	+ 9	− 13						„ Feb. 15th.	C	+ 5	+ 5	−14
„ June 3rd.	Ca	0	+23	− 28	1899 March 7th.	Ca	−14	+ 1	0	„ **April 5th.**	**C**	**+ 3**	**+ 3**	**− 2**
„ „ 7th.	C	− 2	−13	− 13	„ June 29th.	Sa	−15	−23	+ 5	„ „ 6th.	C	+ 9	+12	+13
„ „ 11th.	Ca	−14	−26	+ 3	„ **July 9th.**	**C**	**+ 4**	**− 1**	**+ 2**	„ „ **27th.**	**S**	**0**	**+ 4**	**+ 3**
„ „ 13th.	C	+20	+11	− 8	„ „ 12th.	Ca	− 1	− 4	+ 4	„ May 7th.	C	− 2	+ 7	+12
„ „ 14th.	S	+ 2	+13	+ 16	„ „ **14th.**	**C**	**+ 8**	**+ 1**	**− 3**	„ „ 25th.	Ca	+ 2	− 1	− 2
„ July 3rd.	C	+ 7	− 3	− 5	„ „ 15th.	C	+ 7	+ 8	+ 1	„ June 13th.	S	+ 5	+ 8	+ 1
„ „ 5th.	C	+ 9	+13	+ 19	„ „ 16th.	C	+ 1	+ 9	+12	„ „ **24th.**	**C**	**− 2**	**− 1**	**− 5**
„ „ 10th.	C	− 5	+13	+ 5	„ August 4th.	Ca	−14	− 8	− 1	„ August 6th.	C	+12	+ 5	+ 1
„ August 2nd.	Ca	− 6	+17	− 17	„ „ **17th.**	**C**	**− 3**	**− 1**	**−10**	„ „ **9th.**	***C**	**+ 9**	**+ 5**	**− 2**
„ „ 4th.	C	− 4	+28	− 11	„ **Sept. 4th.**	***Ca**	**0**	**0**	**−11**	„ Sept. 7th.	C	− 2	+ 2	−12
„ „ 6th.	Sa	−34	−15	+ 69	„ „ 10th.	Ca	− 8	− 3	+13	„ „ 8th.	C	+ 1	+ 3	−26
„ „ 10th.	Ca	+25	+15	− 16	„ „ 17th.	Ca	− 2	− 4	+ 9	„ „ 10th.	Sa	−22	−10	+44
„ „ 14th.	Ca	+ 2	0	− 15	„ „ **20th.**	**C**	**+ 4**	**0**	**+10**	„ „ 24th.	C	− 5	0	+ 5
					„ „ 23rd.	Ca	− 2	+ 8	− 2	„ „ 30th.	C	+ 1	+ 3	+19
1894 March 22nd.	Sa	−23	−25	− 8	„ „ 29th.	Ca	− 5	−12	+ 3	„ Oct. 8th.	S	−11	− 2	+ 5
„ April 20th.	Ca	+ 9	− 7	− 20	„ Oct. 18th.	Ca	+ 2	− 8	− 6	„ „ 17th.	C	+ 2	0	− 5
„ „ 27th.	C	+ 7	+13	− 3	„ **Nov. 23rd.**	***S**	**0**	**− 9**	**− 8**	„ „ 19th.	C	+ 6	+ 6	+ 1
„ „ 29th.	S	+11	+31	+ 33	„ „ 24th.	Ca	+ 2	− 7	−23	„ Nov. 8th.	Ca	− 2	− 3	− 1

Thick figures denote those disturbances whose amplitudes are 2·0 m. m. or more as registered by the Milne's Seismograph from 1898 to 1905.

Disturbances marked with an asterisk thus : "*" are those during which the magnetograph traces were affected as explained in paragraph 597.

TABLE 590.—*Showing the dates of seismic disturbances, the magnetic character of the day, the departure of the absolute value of H for the day from that of the preceding day and from the mean of the month and the departure of the diurnal range of H from the mean value of the month.*

Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).	Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).	Date of Seismic disturbance (Greenwich day).	Magnetic character of the day (table 381).	Departure of the absolute value of H for the day from that of the preceding day (table 381).	Departure of the absolute value of H for the day from the mean value of the month (table 520).	Departure of the diurnal range of H for the day from its mean monthly value (table 521).
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
		γ	γ	γ			γ	γ	γ			γ	γ	γ
1901 Nov. 15th.	C	− 1	− 3	−10	**1903 Jan. 14th.**	***C**	**+ 1**	**+ 5**	**0**	1904 Aug. 8th & 9th	C	− 1	+ 2	+ 5
„ „ **18th.**	**C**	**+ 4**	**+ 3**	**+ 1**	„ „ 17th.	C	− 2	− 2	− 8	„ „ 18th.	C	− 2	− 4	− 9
„ „ 25th.	Ca	+ 5	+ 8	− 2	„ „ 22nd.	C	+ 5	+ 1	−17	„ „ **24th.**	**C**	**+ 6**	**− 2**	**−26**
„ Dec. 6th.	C	+ 7	− 4	− 1	„ „ 24th.	*Ca	+ 4	+ 1	+ 5	„ „ **27th. & 28th**	**C**	**+ 3**	**+11**	**−21**
„ „ 9th.	S	− 5	+ 2	+18	**„ Febr. 1st.**	**C**	**+10**	**+ 2**	**− 2**					
„ „ **14th.**	**C**	**+ 1**	**+ 5**	**+ 8**	„ „ 2nd.	C	+ 3	+ 5	+ 2	„ „ **30th.**	***S**	**−27**	**−19**	**+24**
„ „ 26th.	C	+ 2	+ 5	− 6	„ „ **5th.**	**C**	**− 2**	**+ 4**	**− 1**	„ Sept. 11th.	Ca	− 3	− 6	+15
„ „ 30th.	Ca	+ 3	−13	− 6	„ „ 6th.	C	− 2	+ 2	−20	„ **Oct. 3rd.**	***C**	**+ 1**	**+ 7**	**0**
„ „ **31st.**	**C**	**+ 3**	**−10**	**−13**	„ „ 11th.	Ca	− 8	−10	− 9	„ „ 8th.	S	+ 4	−19	+10
					„ „ 12th.	S	+13	+ 3	− 1	„ „ 9th.	S	+ 6	−13	−23
1902 January 1st.	C	− 9	− 2	−15	„ „ **27th.**	**C**	**+ 1**	**+ 4**	**+ 4**	„ „ 28th.	Ca	− 5	− 3	+27
„ „ 12th.	C	+ 9	+ 7	−15	„ „ 28th.	C	+ 5	+ 9	+15	„ Nov. 6th.	Ca	+ 8	− 9	−16
„ „ 20th.	C	+ 3	− 1	−10	„ March 22nd.	Ca	+ 2	+ 5	+ 5	„ „ 9th.	C	+ 2	+ 4	− 7
„ „ 24th.	S	− 3	− 1	+43	„ „ 30th.	S	+ 6	− 3	+ 3	„ „ 21st.	C	+ 8	+13	−11
„ „ 29th.	C	− 2	+ 6	+10	„ April 25th.	Ca	+ 8	+19	+14	„ „ 23rd.	C	0	+ 7	−20
„ „ **30th.**	***C**	**+ 2**	**+ 8**	**0**	„ „ **28th.**	**C**	**+ 7**	**+10**	**− 3**	„ Dec. 16th.	S	− 3	− 8	+22
„ „ 31st.	C	0	+ 7	0	„ „ 29th.	C	0	+10	+ 5	„ „ 19th.	S	+ 4	+ 2	+ 2
„ February 9th.	Ca	+ 7	− 6	− 7	„ May 13th.	*C	+ 4	+ 8	0	„ „ 20th.	Ca	− 3	− 1	−16
„ „ 13th.	C	+ 2	+ 4	+ 5	„ „ **17th.**	**Ca**	**− 8**	**+ 2**	**+ 9**					
„ „ 15th.	Ca	+ 2	+ 3	− 3	„ June 2nd.	S	− 3	−13	−12	**1905 Jan. 22nd.**	**S**	**−19**	**−12**	**+63**
„ „ 17th.	C	+ 3	0	− 5	„ „ 8th.	Ca	0	+ 3	−17	„ February 2nd.	S	−12	+ 6	+21
„ „ 24th.	Ca	+ 4	+ 5	+ 6	„ August 11th.	S	−12	+ 3	+16	„ „ 4th.	Sa	+24	−34	− 5
„ March 1st.	Ca	− 3	+ 3	− 5	„ „ 13th.	S	+ 4	+ 4	− 7	„ „ **14th.**	***S**	**− 4**	**− 5**	**− 2**
„ „ 5th.	*C	+ 4	+ 7	−13	„ Sept. 1st.	S	+ 7	+10	+ 4	„ „ **17th.**	**Ca**	**− 1**	**+ 2**	**−35**
„ „ 22nd.	C	− 3	+ 1	+ 2	„ „ 7th.	S	+ 3	+ 8	0	„ „ 19th.	C	+ 5	+ 7	− 8
„ „ 28th.	C	+ 4	0	0	„ „ 8th.	S	− 4	+ 4	+15	„ „ 27th.	Ca	− 9	− 2	− 2
„ April 7th.	C	+ 6	+ 8	− 4	„ „ 25th.	Ca	+11	− 8	− 8	„ Mar. 4th & 5th.	Ca	+15	−29	− 7
„ „ 12th.	C	+32	−19	−13	„ Oct. 2nd.	S	−13	+ 5	− 8					
„ „ 19th.	Ca	+ 2	+ 1	−15	„ „ 10th.	Ca	+ 7	+28	−10	„ „ **19th.**	**Ca**	**− 3**	**+10**	**+12**
„ „ 20th.	Sa	− 4	− 3	+74	„ „ 21st.	C	+ 2	+19	−28	„ „ **22nd.**	**Ca**	**+13**	**+23**	**−15**
„ „ 21st.	S	− 5	− 8	−11	„ „ 23rd.	Ca	+ 2	+10	−30	**„ April 4th.**	***S**	**+ 2**	**−14**	**− 2**
„ May 2nd.	*C	− 6	− 6	−19	„ „ 30th.	S	+ 4	+24	−22	„ „ 7th.	Ca	0	−10	−21
„ „ 8th.	S	+ 3	+ 2	− 6	„ Nov. 10th.	S	−19	− 9	+ 7	„ May 23rd.	Ca	+ 1	+14	+25
„ „ 25th.	C	− 6	+ 4	− 4	„ „ 26th.	Ca	+ 6	+19	−19	„ „ 31st.	Ca	+ 2	− 1	+ 3
„ June 11th.	**Ca**	**− 3**	**+ 7**	**+ 3**	„ Dec. 4th.	S	+ 7	+ 2	+10	„ June 2nd	C	+ 2	+ 5	−15
„ „ **16th.**	***C**	**− 5**	**− 3**	**−12**	„ „ 5th.	S	− 5	− 3	+ 6	„ „ 14th.	C	+ 2	+ 4	−14
„ July 9th.	Ca	0	+ 2	−11	**„ „ 10th.**	***Ca**	**+ 4**	**+11**	**−22**	„ July 2nd.	C	0	+ 3	+ 8
„ August 3rd.	C	+ 3	+ 7	− 1	„ „ 23rd.	C	+ 2	+ 6	−17	**„ „ 6th.**	**S**	**−24**	**−16**	**+43**
„ „ **22nd.**	***S**	**−16**	**−26**	**−12**	„ „ 28th.	Ca	+ 1	+18	−32	**„ „ 9th.**	***S**	**+ 4**	**− 9**	**+ 4**
„ „ **24th.**	**C**	**+ 7**	**− 7**	**+ 2**						**„ „ 11th.**	***C**	**+ 5**	**− 1**	**+ 6**
„ „ **30th.**	**C**	**0**	**+ 3**	**− 8**	1904 January 20th.	C	+ 2	+13	+ 7	„ „ 14th.	Ca	− 2	− 1	+ 3
„ Sept. 20th.	S	− 6	− 7	+19	„ March 19th.	C	+ 2	+10	+ 4	„ „ 16th.	C	+ 6	+13	+18
„ „ **22nd.**	**S**	**+ 6**	**− 2**	**− 1**	**„ „ 31st.**	**S**	**+ 1**	**+ 7**	**+ 5**	**„ „ 23rd.**	***S**	**+18**	**+14**	**− 4**
„ „ **23rd.**	**C**	**− 7**	**+ 9**	**− 4**	**„ April 4th.**	**S**	**+ 8**	**− 5**	**− 7**	„ Sept. 8th.	S	+ 9	+12	− 5
„ Oct. 6th.	*C	+ 3	+ 7	+ 3	**„ „ 5th.**	**C**	**+ 6**	**+ 1**	**−13**	„ „ 14th.	C	+ 4	+14	−17
„ „ 15th.	C	0	+ 2	+ 2	„ „ 9th.	S	+12	+ 5	− 4	**„ „ 15th.**	**C**	**+ 1**	**+15**	**−14**
„ Nov. 4th.	**C**	**+ 3**	**0**	**− 4**	„ „ 12th.	Ca	+ 6	+ 8	−14	**„ „ 26th.**	**S**	**−22**	**−13**	**+ 6**
„ „ 20th.	C	+ 1	+ 9	+ 3	„ „ 24th.	C	− 3	+10	+ 8	„ „ 29th.	C	+ 6	+ 3	+ 7
„ „ 21st.	Ca	− 4	+ 5	− 6	„ May 1st.	Ca	− 3	−11	− 4	„ Oct. 19th.	C	+ 7	+10	− 6
„ Dec. 13th.	***Ca**	**− 4**	**0**	**+19**	„ June 24th.	C	− 3	+ 8	−11	„ „ 21st.	C	−12	+ 3	+ 3
„ „ **16th.**	**C**	**− 1**	**+ 2**	**+11**	**„ „ 25th.**	**C**	**− 1**	**+ 7**	**− 2**	„ „ 22nd.	C	+ 2	+ 5	− 7
„ „ 28th.	C	− 2	− 5	−10	„ „ 26th.	Ca	+10	+17	− 5	„ Nov. 3rd.	Ca	− 5	+29	−18
„ „ 30th.	C	+ 5	+ 1	− 8	**„ „ 27th.**	**S**	**−24**	**− 7**	**+24**	„ „ 8th.	Ca	+ 4	+23	−17
					„ July 18th.	C	+ 4	+ 3	+25	„ „ 9th.	C	+ 4	+27	− 3
1903 January 4th.	S	0	+ 8	+17	„ „ 24th.	C	+ 1	+ 6	−10	„ Dec. 4th.	M	−31	−23	+75
„ „ 5th.	S	−12	− 4	+30	„ „ 27th.	Ca	−15	− 7	− 1	„ „ 10th.	C	− 2	+11	+ 7

Thick figures denote those disturbances whose amplitudes are 2·0 m. m. or more as registered by the Milne's Seismograph from 1898 to 1905.

Disturbances marked with an asterisk thus: "*" are those during which the magnetograph traces were affected as explained in paragraph 597.

TABLE 591.—*Showing the mean diurnal variation of quiet-days which fall concurrent with the incidence of earthquakes for the years 1900 to 1905 and their excesses over the mean diurnal variation of normal quiet-days.*

Unity = 0·1γ = ·000001 C. G. S.

Bombay Civil Time.	Average diurnal inequality of H on days of seismic disturbances which fall on quiet-days, uncorrected for progressive change.						Excess of the diurnal inequality of H in columns 2 to 7 over the average diurnal inequality of the corresponding year given in table 438 corrected for progressive change.						
	1900.	1901.	1902.	1903.	1904.	1905.	1900.	1901.	1902.	1903.	1904.	1905.	Average, 1900 to 1905.
1	2	3	4	5	6	7	8	9	10	11	12	13	14
H. m.													
10 19 ...	+222	+194	+212	+227	+303	+310	−22	−10	− 1	− 10	+42	+26	+ 4
11 19 ...	+227	+213	+241	+261	+318	+354	−39	− 9	− 4	− 6	+18	+23	− 3
12 19 ...	+193	+196	+210	+238	+286	+316	41	+11	− 7	+ 9	+17	+20	+ 1
13 19 ...	+120	+135	+140	+195	+206	+222	−47	+15	−12	+ 22	+17	− 1	− 1
14 19 ...	+ 57	+ 61	+ 64	+122	+108	+114	−27	+ 6	−14	+ 30	+19	−21	− 1
15 19 ...	+ 13	+ 9	+ 7	+ 41	+ 14	+ 29	− 9	+ 8	− 7	+ 23	+ 8	−24	0
16 19 ...	− 23	− 36	− 40	− 18	− 58	− 39	+ 4	+ 8	− 8	+ 19	− 9	−21	− 1
17 19 ...	− 45	− 62	− 52	− 61	− 73	− 68	+ 2	+ 1	+ 5	+ 3	+14	− 7	+ 3
18 19 ...	− 59	− 79	− 59	− 80	− 91	− 86	+18	+ 4	+14	− 5	+ 1	− 2	+ 5
19 19 ...	− 79	− 89	− 74	− 94	−112	−104	+10	− 1	+ 7	− 6	−11	− 5	− 1
20 19 ...	− 80	− 86	− 85	−102	−126	−118	+14	+ 2	+ 1	− 4	−15	− 2	− 1
21 19 ...	− 84	− 88	− 89	−105	−130	−126	+15	0	0	− 6	−14	+ 1	− 1
22 19 ...	− 89	− 81	− 89	−116	−127	−134	+12	+ 4	− 3	− 24	−14	− 3	− 5
23 19 ...	− 75	− 72	− 80	−106	−117	−126	+19	+ 4	+ 2	− 22	−14	+ 2	− 1
0 19 ...	− 71	− 70	− 74	−103	−109	−136	+19	+ 2	+ 3	− 20	−12	−15	− 4
1 19 ...	− 72	− 75	− 72	−104	−105	−131	+17	− 5	+ 6	− 16	−11	−10	− 3
2 19 ...	− 67	− 73	− 72	− 96	−103	−122	+20	− 5	+ 2	− 10	− 8	−12	− 2
3 19 ...	− 67	− 65	− 69	− 88	−110	−121	+24	− 1	+ 6	− 8	−24	−13	− 3
4 19 ...	− 70	− 59	− 67	− 86	−107	−107	+13	0	+ 6	− 10	−21	+ 1	− 2
5 19 ...	− 63	− 61	− 63	− 72	−103	− 98	+15	− 7	+ 6	+ 5	−27	+ 5	0
6 19 ...	− 49	− 43	− 55	− 53	− 84	− 69	+14	− 2	+ 1	+ 15	−21	+20	+ 4
7 19 ...	− 9	− 1	− 22	− 9	− 14	− 21	+ 7	− 1	0	+ 19	+ 4	+15	+ 7
8 19 ...	+ 54	+ 69	+ 47	+ 65	+ 99	+ 71	−10	− 3	+ 2	+ 14	+29	+12	+ 7
9 19 ...	+141	+152	+137	+152	+220	+206	−14	−13	− 5	− 2	+30	+29	+ 4
10 19 ...	+209	+223	+220	+221	+324	+299	−23	− 9	− 1	− 10	+43	+25	+ 4
Average progressive increase per day.	− 13	+ 29	+ 8	− 6	+ 21	− 11							
Total number of quiet-days in the year.	24	26	26	14	14	16							

quiet days as shown in tables 452 and 453 are $+3{\cdot}7\gamma$ for the Astronomer Royal's days and $+3{\cdot}4\gamma$ for the locally selected quiet days. It appears also that the annual values are subject to irregular fluctuations passing from positive to negative results, which are not seen in the above tables. This may partly be due to the uncertainty of the element as a correct indicator of conditions associated with any 24 quiet hours considered; nevertheless the discrepancy is far too pronouncedly marked to be wholly ascribable to this cause. It may be noted in passing that the results when the element is determined by taking the days from 0^h to 0^h are found to be practically the same also.

589. Accepting the average relation referred to in paragraph 586, of the concurrent incidence of the magnetic quiet epoch with seismically disturbed condition, our attention may rightly be directed to the examination of the magnetograms when the quiet day's curves while almost retaining their characteristic smooth sweep also appear to be perturbed by some suspicious movements superposed upon the initial smooth trace such as for example noted in figure 7, plate 108. These movements almost usually associated with quiet conditions occasionally recur and curiously they nearly always retain more or less their distinctive features enabling them to be readily differentiated from other kinds of movements. But they are noted to occur not on earthquake epochs but occasionally on those of another seismic phenomenon.

590. Digressing for a moment, it may be remarked that as far as our present knowledge extends, no direct connection between earthquakes generally and volcanic action can be demonstrated. Over a large portion of the globe large earthquakes are exceedingly rare, most of them being restricted to certain regions only, especially to those which are in the vicinity of volcanic districts. But this is by no means universally true. While volcanoes in active eruption may and do set up typical local earthquakes which usually do not carry very far, the origins of the most of the world-shaking earthquakes have been traced to lie away from active volcanic districts. For example the disasters which have convulsed the northern parts of India on several occasions in the past, occur in regions remote from volcanoes. They belong however to the same class of terrestrial phenomenon as associates in part, both being the results of the steady evolutionary advancement of the earth to the stable form. Not improbably hence much closer connection may exist between the two allied phenomena as suggested by Dr. See* in the two great processes of nature at work, namely mountain building and continent raising, though his extreme conclusions can scarcely be conceded just yet for want of convincing evidence. In view of the resistance offered by the earth to the stresses due to the tides and pole oscillations, and its behaviour during the passage of earthquake waves as shown by the rates of propagation of the waves through the crust and core, the theory of the liquid interior of the earth must needs be finally abandoned. On the other hand however gravitational observations and geological facts incline us to think that somewhere not far beneath the crust separating it from the core, there must exist a layer more or less plastic in nature, not necessarily at the same depth or continuous throughout the crust but occuring in discontinuous local regional, or even more extensively diffused sections or cavities. If volcanoes are regarded as vents in connection with this layer, an intimate connection of some sort with earthquakes, which are presumably also confined to the superficial layer of the crust not deeper than 10 or 15 miles, is obviously probable.

591. Considering that it is not possible under the circumstances above referred to, to detect any marked or typical magnetic movements† in the traces at or about the time of an earthquake except what is suspected in the average curve as shown in paragraph 588, it is interesting to examine the behaviour of the magnetographs on occasions of some of these volcanic disturbances, two at least of which of the most violent intensity occurred during the period considered, and to see if any suggestive movements can be discerned in the traces. The year 1902 was a year of minimum (spot) disturbance and nothing special can be urged in regard to the incidence of the St. Martinique (Mont Pelee) eruption on the 8th May 1902 which happens to fall concurrent with a magnetic quiet epoch as will be presently seen. The second convulsion that of Krakatoa in the Strait of Sunda, which occurred on the 27th August 1883, was incident also about a magnetic calm epoch as we shall presently also have occasion to explain. The year 1883 however was a year of maximum (spot) disturbance, and the probability hence of the occurrence of a seismic disturbance falling concurrent with magnetically quiet days cannot, in the ordinary course of events, be very great during such a year. The concurrent incidence here too however may off hand be regarded as a case of fortuitous coincidence pure and simple. But the magnetograph traces, when examined in detail, curiously show that certain characteristic movements which somehow appear to gather in fairly large numbers about the years 1883 and 1901-1902, are more or less conspicuous by their absence in most of the intermediate years. These considerations hence call for a pause before any hasty generalisation is made either way. What strikes one as a conspicuous feature besides in these movements is that they carry a strong family resemblance to each other though separated in the traces by an interval of some 20 years. It is because these perturbations curiously happen to fall during magnetic

* Proceedings of the American Philosophical Society, Vol. XLV, 1906.

† *See* paragraph 597.

calm epochs and are fortunately thus well exhibited, and because usually too the Colaba curves are almost always otherwise less disturbed than those at stations in higher latitudes, that it becomes possible to discriminate them readily at Colaba from other movements and to discuss them with some confidence. Any direct relation between these movements and volcanic eruptions is of course scarcely admissible; but the examination of the data all the same becomes essential as the incidence of both these phenomena seem to fall concurrent much too often to be ascribed to pure chance, suggesting the influence of some common cause operating on the two phenomena. The peculiarities of the features characteristic of these movements may now be described. The usual quiet-day sweep of the diurnal wave is suddenly perturbed, a dislocation in the curve occurs and abruptly the value of H rises. This strain is steadily maintained for a few or for several hours as the case may be, and nearly always as suddenly as in the commencement, the force drops again to its normal value and the quiet-day's sweep is resumed. Figure 7, plate 108, represents a typical example of this movement. The day being essentially a quiet day it is not difficult, as will be seen, to identify such movements. It will be also observed that the commencement of these perturbations is precisely of the same jerky character which has been noted more or less to obtain in the beginning of all true magnetic disturbances, especially those known as X disturbances, the features of which have been fully discussed in Chapter X. In all these true disturbances however, almost immediately after this abrupt rise the conditions alter, an abrupt fall or a kind of rupture or giving way of the conditions which induce and maintain a high value of H, occurs indicating a steady demagnetisation of the earth. The maximum effect is reached a few hours later and the storm progresses thereafter on its career more or less in the manner shown in figure 1, paragraph 446. In the suspected movements, on the other hand, no reversal of conditions is observed and no appreciably marked demagnetising effects appear to follow. The strain due to the raised value of H, as shown by the abrupt dislocation upwards of the curve, continues to be maintained for several hours, with small minor fluctuations. Thereafter the strain nearly as suddenly disappears and the normal quiet-day sweep is resumed. In plates* 108, 109 110 and 111 some of these typical movements have been collected for reference. The point worthy of note is that during these perturbations the diurnal wave is not in any way seriously affected or accentuated as is invariably the case in the real disturbance discussed in Chapter X, and the curve continues even while this strain is on, to follow unconcerned the usual normal sweep of the diurnal wave. It is an interesting fact to note that the jerky beginning seen in the perturbation of the 8th May 1902 (see figure 11, plate 108) which occurred at $16^h\ 51^m$ B. M. T. (or $12^h\ 0^m$ G. M. T.) as accurately measured from the magnified trace in figure 1, plate 110, coincides in time to within four minutes of the catastrophe at St. Pierre as shown by the time of the clock which had stopped in the convulsion at $7^h\ 52^m$ A.M. on 8th May St. Pierre time or $11^h\ 56^m{\cdot}5$ G. M. T. To this however no importance need be attached in the present discussion which is more concerned with the concurrence of epochs than with that of the instants of occurrence of these actual spasmodically convulsive events. The strain as shown by the curve in figure 11 appears to have lasted from 7 to 8 hours. The preceding day was a quiet-day and the 8th May itself would be classed as a calm day but for this superposed movement.

592. A passing reference may be made here in regard to the blur in the curve of 8th May which is seen in figure 11 about $21^h{\cdot}5$. This when examined in the enlarged trace (see figure 1, plate 110) shows that for some short time, rapid movements of a period of about 2 minutes, affect the traces and cause in them an apparent blur or burr. These movements which usually last for a very short time are suggestive, as curiously similar ones had been previously noted occasionally to appear in the day's curve when earth waves due to some distant quakes passed Bombay. Early in the year 1898 the examination of the magnetograph traces was especially undertaken in connection with these movements,† and their supposed relation to seismic disturbances. We shall refer to this in detail in due course (see paragraph 597).

593. To recur to the suspected movements, that of the 29th-30th May 1902 (see figure 2, plate 109) draws our attention next. It is essentially a quiet-day at Colaba and a movement somewhat similar to that of 8th May though much reduced in amplitude, appears to affect that day's trace between 20^h of the 29th and 4^h of the 30th, B. M. T. The date and hours curiously fall concurrent with the fresh eruption of Mont Pelee, which is reported about the time. To the rapid short period movements (figure 17, plate 110) on the 19th-20th May 1902 we shall refer later. On June 10th-11th 1902 (see figure 3, plate 109, and figure 5, plate 110) is again seen a similar movement, followed by others on 8th-9th July, and 11th-12th July (see figures 9 and 10, plate 111). On August 16th again occurs another (see figure 4, plate 109) which, it will be seen, appears unmistakably to be practically the prototype of the disturbance of the 8th May. Yet another feeble one follows on October 24th (figure 6, plate 109) corresponding to the epoch of the eruption of Santa Maria in Guatemala. A few others occurring at intervals are shown in plates 108, 109

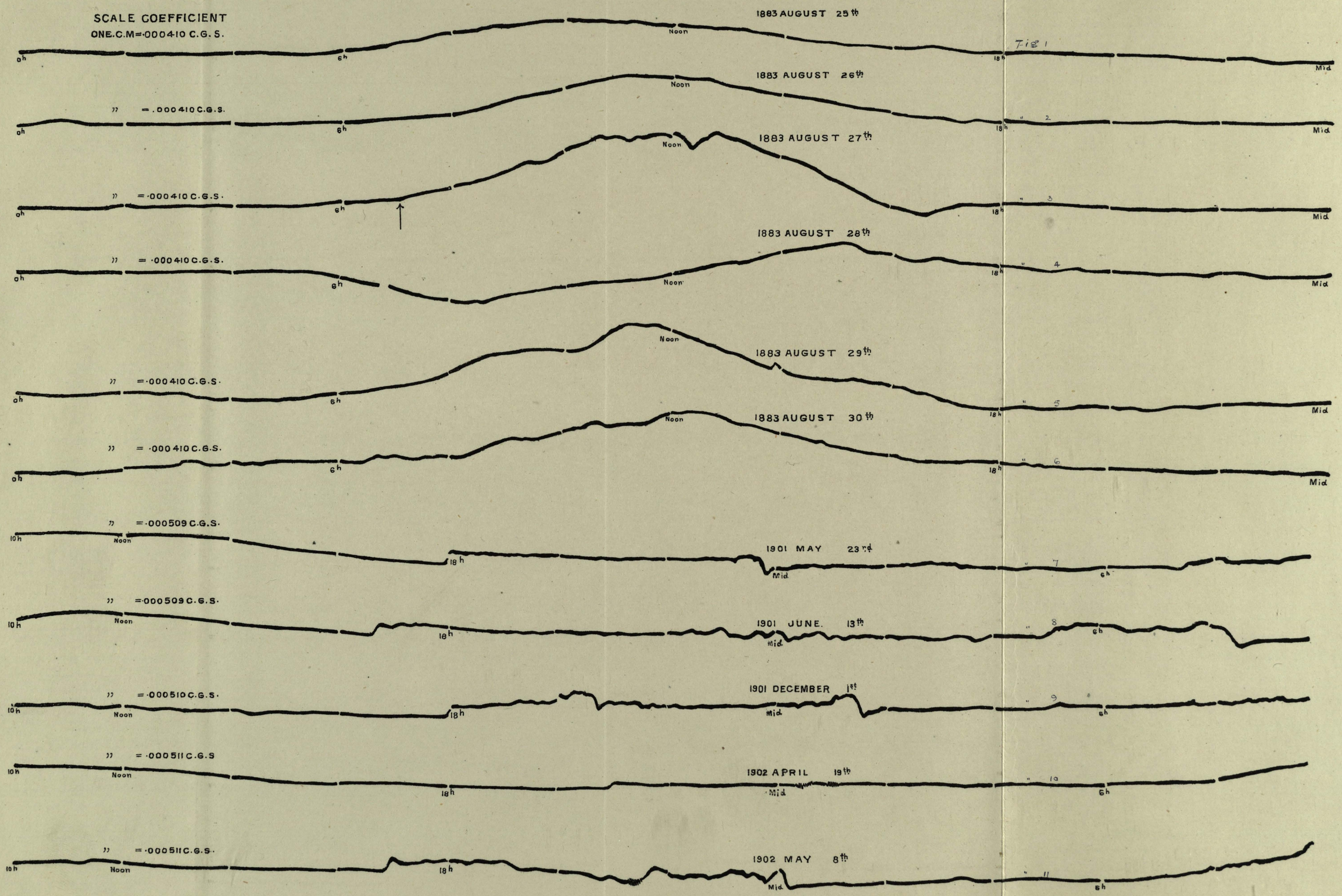
* The drawings in the plates have been made from tracings and the double operation—that at the Observatory and the Photozinco press—has unfortunately resulted in reproducing the pictures not quite so faithfully as they should have been, except in plate 110 which has been wholly reproduced from photo copies.

† Analogous to pulsations of Van Bemmelen.

Colaba Observatory

Magnetograms Showing Typical Movements

Plate 108

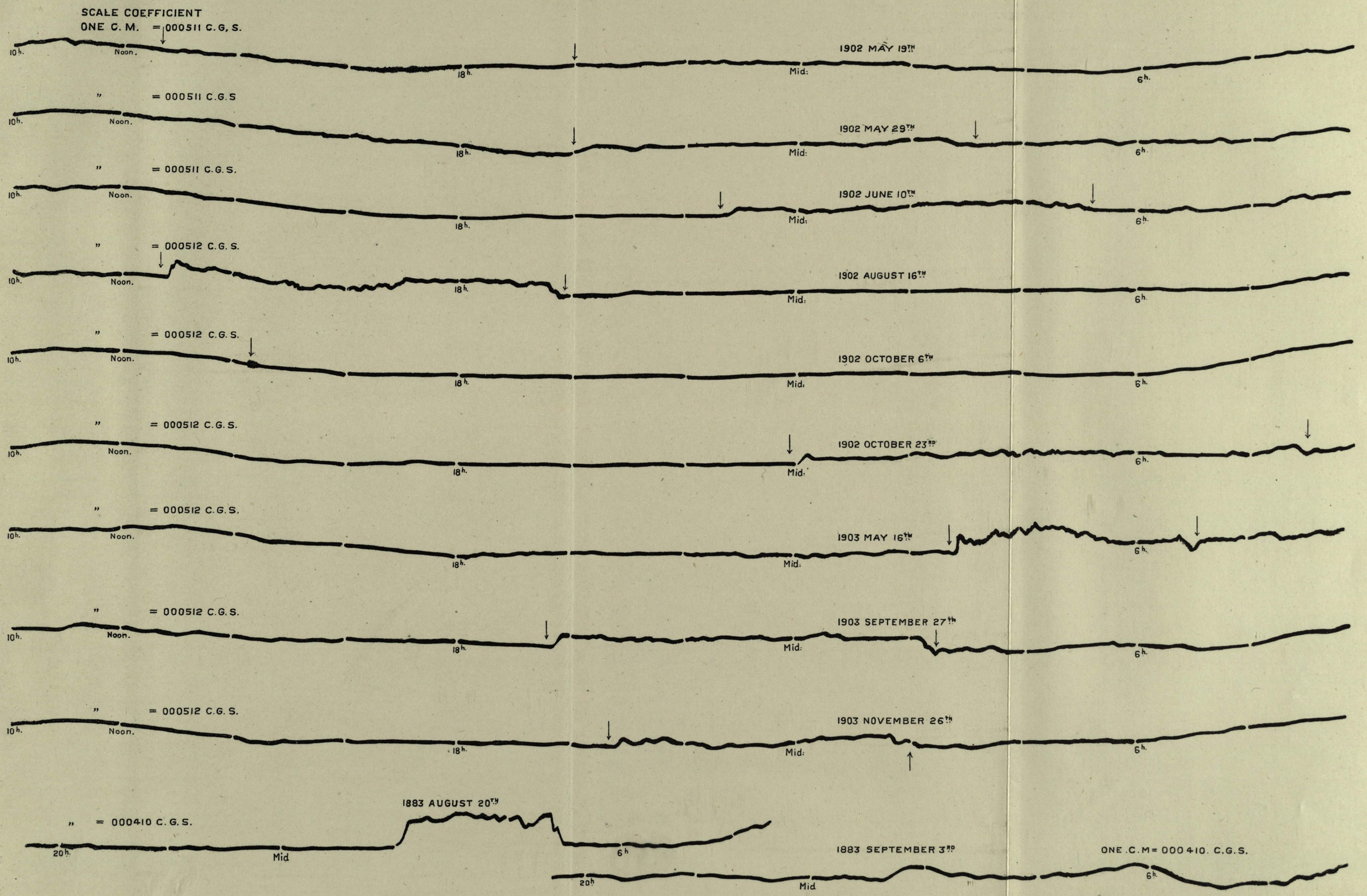


Govt. Photozinco. Office, Poona, 1910.

COLABA OBSERVATORY,

Magnetograms showing Typical Movements.

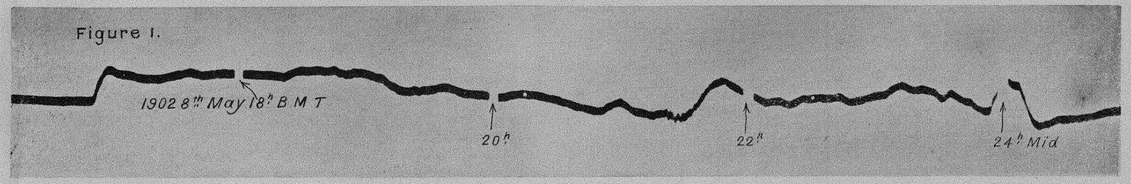
Plate 109.

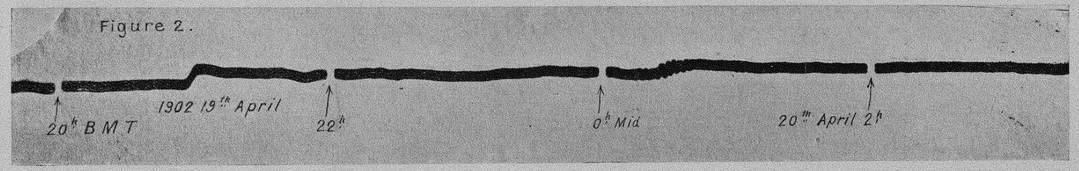


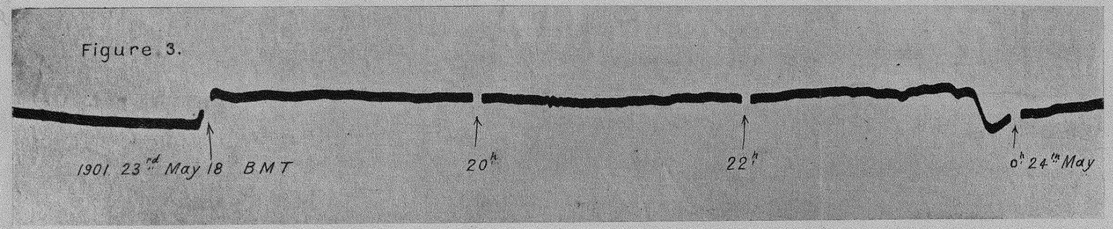
Gov.t Photozinco: Office, Poona, 1910.

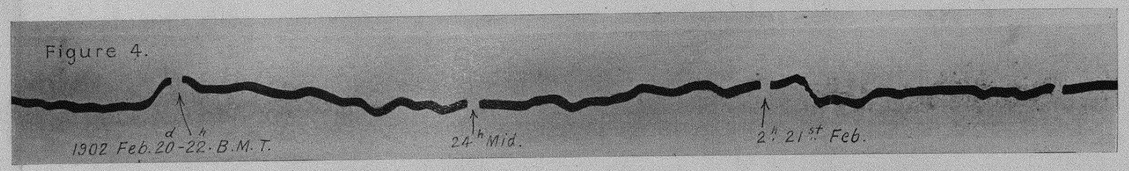
COLABA OBSERVATORY.

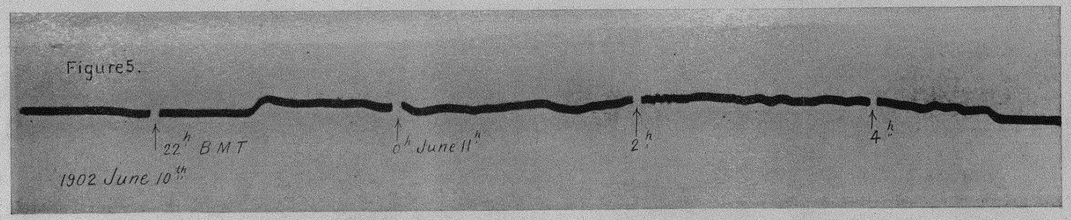
MAGNETOGRAMS SHOWING TYPICAL MOVEMENTS.

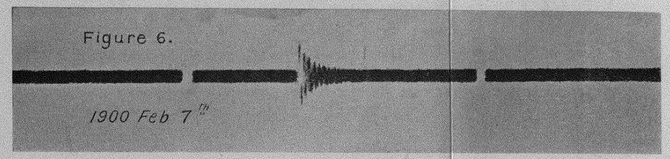


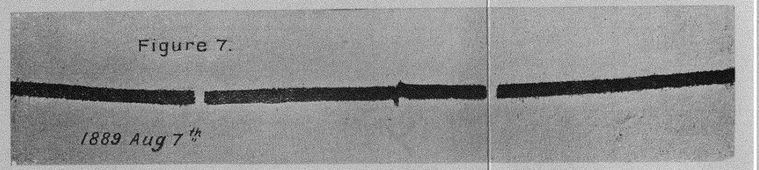


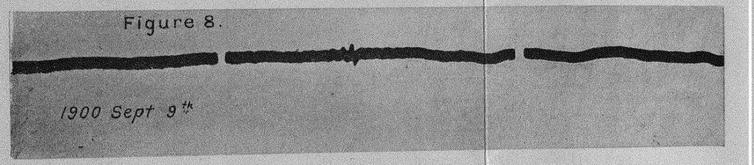


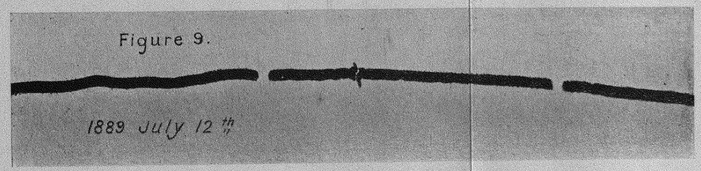


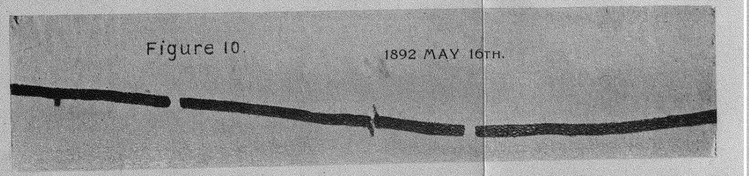


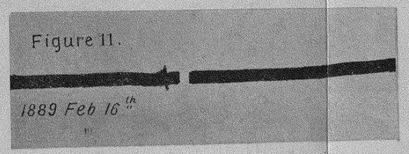


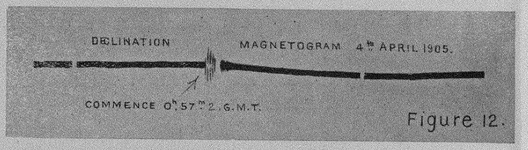


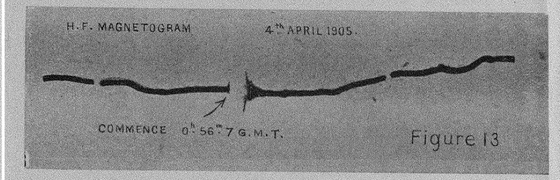


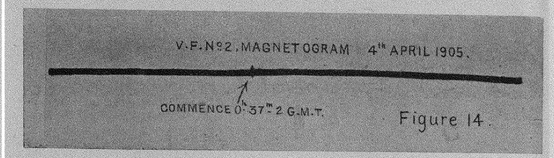


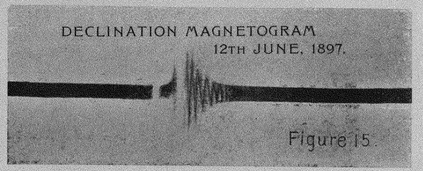


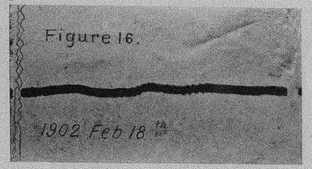












COLABA OBSERVATORY,

Magnetograms showing typical movements during seismic disturbances. Plate III.

Fig. 1. 1872. APRIL 24-25.

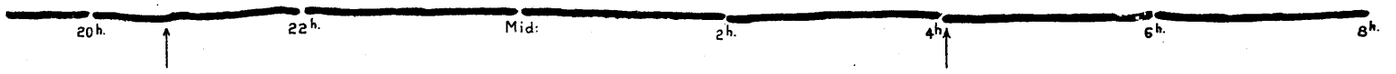


Fig. 2. 1875 MARCH 29-30.

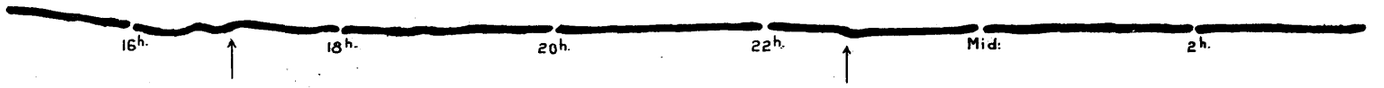


Fig. 3. 1877 JUNE 24-25.

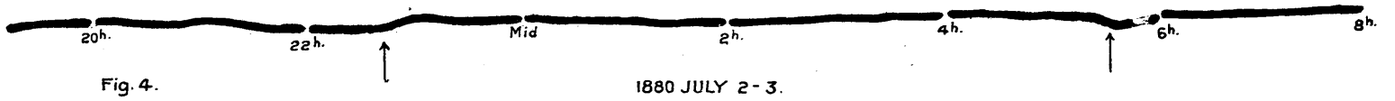


Fig. 4. 1880 JULY 2-3.

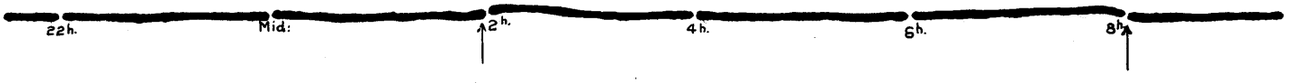


Fig. 5. 1883 JANUARY 15-16.

Fig. 6. 1883 MAY 15-16.

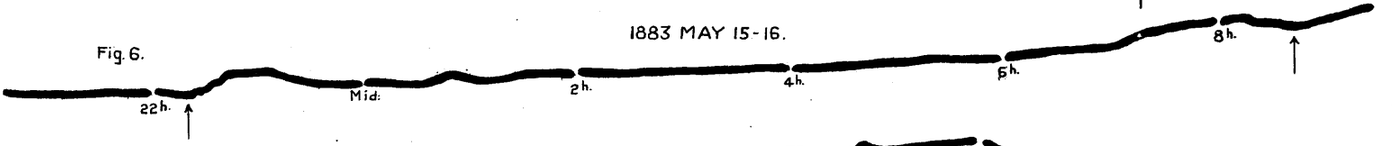


Fig. 7. 1883 JULY 31.-AUGUST 1.

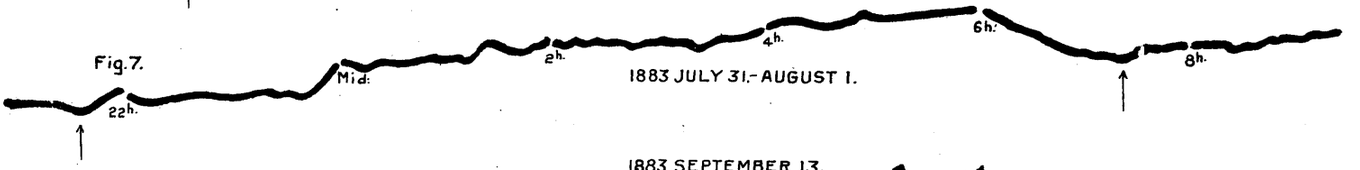


Fig. 8. 1883 SEPTEMBER 13.

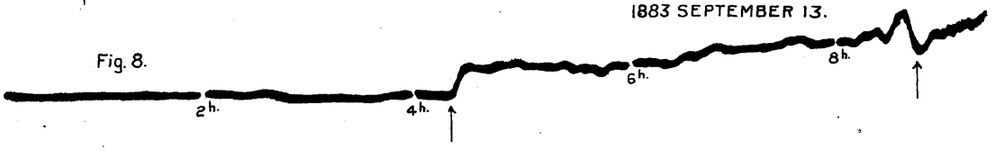


Fig. 9. 1902 JULY 8-9.

Fig. 10. 1902 JULY 11-12.

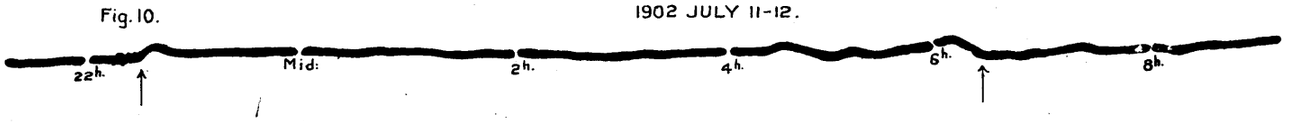
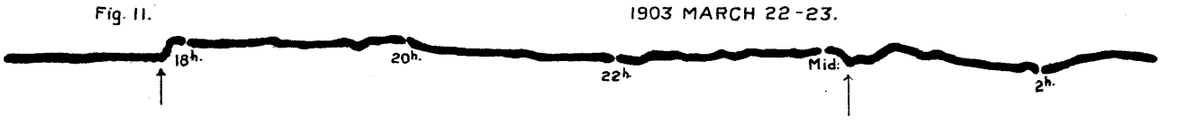


Fig. 11. 1903 MARCH 22-23.



Gov.t Photozinco: Office, Poona, 1910.

and 110. As the magnetic traces of days in the interval do not otherwise show markedly any such characteristic movements, the recurrence of these perturbations on particular days only which correspond to movements in some other phenomenon, cannot but give rise to a strong suspicion that some kind of indirect relation may exist between the two phenomena especially, as we shall presently see, data of other disturbed epochs furnish further evidence in support of this view.

594. On the 23rd May 1901 it has been reported† that the volcano of Keloet in Batavia was suddenly roused into active eruption, causing great loss of life and property. The whole district of Kediri was enveloped for hours in total darkness. If it is a case of coincidence pure and simple, it is a remarkable one, for the Colaba traces (see figure 7, plate 108) do show on that date the same kind of suspicious movement precisely like the one noted on the 8th May 1902, while no such well marked movement can be detected in the previous traces for some years before that date and one is seen to follow not earlier than the 13th June 1901, that is 20 days later. This movement is one of the most typical of all those collected here. The previous day, that is the 22nd May, is a calm day, and the 23rd would also be a calm day but for this dislocation of the curve which maintains for some six hours a fairly constant high value of H. It is to be noted that the usual run of the diurnal pulse is not affected at all that day.

595. Referring to the Krakatoa explosion now, it will be seen that here too the epoch of magnetic calm is concurrent with the event, which is the more striking as the year happens to be one of maximum (spot) disturbance. The 25th and 26th August are both classed as C. The 27th August—the day of the eruption—is classed as Ca while the 28th is classed as S. The character of the curve of this day, though marked as S suggests as will appear from the smooth and otherwise undisturbed sweep of the curve (see figure 4, plate 108) the conditions rather of a quiet-day than of a disturbed one in which the diurnal wave is not only suppressed but inverted. It is the only day in the whole magnetic record of Colaba of 35 years in which this inversion of the diurnal pulse is shown so remarkably clear without being seriously disturbed otherwise by irregular oscillations. There may or may not be any connection between it and the preceding day's disturbance * and it is useless to speculate. The eruption occurred early in the morning coinciding in time to about $7^{h}\cdot8$ A.M. of Colaba time, and as we know that the amplitude of the diurnal wave grows very large during the epoch of maximum (spot) disturbance, it appears that in the general sweep of the rising force in the diurnal pulse, the maximum of which is attained between 11 A.M. and 12 noon, the peculiar feature of the sudden rise in the suspected movement is masked and is not so apparent as in the disturbances of the year 1902. The decreasing movement however, which is markedly shown about 12-15 P.M., may be suspected to indicate the return to normal conditions. In the disturbances of the year 1902 in almost all cases they are incident about the evening or night hours at Colaba, that is during the quiescent state of the daily curve, while the time of the Krakatoa explosion falls about 7 A.M. in the morning. Closer examination of the day's curve however does show (*vide* arrow head, figure 3) that a small but certain inflection in the trace indicating an acceleration in the rise of force can be made out at about $7^{h}\cdot0$ A.M.†† though it is not so pronounced as might be expected. During the same year on the 20th August and later on the 3rd September (see figures 10 and 11, plate 109) however we do find such suspected movements well exhibited because they happen to fall again during the night or early morning hours at Colaba. Early in the year also on the 15th-16th January and later on the 15th-16th May, 26th July and 1st August and 13th September we also find the same kind of movements again incident (see figures 5, 6, 7 and 8, plate 111) which are well pronounced for the same reason.

596. For a few of the other volcanic disturbances which have been definitely recorded and reported, the traces of the magnetograph have been examined also and the suspected causal concurrence noted. For the years 1871 to 1882 unfortunately the Colaba horizontal force magnetograph was not, as we know, adjusted to the same degree of sensitiveness as was the case after 1882. The scale co-efficient in the early period was about four times as large as that of the later period and the examination and identification of the finer movements hence become a difficult task for the earlier record. It will be seen however that though the magnetic curves are reduced in amplitudes to less than a fourth when compared with the movements of the later period which we have just examined, the indications in the earlier record are fairly well marked. Figure 1 in plate 111 shows a portion of the trace of the 24th-25th April 1872 concurrent about the time when Vesuvius was reported‡ to be violently active. Figure 2 represents the chart of the 29th March 1875 when Askja in Iceland was reported similarly to be in active eruption. Figures 3 and 4 show the traces of the 25th June 1877 and the 3rd July 1880 respectively about which time in both cases Kotopaxi in the Ecuadorian Andes was noted¶ to be in violent eruption. Figure 11 shows a portion of the chart of the 22nd-23rd March 1903 about the time when Colima in Mexico was observed§ to be in great activity. Figures

† *Nature*, Vol. LXVI, May 29th, 1902.

* See paragraph 446 in regard to diurnal variation of the second day of large disturbances.

†† This time differs from the time of commencement of the convulsion as made out by Strachey (see report of the Committee of the Royal Society) by about three-fourths of an hour.

‡ Judd's Volcanoes, p. 24. ¶ Bonney's Volcanoes, pp. 43-44. § Geology by Chamberlin and Salisbury, p. 595, Vol. I.

5 to 10 show some of the other well marked suspected movements in the years 1883 and 1902 and 1903 to which reference has already been made. The data with dates, etc., of all such suspected movements from the year 1901 to 1907 are collected for reference in table 592, from which other concurrent cases may be found, as for example that of 5th March 1903 which almost coincides in epoch with the heaviest eruption of Colima reported in *Nature* (Vol. LXVII, March 12th, 1903). As stated above the simultaneous incidence of the two phenonena falls far too frequently together to be ascribed to pure chance, and one is forced to hold his judgment in suspense in regard to the admitted inadmissibility of any intimate connection between the two phenomena.

597. Passing on to the movements referred to in paragraph 592, we have seen that the magnetograph traces are now and again subject to peculiar short-period movements especially noted when the curve is otherwise quiet. Short period movements of course are observed at times of heavy disturbances and these are not referred to here. In the earlier period of the investigation they were noted occasionally as a thickening of the curve, or as a blur or a burr in the fairly quiet trace of the magnetogram indicating a few waves, a wave or two or three of a very short period. Latterly however the numbers of these movements began somehow to increase and about the year 1902 over 200 were recorded and noted. In the earlier years a few only were casually seen to occur here and there in the year. In 1899 the number rose to 20; in 1900, as many as 99, in 1901 157 and in 1902, 201 were noted. These gradually declined and in 1903, 1904 and 1905 the recorded numbers were respectively 142, 45 and 35; and by 1906 the number in the year fell to just a few as before. As they increased in number, they seemed also to be much better defined and prolonged in duration, sometimes lasting for even a few hours (see figures 2, 8, 16 and 17, plate 110).

This fortunately afforded a good opportunity for closer study of the traces which was not possible in the earlier record both because they occurred in very small numbers in the interval of a large number of years, and were also ill-defined. The traces when enlarged show rythmic movements of periods ranging from half a minute to over 3 minutes, the prevailing period however being 2 minutes. These usually last for a short time but occasionally continue for an hour or two. Though some of these curiously happen to fall coincident with the time of passage of earth waves of large distant earthquakes, a very large number of these running into hundreds especially during the period 1900—1904, have been noted when the seismographs show absolutely no disturbance. Whatever hence may be their cause one can entertain little doubt that the origin of these movements must be magnetic. A few of the typical ones have been charted in plate 110. Movements like these have also been noted about the year 1883, but as the photographic traces are old it is difficult to resolve them by magnification. Initially, that is about the year 1898, a small number of these movements such as could be detected, were apparently identified as being associated with seismic disturbances as they left a well marked trail about the time of the passage locally of earth waves due to distant quakes. A careful examination hence of the magnetograms from the year 1898 backwards to 1889 was undertaken and a list of these was prepared. As no earthquake record corresponding to these dates was available Professor Milne was referred to, who very kindly supplied the list from the year 1889. This appears in table 590, while record for subsequent years in the table is taken from the seismograph record itself of this Observatory. The examination of the data* then made favoured the view that these short period disturbances were partly at least due to magnetic causes though at the same time it seemed quite possible that during the passage of earth waves of large seismic disturbances the magnetograph records might be affected by the behaviour of these instruments as seismoscopes. The reasons which led to this view, which is supported, as will be presently seen by the subsequent record, were based on the following facts, namely (1) that movements like these were found occasionally to affect the magnetic traces coincident with the time of passage of the earth waves of large disturbances, but often as not, while smaller disturbances left a clear trace on the mangnetogram relatively larger ones curiously failed to leave a trail; (2) that these movements were noted even when seismic disturbances were not reported or recorded and no other plausible or fortuitous cause such as that of the introduction of a magnetic substance into the magnetograph room, could be assigned; and (3) that even assuming that the origin of the disturbance was mechanical, due to the magnetograph behaving as a seismoscope, it was difficult to conceive how the magnetograph magnet, the period of vibration of which is about 8 seconds, could leave rythmic movements showing a period of 2 minutes and more if mechanically disturbed. As the movements thus were suspected to be due, partly at least, to causes magnetic in origin, it was suggested† that the large earthwaves as they passed Bombay where a strong local (magnetic) factor obtains, may, it is conceivable, set up in some way a disturbance in the highly magnetic magma on which perhaps the indications of the local or regional factor depend, and thus possibly give rise to short period movements noted in the traces. The occurrence, however, of such movements in enormously large numbers about the year 1902, especially on days when all the seismographs at Colaba show a quiescent state seismically, removes at once the doubt about this causal

*See communication of this Observatory in the report of the British Association, 1898. † Observatory Publication, Vol. 35 (1896).

connection with the earthquake waves, and confirms on the other hand the idea of the magnetic origin of the movements. For example the rythmic movements which occur in the traces on 8th May 1902 corresponding to the epoch of the Mont Pelee eruption (see figure 11, plate 108, and figure 1, plate 110) about $21^h{\cdot}4$ B. M. T. or $16^h{\cdot}5$ G. M. T. has no corresponding movement in the seismographs, while an earthquake which was recorded early that day in the morning at 8^h B. M. T. has left no trail on the magnetograph. On the 19th April 1902 the seismographs record two disturbances, one at about $2^h{\cdot}7$ G. M. T. and the other about $11^h{\cdot}1$ G. M. T., the former destroying Quezaltenango in Guatemala. The magnetographs however, remain undisturbed at the time, but curiously most pronounced rythmic movements (*vide* figure 10, plate 108, and figure 2, plate 110) appear in the magnetograph trace about $19^h{\cdot}4$ G. M. T. that day. While a vast number of instances of rythmic movements thus occur and have been noted when absolutely no earthquakes have been recorded, let us examine the opposite cases. In table 590 all earthquakes, the semi-amplitudes of which are more than 2 m.m., have been shewn in thick type. Whenever however during an earthquake, small or large, the magnetographs have been affected, the day is distinguished by an asterisk thus *. It will be seen that out of 25 days so marked 8 fall on days when the amplitudes of the earth movement fall below 2 m.m. and 17 occur when the amplitudes are larger. It will also be seen that these asterisk marks do not occur often on days of large disturbances shown in thick type, such as for example that of 15th September 1905, 25th June 1904, 31st March 1904, 27th February 1903, 5th April 1901, etc., etc. On the other hand the larger disturbances which occurred on the 22nd August 1902, 3rd October 1904, 4th April 1905, 9th and 23rd July 1905 in all of which the traces of Milne's seismograph overlap and thus show heavy type of disturbances the magnetographs have been affected on all occasions. Here we may be inclined strongly to suspect that the movements are due to mechanical causes. But admitting the probability of such action, the registration of the rythmic waves of a period of about 2 minutes as shown in figures 6, 12 and 15, plate 110, by magnets of 8 seconds period disturbed mechanically, must still remain without any plausible explanation, however aptly and readily the blurs like those shown in figure 13, plate 110, indicating rapid oscillations of the magnet in its own period which could leave no trace on the photographic paper, may be ascribed to such mechanical motion of the magnet. From the nature of the movements in the magnetograph traces hence, one is forced to concede that they are induced even on the few occasions on which the seismographs by their overlapping traces show the passage of heavy earth waves, by causes which may after all lie in a magnetic source. The concurrent incidence may either be accidental or causal. If the latter, it is not inconceivable as suggested above and in the publication of the Observatory Volume XXXV (1896), that the passage of large waves of heavy earthquakes may also in some way set up in a place like Bombay, short-period magnetic pulsations similar to those noted in large numbers in the traces of the year 1902; and the failure in cases where the magnetographs do not indicate any such movement, may conceivably also be dependent upon the path taken by the waves beneath the surface as they reach Colaba. The prevalence of these pulsations in large numbers during this magnetic quiet epoch is at any rate undisputable, and if we accept as suggested in paragraph 586 that seismic disturbances generally are also incident in relatively larger numbers during the quiet epochs, some light is thrown on the possible interrelation.

TABLE 592.—*Showing movements in the H. F. Magnetograph traces suspected to be due to Seismic causes.*

Date.	Commencement (B. M. T.).	Duration in hours.	Date.	Commencement (B. M. T.).	Duration in hours.	Date.	Commencement (B. M. T.).	Duration in hours.
1	2	3	1	2	3	1	2	3
1901 January 20 ...	20·0	6	1902 October 11 ...	3·7	5	1905 February 23 ...	0·7	5
,, March 21 ...	17·6	9	,, ,, 24 ...	0·0	9	,, April 1 ...	6·0	3
,, April 11 ...	1·5	6	,, November 6 ...	20·7	3	,, June 3 ...	2·2	6
,, ,, 25 ...	1·0	30	1903 January 2 ...	15·6	11	,, ,, 4 ...	1·2	7
,, May 23 ...	17·9	6	,, ,, 3 ...	21·5	3	,, ,, 21 ...	2·0	3
,, ,, 31 ...	13·3	3	,, ,, 5 ...	21·5	9	,, July 23 ...	13·5	2
,, ,, ,, ...	20·7	5	,, ,, 6 ...	22·8	10	,, August 16 ...	10·8	6
,, June 6 ...	19·9	14	,, ,, 13 ...	22·9	11	,, November 30 ...	23·8	3
,, ,, 13 ...	16·6	15	,, ,, 23 ...	17·8	6	,, December 15 ...	18·9	2
,, July 11 ...	21·6	8	,, ,, 26 ...	13·7	16	,, ,, 16 ...	3·2	2
,, August 7 ...	17·2	7	,, February 12 ...	22·1	6	1906 February 14 ...	20·8	5
,, December 1 ...	17·9	8	,, ,, 15 ...	21·1	...	,, March 4 ...	4·2	4
1902 March 8 ...	21·9	4	,, March 5 ...	2·3	24	,, ,, 12 ...	21·7	6
,, ,, 11 ...	19·8	6	,, ,, 7 ...	10·8	10	,, April 2 ...	21·5	9
,, April 19 ...	20·9	6	,, ,, 22 ...	17·8	12	,, ,, 23 ...	21·0	5
,, May 8 ...	16·9	7	,, ,, 28 ...	0·3	...	,, ,, 28 ...	18·5	20
,, ,, 29 ...	20·1	7	,, ,, 29 ...	5·6	12	,, May 6 ...	22·8	5
,, June 10 ...	22·8	6	,, May 17 ...	2·9	4	,, ,, 7 ...	16·9	12
,, ,, 28 ...	23·2	7	,, August 26 ...	3·8	3	,, ,, 10 ...	21·7	8
,, July 3 ...	23·4	2	,, September 27 ...	19·7	6¾	,, ,, 14 ...	1·6	5
,, ,, 8 ...	19·5	5	1904 April 17 ...	21·2	5	,, June 4 ...	18·6	8
,, ,, 11 ...	22·4	7	,, June 5 ...	3·5	4	,, July 10 ...	6·9	8
,, August 9 ...	12·8	13	,, July 13 ...	20·4	6	,, ,, 30 ...	0·8	14
,, ,, 16 ...	12·8	7	,, December 23 ...	18·6	1½	,, November 10 ...	21·5	7
,, ,, 21 ...	2·0	7	,, ,, 25 ...	18·2	12	,, ,, 25 ...	23·0	6
,, ,, 26 ...	0·3	8	1905 January 4 ...	4·6	4	1907 January 8 ...	21·6	6
,, September 5 ...	0·1	7	,, ,, 14 ...	12·7	3½	,, March 10 ...	10·0	13
,, ,, 17 ...	16·3	13	,, February 11 ...	1·7	3	,, June 4 ...	3·7	13
,, ,, 28 ...	11·0	7	,, ,, 12 ...	21·7	3	,, July 28 ...	5·0	6

CONCLUSION.

598. The various points of importance dealt with in the discussion, which lie scattered over some 782 pages of text and tables in the volume, may with advantage have been shortly summarised here ; but to avoid any unnecessary repetition, the table of contents instead has been specially amplified and made to contain the précis of all essential points discussed in each paragraph. This, it is hoped, will be found sufficient for the requirements.

599. The labours of Gauss and recently of Schuster, Schmidt, Bauer and Bezold, have shown how the earth's magnetic field may in the main be considered adequately grouped into three separate divisions, *viz.*, (1) the bulk of the phenomenon which may be referred to causes that lie within the earth itself, and having a potential; (2) a small portion forming a system of convective earth-air electric currents having no potential indications, the field of which lies partly above and partly below the earth ; and (3) a small magnetic system—about 1/40 of the whole phenomenon—having a potential, the source of which must be looked for not within but almost wholly outside the earth.*

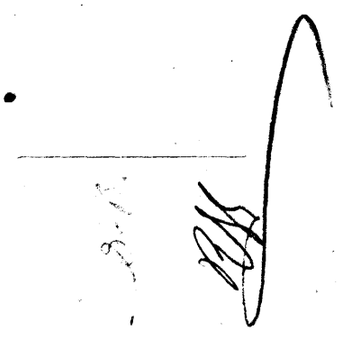
Thus the effective region in which the various forces of nature, initial and secondary, play their part by action and interaction eventually determining the complex phenomenon of terrestrial magnetism, lies both within and without the earth and is thus not only extensively wide but extremely and radically different in character. Within the earth we have the (*a*) outer crust which according to Wiechert, is some 1,500 kilometers in depth forming the rocky mantle, has a density of about 3·4, and which we are apt to regard on the whole as non-magnetic but which is partly at least magnetic, and of no little importance to the phenomenon generally of terrestrial magnetism, enveloping (*b*) the solid metal core a little more dense than the hardest steel, with a density of about 8, which thus must presumably consist of some material in the main like iron. Both these contribute in their way to the bulk of the magnetic phenomenon constituting the major system or field of both symmetrical and asymmetrical distribution of forces. The abrupt dislocation of conditions at the depth of some 1,500 kilometers as indicated by the sudden change in the rate of propagation of the seismic waves (precursors) from 7 to 13 kilometers per second, must sharply differentiate the conductivity which would have a bearing of no little import on all induced phenomena within the earth caused by a change of potential due to electric currents outside the earth. And these effects moreover would not be a little complicated by the activity of the upper layers of the crust of our earth some 30 miles in depth, which according to Strutt, carry all the radio-active substances in the globe, and would thus be probably differentiated from that of the deeper layers, by the varying emission of these radiations into the atmosphere above, under the influence of tidal and other forces (*vide* paragraph 527). It is not improbable that the heavy disturbances noted in the normal distribution of earth currents in the crust itself on occasions of some heavy magnetic disturbances, may possibly also be due in some way to this activity of the upper layers.

Outside the earth extending over to some six miles above, we have first the region of active convection, which embraces nearly three-fourths of the whole atmosphere, in which in all probability nearly all the active portions of the meteorological elements in the main, have their seat. Over this extends from about 8 to 18 miles above, the stratosphere with its isothermal layer. What part this zone plays in the economy of nature, it is difficult to say. If it be really existent, whatever the source of its energy, it is clear that the conditions thus determined help to make the equilibrium unstable. If, as suggested by Schuster, the source of the energy which keeps up the vertical isothermacy, may lie in the electrical forces circulating in the upper regions, the layer would in all probability be increased considerably in depth during the maximum spot epoch and reduced during the minimum. We have seen that the commencement of all characteristic heavy magnetic disturbances is indicated at first, possibly as an induced effect, by a rapid rise of force. When the limiting condition is reached, a rupture occurs and rapid demagnetisation follows. This, it is conceivable, may in part at least be possibly dependent upon the behaviour of this layer under the disturbing forces.

The extension of the atmosphere sufficiently tenuous still further—to about 50 miles—is of course shown by the twilight effects and by the noctilucent clouds formed by ejected volcanic dust observed occasionally during violent eruptions. Above this the atmosphere still further extends, but now in a highly attennuated form, the physical properties of which differ perhaps more widely in character from the lower layers nearer to the surface of the earth, than do those of the upper

* The issue in regard to the question of the seat of forces which control the diurnal variations must in the main be decided by the behaviour of the vertical component. Schuster's investigations on the question are based on data of disturbed years of four stations including those at Colaba. If as we have seen in the Colaba data, the vertical force variations, unlike those of H, are not at all accentuated in amplitude during disturbances (see Chapter X, plate 73) and if this holds good for all stations the results can scarcely be affected in the main issue by the adoption of data of other quieter years. It may however be desirable to have fresh calculations made from reliable data of six to eight stations well distributed over the globe.

layers of the solid crust of the earth from those of the metal core. The trail of the meteor indicates its existence high up from about 40 to 95 miles, while the auroral discharges and kindred phenomena with their two marked zones of maximum frequency at about 40 miles and 125 miles above, show the zones or seats of disturbance where the electrical and magnetical forces are chiefly effective. If, as suggested by Schuster and others, that for the same ionisation, the conductive power of air at high altitudes under the condition of diminished pressure, does become enormously greater than that of air near the surface of the earth, this condition in itself possibly constitutes that highly sensitive and somewhat unstable condition of the atmosphere which by the interference of the most tiny of forces from without may, triggerlike, set up violent changes locally in the critically balanced system of electrical forces in the upper regions of our atmosphere. The rotation of the earth on its axis carrying the atmosphere with it but resulting as it must in the slow rotation of the outermost shell of the air with its different conductivity, in relation to the lower layers nearer the surface, and the general drift from west to east of the atmosphere in relation to the interplanetary space with its presumably varying conductivity, might be regarded tentatively as sufficient in themselves to account for the system of electrical forces in the upper regions of the atmosphere with their concomitant induced effects within the earth If this be conceded, it is also conceivable that the earth with its 30 miles of the rock crust laden with radioactive substances which have been suspected to radiate their emanations both periodically and irregularly, may contribute by the ionisation of the lower regions at least of the atmosphere, however small in magnitude be the effect, to the restoration in part at least of the equilibrium disturbed by the initial exciting cause from without. In what exact relation do ionising effects from without and within stand to meteorological conditions, especially those of evaporation at ordinary temperatures (see paragraph 582), and in what manner or way they interact, are beyond our ken for the present. The little we know is not much or definite, and until these important links connecting the meteorological with the electrical phenomenon are forthcoming, the difficulties in the elucidation of the great problem of terrestrial magnetism must continue to remain insuperable as heretofore.

600. In conclusion a few words by way of explanation and apology become necessary in regard to the unavoidable delay that has occurred in the printing and publication of this volume which, as it was sent to the press in October 1908, should in the ordinary course have been completed and issued before the end of the year 1909 at latest. Owing to reasons however over which this Observatory had no control, and which in any case were unavoidable, the printing could not be completed before October 1910.

It remains now to place on record my acknowledgment of the valuable assistance given to me generally in the preparation and publication of this volume, by my first assistant Mr. Mukundrai Virshanker Unaker and second assistant Mr. Waman Vinayak Nene, to both of whom I am indebted for unremitting attention and most useful help willingly rendered often even at the sacrifice of the few hours of leisure which their official duties leave them during the day.